Gendered Emissions: Counting Greenhouse Gas Emissions by Gender and Why it Matters

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ABSTRACT: In recent years, as a result of women's concerted efforts, more attention has been paid to gendered distinctions related to climate change. Most of this literature focuses on the implications for women and their work in developing nations. In contrast, the gendered discussion that is focused on developed countries tends to be more concentrated on the distinctions in attitudes toward climate change and the implications this has for public policy initiatives. While this is an important step toward understanding the gendered distinctions at the household level, still relatively unexplored are the implications of the gendered distinctions in contributions toward greenhouse gas (GHG) emissions. This paper will focus on gendered distinctions relating to climate change for both paid and unpaid labour, as well as consumption issues in developed nations. Specifically it attempts to measure the greenhouse gas emissions by gender through work and the aspects of consumption that can be separated by gender. It then attempts to understand the significance of this in relation to both climate justice issues and public policy strategies to mitigate climate change. The paper will argue that knowing the gendered distinctions in GHG emissions can be informative for creating ideas about green jobs and a green economy that could provide a radical way to think about public policy and climate change.

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INTRODUCTION

Both climate disasters and incremental climate changes have an enormous impact on the way people live and work and these physical changes are not confined to the most marginal areas of the world's surface, but impinge upon the developed world as well. It is also fairly clear that public policy to deal with climate change in too many places is woefully inadequate to deal with the magnitude of the problem (Victor, 2011).[2] Public policy to deal with climate change has gendered implications both for its effectiveness in mitigating greenhouse gas emissions and for what it means for different aspects of work, play and consumption.

Feminists have not ignored the gendered effects of climate change but, unsurprisingly, gender issues have a fairly low profile in policy discussions. At the international level there is discussion of procedural justice, as more recognition is given to the need for a variety of interests to be part of the discussion and decision making process (IPCC, 2007; Agarwal, B., 2001). But any formal way to facilitate procedural justice has been absent from most concrete policy making (Klinsky and Dowlatabadi, 2009; Dankelman, 2002). Even popular sector movements that recognize the need for inclusivity in the discussion of alternatives tend to ignore women and the distinctions by gender (Riddell, 2011; Stahl, Rees and Byers, 2011).

This void is explained by some as a result of several things: one relates to the need to focus on "universal" issues, given limited resources, and the other stresses the prominence of technology and science solutions in policy discussions, as opposed to the 'soft' policies that look at social differences, particularly as they relate to incomes and opportunities (Lambrou and Piana, 2006). These are the kinds of factors that frequently inhibit a gender analysis of any social issues, but climate change has a specific disadvantage that contributes to the gender blindness that occurs in research and policy, particularly in developed nations. This is the lack of visibility of gendered environmental differences or injustices and a lack of imagination about how a gender analysis could be applied in research. Gender issues are more visible in developing countries or among aboriginal societies and the literature about the effects of climate change and gender related to these areas constitutes the bulk of the information available on gender and

2 Canada reduced its GHG emissions between 2007 and 2010, but much of this can be attributed to the decreased production associated with the economic recession, although the shift away from using coal from electricity production in some provinces also contributed to the improvement. But, the long-term trajectory shows the pattern of reduction is not expected to continue to decline (Environment Canada, 2011; 2013).

climate change.[3] Because of the less developed nature of the economies, and the close proximity women have to agriculture and the resource sectors, climate change's effect on women's work in these countries is visible and dramatic (Brownhill, 2007; Agarwal, 2001; Beaumier and Ford, 2010; Nelson and Stathers, 2009).

The issue of invisibility of gender issues for such a long time in the climate-justice literature and action in developed countries is also explained by some as a result of the dominance of males in the environmental movement's senior posts and the general gender blindness of the movement (Buckingham and Kulcar, 2009, p. 673). The actions of the state on environmental issues are conditioned by the ways it is contested by activist organizations and the kinds of issues they highlight. The fact that these organizations usually are male dominant means that gendered issues are not explored in either identifying environmental justice issues, or in seeking policy solutions.

As most groups dealing with inequality know, identifying the distinctions of experience itself is crucial for being included in policy discussions. But when the differential experiences are less visible through being diffuse as a community or income group, unpacking the implications is not straightforward. While academics are increasingly interested in environmental injustices, particularly as they relate to public policy, they tend to focus on inequalities in income and/or race and neglect gender (Buckingham and Kulcur, 2009). The most common understanding of environmental justice as it applies to individuals is exemplified in the definition used by the US Environmental Protection Agency: "Environmental Justice is the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies." (http://www.epa.gov/environmentaljustice/). For the most part gender (and age and disability) issues have been subsumed under class or income issues with the assumption that women's issues will be covered under the treatment of low-income and poverty groups.

Many of the methods that have been used to talk about gender and climate change tend to conflate the material related to developing nations with conditions associated with developed nations. While some studies are careful with regard to how examples are being used in specific references, there is an assumption (based primarily on experiences in developing regions) that in general, women are more vulnerable to climate change than men, have fewer resources to deal with it, and have

3 For a bibliography related to gender and climate change see Whiteside and Cohen, 2012.

greater work burdens as a result (Haight and Valley, 2010; Johnsson-Latham, 2007, Bjonberg and Hansson, 2013).

The primary method that is used to span the national divides is the assumption that since everywhere women on average are poorer than men in general, they will, as a result, be disproportionately disadvantaged by climate change. While it is true that women in developed nations have lower incomes on average than men, gender distinctions are not confined to income distribution alone, but also relate to the entire gendered experiences of our societies. One particular gap in knowledge pertains the relationship between climate change and gender in developed nations.

The intention in this study is to try to understand how men and women contribute to climate change through both work and consumption. The first part of the paper will specifically examine the gendered nature of paid work-related contributions to climate change by quantifying emissions associated with major GHG emitters in Canada. It will also discuss the gendered nature of consumption as it relates to work with a particular focus on the problems of unpacking gendered work/consumption within the household. One area of work/consumption that is easily quantifiable by gender is consumption related to vehicle transportation, one of the major sources of GHG emissions in Canada. The findings will then be analyzed in light of two categories of understandings of their significance. One will be how the gendered distinctions in GHG emissions through work and consumption can be understood in relation to climate justice. The other will be an exploration of the significance of gender in expanding our ideas about both green jobs and a green economy.

