Identifying Promising Policies and Practices for Promoting Gender Equity in Global Green Employment

AUTHOR DETAILS:

1) **Bipasha Baruah, Ph.D**

Professor and Canada Research Chair in Global Women's Issues

Department of Women's Studies and Feminist Research

Lawson Hall Room 3244

Western University

1151 Richmond Street

London, Ontario

Canada N6A 5B8

Tel: (519) 661-2111 (extn. 86316)

E-mail: bbaruah@uwo.ca

2) **Sandra Biskupski-Mujanovic**

PhD Student, Women's Studies and Feminist Research, Western University

TABLE OF CONTENTS

KEY FINDINGS: Concerns about climate change and fossil fuel insecurity have ensured that there is significant interest in Canada in the technologies and financing for transitioning to a green economy, but far too little attention is being paid to the employment equity implications of such a transition. In Canada, women make up only 23 percent of those employed in transportation, 12 percent in construction, and 28 percent in manufacturing. This report synthesizes existing scientific and practitioner literature on promising programs and policies for optimizing women's employment in three sectors that are critical for the global green economy, and in which women are currently severely underrepresented, namely, construction, transportation and manufacturing. Our findings revealed that although there are promising Canadian and international examples of programs and practices that attempt to optimize women's employment in these fields, the gender disparities and hierarchies remain persistent and entrenched. Governments, civil society organizations and private corporations have attempted to remedy some of the inequities and barriers women face through legislation and policy, but such interventions have been largely unable to subvert the broader social structures that create the inequities in the first place. Most policies designed to address women's underrepresentation in these fields tend to be reactive responses that do not engage adequately with broader societal structures and institutions that produce and maintain inequality. Improving lighting in construction sites in order to prevent sexual assaults against women and requiring women to work in pairs instead of alone are classic examples of reactive interventions that end up reinforcing social hierarchies rather than challenging them. Our findings suggest that although the formal realms of law and policy can and does play a significant role in optimizing women's employment and retention in the labour force, legislation and policy cannot be the sole vehicles for social change since their ability to transform entrenched gender roles, social hierarchies and entitlements is quite limited. Raising broader societal awareness about the benefits of gender equity, and about women's equal entitlement to employment in all fields, is as crucial as state or corporate policies that seek to protect women's interests and facilitate their agency.

While acknowledging that policy alone cannot alter social hierarchies, our findings highlight the need for targeted measures, monitoring and enforcement to improve women's access to and retention in green jobs. We found that it was critical to address inequities in existing "brown" industries rather than just focusing on building equity in green industries. Considering that much of the workforce in low-carbon construction, manufacturing and transportation will come from the fossil-fuel dependent versions of these sectors, we must start planning for equity in the traditional sectors if we expect to see any changes in the green economy. Although many employers in these three sectors are paying lip service to the value of having a diverse workforce, most attempts at diversifying the workforce are tokenistic. We found that employers in these industries will often attempt to meet diversity requirements, especially if government contracts and procurement policies require that they do, but they may just as easily let the workers hired to meet the diversity requirement go as soon as the requirement has been met and the contract has been secured. We found this practice, called "checkerboarding," to be common in transportation and construction. Stronger enforcement and longer-term monitoring of employment trends is necessary to eliminate such practices. Another key finding of this research is the importance of paid apprenticeships in enabling women and other marginalized workers access employment in these three sectors. We found that women may more easily access education and employment in these sectors because of the existence of affirmative action policies but the processes for seeking apprenticeships, which is often a requirement before a worker can secure full-time employment, remain largely informal and unregulated. Female workers refer (not facetiously) to their inability to access FBI apprenticeship networks (friends, brothers and in-laws) as a major impediment in gaining full-time employment in the trades. The fact that many apprenticeships are either unpaid or pay a nominal stipend is also a major barrier for many workers. Having the opportunity to learn a trade while supporting a family is crucial in breaking down barriers many poorly represented groups, including women, face in accessing skilled employment in the trades. The need for policies aimed at enabling fair and equitable access to paid apprenticeships is urgent and critical for promoting equity in these sectors.

EXECUTIVE SUMMARY

Countries around the world are figuring out ways to make their economies less carbon-intensive by creating new green jobs, developing less polluting technologies, and by retrofitting existing sectors. A gendered analysis of such green growth and development strategies reveals two blind spots. First, women are known to have weaker access to new technologies almost everywhere in the world so there are likely to be unequal access issues inherent in the transition to low-carbon economies. Second, it is well-established not only that 70% of the world's poorest 1.3 billion people are women and children but also that women are already very poorly represented globally in some of the sectors that are critical to the green economy. For example, women account for 9% of the global workforce in construction, 12% in engineering and 24% in manufacturing. In the absence of appropriately targeted training, education, apprenticeships, employment placement, financial tools and supportive social policies, transitioning to a green economy may exacerbate existing gender inequities and hinder poverty alleviation goals. This report synthesizes existing scientific and practitioner literature on promising programs and policies for promoting and optimizing women's employment in three sectors that are critical for the Canadian and global green economy and in which women are currently severely underrepresented, namely, manufacturing, construction and transportation.

To enable the transition to a gender-sensitive global green economy, we must (a) understand the opportunities and constraints women face in accessing green technologies and jobs and (b) document and analyze grounded examples from around the world of making green technologies, education, training, financing and employment accessible for women. Most green initiatives in Canada have been driven by the private sector, municipalities and provincial governments. The federal government has, at least until very recently, not played an active role in framing and implementing effective policies to enable the transition to a low-carbon economy. Despite growing evidence of the potential for the green economy to generate a larger volume of employment than the "brown" (fossil-fuel based) economy, even organizations committed to advocating for equity and social justice in environmental sustainability in Canada have never specifically mentioned or addressed gender inequity.

Most future green job creation in Canada will be in occupations in which women are currently underrepresented, such as engineering and the skilled trades. A Statistics Canada study found that in 2007 women only accounted for 1- 2% of completions in apprenticeship training in major trade groups. Another report published by Statistics Canada shows that in 2011, women comprised just 23% of engineering graduates aged 25-34. Since workers are likely to transition from jobs in the "brown" economy (which is heavily male dominated) to the "green," it is a self-fulfilling prophecy that women will also be underrepresented in green jobs unless gender equity in employment is planned and implemented proactively. Recent media reports confirm this trend, indicating, for example, that laid-off oil and gas workers in Alberta are beginning to find employment in the clean energy sector.

The conversation about gender equity or social justice (more broadly) in Canada's green economy is at best incipient and tokenistic. Raising awareness is therefore urgent and critical. Previous research on this topic has revealed that grounded interventions to promote gender equity in green employment are more prevalent and better established in other OECD countries and certain emerging economies (China, Brazil and India, for example) than they are in Canada. The European Union, for example, has made tremendous strides in simultaneously expanding urban public transportation systems and strengthening women's employment in the sector (see, for example, Project WISE). Other OECD countries such as Sweden and the Netherlands are using new and existing public policy tools to expand social protection schemes, introduce or expand flex-time, part-time and job-sharing arrangements in order to reconcile economic security with gender equality and environmental protection. Canada will benefit tremendously from learning more about such interventions and identifying policies and practices that may also be implementable here. Of course, since women's ability to take advantage of new employment options is, to begin with, often constrained by social

barriers that limit their access to education and training, employment, childcare, credit and property rights, to name just a few constraints, it is crucial social policies go well beyond the green economy to optimize economic opportunities for women.

It is estimated that 200,000 new jobs will be created in the Canadian construction industry over the next decade but women only account for 4 percent of new registrants in the construction trades. There is also presently an estimated shortfall of 20,000 employees in manufacturing that could be filled more easily if women were part of the manufacturing workforce in larger numbers. The International Labour Foundation for Sustainable Development reports that retrofitting and upgrading residential buildings will make up a third of projected green jobs. This sector includes solar heating and cooling, thermal insulation, energy efficient window installation, and lighting and air conditioning upgrading to energy efficient standards. Further, transportation is expected to contribute substantially to green growth through fuel-efficient vehicles, new infrastructure and public transport. In manufacturing, new jobs will be linked to the use of clean processing techniques and pollution control equipment.

The literature points to four overarching barriers that exist for women who seek to enter and remain in these fields: lack of information and awareness about employment in these sectors, gender bias and gender stereotyping, masculinist work culture and working conditions, and violence against women. Our findings revealed that although there are promising Canadian and international examples of programs and practices that attempt to optimize women's employment in these fields, the gender disparities and hierarchies remain persistent and entrenched. Governments, civil society organizations and private corporations have attempted to remedy some of the inequities and barriers women face through legislation and policy, but such interventions have been largely unable to subvert the broader social structures that create the inequities in the first place. Most policies designed to address women's underrepresentation in these fields tend to be reactive responses that do not engage adequately with broader societal structures and institutions that produce and maintain inequality. Improving lighting in construction sites in order to prevent sexual assaults against women and requiring women to work in pairs instead of alone are classic examples of reactive policies that end up reinforcing social hierarchies rather than challenging them. We found that the most common response to women's underrepresentation in these fields has been to 'add women and stir,' simply adding women to industries with unchanged masculinist values and work cultures. Policy responses also often reinforce affirmative gender essentialisms. Women are valorized in essentialist ways that also reinforce existing social hierarchies. Assumptions that women are gentler with machinery than men and therefore maintain machinery better, or that women bring specific valuable qualities and skills to the job (empathy, patience, for example) simply by being women end up reinforcing social hierarchies since most women acquire these skills because of historical and current social oppression, and not because they are biologically female. Our broader findings suggest that although the formal realms of law and policy can and does play a significant role in optimizing women's employment and retention in the labour force, legislation and policy cannot be the sole vehicles for social change since their ability to transform entrenched gender roles, social hierarchies and entitlements is rather limited. Raising broader societal awareness about the benefits of gender equity, and about women's equal entitlement to employment in all fields, is as crucial as policy reforms and state or corporate actions that protect women's interests and facilitate their agency.

While acknowledging that policy alone cannot alter social hierarchies and structures, our findings highlight the need for targeted measures, monitoring and enforcement to improve women's access to and retention in the growing green economy. We found that it is critical to address inequities in existing "brown" industries rather than just focusing on building equity into green industries. Considering that much of the workforce in low-carbon construction, manufacturing and transportation will come from the fossil-fuel dependent versions of these sectors, we must start planning for equity in the traditional sectors if we expect to see any changes in the green economy. Although many employers in these three sectors are paying lip service to the value of having a diverse workforce, most attempts at diversifying the workforce are

tokenistic. We found that employers in these industries will often attempt to meet diversity requirements, especially if government contracts and procurement policies require that they do, but they may just as easily let the workers hired to meet the diversity requirement go as soon as the requirement has been met and the contract has been secured. We found this practice, called "checkerboarding," to be common in transportation and construction. Stronger enforcement and longer-term monitoring of employment trends is necessary to eliminate such practices. Another key finding of this research is the importance of paid apprenticeships in enabling women and other marginalized workers access employment in these three sectors. We found that women may more easily be able to access education and employment in these sectors because of the existence of equity legislation and affirmative action policies but the processes for seeking apprenticeships, which is often a requirement before a worker can secure full-time employment, remain largely informal and unregulated. Female workers refer (not facetiously) to their inability to access FBI apprenticeship networks (friends, brothers and in-laws) as a major impediment in gaining full-time employment in the trades. The fact that many apprenticeships are either unpaid or pay a nominal stipend is also a major barrier for many workers. Having the opportunity to learn a trade while supporting a family is crucial in breaking down barriers many poorly represented groups, including women, face in accessing skilled employment in the trades. The need for policies aimed at enabling fair and equitable access to paid apprenticeships is urgent and critical for promoting equity in these sectors.