EFFECTS OF WORK ON CLIMATE CHANGE

Almost nothing has been written about the impact of work in developed nations on climate change with distinctions made by the gendered nature of paid work. Most of the interest in work has been on creating "green jobs," as a positive way of ensuring that government programs to reduce GHG emissions do not result in actions that increase unemployment rates.[4] The assumption is that with correctly designed policy, jobs can be created that have a low impact on the environment and that are well paid (Lee and Carlaw, 2010). This argument has been advanced to counteract the slow move of many developed nations to enact effective legislation to reduce GHG emissions. North American governments' rationale for inaction either

4 For example, Blue/Green Canada, the alliance between environmentalists, civil society, and trade unions describes on its website its work to "advocate for working people and the environment by promoting solutions to environmental issues that have positive employment and economic impacts." (http://bluegreencanada.ca/).

explicitly stated, or at least implied, is that unless all countries in the world adopt similar climate change policies, those countries that do so will be punished with poorer economic performance and rising unemployment rates as corporations readjust their production process to those jurisdictions that have no or few restrictions on emissions. This is the argument that Canada uses, for example, for not highly regulating the emissions from the tar sands in Alberta (Clarke, 2008) and why the US government did not sign on to the Kyoto Agreement (Biermann and Brohm, 2005).

In broad terms some jobs are dirty jobs that add a great deal to GHG emissions, while others have a more benign effect on the economy. This can be calculated in a variety of ways, with different types of measures of damage. While studies that look at these measures tend to talk in very broad terms, and not with reference to who does what type of jobs, it is possible to get an idea of where gender distinctions occur.

While there are methodological (and justice) problems associated with attributing GHG emissions to specific groups of labour, counting something seems to be the primary way that gender issues get noticed. In virtually anything related to distributional impacts (such as wage inequality, occupational distribution, poverty levels) calculating gender differences is the major way to have an issue recognized as significant. In the case of labour and GHG emission policies, bringing the gendered dimension into the discussion necessitates showing both the unequal contributions by gender and the gendered nature of mitigation or adaptation policies.

The method I have used for calculating gendered GHG emissions through work is to use the known major contributors to GHG emissions in a variety of different ways. The two most important contributors are through the industrial output by sector and the numbers of hours at work. In dealing with these issues, I first examine the major sectors of the economy in Canada that contribute to GHG emissions and, through a simple weighting of the gendered composition of the labour force in that sector, calculate the gendered contribution in each sector.

PAID EMPLOYMENT: GHG EMISSIONS BY INDUSTRIAL SECTOR

The energy sector is the biggest source of GHG emissions, accounting for 81 percent of the total in Canada. It should be noted that this includes all energy and heat generation and consumption in households, business, and transportation (Environment Canada, 2011). The rest of the GHG comes primarily from the agricultural sector (8 percent) and the industrial process sector (8 percent).

Energy production itself (from electricity, and oil and gas) accounts for 37 percent of total GHG emissions. While electricity production in Canada is largely hydro based and accounts for only 16 percent of total GHG emissions, this country is the source of a particularly dirty form of oil that is derived from the tar sands in Alberta. Production in the oil and gas sector alone accounts for 21 percent of total GHG emissions. Below is an example of the gender breakdown of those employed in the energy sector compared to the gender breakdown in the labour force as a whole.

Table I. Labour Characteristics of the Energy Sector – Canada
(% of total employed)

	Cdn. Labour Force	Oil & Gas	Electricity
Men	52%	72%	75%
Women	48%	28%	25%

Source: Statistics Canada, *Labour Force Survey*, 2007.

In what follows I calculate the gendered distinctions in production of GHG emissions by focusing on the categories of Industrial production, Transportation, and Residential contributions to GHG. Industrial production accounts for 66 percent (455,000 MT) of the total, transportation 28 percent (195,000 MT) and residential use 6 percent (41,000 MT). These calculations come from the National Inventory Report 1990-2011 prepared by Environment Canada.

Table II shows the major sources of GHG emissions by industry in Canada. Transportation, the largest single sector contributing to GHG emissions, is omitted from this table. It will be dealt with in the subsequent section because the method used for calculating the gender share in transportation is slightly different from that used below.[5]

As Table II shows, industrial production in Canada is highly gendered with females dominant in industries that have lower GHG emissions than those dominated by males. So, for example, the commercial and institutional industries account for only 4 percent of total industrial GHG emissions and are sectors that are dominated by females. The

5 The calculations of the gendered share, (e.g. Female share) of GHG emissions from major industrial emitters (GHG female major industrials = GHGfmi) is as follows: GHGfmi = I1-12(F1-12). I1 = GHG emissions from electricity and heat generation; I2 = fossil fuel production and refining; I3 = mining and oil and gas extraction; I4-8 = manufacturing heavy emitters (iron, steel, and non-metals; chemical; paper and pulp; cement; other manufacturing); I9 = Construction ; I10 = Commercial & Institutional; I11 = Agriculture; I12 = waste; F1-12 = % of women working in these industrial sectors.

industries with the highest GHG emissions are the energy sector whose gender breakdown was presented in Table I, and agriculture where women comprise 30 percent of the labour force. Within manufacturing and industrial processes males again dominate in most of the heavy emitters (iron, steel and metal production), cement and mineral products, and 'other' sectors. The only sector in this category with high emissions and where women's employment is a large proportion of the total is the chemical sector where women account 41 percent of the labour force.

Altogether the gendered breakdown of GHG emissions in the manufacturing and industrial processes is highly skewed. The male share of GHG emissions in the industrial and manufacturing sector is 76 percent and the female share is 24 percent.

Table II. Gender Share (%) of GHG Emissions by Industry

Canada 2010 in Megatons (MT)

GHG Categories	Total GHG Emissions in MT	% of total Labour Force	Female % of total labour in industry	Male % of total labour in industry	Female Emissions in MT	Male Emissions in MT
GHG Emissions Total MT	**692,000**					
Major Industrials						
Electricity and Heat	101,000	15%	24%	76%	24,240	76,760
Fossil Fuel Production	53,000	8%	10%	90%	5,300	47,700
Mining, Oil and Gas[1]	96,800	14%	18%	82%	17,424	79,376
Mfg Industries and Industrial Processes[2]	93,100	13%	28%	72%	26,068	67,032
Iron and Steel	22,890	3%	11%	88%	2,518	20,143
Chemical	16,500	2%	41%	59%	6,765	9,735
Pulp and Paper	6,460	1%	23%	77%	1,486	4,974
Cement, Lime, Mineral	12,070	2%	8%	92%	966	11,104
Other Manufacturing	35,700	5%	28%	72%	9,996	25,704
Construction	1,490	0%	11%	89%	164	1,326
Commercial and Institutional	28,400	4%	56%	44%	15,904	12,486
Agriculture	59,260	8%	30%	70%	16,800	39,200
Waste	22,000	3%	19%	81%	1,480	17,820
Total Major Industrial Emitters	**455,050**	**65%**	**24%**	**76%**	**111,058**	**343,992**

[1]Mining, oil and gas extraction and fugitive sources

[2] Mfg. industries and Industrial Processes are combined

Sources: Environment Canada, *National Inventory Report 1990-2010* Table A12–2 Canada's 1990–2010 GHG Emissions by Sector; Statistics Canada, Labour Force Survey, Table 282-0008; NAICs; Custom Data for *Labour Force Survey* 2012

TRANSPORTATION

Generally when issues of consumption are examined, the main focus tends to be on gender differences with regard to transportation, primarily because this form of consumption looms so large in GHG emissions. In Canada, transportation accounts for about 28 percent of total GHG emissions, the single largest category, and within this group road transportation accounts for 69 percent of total emissions for all transportation (or 19 percent of total GHG emission).[6]

In the US men are more likely than women to drive long distances to work[7]: about 3.5 million people have a travel time of four hours per day and two-thirds of these are men. In Sweden it is estimated that men account for at least about 75 per cent of all driving, expressed as person kilometers. About 6.9 million cars are registered in the country, of which women own only 1.7, or 25 percent, and women represent about two-thirds of all households where no one has a driving license (Johnsson-Latham, 2007 p. 53).

My calculations for Canada show clearly that males dominate in the number of miles driven and account for most of the vehicle emissions. As can be seen from Table III, females account for about 34 percent of the miles driven and almost all of these occur in passenger vehicles. Passenger vehicles emit fewer GHGs than do trucks, especially very big trucks, which are almost exclusively driven by males. In calculating women's proportion of the driving by vehicle type (Table III), and applying that to the emissions by vehicle type (Table IV), it is possible to show that women as a group contribute about 11 percent of GHG emissions from driving vehicles. I have calculated this in the following way: GHGtf = V1 (f1) +V2 (f2) + V3(f3).

GHGft = GHG emissions for female vehicle owers; V1 = GHG emissions from vehicles up to 4.5 tonnes; V2 = Trucks 4.5 – 14.9 tonnes; V3 = Trucks over 15 tonnes. f1,2,3 = % of women driving each class of vehicle.

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6 Calculated from Environment Canada 2011, Table S-1.

7 It should be noted that information available is not consistent across countries. In Canada the information about vehicle use is available by vehicle type and mileage, but not by the division between work and other activities.

Table III

Vehicle-Kilometers by Gender, Canada 2009 (Million km)				
Type of vehicle	Total	Males	Females	Females %
Total, all vehicles	332432	236908	95524	29%
Vehicles up to 4.5 tonnes	302959	208083	94877	31%
Trucks 4.5 tonnes to 14.9 tonnes	8242	8153	89	1%
Trucks 15 tonnes and over	21231	20673	558	3%

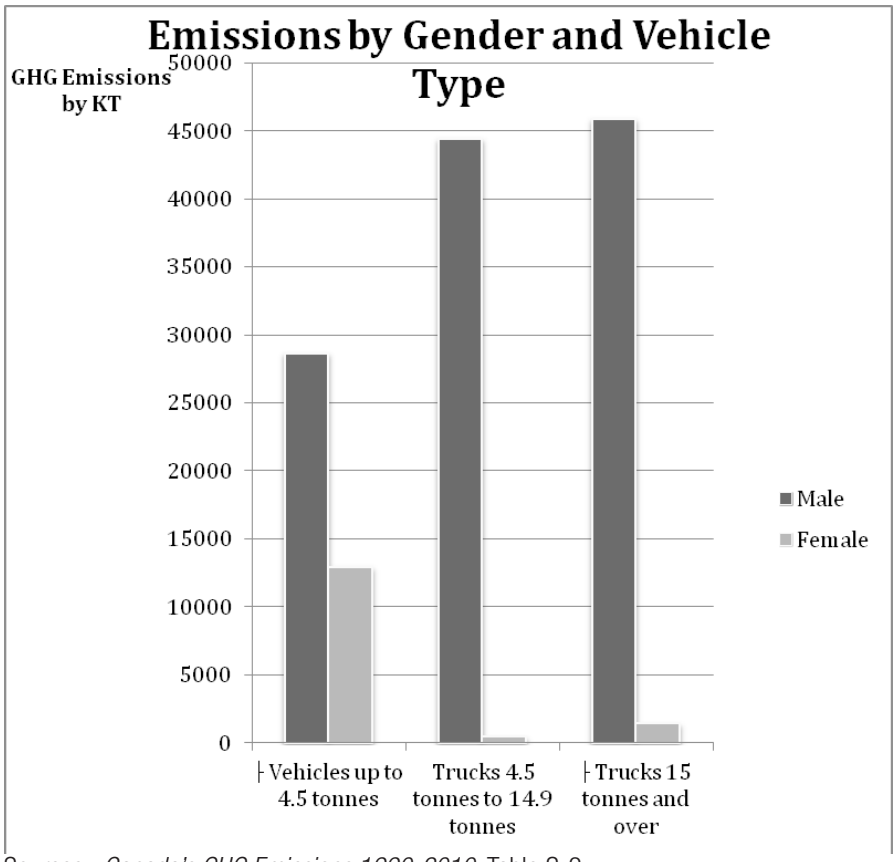
Table IV. Gender Share of GHG emissions for Road Transportation