Since women are already underrepresented and marginalized in key sectors of the green economy, growth in these sectors may further exclude women if proactive measures are not adopted. Given women's current patterns of participation in jobs and training in the trades, almost none of the green jobs we expect to be created, would go to women. This highlights the dire need for equity programs and quotas that are monitored and enforced. Canada needs all stakeholders, including government, civil society organizations, corporations, trade unions, labour associations, public policy institutes and think-tanks, to work together to ensure that women are not further marginalized as more green jobs are created in transportation, construction and manufacturing. The International Labour Foundation for Sustainable Development highlights specific stakeholder action required to optimize women's employment in green jobs. They propose a series of recommendations including anti-discrimination laws and family-friendly mandates, recruitment for non-traditional jobs through quotas, measures to promote equity in access to apprenticeships, reduction of gender-based wage gaps, and increase in union membership of women in green sectors.

Our review of the scholarly and practitioner literature revealed other common findings about what is needed to address women's marginalization and underrepresentation in these key sectors: safety from violence; networking and mentorship opportunities; awards and bursaries; more training in STEM fields; and equity in access to recruitment, apprenticeship and training programs. The Pink to Green toolkit produced by Wider Opportunities for Women (WOW), a leading institution in the United States in advocating for gender equity, is a useful resource for employers and workers wishing to promote gender equity in the green economy. An interesting example of a Canadian program that encourages women's employment in transportation is in Newfoundland, where the Office to Advance Women Apprentices offers a wage subsidy of up to 75 percent for two contracts as an incentive for employers to hire female apprentices. There is no data available on what happens to these women's careers once the subsidy runs out. The Vancouver Island Highway Project and Women Building Futures are other Canadian examples of innovative strategies to increase women's participation in non-traditional trades and occupations. Again, we know very little about the long-terms outcomes and sustainability of such initiatives. Primary research aimed at understanding such programs in more depth and detail - to evaluate them for their effectiveness in promoting employment equity, and to understand their potential for replication in Canada and other parts of the world - is a logical next step for this research.

INTRODUCTION

Countries around the world are figuring out ways to make their economies less carbon-intensive by creating new green jobs, developing less polluting technologies, and by retrofitting existing sectors such as forestry, agriculture, tourism, manufacturing, water and waste management, construction, transportation and energy production (ILO, 2011). A gendered analysis of such green growth and development strategies reveals two blind spots. First, women are known to have weaker access to new technologies almost everywhere in the world (Hafkin and Huyer, 2006) so there are likely to be unequal access issues inherent in the transition to low-carbon economies. Second, it is well-established not only that 70% of the world's poorest 1.3 billion people are women and children but also that women are already very poorly represented globally in some of the sectors that are critical to the green economy (UN Women, 2012). For example, women account for 9% of the global workforce in construction, 12% in engineering and 24% in manufacturing (ibid). In the absence of appropriately targeted training, education, apprenticeships, employment placement, financial tools and supportive social policies, transitioning to a green economy may exacerbate existing gender inequities and hinder poverty alleviation goals. In this report, we present findings from our synthesis of existing scientific and practitioner literature on promising programs and policies for promoting and optimizing women's employment in 3 sectors that are critical for the Canadian and global green economy and in which women are currently severely underrepresented, namely, manufacturing, construction and transportation. We exclude energy production - a sector which is both critical for the green economy and in which women are also extremely marginalized - from this report because a previous successful SSHRC Knowledge Synthesis Grant on Energy and Natural Resources (awarded in November 2015) enabled us to study promising economic programs, financial instruments and public policies for optimizing the employment of women and other marginalized groups (ethnic minorities, indigenous peoples, migrants, for example) in both the Canadian and global renewable energy sector, see findings (Baruah and Gaudet, 2016) at: http://www.ideas-idees.ca/sites/default/files/sites/default/uploads/general/2016/2016-sshrc_ksg-baruah_bipasha.pdf

CONTEXT

Women's participation in the formal labor market has always been determined by a combination of social norms, cultural attitudes, societal values and economic necessity. In many parts of the world, women's roles and responsibilities were traditionally geared toward household duties and unpaid labor. At the same time, gender roles tend to be malleable, and social norms are changing worldwide. Women are economically active even when confined to the private sphere or the informal sector, but they are also participating out of choice and necessity in the formal labor force in unprecedented numbers (Runyan and Peterson, 2013).

The current global labour force participation rate for women sits at 49 percent, which is nearly 27 percentage points lower than the rate for men - with no improvements anticipated in 2018 (ILO, 2017). In Canada, women comprise only 23 percent of those employed in transportation and warehousing, 12 percent in construction and 28 percent in manufacturing (Statistics Canada, 2016). Unfortunately, this data is not disaggregated further to provide specific information on the types of positions women hold (administrative, technical, professional, managerial, for example) in these sectors. Writing about why efforts made to include women in the green construction sector have not had impressive results, Afolabi et al. (2017) emphasize that "as one barrier is removed, another is formed or only lip service is paid, not actualization of women's inclusion." We found that this statement also applies to women's employment in transportation and manufacturing. In the next few pages, we will present challenges faced by women in transportation, construction and manufacturing. Later in this report, we will discuss promising Canadian and global policies and practices, with specific examples in each category (transportation, construction and manufacturing). We intended to specifically collect data on women's employment in "green" or low-carbon transportation, construction and manufacturing, but found that most of the available data and information is general to the three industries, with limited available examples of women's inclusion in green transportation, construction and manufacturing.

Men tend to apply for jobs in these three sectors even when they meet some of the requirements, but women tend not to apply for jobs unless they meet all requirements (Asia-Pacific Gateway Skills Table, 2015). Women are also less likely to negotiate salaries and benefits. Women must often outperform men in male-dominated industries just to fit in and certainly to progress. Turnbull (2013) argues, "The preference for male recruits in most transport jobs is very much a 'chicken and egg' problem - women often lack the necessary educational qualifications for many jobs in the transport sector, but these jobs have usually not been designed with women in mind and are therefore not particularly attractive. Thus, when it comes to selection, (male) managers are less likely to regard women as suitable candidates." This chicken and egg problem is one which several organizations and initiatives are attempting to tackle in various ways in Canada and around the globe. Further, the "sticky floor and glass ceiling" phenomenon highlight the entrenched difficulties for women in navigating employment in these industries, where careers may never get off the ground because of persistent and confining stereotypes of feminised roles, with limited opportunities compounded by few female role models or gender-balanced initiatives to support career progression (Turnbull, 2013).

As more jobs are created in these sectors due to the transition to low-carbon economies, equitable representation of women in transportation, construction and manufacturing is becoming even more

important. In Canada, women's employment in the transportation industry ranges between 22-25 percent while women's employment in all industries is 48 percent (Asia-Pacific Gateway Skills Table, 2015). The lowest employment rate for women is in rail and truck transportation, 13 and 14 percent respectively, while postal service and air transportation have the highest representation of women, at 50 and 39 percent respectively (ibid.). Canada will create 200,000 new jobs in the construction industry over the next decade but women only account for 4 percent of new registrants in the construction trades (Status of Women, 2017). There is also an estimated shortfall of 20,000 employees in manufacturing that could be filled more easily if more women were part of the industry (ibid.). UNDP reports that 75% of people worldwide who earn their living from construction live in developing countries. The construction sector provides employment opportunities to 7 percent of the world's formal workforce and contributes 5 to 15 percent to gross domestic product (GDP). Also, over 1 billion residential buildings in the developing world need refurbishment, suggesting major employment opportunities for decades to come (UNDP, 2013).

Retrofitting and upgrading residential buildings will make up a third of projected green jobs (Sustain Labour 2009). This sector includes solar heating and cooling, thermal insulation and energy efficient window installation, and lighting and air conditioning upgrading to energy efficient standards. Further, transportation is expected to contribute substantially to green growth through fuel-efficient vehicles, new infrastructure and public transport. In manufacturing, new jobs will be linked to the use of clean processing techniques and pollution control equipment (ibid).

There is a growing literature on the benefits women derive from employment in green industries. Specific reported benefits of women's inclusion in green construction include the improvement of women's skills, ability and family health (Afolabi et al. 2017). Female employees report satisfaction derived from producing, consuming and marketing sustainable solutions for environmental protection (ibid.). The United States Agency for International Development reports that companies in Chile, Ghana, and Papua New Guinea have noticed that machinery is maintained better and operating costs are lower when women operate heavy mining equipment such as trucks and excavators (USAID, 2014). Thus, there is also an economic incentive for companies to include women in larger numbers. Arcand (2016) emphasizes that the gender wage gap in construction is much smaller than in other fields. Women in construction earn 98 cents for every dollar earned by a man compared to earning just 75 cents for every dollar earned by a man in the personal care and services field. The gender wage gap can be further narrowed by encouraging women's participation in construction and other non-traditional occupations. Hegewisch and O'Farrell (2015) argue that women may be especially valuable in green construction because of their higher interest in environmental issues compared to men. They write that in the US women represent more than one in five

environmental engineers, but only one in eight civil engineers. The same study reports that people who are already employed in the traditional construction industry can access training in green construction skills quite easily. Since women are a minority in the traditional construction sector, their ability to access green construction training is significantly weaker than their male counterparts. Most women who are in the traditional construction sector in the United States indicated that green training and work is part of their construction trade and not a separate route into the trades. This highlights the need to influence equity practices in the traditional construction sector and not just in green construction. Writing specifically about women's participation in green construction in Nigeria, Afolabi et al. (2017) note: "Women in construction exhibited moderate participation in solar panel manufacturing, installation, and maintenance and in the enforcement of environmentally friendly practices on-site, which are areas of green construction." Although women have not been able to participate in many areas of green construction, the authors posit that, even with less than a 3 percent participation rate, solar panel installation is an area where women have made a 'niche' for themselves and that their participation rates can continue to grow. In a report about good practices for the construction sector, Peters and Katalytik (2011) emphasize that companies with more women on their boards succeed better than their rivals with a 42 percent higher return in sales, 66 percent higher return on invested capital and 53 percent higher return on equity. This data should encourage employers to consider women not just for entry-level positions but also for leadership positions. Further, better gender balance in male-dominated professions contributes to the improvement of working conditions for both men and women, with positive effects on wellbeing, work culture and productivity (WISE, 2017).

METHODOLOGY

This knowledge synthesis included both scientific and practitioner knowledge sources. Peer-reviewed scholarship on women's employment in transportation, construction and manufacturing is limited. Most of the information for this study was gathered from practitioner organizations working on optimizing women's employment in construction, transportation and manufacturing. Online search engines such as Google Scholar, Scopus, Scholar's Portal and JSTOR were used to find peer-reviewed literature. We also drew upon information from websites, annual reports, policy reviews, position papers and survey results of Canadian and international governmental and non-governmental organizations (NGOs), labour associations, professional networks, public policy institutes, think-tanks, financial institutions and social enterprises. The data collected was analyzed using the *Codebook for Standards of Evidence for Empirical Research (*SoE) (Heck and Minner, 2009). The SoE and their process of application result in a careful review of the claims of individual studies and reports based on six categories: adequate documentation,

internal validity, analytic precision, generalizability/external validity determination, overall fit and warrants for claims.

To begin, we identified available statistics on women in transportation, construction and manufacturing in Canada and globally. Sex-disaggregated data was very difficult to find. The resulting review of available statistics identified both existing knowledge and gaps in information. Each source was vetted for relevance and value, including documents that lacked any content on equity. Such documents provided evidence of the absent or incipient nature of gender analysis when it comes to employment in transportation, construction and manufacturing. Many articles or reports which came up were not directly related to women's employment in these three sectors. For example, we found significant scholarly and practitioner literature on women's access to transportation but very little on women's employment in transportation. In manufacturing, most of the literature related to women's employment was from the garment industry. It dealt extensively with the precariousness of women's employment in this sector. We found very little on good practices for decent work and gender equity, and even less on women's employment in the context of the greening of the garment manufacturing industry so we decided not to include this literature in our knowledge synthesis.

We asked ourselves several questions while reading the assembled documents: Does this piece discuss equity? Is there mention of gender equity specifically? Does this reference green or sustainable employment in transportation, construction or manufacturing? Although we were very interested in women's employment in green transportation, besides a small selection of examples, available data was about transportation in general, not specific to green jobs or even to employment (most often the focus was on women's access to public transportation).