		Total GHG MT	female% miles	male % miles	F GHG	M GHG
Vehicles up to 4.5 tonnes	***	41,701	31	69	12927	28774
Trucks 4.5 tonnes to 14.9 tonnes	****	44,890	1	99	449	44407
Trucks 15 tonnes and over	*****	47,110	3	97	1413	45697
All Road Vehicles		**133,701***			**14,789**	**118,878**
% Total Vehicle Emissions					**11%**	**89%**

Note: The total for emissions from vehicle type differs slightly from the total GHG from Road Transportation on table S-5.
Source: Calculated from Table A12–2 Canada's 1990–2010 GHG Emissions by Sector, National Industry Report; data by gender calculated from Table 405-0073 Canadian vehicle survey

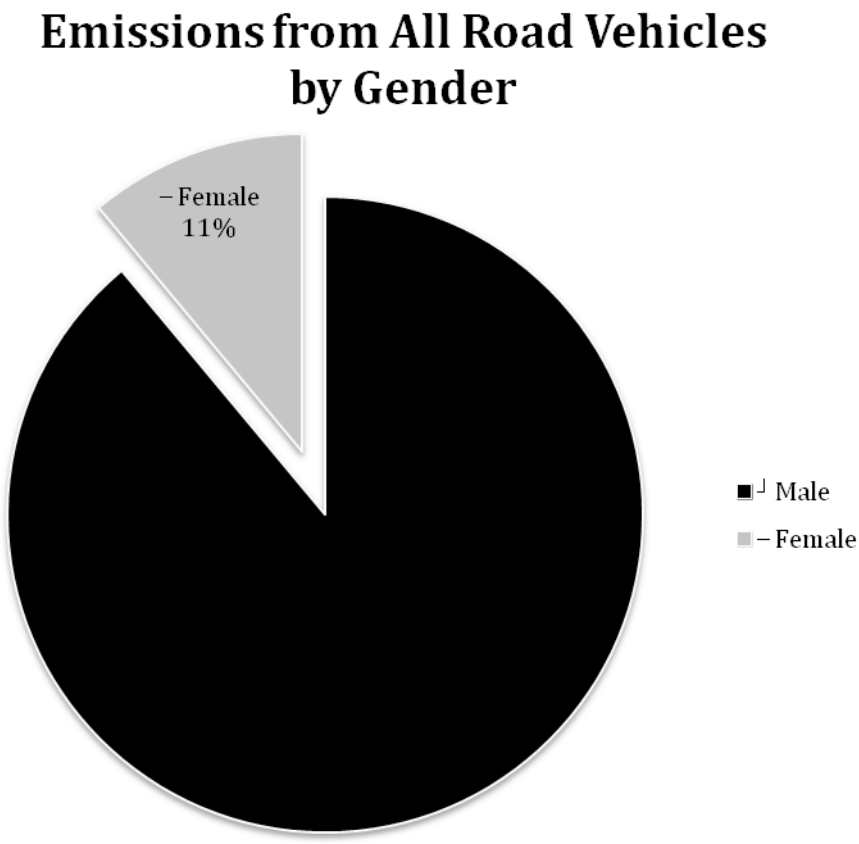
Graph I visually shows the large discrepency in the gender of vehicles driven and the GHG associated with these vehicles. Graph II shows the total proportion of GHG emissions by gender in Canada

Graph I



Sources: *Canada's GHG Emissions 1990-2010,* Table S-2,

Graph II



Calculated from Table A12–2 Canada's 1990–2010 GHG Emissions by Sector, National Industry Report; data by gender calculated from Table 405-0073 Canadian vehicle survey

The gender breakdown is also available for domestic civil aviation, but not for railways, navigation and other forms of transportation. The total GHG emission from civil aviation is 6,200 MT. According to the Commercial Aircraft Travel Survey of Residents of Canada 2010, females account for 54 percent of air travel and men 45 percent. Through air travel then, women would be responsible for 3,370 MT and males 2,829 megatons. (Statistics Canada, Travel Survey 2010)

HOUSEHOLD GENDER/WORK AND CONSUMPTION-RELATED ISSUES

One major difficulty in discussing the gendered distinctions in the impact of work on the climate is the problem of separating the act of consumption from activities that constitute work. Consumption is integral to concepts of work (such as gasoline consumption) and is especially relevant in places like the household. Dealing with what constitutes work within the household is a conceptual problem that separates it from work that is marketized. Certain kinds of household related consumption have gendered patterns that relate to the work roles within or for the household. In this paper I am primarily concerned with the gendered division of labour within the household because it has important implications for public policy responses to climate change.

In broad sweeps the literature tends to find that virtually everywhere throughout the world males account for greater consumption and greater carbon dioxide emissions than females (Johnsson-Latham, 2007). This consumption pattern is primarily associated with greater mobility for a larger proportion of men. Analysis of gendered consumption in Sweden, for example, shows that males' consumption of transport is double that of females. Other areas where male consumption is higher than females in Sweden is in dining out, alcohol and tobacco consumption, and leisure activities related to sports. The areas where female consumption is greater than males is in household related consumption, where women make the majority of purchases for consumer goods, clothing and shoes, health and medical care, and books, newspapers and media (see Appendix I). The Swedish study does not show the energy content of the gendered consumption baskets, so for areas other than transport, the GHG emissions impact of consumption by gender is not clear.

Getting a clear picture of gendered consumption in the household is not straightforward. In Canada there is no attempt to understand these distinctions by Statistics Canada, our major data collection body. In the US there is an interest in the subject, but the lack of data that includes observations of consumption for men and women separately does not permit understanding of spending by gender in households with both males and females. In one attempt to get at this issue the US Consumer Expenditure Survey examines gender differences between single men and single women. Because the survey does not collect data on which member of households consisting of both men and women purchased an item, this is the only data so far to show gender differences in household

spending. Of course, the spending patterns of single men and women may be very different from households where joint decisions are made (Shipp, 1987).

Class or income level is the issue that is usually found to affect the level of consumption in any country (OECD, 2008). The more wealthy the country, the higher the level of consumption, and within countries the wealthier the household, the higher the consumption level. Measures of consumption for climate change purposes usually invoke the 'carbon footprint,' a measurement of quantities of carbon dioxide emissions associated with an activity (Kitzes and Wackernagel, 2009).[8] Sweden, for example, has a considerably higher level of energy consumption than the EU average, with the average Swedish consumer driving a more energy intensive car, living in more space, and eating more meat than other EU citizens (Johnsson-Latham, 2007, p. 38). Similarly, the average person in the US consumes a great deal more than most people in the world and those in Canada have among the highest per capita energy consumption.[9] In Canada the high energy use is usually explained by the cold climate and massive size of the country.

Within nations, consumption usually is correlated with income levels, which in turn can be associated with marital status and paid employment by gender (McKenzie, Messinsger and Smith, 2008). However, information on this varies from country to country. A Netherlands study shows that two-income families, or families where women have paying jobs, tend to have higher consumption levels as a result of higher incomes and the increased time pressures from having both paid and unpaid work. The two-income household uses more energy than a household where either the female partner did not work or a woman was living alone (Clancy and Roehi, 2003).

A UK study showed somewhat different results. As elsewhere, energy and transport are the biggest contributors to the 'footprint' of households. Rural and adult households with few members had significantly larger energy use than did urban/suburban households and households with many members. The direct household energy use relates to heating,

8 The carbon footprint is a component of the ecological footprint. The ecological footprint is a concept in resource accounting that measures how much productive land and sea is used, either by an individual, nation, or type of activity, and relates this to the total available. According to William Rees, 'a complete eco footprint analysis would quantify the total ecosystem area that the population effectively 'appropriates' to meet its final demand for economic goods and services." (Rees 2006).

9 The US and Canada are among the highest energy users in the world. According to World Bank statistics Canada used 7,243 kg of oil equivalents per person in 2012 and the US used 6,793. (http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE)

cooking, fueling cars, but also considered was the indirect energy use in consumption associated with production, processing, and distribution of food. This study also found that a higher household income affects energy use, most notably for travel (Caird and Roy, 2006). In Canada, evidence shows that the ecological footprint of high-income households is substantially greater than other households and that with the exception of expenditures on food, consumption in every category increases steadily as incomes increase (Mackenzie, Messinger and Smith, 2008). At least one study in the US, however, finds little evidence to indicate differences between male and female-headed households, and in countries where more equal economic conditions exist, women tend to adopt male-type lifestyles and consumption patterns (Lambrou and Piana, 2006).

In lieu of a method for calculating the gendered nature of GHG within a household I have divided these equally so that females and males each account for 50 percent of the residential GHG emissions, or 20,500 MT.

GENDER TOTALS AND SHARES

By aggregating the GHG emissions by gender from three main categories, Industrial Sectors, Transportation, and Residential use, one is able to arrive at an approximate sense of the gendered nature of GHG emissions in Canada.

Table V. GHG Emissions by Gender in Canada

Categories	Total GHG Emissions	Female GHG	Male GHG
Industrial	455,050	111,058	343,992
Transportation			
Road	133,701	14,789	118,878
Air	6,200	3,370	2,829
Residential	41,000	20,500	20,500
Total	**635,951**	**149,717**	**486,199**
Share		**23.5%**	**76.5%**

*Note: The total GHG emissions in Canada = 692,000. I have only included categories in my total where it was possible to ascertain gender differences. So, for example, I did not include transportation other than road and air.

DISCUSSION

The major question is whether knowing the gendered contributions to climate change matters in any way. There are several ways to examine the significance in this sense, but I will focus on three issues that may be significant. One relates to issues of climate justice, where it is often understood that those responsible for GHG emissions have a greater responsibility and thus greater obligations than those who do not. The second framework relates to public policy initiatives to reduce GHG. Knowing the gendered impact of these policies can be important for climate justice. The third major framework that ultimately may be most significant relates to climate change initiatives that are broader than those currently envisioned. As you will see as the discussion proceeds, my sense is that the climate justice implications are less significant than what the implications of gendered distinctions in GHG emissions can indicate about the economy itself. I hope to show that expanding the notions of what constitutes a 'green job' or a 'green economy' can be accelerated if issues of gender are taken into account. This could ultimately be crucial for moving toward a cleaner, fairer economy altogether.

CLIMATE JUSTICE

Academic discussions of climate change and issues of ethics focus almost exclusively on distributive and procedural justice as it pertains to climate reduction policy of nations (e.g. Klinsky and Dowlatabadi, 2009; Posner and Sunstein, 2008; Adger, 2006).[10] Some international groups have posited principles for climate justice that go beyond ethical issues between nations and recognize the significance of identifying certain identifiable populations as crucial for consideration in public policy issues. The Environmental Justice movement in the US, for example, cites ten principles for climate justice policies in the US and specifically mentions "low-income workers, people of color, Indigenous Peoples," and future generations. It also calls for community participation in decisions related to climate change (Environmental Justice Movement, n.d.). The Bali Principles of Climate Justice has a more extensive list of twenty principles and includes various types of justice that focus on the poor, women, rural, and indigenous peoples (International Climate Justice Network, 2002).

10 Distributive justice refers to the ways that both the burden of climate change and its solutions are ethically part of public policy. Procedural justice refers to the inclusion of all who are affected by climate change in designing public policy to deal with it.