Challenges and Opportunities for Women in Transportation, Construction and Manufacturing

The challenges and opportunities women face in the transportation, construction and manufacturing industries are similar given that they are all non-traditional occupations for women. A non-traditional occupation (NTO) is defined as any occupation in which women or men comprise less than 25 percent of the workforce. Thus, nursing, for example, is an NTO for men in Canada whereas construction, transportation and manufacturing are NTOs for women. A review of the literature points to four major barriers for women in these fields: lack of information and awareness about these fields of employment, gender bias and gender stereotyping, male-biased work culture and working conditions, and violence against women.

Asia-Pacific Gateway Skills Table (2015) reports that women often lack information about the opportunities and prerequisites for employment in the transport industry because careers in transportation are rarely pitched to women and girls through avenues such as recruitment sessions and career fairs. Much more needs to be done to introduce girls at an early age to the potential in these careers. Encouraging girls to study science, technology, engineering and math (STEM) fields is critical since employment in the most well-paid jobs in these three sectors (for example, installation, engineering and architecture) tend to require STEM training (Antoni et al., 2015). Young men tend to get job opportunities in these fields through friends and relatives while women usually do not have the same social connections; therefore, there is an urgent need to need to mainstream, i.e. improve equity in access to, job information (ILO, 2011).

Because transportation is presently such a male-dominated industry, it is neither attractive nor welcoming to women. For this to change, the masculinist culture of the industry must be dismantled and career opportunities within the transportation industry must be publicized more directly to women. Women who do work in the transportation industry are routinely underestimated or discounted because of gender-based stereotypes. Of course, women are keenly aware of this and will often forgo applying for certain types of jobs, for example those involving fieldwork, because they know gender stereotypes will work against them. This explains, at least partially, why more women in these industries end up in administrative and clerical jobs rather than technical ones (Asia-Pacific Gateway Skills Table, 2015). Turnbull (2013) emphasizes that social attitudes play a large part in discouraging women from pursing careers in these fields when he writes: "the fact that sex discrimination has not disappeared from the world of work may be due, in part, to a lack of political commitment and - in some contexts - legal laxity, but the underlying cause remains embedded in social attitudes." Thus, women in construction are either ridiculed as masculine, or they are caught between expected roles and stereotypes - such as being treated as sexual objects, or labelled as lesbian for choosing a more masculine field to work in (Moir et al. 2011). Clearly, this issue highlights much broader gender inequities and problematic social attitudes based on misunderstandings and misperceptions about gender.

The transportation industry is frequently referred to in the literature as having a work culture and environment rife with risks of sexual harassment and isolation. Turnbull (2013) traces the primary causes of women's low participation in the transportation sector to working conditions and argues that working time, shift work (24/7) and location of employment (i.e. at sea, driving long distances from home) are often unappealing to women (especially those with childcare or eldercare responsibilities) and the transportation sector may be not only unwelcoming, but hostile towards women. It is important to remember, though, that although such factors may, to some extent, explain women's underrepresentation in transportation or

construction employment, many women may already work in less-than-optimal environments for much less pay than they would make in the construction or transportation industry. Given the option, some women would probably prefer work in construction or transportation simply because of the potential to earn higher wages. Because of persistent entrenched male-biased norms in these industries, even women who may be able and willing to work may not be given the option to choose between difficult or dangerous working conditions with low pay and similar conditions with higher pay (McKee, 2014; Carpenter et al., 2015).

Writing about the outcomes of the US Workforce Investment Act upon women in construction, Arcand (2016) emphasizes that women often experience a practice called "checkerboarding" - i.e. they are hired to ensure that a diversity quota is met but they are let go once a required number of hours is reached. Moir et al (2011) write that women and minorities are often hired as poorly paid apprentices to meet diversity compliance requirements; some contractors specifically hire women of color to simultaneously meet their quotas for race and gender. Affirmative action policies in the United States require that 6.9 percent of jobs in construction go to women. As Arcand (2016) notes, such modest targets for recruitment and outreach should be reasonably attainable through good faith efforts. The checkerboarding example (among others) offer proof that good faith is not enough to ensure that these targets will be met. Women are also (literally) not moving up the career ladder in construction: in the Big Dig project in Boston, women represented 8.2 percent of apprentices and only 0.9 percent of forepersons (ibid).

Violence against women transport workers is frequently reported as a factor limiting women's ability or willingness to seek and keep transportation jobs (Turnbull et al. 2013). Moir et al. (2011) emphasize the same about the construction industry. They suggest that because construction work is carried out autonomously or with minimal supervision and often in dark corners, trenches, and small or secluded spaces, there are concerns about safety, especially for female workers. The Health and Safety of Women in Construction (HASWIC) Workgroup reported that 88 percent of female construction workers surveyed had experienced sexual harassment at work (Moir et al., 2011). The immediate safety risks for women can certainly be mitigated by certain actions and practices (better lighting and working in pairs, for example) but eliminating violence against women will require much deeper and more proactive engagement with the social structures and power relations that sustain and reproduce it. We found very little engagement in the practitioner literature on the structural causes of violence against women.

Turnbull (2013) analyzes the barriers women face in the transportation industry using the career-cycle model. He identifies issues facing women at every stage: attraction, selection, retention, interruption, re-entry and realisation. Attraction to the transport sector comes from exposure at school, home and community which he argues is "heavily influenced by the HR policies of transport organizations (e.g.

corporate image, commitment to equal opportunities) and societal values (e.g. prevailing views on what constitutes 'men's work' and 'women's work.'" Turnbull writes that most separations (quits and dismissals) occur within the first 6 months of employment, therefore the women's initial experiences and how they are welcomed is most critical. Success in retention of female employees in transportation, especially in the aftermath of interruptions for childbearing or other caring work, appears to be dependent both on the support of the organization and the support of co-workers. Attitudes of male co-workers was deemed particularly important in retaining women after career interruptions. Turnbull (2013) differentiates between gender-specific barriers such as stereotypes about men's and women's work and gender-intensified barriers such as the absence of working arrangements to accommodate childcare and other reproductive responsibilities. Arcand (2016) arrives at similar findings about women's experiences in the construction industry: "women tend to enter the industry with fewer skills than their male counterparts, not having access to informal networks commonly used to find work, being let go once diversity quotas have been met, and encountering hostile work environments and sexual harassment on the job." The fact that informal networking is still the norm rather than the exception for seeking apprenticeships and employment in the trades is identified repeatedly as a barrier to women's entry into and advancement in these fields. Female workers refer (not facetiously) to their inability to access FBI (friends, brothers and in-laws) networks as a major impediment in gaining full-time employment in the trades. (National Women's Law Centre, 2014). Gender-segregated data on the number of new registrations in apprenticeship programs in Canada paint a stark picture. In 2015, for example, there were just 66 women who enrolled as machinists, compared to 1,545 men. There were 54 women registering as sheet metal workers, compared to 1,476 men (Smith, 2017). The need for policies aimed at enabling fair and equitable access to apprenticeships is urgent and critical for promoting equity in these sectors.

The study conducted by Afolabi et al. (2017) on women's inclusion in green construction in Nigeria reveals four major barriers: the stressful nature of work, low interest from women, low career growth/progression, and low investments in green works. They identify the following as less significant barriers to women's employment in green construction: male dominance of green jobs, biased recruitment, discrimination, low level of green job training, inadequate skill sets, sexual harassment, low-ranking positions at work, harsh working conditions, lack of experience, low pay in green jobs, cultural and traditional factors, reluctance to accept women's skills, limited green job opportunities, and lack of role models in these fields.

There are similarities and differences in the barriers and opportunities faced by women in these three sectors in different parts of the world. There is tremendous additional potential globally to create and optimize livelihoods for women in transportation, construction and manufacturing. However, women can gain

optimal traction from employment in these fields only within the context of wider socially progressive pro-women policies, as well as more transformative shifts in societal attitudes about gender roles. This is as true for developing countries and emerging economies as it is for industrialized nations.

The growth of these three sectors should benefit both women and men, but we must be proactive about enabling women to establish a stronger equity stake to compensate for historical and contemporary economic injustices and unequal outcomes. This will require more concrete and proactive actions and policies. Simply creating opportunities for training and employment in new fields and suggesting that women are not unwelcome in them is not enough.

Promising Programs and Practices in Canada

Planning and implementing measures for social equity and inclusiveness in the green economy is critical for Canada. Most green initiatives in Canada have been driven by the private sector, municipalities and provincial governments. The federal government has, at least until very recently, not played an active role in framing and implementing effective policies to enable the transition to a low-carbon economy. Despite growing evidence of the potential for the green economy to generate a larger volume of employment than the "brown" (fossil-fuel based) economy, even organizations committed to advocating for equity and social justice in environmental sustainability in Canada have never specifically mentioned or addressed gender inequity. As an example, the One Million Climate Jobs Campaign - an alliance of labour, social movements and other civil society organizations in Canada - is mobilizing for practical solutions to the threat of climate change. Although the campaign claims to place the interests of workers and the poor at the forefront of strategies to combat climate change, and demands that governments work to create 'one million climate jobs,' it makes no mention whatsoever of the importance of addressing gender inequity. Reports that do highlight opportunities to employ underrepresented groups, including women, in the green economy stop short of calling for specific policies and concrete actions required to ensure equity (see, for example, BlueGreen Canada 2012; Katz 2012). Most future green job creation in Canada will be in occupations in which women are currently underrepresented, such as engineering and the skilled trades. A Statistics Canada study found that in 2007 women only accounted for 1-2 percent of completions in apprenticeship training in major trade groups (McMullen et al. 2010). Another report published by Statistics Canada shows that in 2011, women comprised just 23 percent of engineering graduates aged 25-34 (Hango 2013). Since workers are likely to transition from jobs in the "brown" economy (which is heavily male dominated) to the "green," it is a self-fulfilling prophecy that women will also be underrepresented in green jobs unless gender equity in employment is planned and implemented proactively. Recent media reports confirm this

trend, indicating, for example, that laid-off oil and gas workers in Alberta are beginning to find employment in the clean energy sector (Bickis 2016).

The conversation about gender equity or social justice (more broadly) in Canada's green economy is at best incipient and tokenistic. Raising awareness is therefore urgent and critical. OECD (2016) reports that while Canada performs better than the OECD average for the gender employment gap (6.1 percent compared to 11.7 percent), the gender wage gap is above the OECD average (19 percent compared to 15.5 percent overall). Not only does Canada have a large gender wage gap, but women are severely underrepresented in all green growth sectors (Thirgood et al. 2017). The types of policies and programs put in place by governments and corporations will promote or impede decent work for all. Although employment in the green economy in Canada is a growing topic of research and policy engagement, the need to promote gender equity in green jobs is rarely a topic of conversation. For example, the One Million Climate Jobs campaign proposes a 5 percent investment of the annual federal budget in renewable energy, energy efficiency and public transportation in order to create one million new jobs while reducing greenhouse gas emissions by 25-35 percent. Although this campaign discusses the types of jobs that will be created quite extensively, there is no explicit or even subtle mention of employment equity.

A 2015 report prepared by the Steering Committee of the Green Economy Network identifies priority areas to stimulate the transition to a green economy, including: a renewable energy development strategy, improved energy efficiency of homes and buildings, and expanded public transit. The report emphasizes that millions of new decent jobs would be created by transitioning to a green economy. In order to ensure social equity, this report suggests creating a transition fund to assist workers displaced by the phasing out of fossil-fuel production, to promote affirmative action for members of marginalized communities, and to enable consultation with indigenous peoples. Among the suggested equity measures, there is no mention of gender and no consideration of the underrepresentation of women in the industries that will help Canada reduce greenhouse gas emissions. This section will outline some promising practices and policies for the inclusion of women in Canada's transportation, construction and manufacturing sectors.