One academic study that is useful for dealing with the applied ethics involved in climate policy is by Sonja Klinsky and Hadi Dowlatabadi (2009). In this review of the literature on climate change justice, five basic principles emerge as a guide to the ethics of climate change policy. These are as follows:

- Causal responsibility (polluter pays)
- Preferential treatment based on need (related to both the ability to pay for emission reductions and to recover from climate change impacts with a focus on the most vulnerable)
- Equal entitlements (to protection from climate impacts)
- Equal burdens (to climate policy costs). The assumption is that all people have equal moral responsibility and there is no reason why some should have a heavier burden than others.
- Procedural justice (i.e., representation by all who have a stake in the outcomes of climate policy)

Clearly, some of these principles can be at odds with others: causal responsibility is at odds with the equal burden principle and equal entitlements can be at odds with preferential treatment. These are the types of ethical issues that are common in discussions about crafting public policy and have been addressed in various types of human rights legislation.

I will focus my analysis on causal responsibility and what this might mean for certain kinds of policy initiatives. The main point of causal responsibility is that "the mismatch between beneficiaries of fossil energy and victims of climate impacts gives the beneficiaries special obligations" (Klinsky and Dowlatabadi, 2009, p. 90). Normally this is associated with the pain experienced in less developed nations and the benefits conferred upon developed nations. The climate justice message is that it is not justifiable that those who have benefited and those who have not benefited bear equal obligations. However, the idea of identifying who is responsible for climate change is problematic, particularly when people individually benefit from increased GHG emissions in different ways, either through their work, consumption, or profits.

The major problem with assigning a gendered position to causal responsibility is that the beneficiaries, by gender, are not easily determined. While males benefit, often because of higher rates of employment and wages when working in 'dirty industries,' our economic reality is that what is produced is diffuse throughout the population and often is

essential to maintain life or a standard of living. Also, men and women live together and share material goods within the household. While this may not be equal sharing, as discussed above, until consumption patterns reveal that males do consume in ways that are more detrimental to the environment than females, for most purposes the assumption of equal benefit from male employment in 'dirty industries' makes sense.

Because the household is shared space, assigning gendered weight for consumption intensity is problematic. So while males may have a larger carbon footprint because they drive more and further, with more gas-guzzling machines, the social gendered nature of the division of labour, rather than consumption decisions, largely conditions these work-related aspects of consumption. All consumption practices are embedded in a social context and households are collective entities where some consumption practices do relate to individual preference, but most household consumption decisions relate to collective use and are subject to the usual processes of organizing household behaviour. The structural nature of the economy greatly affects how closely households shape their consumption patterns according to income distribution, employment levels, and the gendered division of labour (Schultz and Steib, 2009). The important point to be taken from this is that gendered consumption intensity may in some respects reflect individual choices, but for the most part is shaped by larger economic and social issues. This does not, however, mean that the impact on public policy decisions relating to household consumption will not have significant gendered impacts.

SOME PUBLIC POLICY CONSIDERATIONS

Having different information about the gendered nature of climate change issues could be very important for understanding the impact of various types of public policy designed to reduce GHG emissions. I will use as examples two of the most frequently used policy instruments that are designed to change people's behaviour in order to reduce GHG emissions. These are time-of-use electricity metering and carbon-taxes on gasoline. Because of the gendered division of labour and different consumption habits, the respective policies may have different impacts.

Smart Meters and Time-of-Use Electricity Policy

Time of use electricity metering is gaining popularity, particularly in jurisdictions that rely on fossil fuel for electricity generation. In order to save the electricity company expensive building for new generation,

several different types of strategies are used to reduce energy use. One important one that would smooth out energy use (to avoid building for peak periods) is to encourage people to reduce their household concentration of energy use at specific times (e.g. from 7-9 a.m. and from 5-10 p.m.) to other times of the day. Usually this is done by providing reduced rates for off-peak periods. The impact this could have on certain types of household labour could be substantial. The most often cited example of how this could reduce a household's electricity bill would be by shifting activities like laundry to late-night hours when the demand for electricity drops dramatically.

Many new daily housework and caring responsibilities are incurred through public policy on climate change without any understanding of what this means for work within the household. As one analyst has noted, "with the rise of public campaigns for environmental awareness, those who manage households...are expected to be more diligent in adopting time consuming green practices like recycling and precycling" (MacGregor, 2006, p.69). All of these issues become even more significant in a neoliberal climate where appropriate public services are being reduced without new ones being created to meet the additional needs of families at a time when two incomes are the norm.

This is not to imply that government environmental policy should not apply to the realm of the household, but that there needs to be an increased understanding of the work burdens these changes imply. The method to be used here would be time/use studies of gendered work within the household. With knowledge of these gendered impacts different kinds of public policy initiatives might be considered. What I have in mind are policies related to paid work that affect the gendered division of labour within the home. It has long been recognized that the higher demands of male work-force participation by hours worked have contributed to a negative effect on contributions to household labour. The policy implications, then, would not only have environmental, but also market oriented as well as social implications. Reducing hours of work, hourly productivity and the employment to population ratio is thought to be a solution to the environmental problem posed by long hours of work (Hayden and Standra, 2009, p. 592). Reduction of hours of work through productivity gains would shift remuneration to 'time affluence' and could have a marked impact on household workloads by gender.

So far, the examination of household behaviour seems to be of interest to climate change researchers less because of the justice issues involved than because of the ways different consumer behaviours can

be affected by public policy. Public policy makers or analysts are interested in knowing what affects people's attitudes and decisions and how households respond to environmental policies (OECD, 2008). So, while certain kinds of policies, such as user charges for waste disposal, can be identified as being regressive with poorer households assuming a greater proportional impact of the policy, little is known about the increase in household work and who does it when policy initiatives result in more work intensive processes.

Carbon taxes

The literature on the effects of carbon taxes tends to focus on differential impacts based on class. A carbon tax is a tax on the purchase of fuels, including gasoline, diesel, natural gas, and coal – all fuels emitting carbon. In the body of literature on this subject, households are treated as undifferentiated units and gender distinctions are not usually considered (Metcalf, 2008). The usual interest is whether the poor are unjustly treated through a disproportional tax burden. When this is understood, there are attempts to encourage the government to design the tax to correct the regressive nature of its incidence (Lee and Carlaw, 2010).