Violence against women has been identified as a barrier for women's equitable access to public transit. Toronto has initiated the Metropolitan Toronto Action Committee on Violence against Women and Children (METRAC), a collaborative relationship formed by community-based women's organizations, the Toronto Transit Commission, and the Toronto Police Department, to conduct safety audits of the city's transport system. Although women's safety in accessing public transportation in Toronto is being addressed, less attention is being paid to optimize women's employment in transportation. The Toronto Transit Commission has a mandate to staff its workforce with "employees as diverse as the riders it serves"

(McIntyre, 2015). The City of Toronto's benchmark for women's employment in transportation in 48.7 percent. While women account for 57 percent of ridership, they only accounted for 15 percent of its workforce in 2014. Perhaps in response to this unimpressive number, the TTC has introduced the Diversity and Inclusion Lens and Toolkit to guide "managers and employees to consider the potential impacts of projects, actions and initiatives on diverse employees and customers" (Toronto Transit Commission, 2017). The toolkit includes a guide to inclusive language on disability, race, ethnicity, indigenous peoples, gender, gender identity and gender expression, sexual orientation and LGBTQ+. One guideline from the toolkit states: "Avoid making assumptions based on stereotypes/unconscious biases, such as assuming clerks are female, or assuming mechanics are male" (TTC, 2017). This is an example of an education and awareness initiative that can play a role in dismantling gender stereotypes and in promoting women's employment in transportation.

Canadian Pacific Railway has several initiatives aimed at optimizing women's employment. It offers networking opportunities for women employees through a program called 'Women on Track' and requires all departments to have diversity goals. CPR has a mentorship program and it holds forums where senior women leaders can talk about their experiences. Although women make up only 10 percent of the company's labour force, i.e. 7 percentage points short of its 17 percent goal, these initiatives have doubled the proportion of women in senior management positions between 2004 and 2009 to 22 percent (Grant, 2011). Given the importance of leadership and role models upon hiring, the number of female employees is likely to keep growing. The Alberta government began an outreach initiative called "Women in Non-traditional Occupations: Stories to Inspire" to make role models visible for women. This initiative reaches out to women who are interested in, but wary of, careers in non-traditional occupations by sharing stories of how successful women addressed issues of feminized stereotypes, attitudes of men, physical requirements, and assumed incompetence for non-traditional work (Alberta Human Services, 2013). These positive images and inspirational stories of successful women can encourage interested women and girls to pursue non-traditional careers

Canada's Building Trades Union released a report in July 2017, the first original study on the impacts of Canada's transition to low-carbon development upon the construction industry. The report identifies new employment opportunities that will emerge if Canada meets its commitment to the 2015 Paris Agreement. It contained no sex-disaggregated data, and not a single mention of women, gender or equity. The study proposes that moving to an electrical supply grid would result in over 1.75 million jobs but fails to mention who would get these jobs and how. Gender analysis is necessary to ensure that women are not left out of these opportunities.

Cohen and Braid (2000) conducted research on the British Columbia Vancouver Island Highway Project (VIHP) and its effort to integrate women and First Nations communities as part of its commitment to equity initiatives. They found that at its peak production periods, the equity hires constituted more than 20 percent of the workforce, ten times higher than usual. Women's participation in the project reached 6.5 percent and Aboriginal workers reached 7.5 percent (9 and 11 percent at peak times, respectively). Further, 93 percent of the workforce consisted of local hires. The equity provisions in this program had support at the highest levels, including the Premier of BC, and they were continually monitored and supported by women's groups and First Nations organizations on Vancouver Island. The local community strongly supported the initiative as local hires dominated the workforce of the project and all labour on the VIHP was unionized. Initially, few members of the targeted equity groups applied but recruitment practices were changed as a result. Active recruitment on reserves and in women's centres was a remedy to this barrier and the interview process was even adjusted to include non-paid labour as work experience. Cohen and Baird note that the workplace culture on the VHIP project changed over time. Female workers were frequently reported to have better attitude and work harder. The project also had an Employment Equity Coordinator, whose role it was to advocate for employment equity, and an Equity Integration Committee, which ensured constant monitoring of the equity initiative.

The Alberta Council of Turnaround Industry Maintenance Stakeholders (ACTIMS), which includes oil sands owners, heavy industrial maintenance contractors and labour providers run The Women in Trades Awards/Bursaries Program to recognize female members of the Canadian Building Trades and to create awareness about opportunities for women in the skilled trades. Each year this organization provides three recipients with $1,500 (one for any woman Journeyman, and two for apprentices). Although the intent of the project is laudable, ACTIMS should take note of the power of language in their quest to combat women's underrepresentation in the field ("woman Journeyman" is not as inclusive as "journeywoman" or "journeyperson").

Women in the Building Trades is another initiative run by Canada's Building Trades Union (CBTU) that promotes creating "the space for conversation on how to engage women" in construction. The initiative focuses on outreach activities including tradeshows, career fairs, mentorship events and networking functions. They will be launching an industry wide 'Industry Champion' campaign calling on workplace leaders to advocate for respectful workplaces. The Canadian Association of Women in Construction (CAWIC) is a non-profit organization with individual and company membership that was founded in 2005 although they began working in 1982 as a Toronto area chapter of the National Association of Women in Construction. Their mandate is to "facilitate the long-term success of women in Canada's construction-

related fields such as general contracting, trades, building products, architecture, engineering, interior design, and professional services." This organization offers bursaries, community outreach, educational seminars and workshops, industry research and information exchange, mentoring and networking. They are currently running a women's advancement project called Level Best. This project wants to build and widely promote an action plan to increase hiring, retention and advancement of women within the Canadian construction industry. This project also wants to create a committee staffed with experts which will be available to industry stakeholders interested in findings solutions and strategies for hiring and retaining women. Level Best plans to conduct a gender-based analysis by documenting the successes and challenges shared by 60 women working in construction. Recommendations will be submitted to Status of Women Canada (CAWIC, 2017).

Women Building Futures is an organization that specializes in attracting women to construction, helping women make career decisions, offering skills and safety certifications, coaching and job search support. One program they run is called Journeywoman Start, a 17-week program in Alberta that exposes women to six different trades in construction. They also offer a 5-week skills development program on Electrical and Solar Energy Basics, preparing women for the solar energy industry. In Burlington, Ontario, The Centre for Skills Development and Training offers a free 29-week course for women interested in construction. The course focuses on carpentry and women learn about tools, energy star building practices, the building code, and marketing and communications. The United Brotherhood of Carpenters union has created a chapter called Sisters in the Brotherhood that advocate on women's issues and mentor new members, including pairing apprentices with journeywomen. Canadian Construction Women is another organization that hosts monthly tours, speakers, socials and an online community. Past events include touring new commercial and retail building developments (CCW 2017). Training, mentoring, and networking are areas where several examples of supporting women in construction exist although none of them focus specifically on green jobs.

Building Up and BUILD Inc. are two non-profit social enterprises that offer employment and training in the construction trade to those with barriers to employment (i.e. minorities, those with criminal records, high school dropouts). Building Up is based in Toronto. It provides energy and water retrofits in affordable housing while employing those living in poverty, often from within the public housing units they live in. Building Up calls itself a 'social contractor' and specifically trains and employs those with the most barriers to employment. They offer 16-week paid apprenticeships and 90 percent of their graduates go on to full-time employment in the skilled trades. BUILD Inc. partners with Manitoba Hydro to improve insulation in low-income housing to reduce carbon emissions and to lower utility bills. They offer a 6-month paid training

program for those who "would often be deemed unemployable." BUILD Inc. also offers life skills, vocational training and remedial education on topics such as math and money management. Although there is no explicit focus on gender, there is a very clear mandate to work with those who have the most significant barriers to employment, often including women.

A report of the Standing Committee on Industry, Science and Technology identifies manufacturing as a strategic sector for economic development and documents skill shortages and innovation in government programs and the wider industry. The report offers recommendations to reverse recent erosions in employment in the manufacturing sector but contains no discussion at all on equity or gender. We found the absence of any mention of gender equity in discussions about employment in manufacturing to be a consistent pattern during this research. One initiative of Canadian Manufacturers and Exporters (CME), entitled Industrie 2030, which aims to double manufacturing in Canada by 2030, does aim to also include gender-based analysis. The Women in Manufacturing working group for Industrie 2030 was launched in March 2017 and is focused on introducing STEM to young women and girls, increasing the numbers of women entering manufacturing, and helping them achieve success once they pursue manufacturing as a career. A CME report released in October 2017 emphasizes that women's employment in the Canadian manufacturing industry has remained at 28 percent since the mid-1980s (Smith, 2017). The existing gender imbalance discourages women from considering a career in manufacturing. And that creates a self-perpetuating cycle whereby women avoid manufacturing jobs because there are not enough women in manufacturing (ibid). The same CME report mentions that most men in manufacturing believe men and women are treated equally at work: "The fact that men do not see a problem is itself part of the problem (ibid). One of the biggest obstacles is the shortage of women getting education and skills training for manufacturing jobs, which creates a vicious cycle.

That the average CME-reported wage in manufacturing ($75,000) is well above the national average for other occupations should provide added incentive for women to aspire to employment in the sector. Over the summer of 2017, a survey will be conducted to better understand the status of women in the Canadian manufacturing industry with the goal of creating and implementing an action plan for attracting, retaining and advancing women in manufacturing careers in Canada (the plan is set to be released at CME's annual conference in Ottawa in October 2017) (Industrie 2030).

In New Brunswick, TrentonWorks, a former railcar manufacturer, was taken over in 2010 by Daewoo to manufacture towers and blades for wind turbines (McFarland, 2013). At Daewoo's peak operating period, out of 140 employees, only two employees were women. Yet, at the peak of the TrentonWorks' operation, there were 40 women working as welders. The relatively high numbers of women welders in

TrentonWorks' operation was probably a result of a 1997 HRDC training program designed specifically for women welders at the plant. Before the HDRC program, there were no women welders at TrentonWorks. Joan McFarland writes that in 2012, women made up only 2.4 percent of registered apprentices in New Brunswick, up from 1 percent in 2002-2007 but still too low to resemble anything remotely like equity. These findings speak to the value of targeted measures to attract and retain women in occupations in which they are underrepresented.

Build Together, a Canadian national program focused on the recruitment and retention of workers from underrepresented portions of the population, has compiled a list of suggestions for what a union or employer can do in order to attract women to the construction sector. Their recommendations to unions and other representative organizations for building a more inclusive and diverse construction sector include the following: training for diversity and respectful workplaces, putting pressure on industry leadership to promote inclusivity, mentorship programs, networking and conferences to build community and ease isolation, ensuring proper safety equipment and gear for women, flexible hours to navigate childcare and family needs, and starting a women's committee. Unions and other organizations that represent workers do have the opportunity and responsibility to play an important role in promoting women's employment in transportation, construction and manufacturing. With 80 percent of female apprentices participating in union-sponsored programs, union apprenticeship programs have had greater success at recruiting women, along with higher completion rates, than non-union programs (Arcand, 2016). Based on their study of female masons in Tamil Nadu, India, Barnabas et al (2009) recommend unions as good starting points for women seeking construction employment because they must usually comply with equity-based criteria in their programming and because they offer employment benefits that may not be offered in non-union settings. Of course, as many researchers writing about unions have pointed out, unions are often themselves masculinist organizations that have historically ignored women and other socially marginalized groups. Depending on the setting, unions may be in as much need of institutional reform as other organizations.

Will workers' unions remain relevant in low-carbon economies, or will new modes for organizing, mobilizing and collective bargaining emerge in the future? These are also important questions to ask. Unions are generally much stronger in European (especially Scandinavian) countries and even in Canada and the United Kingdom than they are in the United States (OECD Stats Database, 2013). Regardless of what form representative organizations may take in the future, promoting gender equity must feature as a core principle. Countries that have the highest union densities (Denmark, Netherlands, Sweden, Norway, France) have strong feminist movements and feminist contingents within the big unions. These movements have managed to rearticulate what contemporary unions should be, and have brought back to prominence

some of the union movement's original causes, as well as broader societal questions about the importance of delinking social entitlements from employment status (Malleson, 2014). Other OECD countries, emerging economies and developing countries that do not have strong feminist contingents within unions might benefit from such organizing and strategizing. In most countries, the levels of unionization in new "green" jobs tend to be low to begin. Whether new or reconfigured modes for organizing, mobilizing and collective bargaining will emerge in the future remains a matter of conjecture.

The following section will outline some specific examples of promising practices of encouraging and optimizing women's employment in transportation, construction and manufacturing from outside North America. Before presenting these global examples, we want to note the work of Wider Opportunities for Women (WOW), based in Washington, DC. WOW is a leading institution in the US in advocating for gender equity in employment. Preparing women for well-paid high-potential careers in non-traditional fields (including green jobs) and influencing social and economic policy change to enable women to benefit optimally from paid employment are cornerstones of its work. WOW has created a Pink to Green Toolkit which includes presentations, trainings, webinars, curriculum guides and modules, briefs, templates, tip sheets and planning documents designed to maximize capacity building in recruiting, assessing, placing and retaining women in green non-traditional occupations. The toolkit is a valuable resource for Canadian organizations and those outside of Canada; it is user friendly, well organized, thorough and specific. The toolkit is organized into five categories: outreach and recruitment of women, assessment and case management for women, building critical skills of job readiness, gender-inclusive and gender-focused training design, and how to address and prevent sexual harassment. The resources in the toolkit include a myths and facts worksheet about common stereotypes about these occupations, presentations about the benefits of green jobs for women, an assessment of a company's/organization's capacity to serve and recruit women, a tip sheet to plan a career fair, a module on building skill and confidence of women to perform well in interviews, modules addressing communication and learning styles of women, and many more. The pink to green toolkit can be a useful resource for optimizing women's participation in any of the three sectors studied in this report.

Promising Global Programs and Practices

Transportation

A partnership between APEC (Asia-Pacific Economic Cooperation) and the Unites States Agency for International Development (USAID) has resulted in the Women in Transportation framework which aims to benchmark and track women's inclusion in the transportation industry. The framework addresses five pillars including education, hiring and entrepreneurship, retention, leadership and user access (US-

ATAARI, 2017. The framework lists possible actions, indicators of their achievement and the sources through which they can be achieved (i.e. ministries, associations, departments, etc.). Some examples include: promoting awareness of transportation professions among primary and secondary school-aged girls, encouraging women to pursue STEM-related areas in higher education and increasing women's presence in formal apprenticeship programs by setting benchmarks, and tracking the percentage of women within STEM faculties and apprenticeship programs. They propose countering gender stereotypes that may inhibit women's full participation in the transportation industry and ensuring that women have equal access under law to transportation-related jobs. Additionally, they propose holding transportation companies accountable for workplace inclusion and diversity through HR practices that include achievements in diversity and inclusion as factors that influence CEO compensation and ensuring equal opportunity and accessibility of government procurement in transport by tracking the percentage of transportation contracts awarded to women-owned enterprises .The WiT framework proposes examples of retaining women through means such as equal compensation, flexibility, safety, integration of technology and equitable opportunity for promotion to leadership positions. Finally, this program highlights the importance of maintaining reliable sex-disaggregated statistics of each transportation mode and ensuring policies, systems and regulations are 'gender-informed.'

Women's Employment in Urban Public Sector (WISE) is funded by the EU commission and the project partners include UITP – International Association of Public Transport, ETF – European Transport Workers' Federation, and the Akademie of Verband Deutscher Verkehrsunternehmen (VDV-Akademie). WISE reports that public transport operators in the EU directly employ 1.2 million persons and for every direct job in public transport 2 to 2.5 indirect jobs are typically created. Approximately 90 percent of the drivers employed are men. WISE has several objectives including improving women's access to all public transport jobs, improving safety and security, equal access to training, a workplace culture that accommodates the needs of both men and women, better work-life balance and the implementation of EU equal opportunities legislation in the transportation sector. The expected outcomes of the project include adoption of recommendations by partner organizations, dissemination of results and good practice examples, and the organization of a conference on women's employment in public transportation as well as a resulting network of women transportation professionals. The research conducted by WISE offers insight into which factors are most important to ensure women's success in the transport sector. These include: work and family/social life reconciliation and balance, working culture, wages, qualifications and training. In terms of recruitment for technical jobs, it is recommended that when qualifications of male and female applicants are commensurate, women get priority. WISE recommends that female apprentices not be placed in a department or team that is exclusively male, and that each team have at least two female apprentices.

Although these recommendations were intended to facilitate women's entry into the transportation sector in larger numbers, they may have the unintended effect of restricting additional hiring in departments or teams that already have two female apprentices. They may also lead to tokenistic hiring in all-male departments without any additional changes to masculinist institutional cultures.

Shift work is mentioned in the research conducted by WISE by 52 percent of companies and 79 percent of trade unions as an obstacle for women's employment and retention. Interestingly, women who responded did not think of it as a major barrier, except when they had young children. We encountered this discrepancy between what are assumed to be barriers to women's employment and what women themselves thought of as barriers quite frequently during this research. We found that assumptions made about women's willingness or ability to work in certain occupations or working conditions were themselves barriers to women's employment in some fields. Assumptions made on behalf of women had the effect of becoming self-fulfilling prophecies because they foreclosed possibilities for women and reinforced male-based norms and work culture within the sector.

Through its empirical research, WISE tries to address the discrepancy between what companies and unions believe to be problems for women and what women describe as problems. WISE provides concrete recommendations for meeting barriers for women's employment in public transport. For example, it details how Finland has overall comprehensive regulations for childcare and parental leave, which must be supported by employers. Companies are required to offer support for childcare matters such as illness by offering flexible working time arrangements. It is the entrenchment of these values through regulations that trickle down to improve women's experiences of employment in transportation. Women currently comprise 35 percent of tram drivers, 42 percent of metro drivers and only 6 percent of bus drivers (WISE, 2017). Another example WISE provides is from Bulgaria where employees with schoolchildren are given priority regarding holiday planning. Other incentives for women to work in public transportation include Berlin's and Sofia's policy of giving employees free use of public transport; spouses are only required to pay 50 percent of the regular cost (ibid). Efforts like these enable women with childcare responsibilities to enter jobs that have traditionally been male-dominated.

The United States Department of Transportation (2011) makes similar suggestions and proposes a few innovative strategies including: organizing 'hands-on' recruitment opportunities, including job-shadowing and experiential sessions; offering non-traditional skills development training, including mock job interviews and job-coaching; preparing women to be more assertive in a male-dominated industry, including offering role-playing training sessions to address potentially confrontational situations. As with policy interventions discussed in various other places in this paper, these recommendations do not address

or attempt to subvert entrenched structural hierarchies or barriers. They enable women to fit themselves into masculinist institutions but not necessarily to question why certain occupations and institutions are so male-biased to begin with.

Founded in 1977, Women's Transportation Seminar (WTS) is an international organization dedicated to building the future of transportation through the global advancement of women. With more than 6,500 members - both women and men - WTS is helping women find opportunity and recognition in the transportation industry. Through its professional activities, networking opportunities, and unparalleled access to industry and government leaders, WTS aims to "turn the glass ceiling into a career portal." To fulfill its mission of advancing both the transportation industry and the professional women who are a growing part of it, WTS offers a range of programs and activities. It provides its members with access to leaders in the transportation industry, hosts a monthly speaker-series, offers a networking site and a members-only 'knowledge-lab' containing transportation industry content and mentoring, offers annual awards and an international member directory where members can get career advice and access new opportunities (WTS, 2017). Further, WTS hosts an annual conference to focus on 'critical transportation themes' and to showcase the host city's transportation projects. WTS has a career centre where employers and recruiters can access a talent pool and aspiring transportation employees can access professional development and leadership training programs. WTS offers four scholarships every year to young women who aspire to professional careers in transportation. WTS has a Toronto chapter which hosts monthly events including a speaker-series, technical tours, golf tournament, career day/job fair and networking events. Transportation YOU, run by WTS, is a "hands-on, interactive, mentoring program that offers girls ages 13-18 an introduction to a wide variety of transportation careers." Its major goal is to encourage girls to take an interest in transportation careers and to pursue STEM secondary and postsecondary training. A mentorship program, a youth summit and a design engineering challenge for girls are other components of the program. The city of Chicago is home to another innovative program that encourages girls to pursue transportation-related careers. Olive-Harvey College hosts annual Girl Scout days where girls learn about trucks and tractor-trailers. At the end of the 2014 event, each of the 84 girls, ranging from age four to thirteen, was presented with the first ever Transportation Patch for her sash (Voie, 2014).

In Australia, the Queensland Department of Transport and Main Roads began a program called Women Take the Wheel. Women's participation in the transport sector in Australia is presently at 22 percent and has been declining over the years. This program was designed to recruit new female participants and retain women already in the industry. The program has trained numerous women, equipped them with a heavy vehicle license and placed them in traineeships with JJ Richards' waste management company, all cost-free

(US-ATAARI, 2017). This program won the 2011 Australian Trucking Industry Training Excellence Award. Supporting and Linking Tradeswomen (SALT), also based in Australia, offers a unique mobile custom-built trailer with tools and equipment that can be taken anywhere to offer a hands-on experience for women and girls as an introduction to the trades. This allows the organizers to set up anywhere, for example in remote and rural areas where access to training may not be readily available.

Governments of some countries have formulated specific policies to ensure women's inclusion in transportation. In the Philippines, the Department of Transportation and Communications allocates at least five percent of its annual budget to gender-equity related activities. It undertakes gender audit reviews of regional offices, agencies, and corporations to enable the participation of women in addressing gender issues (US-ATAARI, 2017). A 2014 transportation summit with 300 stakeholders ended with several memoranda of agreement or understanding and manifestos of support for the initiative to ensure gender equality in the transportation sector. At the 2015 International Transport Forum's Annual Summit in Leipzig, Germany, Tunisia's Minister of Transport, Mahmoud Ben Romdhane, announced that he has appointed women as CEOs of two major transport companies, Tunisair and the national rail company SNCFT (Olczak-Rancitelli, 2015). In Spain, there is a sectoral agreement where pregnant women can be protected from health risks by exchanging their maternity leave for a reduction in working hours. Spanish rail operator, Renfe-Operadora, gives preference to divorced workers when booking holidays in order to facilitate work-life reconciliation (Turnbull, 2013).

Construction

The European Trade Union Confederation (ETUC) has a programme, 'Membership to Leadership - Advancing Women in Trade Unions,' that lists ten things trade unions can do to promote gender balance in union leadership and decision-making: make the argument for gender balance as a core union priority; actively promote gender equality at all levels of the organization through gender mainstreaming; introduce statutory rule changes on gender balance; prepare women for decision-making and leadership roles; engage men to build a consensus for balanced gender representation; address the image and culture of unions; build union organization so that women's activism, involvement, decision-making roles exists at all levels of the union; ensure that trade union organizations promote gender diversity through their own internal human resources; provide gender-disaggregated data; and take a strategic approach and develop concrete actions plans to improve gender balance, including measures to monitor and assess the outcomes and implementation of actions (Turnbull, 2013)

Marjorie Griffin Cohen has written extensively about equity initiatives resulting from the American Economic Recovery and Investment Act of 2009. She argues that many of these initiatives were

unsuccessful due to the economic climate of the recession. Step Up to Green Carpentry, for example, had women shadowing construction workers in weatherization and energy auditing even though there were very few jobs for them to go to once their training was complete. She argues that short-term initiatives limited specifically to green training are not helping women get construction jobs (Cohen, 2015). She emphasizes that skills must be transferable and that training must be available to women in the context of the traditional construction sector. Cohen (2015) also emphasizes that the programs with the most successful equity initiatives were typically run by women. She found that women were very eager to participate in these programs. These findings reinforce the necessity of strong buy-in from governments and insistence on equity in hiring for government-funded construction projects. Cohen (2015) identifies one program at Austin Community College that offered training for solar installation, pricing and configuration. Although the program was successful in recruiting and graduating participants, they had difficulty finding work after graduation due to the recession. Speaking of inequity, Cohen emphasizes that a glaring double standard exists in skills training in construction. General construction programs, which were pursued almost exclusively by men, were funded through a $4.4 million grant with no cost for attendance whereas commensurate training for women only received a $60,000 grant and participants had to pay $625 per course.