One exception in the approach in the academic literature is the work done by Nathalie Chalifour. Her study examines carbon taxes as they were instituted in two provinces in Canada, namely British Columbia and Quebec. In B.C., the government sought popular approval by making the carbon tax 'revenue neutral,' meaning that it was not going to be instituted as a tax gatherer, but rather was designed to change consumer behaviour. This meant that many tax reductions and rebates were a feature of the design as were the promises for using any surplus revenues. Chalifour uses the causal responsibility principle of social justice as her framework for understanding gender distinctions: "just as it would be inequitable to expect the same level of emissions reductions from countries that have contributed little to creating the climate change problem, it would be inequitable to design policy responses to climate change that place a greater burden on women than on men" (Chalifour, 2010, p. 186). She also makes the point that any analysis of environmental tax policy must include an examination of not only the tax but also of any complementary policies (that is, income tax deductions) and decisions pertaining to the use of the revenue generated by the tax. The "purpose of this goal is to ensure, at a minimum, that inequality between women and men is not perpetuated by the policy and, ideally, to seek out carbon tax policies that are capable of promoting gender equality"

(Chalifour, 2010, p. 191). Chalifour's conclusion is that women are disproportionately affected because they are, on average, poorer than men and, therefore, pay a great proportion of their income on the tax than would men. This may well be the case and is an important contribution to the understanding of the complexities of climate change policy.

My intention is to build on this approach by urging greater research into gendered distinctions in both the contribution to climate change and the impact of public policy to either mitigate or adapt to climate change. So, for example, if we assume that the household is shared space with equal responsibilities for climate change, the impact of a carbon tax on individuals by gender may be on vehicle drivers. If this is true (and it is by no means certain), the heaviest impact would be on males who drive considerably more than females. Figuring out who, in this case, would be most affected by gender is complex and new ways of looking at disparities besides income distribution need to be considered. So, for example, information about the incidence of the tax would also benefit from clear understandings pertaining to the kinds of households (male headed or female headed, age of person within the household, etc.) and energy use.

WIDER IMPLICATIONS FOR GREEN JOBS AND A GREEN ECONOMY

Ultimately, knowing the gender contribution to GHG emissions lends weight to the argument that including gender considerations in public policy decisions about climate change could be a significant dynamic for a very different policy approach to the economy. Currently most ideas about 'green jobs' and a 'green economy' focus fairly narrowly on reducing the GHG emissions from the dirtiest industries. This includes substantial subsidies to 'dirty industries' in order to 'green' them and creating entirely new industries in the energy sector to displace the reliance on fossil fuels. When gender issues are considered at all in this framework, it is on how to get women into the typically male-dominated jobs in these sectors. In the instances when training for 'green jobs' occur, for example, this is usually in the building trades, transportation, or in the energy sector. The push, then, is to include women in the training initiatives that are normally the purview of men with the hope that ultimately women will receive jobs through green initiatives in this sector. What tends to be ignored is the daunting task of not only training, but getting women accepted in non-traditional jobs in skilled trades (McFarland, 2013). The strug-

gles with this over the years has been the object of much feminist activity and while there are significant initiatives from time to time, the over-all tendency is for little to change (Cohen, 2003). Within the new 'green' industries that are created (such as wind, solar, bio-mass) the overwhelming tendency is for the labour distribution by gender to continue the same pattern as in the energy industry at large (Cohen and Calvert, 2013).

The initiatives related to continue to dominate the discussion of 'green jobs,' but there is increasingly an interest in expanding the concept so that a wider range of occupations can be included in policy initiatives. Often this is referred to as 'greening jobs,' and includes ideas about how all existing jobs can be less environmentally damaging (Lipsig-Mumme, 2013).

This is a considerable shift from the current way of treating employment that is not only environmentally damaging, but also largely segregated by gender. In addition, there are beginning to be some serious discussions, even in more traditional arenas like the UN, for a more expansive concept of a 'green economy' as a way of rethinking traditional ideas about how economies are structured and oriented primarily toward economic growth. The United Nations Environment Programme has gone so far as to state (in its Green Economy Initiative, 2011) that there is 'disillusionment with our prevailing economic paradigm,' and the sense that the economic and ecological crisis can be overcome by fostering a green economy. In many respects it may appear utopian to envision an economy that is light on the environment, but is able to provide the crucial materials and services that people need. Clearly moving in this direction would be almost impossible with the vested interests of the current economic structures so firmly in place. But if governments could be convinced that promoting areas where there are real needs, primarily among the caring sector, and reducing all of the government support that goes toward the energy and material goods sectors, the beginnings of a shift in economic emphasis could occur. My main point in this regard is that by making caring work more visible by recognizing its significance to the general economic health of a nation, a shift in the structure of an economy could begin to occur. Identifying sectors of the economy that are already 'green,' that is, sectors where women are concentrated, and giving jobs in these sectors as much prominence in the discussion of what is 'green' would be a first step in rethinking economic priorities.

CONCLUSION

There are gendered differences in the work associated with climate change. Men, as a group, are more involved with work that contributes to GHG emissions than are women. This is evident by their direct work in industries that are identified as the major sources of GHG emissions in Canada. It is also evident by the much greater contribution of males to GHG emissions through vehicle use. Less clear is the division of responsibility for GHG emissions from labour within the household. This paper argued that until significant time/use studies within the household associated with GHG emissions is undertaken, the assumption of shared responsibility for this source of emissions needs to be taken. This does not mean, however, that labour within the household is unaffected by public policy related to GHG emissions. Public policies frequently impose increased labour burdens on households, that without appropriate offsets could have significantly unequal impacts by gender.

But the most significant implications of understanding gender contributions to GHG emissions will be the shifts that could occur in dealing with issues of climate change. While the production of clean energy and energy efficiency and the reduction in emissions from 'dirty industries' and vehicle use are all clearly essential, more attention must be given to boosting those areas of the economy that are inherently less damaging to it, but provide essential human needs. Such a shift would have the most positive gender implications.