Chicago Women in Trades offers free training for women through their Technical Opportunities Program, where women can practice hands-on skills and compete for apprenticeship program openings. Chicks with Bricks, a London, UK, based organization, hosts events with key industry leaders as speakers and, through networking activities, connects established and emerging women in the construction industry. Moir et al. (2011) draw on a few examples of women's inclusion in the construction industry such as the Portland Maine bridge project that funded near-site childcare, including evening and overnight care. Another example is the Century Freeway Project in Los Angeles county, which ran a fund for women to get childcare stipends, union initiation fees, tools, boots, and transportation funds. It also organized a support group for women, provided one-to-one guidance to women workers, and conducted media outreach for recruitment of women. Because of this program, women's employment on the freeway went from 0.5 percent in the first year of construction to 8.2 percent in the last year.

Women comprise 2.5 percent of construction workers in the United States, well below the federal goal of 6.9 percent (Arcand, 2016). Drawing on data from the 20-year Big Dig project in Boston, Arcand reveals that American Job Centers (AJCs) can play an important role in connecting women to employment in construction but women are not generally matched to employment in non-traditional fields through AJCs. Career centres and employment resources should take more initiative in this regard. Moir et al. (2011)

suggest that good faith measures for affirmative action programs should be redefined as "maximum possible effort." In order to have the desired equity outcomes, employers must continually track the outcomes of equity-based interventions. New Haven Connecticut's Commission on Equal Opportunities required all contractors to use "maximum effort" to hire women and the city reports that women's participation in construction ranges from 7-10 percent (Moir et al. 2011). Further, New York City initiated a 2005 agreement with developers, contractors and unions to have women represented in 10 percent of apprenticeships and 15 percent of hires on major construction sites. Both goals were achieved (Sustain Labour, 2009).

Leicester City Council, UK, hosts an initiative called Women in Construction that organizes free 'taster' sessions for women over 15 to gain hands-on experience and information about the trades including bricklaying, carpentry, plastering, plumbing, and electrics. The program is free and available exclusively to women. Norway adopted a 40 percent female representation quota in all sectors of employment in 2003 but the national average for women in construction remains at 35 percent, in part due to inadequate enforcement. Of the 35 percent of women in construction, 4 percent are CEOs of construction companies and 15 percent are board members (Building Radar, 2014). The Norwegian example suggests that enforcement of equity standards, through either or both rewards and punishments, may be necessary even in the most promising scenarios. The German government is enforcing a 30 percent female quota on all publicly-listed companies. If female candidates cannot immediately be found for certain positions, they will remain vacant until they are (ibid). The idea of "women with golden skirts" has been offered as a solution through which individual women can hold multiple senior positions in different companies to fulfil the equity requirement (ibid).

Examples of promising practices to promote women's inclusion in the construction industry can also be found in emerging economies and developing countries. The ILO (2009) reports that women in India do most of the unskilled work in construction, the 'heavy work' that includes carrying bricks, gravel, mortar and water up to the skilled carpenters and masons. The Self-Employed Women's Association (SEWA) is a trade union established in 1972 to organize poor, self-employed women workers. SEWA supports the unprotected and unorganized labour force, in which 94 percent of women in India work. They offer a variety of services including: bank loans, health care, child care, insurance, legal aid, and capacity building. SEWA's annual report from 2013 provides an example of the Racheta Women Construction Workers' Cooperative, which takes on construction contracts for women who are members of SEWA. It also runs a tool bank through which women can rent out tools at reasonable rates. Borrowing tile-cutting and plastering machines and other expensive tools, has enabled women who previously earned INR 250 per day to earn INR 400 per day (SEWA, 2013). The "toolbank" is an innovative idea that could be replicated in other

industrialized, emerging and developing country settings. The Karmika School for Construction Workers, established by SEWA's Women's Housing Trust in 2003 in the city of Ahmedabad, India, provides three months of training in a variety of trades (including masonry, carpentry, welding, electrician training) as well as functional literacy and life skills such as conflict resolution and bargaining/negotiation with employers (Baruah, 2010). Karmika linked women to employment opportunities and fulfilled builders' needs for a sustainable supply of skilled labour. Most notably, Karmika provided a daily stipend to trainees and covered transportation costs. Baruah (2010) writes, "few women can afford to take the time out from their existing income-generating activities to learn new skills - however lucrative they may be in the long run - if they are not compensated financially during the training." The stipend has played an important role in the program's success. A survey conducted in 2004 with participants before they entered the Karmika School revealed that 50 percent of the trainees were non-literate and only 13 percent had more than 8 years of formal education. A follow-up survey of Karmika graduates conducted in 2007 reported that women were more successful than they had been before entering the program in securing skilled construction work and earning significantly higher incomes. Further, 68 percent women reported higher confidence levels in doing construction work and many reported higher status within the family and better bargaining skills (Baruah, 2010).

Few existing initiatives in construction deal with more than one intersectional identity although women's identities as women do not exist in isolation from other social categories (such as race and ethnicity). Women of color make up a miniscule number of construction workers. Hispanic women account for 0.4 percent of construction workers, African American women 0.2 percent and Native women only 0.1 percent (National Women's Law Centre, 2014). The Baltimore Black Worker Centre in Baltimore hosted an event titled "From Girls in the Hood to Women in Construction", an initiative that offered an interesting intersectional take on women in the construction industry as it was targeted to black women whose unemployment rate is nearly double the general population (Meehan, 2017). There are a few programs in Canada specifically targeting Indigenous women's recruitment in the skilled trades (Aboriginal Construction Careers, 2010). A program was set up in Vancouver to support Aboriginal women looking to enter the skilled trades. They received a variety of training opportunities including two weeks of employability skills training, two weeks of painting and decorating training, one week of heavy equipment operation, and three weeks of the metal trades - pipefitting, welding and metal fabrication (Construction Sector Council, 2010). Women were also offered the opportunity to complete a three-week practicum with an employer with the opportunity to enter an apprenticeship in a chosen trade. In British Colombia, Aboriginal Apprenticeship and Industry Training (AAIT) supports women with barriers to employment through programs in carpentry, math upgrading, project management, building inspector, and building

maintenance worker apprenticeship (ibid). The Saskatchewan Indian Institute of Technologies' (SIIT) Women in Trades (WIT) program assists women in gaining entry-level work in construction. The 16-week program provides First Nations women with hands-on skills development based on coursework and a one-to two-week practicum coordinated through an SITT job coach (ibid). Culturally appropriate programs can be especially valuable for women who are disproportionately marginalized based on other factors such as race, ethnicity or indigenous identity.

Manufacturing

Barefoot College, based in Rajasthan, India, works to "demystify and decentralise technology and put new tools in the hands of the rural poor with a singular objective of spreading self-sufficiency and sustainability." Through the International Solar Training Program (supported by the Indian Technical and Economic Cooperation Assistance Program), Barefoot College trains rural women from various Asian and African countries and other Global South settings as solar engineers. The women return to their villages after the training and continue with solar manufacturing, installations, maintenance and repair activities in their communities. The program has globally replaced 500 million litres of kerosene with clean energy. This initiative targets the UN sustainability development goals directly through a community-based approach. Women are also trained to make and install solar water heaters, solar powered desalination and parabolic solar cookers. Several women, referred to as the Solar Mamas, returned to Zanzibar, Tanzania and have installed solar panels on over 800 homes (Kennedy, 2016). BFC receives funding from organizations, including Sun Edison and the Sierra Club, which pays for the actual solar hardware as well as expenses associated with the training workshop. The households enrolled in the program pay a monthly fee - half of which goes directly to the woman who installed the solar panel and the other half gets reinvested into the community. The Kinyasini Solar Committee in Zanzibar - comprised of thirteen Solar Mamas, the village leader, the regional program manager and two additional elected representative - decide where to invest the revenue and how to best manage the growth of the project. A similar initiative was launched by SEWA and Sustainable Energy for All (SE4ALL) where women who had previously worked as salt workers, often for very low wages, were trained to replace diesel pumps with solar pumps on farms (Jaiswal, 2015). The savings in cost to the farmers allow them to pay in instalments for the pumps over 1 to 3 years (SEWA, 2013). These are excellent examples of including women in manufacturing in ways that generate green livelihoods and promote gender equity and self-reliance.

Most of the examples cited in this section on promising practices for promoting women's greater participation in construction, manufacturing and transportation seem to have a common element of supporting other women through networking and mentorship. Although there are some examples of

bursaries and scholarships, we found little evidence of financial or business incentives to enable women's participation in transportation, construction and manufacturing. Several governments have initiated quotas with success as have some corporate entities and city-level organizations. Although most of these examples are not specifically about green initiatives, guiding principles and lessons learned are transferable to green transportation, construction and manufacturing. More research is needed in order to generate specific recommendations to green industries since only a few examples demonstrate how to increase women's participation in green fields.

Future Research

As the previous sections describe, there are promising programs and practices that aim to improve women's participation in transportation, construction and manufacturing. Although these examples demonstrate that some gaps are being addressed, there is very little information on the long-term sustainability and success of these initiatives. Future research should address the long-term impact of these programs, identifying where there is room for improvement, and providing detailed documentation of what has worked well and what has not. In order to accomplish this, primary qualitative research is essential. This research should include the organizations running the programs listed on this report as well as individuals participating in them. Ideally, future research should focus on the trades not just as jobs but as long-term careers. With little information on whether participants are securing employment after they complete training programs and how some of the policies and tools developed to optimize women's participation in these three sectors have worked to change male-biased work cultures and institutions, it is difficult to fully understand the impacts of these practices and programs, or to offer policy recommendations.

Knowledge Mobilization

The knowledge mobilization products that will emerge from this study aim to inform and influence research, practice and policy formulation to enable the equitable participation of women and other underrepresented groups in the Canadian and global green economy. This knowledge synthesis has shed light upon problems that warrant more detailed empirical investigation as well as knowledge gaps that warrant further research. These should provide the grounding and detail against which other research, perhaps using very different methodologies and disciplinary perspectives, can be developed, tested and verified. In addition to this knowledge synthesis report, deliverables that will result from this project (within and after the duration of the grant) are as follows:

(1) Publications: We were motivated to propose this project because (a) no previous attempt has been made to comprehensively synthesize research on women's employment in the global green economy and (b)

Canada might benefit from learning about economic tools and public policies being explored in other countries to optimize women's participation in green employment. Findings from this knowledge synthesis will be organized along these (a and b) lines and prepared for publication in highly-ranked peer-reviewed journals that have a readership of scholars, practitioners and policymakers (eg. *Natural Resources Forum, Canadian Public Policy, Labor Studies*). Articles exploring comparative perspectives on women's employment in the green economy from OECD countries (including Canada), emerging economies (Brazil, Russia, India, China and South Africa) and developing countries may also be published in women's studies and human development journals (eg., *Feminist Economics; Gender, Work and Organization*). Shorter versions of the articles will be published in popular practitioner and public opinion venues such as *Policy Options, The Hill Times, Huffington Post* and *Women & Environments International*. We have employed this strategy previously to disseminate findings from other SSHRC-funded research (including the previous Knowledge Synthesis Grant) on global trends in women's employment in clean energy (see, as examples, Baruah 2016b; Baruah and Gaudet 2016). Sandra Biskupsi, the doctoral research assistant on this project, will be listed as the second author in all publications emerging from this project

(2) Conference and workshop presentations: Papers based on the proposed research will be presented at important gender-focused venues such as the Association for Women's Rights in Development (AWID) global conferences and the Canadian Women's Studies Association conference. We will also present findings at high-profile green economy, labor and sustainable development conferences and workshops that do not currently prioritize gender equity issues. This may include the biennial *Technologies for Development Conference* organized by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in Lausanne, Switzerland. I served on the scientific committee of this conference in 2014 and 2016. I have just submitted a proposal to host a session on Identifying Promising Practices for Promoting Social Equity in Low-carbon Economies at the 2018 conference in Lausanne. My established connections with Canadian and international organizations working on social equity issues in low-carbon development (Global Green Growth Institute, World Resources Institutes, Mowat Centre for Policy Innovation, Smart Prosperity Institute, for example) will enable identification of other venues to disseminate this research.

(3) Conceptual animation: Two animated short videos (approximately 4 minutes each) aimed at summarizing the findings from the proposed knowledge synthesis will be produced to complement the more conventional means - publications and conference presentations - of disseminating research findings. KindeaLabs, a start-up firm that works with research institutes and thought leaders to share knowledge through animation will be employed to produce the videos. Conceptual animation is being used extensively

by American universities but it has not yet been used widely by Canadian and European universities. Conceptual animation is an effective way of synthesizing large volumes of data for several reasons: complex ideas can be represented as large diagrams, information can be digested and remembered easily, and visual cues make it easy to understand how smaller details relate to bigger structural issues. The use of music and voiceover also make animated videos an effective teaching and communication tool. We will own all rights to the videos but once they are produced and posted online, they may be used by other end users of this knowledge synthesis for research, teaching, public communication and advocacy purposes. Funding from a previous Knowledge Synthesis Grant (on energy) enabled us to produce two animated videos on women's employment in renewable energy. These videos can be viewed at Women in Renewable Energy: https://vimeo.com/194718318 and Why should Canadians care about gender equity in clean energy employment: https://vimeo.com/214883162

(4) Teaching and development of academic curricula: Academic curricula will be enhanced in two undergraduate courses (*Gender, Justice, Change; Gender and the Environment*) and one graduate course (*Gender and Development: Engaging with Theory, Practice, Policy and Advocacy*) at Western with knowledge products from this research. Findings from previous research on gender, development, environment and economy have appeared in courses at Western University, California State University, University of Toronto and York University. Publications based on previous research also appears in graduate and undergraduate syllabi across North America: for example, Massachusetts Institute of Technology (*Planning Resilient and Just Cities*), University of Hawaii (*Urban and Regional Planning in Asia*), UCLA (*Housing in Developing Countries*), UC Irvine (*Planning and Poverty in Developing Countries*), Rutgers (*Sociology of Labor and Globalization*), University of Denver (*Environment and Sustainable Development*), San Francisco State (*Urban Poverty and Policy*), University of Michigan (*Gender and Sexuality*), and Osgoode Hall Law School (*International, Comparative, Transnational Law*). Existing networks with scholars working on gender and low-carbon development will enable the incorporation of publications emerging from the proposed knowledge synthesis at academic institutions in Canada and beyond.

Conclusion

In Canada women make up only 23 percent of those employed in transportation and warehousing, 12 percent in construction, and 28 percent in manufacturing. Further, this data does not provide specific information on the capacities in which women are employed. Thus, women may be categorized as working in the construction sector when they may be performing clerical or administrative duties, not directly related to the construction trades. Concerns about climate change and fossil fuel insecurity have ensured that there

is significant interest in Canada in the technologies and financing for transitioning to a green economy, but far too little attention is being paid to the employment equity implications of such a transition. In the absence of appropriately targeted training, education, apprenticeships, employment placement, financial tools and supportive social policies, transitioning to a green economy may exacerbate existing gender inequities and social hierarchies. This research synthesized and assembled existing scientific and practitioner literature on promising programs and policies for promoting and optimizing women's employment in three sectors that are critical for the Canadian and global green economy and in which women are currently severely underrepresented, namely, manufacturing, construction and transportation. Our findings reveal that there are significant gender inequities in employment trends in transportation, construction and manufacturing in Canada and worldwide. Although there are some promising Canadian and international examples of programs and practices that attempt to promote women's employment in these fields, the gender disparities and hierarchies are persistent and entrenched. Our findings suggest that although governments, civil society organizations and private corporations have attempted to remedy some of the inequities and barriers women face through legislation and policy, such interventions cannot adequately subvert the broader social structures that create the inequities in the first place. Most policies designed to address women's underrepresentation in these fields tend to be reactive responses that do not engage adequately with structural social, economic and political inequality. Improving lighting in construction sites in order to prevent sexual assaults against women and requiring women to work in pairs instead of alone are classic examples of reactive policies that end up reinforcing social hierarchies rather than challenging them. We found that the most common response to women's underrepresentation in these fields has been to 'add women and stir;' simply adding women to industries with unchanged masculinist values and work cultures. Policy responses also often reinforce affirmative gender essentialisms. Women are valorized in essentialist ways that also reinforce existing social hierarchies. Assumptions that women are gentler with machinery than men and therefore maintain machinery better, or that women bring specific valuable qualities and skills (empathy, patience) to the job simply by being women reinforce social hierarchies since most women acquire these skills because of historical and current social oppression and not because they are biologically female. Our findings suggest that although the formal realm of law and policy can and does play a significant role in optimizing women's employment and retention in the labour force, legislation and policy cannot be the sole vehicle for social change because they are not enough to alter entrenched gender roles, social hierarchies and entitlements. Consciousness-raising initiatives that raise awareness among women as well as men about the benefits of greater equity and about women's equal entitlements to employment in all fields are as crucial as policy reforms and state or corporate actions that protect women's interests and

facilitate their agency. Scaling up consciousness-raising efforts to educate both men and women about their equal entitlements to employment in all fields is a major recommendation emerging from this research.

While acknowledging that policy alone cannot alter social hierarchies and structures, our findings highlight the need for targeted measures and monitoring to improve women's access to and retention in the growing green economy. Since women are already underrepresented and marginalized in key sectors of the green economy, growth in this sector may further exclude women if proactive measures are not adopted. McFarland (2013) argues that given women's current patterns of participation in jobs and training in the trades, almost none of the green jobs we expect to be created, would go to women. She stresses the dire need for equity programs and quotas that are monitored and enforced. Canada needs all stakeholders, including government, civil society organizations, corporations, labour associations, public policy institutes and think-tanks to work together to ensure that women are not further marginalized as more green jobs are created in transportation, construction and manufacturing. The International Labour Foundation for Sustainable Development highlights the need for stakeholder action to optimize women's employment in green jobs. They propose a series of recommendations including anti-discrimination laws and family-friendly mandates, recruitment for non-traditional jobs through quotas, measures to promote equity in access to apprenticeships, reduction of gender-based wage gaps, and increase in union membership of women in green sectors (Sustain Labour, 2009).

Our review of the scholarly and practitioner literature revealed other common findings about what is needed to address women's marginalization and underrepresentation in these key sectors: safety from violence; access to networking and mentorship opportunities; awards and bursaries; more training in STEM fields; and equity in access to recruitment, apprenticeship and training programs. The Pink to Green toolkit produced by Wider Opportunities for Women (WOW) in the US is a useful resource for employers and workers wishing to promote gender equity in the green economy. An interesting example of a Canadian program that encourages women's employment in transportation is in Newfoundland, where the Office to Advance Women Apprentices offers a wage subsidy of up to 75 percent for two contracts as an incentive for employers to hire female apprentices. There is no data available on what happens to these women's careers once the subsidy runs out. The Vancouver Island Highway Project and Women Building Futures are other Canadian examples of innovative strategies to increase women's participation in non-traditional trades and occupations. Again, we know very little about the long-terms outcomes and sustainability of such initiatives. Primary research aimed at understanding such programs in more depth and detail - to evaluate them for their effectiveness in promoting employment equity, and to understand their potential for replication in Canada and other parts of the world - is a logical next step for this research.

Bibliography

Aboriginal Construction Careers. 2010. How-to Kit for an Aboriginal Career Awareness, Recruitment and Retention Program. http://www.aboriginalconstructioncareers.ca/toolkit/step-5-coaching-and-mentoring-long-term-success (accessed on October 27, 2017)

Afolabi, A., Tunji-Olayeni, P., Oyeyipo, O. and R. Ojelabi. 2017. The Socio-Economics of Women Inclusion in Green Construction. *Construction Economics and Building* 17(1): 70-89.

Alberta Human Services. 2013. Women in Non-Traditional Occupations: Stories to Inspire. https://alis.alberta.ca/pdf/cshop/winto.pdf (accessed on October 27, 2017)

Antoni, M., Janser, M., and F. Lehmer. 2015. The Hidden Winners of Renewable Energy Promotion: Insights into Sector-Specific Wage Differentials. *Energy Policy* 86: 595-613.

Arcand, Carolyn. 2016. Women in Construction and the Workforce Investment Act: Evidence from Boston and the Big Dig. *Labor Studies Journal* 41 (4): 333-354.

Asia-Pacific Gateway Skills Table. 2015. Women in Transportation careers: Understanding Participation in Canada. http://apgst.ca/projects/pdfs/APG_WIT_web.pdf (accessed on October 27, 2017)

Barefoot College. 2017. https://www.barefootcollege.org/approach/ (accessed on October 27, 2017)

Barnabas, A., Anbarasu, J. and P. Clifford. 2009. A Study on the Empowerment of Women Construction Workers as Masons in Tamil Nadu, India. *Journal of International Women's Studies* 11(2): 121-141.

Baruah, B. 2010. Gender and Globalization: Opportunities and Constraints Faced by Women in the Construction Industry in India. *Labor Studies Journal* 35(2): 198-221.

Baruah, B. and C. Gaudet. 2016. Creating and Optimizing Employment Opportunities for Women in the Clean Energy Sector in Canada. Knowledge Synthesis Report prepared for SSHRC Knowledge Synthesis Symposium, Imagining Canada's Future, June 1, 2016, University of Calgary.

Baruah, B. and C. Gaudet. 2016b. Confronting the Gender Gap in Canada's Green Transition. *This Changes Everything: The Leap*. August 19. https://theleapblog.org/confronting-the-gender-gap-in-canadas-green-transition/ (accessed on October 27, 2017).

Bickis, I. 2016. Renewable Energy, Other Industries Draw laid-off Oil and Gas Workers. *HuffPost Alberta*. http://www.huffingtonpost.ca/2016/01/27/oil-and-gas-career-change_n_9089360.html (accessed on October 27, 2017).

BlueGreen Canada. 2012. Building Ontario's green economy: A road map. http://environmentaldefence.ca/report/report-building-ontarios-green-economy-road-map/ (accessed on October 13, 2017)

Building Radar. 2014. Women in Construction: Time to think differently. https://buildingradar.com/construction-blog/women-in-construction/ (accessed on October 27, 2017)

Canada's Building Trades Unions. 2017. Jobs for Tomorrow: Canada's Building Trades and Net Zero Emissions. http://www.columbiainstitute.ca/resources/jobs-tomorrow-canada-s-building-trades-and-net-zero-emissions (accessed on October 27, 2017)

Canadian Association of Women in Construction. 2017. http://www.cawic.ca/ (accessed on October 27, 2017)

Canadian Construction Women. 2017. https://www.constructionwomen.org/About-Canadian-Construction-Women (accessed on October 27, 2017)

Carpenter, J.P., Matthews, P.H. and A. Robbett. 2015. Compensating Differentials in Experimental Labor Markets. IZA Discussion Papers, 8820. Bonn, Institute for the Study of Labor (IZA).

Chicago Women in Trades. 2017. Building Equal Opportunity for More than 30 Years. http://chicagowomenintrades2.org/ (accessed on October 27, 2017)

Chicks with Bricks. 2017. http://www.chickswithbricks.com/ (accessed on October 27, 2017)

Cohen, Majorie Griffin. 2015. Gender in Government Actions on Climate Change and Work. *Women and Environments* 94/95: 11-16.

Cohen, M. and K. Braid. 2000. Training and Equity Initiatives on the British Columbia Vancouver Island Highway Project: A Model for Large-Scale Construction Projects. *Labour Studies Journal* 25(3):70-103.

Construction Sector Council. 2010. The State of Women in Construction Canada. http://www.buildforce.ca/en/system/files/products/State_of_Women_in_Construction_in_Canada_0.pdf (accessed on October 27, 2017)

Department of Transportation and Communications. (2017). DOTC bats for gender equality in public transport. http://www.officialgazette.gov.ph/2014/11/18/dotc-bats-for-gender-equality-in-public-transport/ (accessed on October 24, 2017).

European Transport Workers Federation. ETF campaign to say 'no' to workplace violence against women transport workers. http://www.etf-europe.org/etf-4009.cfm (accessed on October 27, 2017).

European Transport Workers Federation. EFT gender equality. http://www.etf-europe.org/women.cfm (accessed on October 27, 2017)

European Workers Transport Federation. EFT Women's Committee. EFT Action Plan on Gender Equality 2013-1017 Retrieved from: http://www.etf-europe.org/files/extranet/-75/46643/ETF%20Gender%20action%20plan%202013_2017%20EN.pdf

Grant, T. 2011. How CP Put Women on the Executive Track. *The Globe and Mail.*

Hafkin, N. and S. Huyer. 2006. *Cinderella or Cyberella? Empowering Women in the Knowledge Society.* Boulder: Kumarian Press.

Hango, D. 2013. Gender differences in science, technology, engineering, mathematics, and computer science programs at university. Ottawa: Statistics Canada.

Heck, D. J. & D.D. Minner. 2009. *Codebook for standards of evidence for empirical research.* Chapel Hill, NC: Horizon Research, Inc.

Hegewisch, A. and B. O'Farrell. 2015. Women in the Construction Trades: Earnings, Workplace Discrimination, and the Promise of Green Jobs. Findings from the IWPR Tradeswomen Survey. Institute for Women's Policy Research. https://iwpr.org/wp-content/uploads/wpallimport/files/iwpr-export/publications/C428-Women%20in%20Construction%20Trades.pdf (accessed on October 27, 2017)

Industrie 2030. 2017. Canadian Manufacturers and Exporters. https://www.industrie2030.ca/english/actions/actions.html (accessed on October 27, 2017)

ILO. 2009. Building a Safety and Health Culture in India's Construction Sector. http://www.ilo.org/global/about-the-ilo/multimedia/video/video-news-releases/WCMS_106305/lang--en/index.htm?ssSourceSiteId=inform (accessed on October 27, 2017).

ILO. 2011. *Promoting Decent Work in a Green Economy*. Geneva: International Labour Organization.

ILO. 2017. World Employment and Social Outlook: Trends for Women 2017. http://www.ilo.org/wcmsp5/groups/public/---dgreports/---dcomm/---publ/documents/publication/wcms_541211.pdf (Accessed on October 24, 2017)

Jaiswal, A. 2015. Solar pumps help Indian women salt workers escape from poverty. https://www.nrdc.org/experts/anjali-jaiswal/solar-pumps-help-indian-women-salt-workers-escape-poverty (accessed on October 26, 2017)

Katz, J. 2012. *Emerging Green Jobs in Canada: Insights for Employment Counsellors into the Changing Labour Market and its Potential for Entry-Level Employment.* Toronto: Green Skills Network.

Kennedy, K. 2016. Women at the Forefront; Scaling up Solar in Rural Africa. https://www.nrdc.org/experts/kit-kennedy/women-forefront-scaling-solar-rural-africa (accessed on October 27, 2017)

Leicester City Council. 2017. Women in Construction. http://www.leicester.gov.uk/your-council/our-jobs-and-careers/opportunities-for-young-people/apprenticeships/women-in-construction/ (accessed on October 27, 2017)

Malleson, T. 2014. *After Occupy: Economic Democracy for the 21st Century*. New York and London: Oxford University Press.

McFarland, J. 2013. The Gender Impact of Green Job Creation. Presentation at Work in a Warming World International Conference, Toronto, November 29-December 1. http://warming.apps01.yorku.ca/wp-content/uploads/WP_2013_03_McFarland_Gender-Impact-of-Green-Job-Creation.pdf (accessed on October 14, 2017)

McIntyre, C. 2015. TTC Falls Short on Gender Equality Targets. *Torontoist.* http://torontoist.com/2015/12/ttc-falls-short-on-gender-equity-targets/ (accessed on October 27, 2017)

McKee, L. 2014. Women in American Energy: De-feminizing Poverty in the Oil and Gas Industries. *Journal of International Women's Studies* 15(1): 167-178.

McMullen, K., J. Gilmore and C. Le Petit. 2010. *Women in Non-traditional Occupations and Fields of Study*. Ottawa: Statistics Canada.

Meehan, S. 2017. Encouraging Women to Pursue Construction as a Career They Can Build On. *The Baltimore Sun*. http://www.baltimoresun.com/news/maryland/baltimore-city/bs-md-women-in-construction-20170325-story.html (accessed on October 27, 2017)

METRAC. 2017. https://www.metrac.org/what-we-do/safety/ (accessed on October 27, 2017)

Moir, S., Thomson, M. and C. Kelleher. 2011. Unfinished Business: Building Equality for Women in the Construction Trades. Labor Resource Center Publications. Paper 5.

National Women's Law Center. 2014. Women in Construction: Still Breaking Ground. https://nwlc.org/wp-content/uploads/2015/08/final_nwlc_womeninconstruction_report.pdf (accessed on October 27, 2017).

North America's Building Trades Unions and NABTU's Committee of Women in the Trades. 2016. Diversity Toolkit: Your Guide to Best Practices for Recruiting a More Diverse Membership. https://nabtu.org/wp-content/uploads/2017/06/Diversity-Toolkit-draft-6-15-17.pdf (accessed on October 27, 2017)

OECD Stats (2013) Trade Union Density. https://stats.oecd.org/Index.aspx?DataSetCode=UN_DEN (accessed on October 27, 2017).

OECD. 2016. Promoting Green and Inclusive Growth in Canada. http://www.oecd.org/canada/promoting-green-and-inclusive-growth-in-canada.pdf (accessed on October 27, 2017).

Office to Advance Women Apprentices. http://www.womenapprentices.ca/ (accessed on October 27, 2017).

Olczak-Rancitelli, M. 2015. Women in Transport. International Transport Forum. http://2015.internationaltransportforum.org/women-transport (accessed on October 27, 2017)

Ontario College of Trades. (2015). Women in the Trades. http://www.collegeoftrades.ca/resources-for-women (accessed on October 27, 2017)

Peters, J. and M. Katalytik. 2011. Equality and Diversity: Good Practice for the construction Sector. Equality and Human Rights Commission. Retrieved from: https://www.equalityhumanrights.com/sites/default/files/ed_report_construction_sector.pdf (accessed on October 27, 2017)

Runyan, A. and S. Peterson. 2013. *Global Gender Issues in the New Millennium*. New York: Westview Press.

Self Employed Women's Association [SEWA]. 2013. Annual Report. http://www.sewa.org/pdf/Sewa_Annual_Report.pdf (accessed on October 27, 2017)

Smith, Joanna. 2017. Women account for just 4.5% of skilled trade workers in Canada: report. *Canadian Press.* https://globalnews.ca/news/3823621/women-skilled-trades-manufacturing/ (accessed on October 27, 2017)

Standing Committee on Industry, Science and Technology. 2017. The Canadian Manufacturing Sector: Urgent Need to Adapt. https://www.ourcommons.ca/DocumentViewer/en/42-1/INDU/report-6 (accessed on October 27, 2017).

Statistics Canada. 2016. Employment by Industry and Sex. http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/labor10a-eng.htm (accessed on October 24, 2017).

Status of Women Canada. 2017. The Competitive Advantage: A Business Case for Hiring Women in the Skilled Trades and Technical Professions. http://www.swc-cfc.gc.ca/rc-cr/bc-cb/index-en.html (accessed on October 27, 2017).

Steering Committee of the Green Economy Network. 2015. Making the Shift to a Green Economy: A Common Platform of the Green Economy Network.

http://canadianlabour.ca/sites/default/files/media/GEN-Common-Platform-EN.pdf (accessed on October 27, 2017)

Supporting and Linking Tradeswomen [SALT]. 2017. Women in Trades https://saltaustralia.org.au/ (accessed on October 27, 2017)

Sustain Labour. 2009. Green Jobs and Women Workers: Employment, Equity and Equality. http://www.greengrowthknowledge.org/sites/default/files/downloads/resource/Green_jobs_and_women_workers_employment_equity_equality_Sustainlabour.pdf (accessed on October 27, 2017)

The Centre for Skills Development and Training. 2017. WIST- Enhanced General Carpentry for Women. http://thecentre.on.ca/skilledtrades/women-in-skilled-trades-wist/ (accessed on October 27, 2017).

The Policy Group on Tradeswomen's Issues. 2016. https://policygroupontradeswomen.org/ (accessed on October 27, 2017)

Thirgood, J., McFatridge, S., Marcano, M. and J. van Ymeren. 2017. *Decent Work in the Green Economy.* Toronto: Mowat Centre.

Toronto Transit Commission. 2017. Annual Report on Diversity and Human Rights Achievements. http://www.toronto.ca/legdocs/mmis/2015/ex/bgrd/backgroundfile-85432.pdf (accessed on October 27, 2017)

Transportation YOU. 2017. http://www.transportationyou.org/ (accessed on October 27, 2017)

Turnbull, P. 2013. *Promoting the Employment of Women in the Transport Sector: Obstacles and Policy Options.* Geneva: International Labour Office.

Turnbull, P. Lear, J. and T. Huw. 2013. Women in the Transport Sector: Promoting employment by preventing violence against women transport workers. http://www.ilo.org/wcmsp5/groups/public/---ed_dialogue/---sector/documents/briefingnote/wcms_234882.pdf (accessed on October 27, 2017)

United Brotherhood of Carpenters [UBC]. 2017. SIB Tips Newsletter. https://www.carpenters.org/sisters-in-the-brotherhood/ (accessed on October 27, 2017)

United Nations Development Program. 2013. *Green Jobs for Women and Youth- What can Local Governments Do?* New York: UNDP.

UN Women. (2012) Fast-forwarding Women's Leadership in the Green Economy. http://www.unwomen.org/2012/06/fast-forwarding-womens-leadership-in-the-green-economy/ (accessed on October 27, 2017)

USAID. 2014. Women at the Forefront of the Clean Energy Future. http://www.climateinvestmentfunds.org/sites/default/files/knowledge-documents/iucn_gender_and_re_-white-paper.pdf (accessed on October 27, 2017)

US-APEC Technical Assistance to Advance Regional Integration (US-ATAARI). 2017. APEC Women in Transportation Data Framework and Best Practices Report. Asia-Pacific Economic Cooperation and USAID. http://www.nathaninc.com/sites/default/files/APEC%20Women%20in%20Transportation%20Data%20Framework%20and%20Best%20Practices.pdf (accessed on October 27, 2017)

U.S Department of Transportation. 2011. Dialogue for Women in Blue-Collar Transportation Careers FINAL REPORT. https://www.transportation.gov/sites/dot.dev/files/docs/women-blue-collar-dialogue-fall-2011.pdf (accessed on October 27, 2017)

Voie, E. 2014. Transportation Patch for Girl Scouts. Fleet Owner http://fleetowner.com/news/transportation-patch-girl-scouts (accessed on October 27, 2017)

Wider Opportunities for Women. 2017. Pink to green Toolkit. http://www.wowonline.org/what-we-do/our-projects/women-and-work/pink-to-green-toolkit/ (accessed on October 24, 2017)

Women Employment in Urban Public Sector. 2017. http://www.wiseproject.net/downl/final_wise_project_report.pdf (accessed on October 24, 2017).

Women Building Futures. 2017. https://www.womenbuildingfutures.com/ (accessed on October 24, 2017).

Women in Construction Program https://womeninconstructionms.wordpress.com/ (accessed on October 27, 2017).

Women in Renewable Energy. http://www.womeninrenewableenergy.ca (accessed on October 27, 2017).

Women in Skilled Trades [WIST]. (2017). http://www.westofwindsor.com/our-programs-women-in-skilled-trades (accessed on October 27, 2017).

WTS International. 2017. www.wtsinternational.org/aboutus (accessed on October 27, 2017).