Appendix I

Consumption Expenditure in Swedish krona/capita 2004			
Type	**Male**	**Female**	**Men's consumption as a share of women's**
Eating out	2 010	1 370	3/2
Alcohol	360	160	2.5/1
Tobacco	620	380	2/1
Consumer goods	190	820	1/4
- (incl. hygiene)	40	800	1/20
Household services	620	1 220	1/2
Clothing and shoes	3 010	4720	2/3
Health and medical care	1 470	2450	2/3
Transport	1 350	740	3/2

-of which car repairs and maintenance	670	380	2/1
Leisure-time activities	2 800	2 650	1/1
- of which sport	1 350	970	3/2
- books, newspapers, TV licence	430	690	2/3

Source: Johnsson-Latham, 2007, p. 39.

REFERENCES

Adger, W. Neil, ed. (2006). *Fairness in adaptation to climate change.* Boston: MIT Press.

Agarwal, B. (2001). "Participatory Exclusions, Community Forestry, and Gender: An Analysis for South Asia and a Conceptual Framework," *World Development*, 29(10), 1623-1648.

Anderson. Deb. (2009). "Enduring drought then coping with climte change: Live experience and local resolve in rural mental health," *Rural Society* 19(4), 340-352.

Beaumier, M.C. and Ford, J.D. (2010). "Food insecurity among Inuit women exacerbated by socioeconomic stresses and climate change," *Canadian Journal of Public Health*, 101(3), 196-201.

Biermann, Frank and Brohm, Rainer. (2005). "Implementing the Kyoto Protocol without the USA: the strategic role of energy tax adjustments at the border," *Climate Policy,* 4, 289-302.

Bjornberg, Karin Edvardsson and Sven Ove Hansson. (2013). "Gendering local climate adaptation," *Local Environment*, 18(2), 217–232, http://dx.doi.org/10.1080/13549839.2012.729571

Brownhill, L.S. (2007). "Gendered struggles for the commons: Food sovereignty, tree-planting and climate change. *Women & Environments International Magazine*, *4, 34-37.*

Buckingham,S. and Kulcur, R. (2009). "Gendered Geographies of Environmental Justice, *Antipode* 41(4), 659-683.

Caird, S. and Roy, R. (2006). "Household Ecological Footprints – Demographics and Sustainability. *Journal of Environmental Assessment Policy & Management*, 8(4), 407-429.

Canada, *Census 2006*, Industry – North American Industry Classification System, Class of Worker and Sex for the Labour Force.

CERI (Canadian Energy Research Institute). (2009). *The Impacts of Canadian Oil Sands Development on the United States' Economy. Final Report.* October

Chalifour, N. (2010). "A Feminist Perspective on Carbon Taxes," *Canadian Journal of Women and the Law*, 21(2), 169-212.

Clancy, Joy and Ulrike Roehi. (2003). "Gender and Energy: is there a northern perspective? *Energy for Sustainable Development. 7(3), September, 44-49.*

Clark, Tony. (2008). *Tar Sands Showdown: Canada and the New Politics of Oil in an Age of Climate Change*. Toronto: James Lorimer.

Cohen, Marjorie Griffin, ed. (2003). *Training the Excluded for Work: Access and Equity for Women, Immigrants, First Nations, Youth and People with Low Income* Vancouver: UBC Press.

Cohen, Marjorie and John Calvert. (2013). "Climate Change and Labour in the Energy Sector." In Lipsig-Mummé, C. ed., *Climate @ Work* (pp.76-104). Halifax & Winnipeg: Fernwood.

Dankelman, I. (2002). "Climate change: Learning from gender analysis and women's experiences of organizing for sustainable development," *Gender and Development*. 10(2), 21-29.

Environment Canada 2011. National Inventory Report 1990–2009: Greenhouse Gas Sources and Sinks in Canada. http://www.ec.gc.ca/ges-ghg/

Environment Canada 2013. National Inventory Report 1990-2011 : Greenhouse Gas Cources and Sinks in Canada. http://www.ec.gc.ca/ges/ghg/

Environmental Justice Movement (nd). "10 Principles for Just Climate Change Policies in the U.S." http://www.google.ca/url?sa=t&rct=j&q=environmental%20justice%20movement

Haigh, Christine and Bernadette Valley. (2010). *Gender and the Climate Change Agenda: The Impacts of Climate Change on Women and Public Policy*. UK: Women's Environmental Network.

Hayden, A., and Shandra, J.M. (2009). "Hours of Work and the Ecological Footprint of Nations: An Exploratory Analysis, *Local Environment* 14(6), 575-600.

Intergovernmental Panel on Climate Change (IPCC) 2007. "Summary for Policymakers." In Parry, ML., Canziani, O.F., Palutikof, J., van der Linden, J.P. and Hanson, C.E., eds., *Climate Change 2007: Impacts, Adaptation and Vulnerability: Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (pp. 7-22). Cambridge: Cambridge University Press.

International Climate Justice Network. (2002). *Bali Principles of Climate Justice*.http://www.indiaresource.org/issues/energycc/2003/baliprinciples.html

Johnsson-Latham, Gerd. (2007). *A study in Gender Equality as a Prerequisite for Sustainable Development: What we know about the Extent to which Women Globally Live in a More Sustainable Way than Men, Leave a*

Smaller Ecological Footprint and Cause Less Climate Change. Report to the Environment Advisory Council, Ministry of the Environment. Sweden.

Kitzes, J. and Wackernagel, M. (2009). "Answers to common questions in Ecological Footprint Accounting, *Ecological Indicators* 9(4), pp 812-817.

Klinsky, Sonja and Dowlatabadi, Hadi. (2009). "Conceptualization of Justice in Climate Policy," *Climate Policy* 9(1), 88-108.

Lambrou, Y. and Piana, G. (2006). "Gender: The Missing Component of the Response to Climate Change," USA: Food and Agriculture Organization (FAO). http://www.fao.org/sd/dim_pe1/docs/pe1_051001d1_en.pdf

Lee, Marc and Kenneth L. Carlaw. (2010). *Climate Justice, Green Jobs and Sustainable Production in BC*. Vancouver: Canadian Centre for Policy Alternatives.

Lipsig-Mummé, C. (2013). "Climate, Work and Labour: The International Context." In Lipsig-Mummé, C. ed., *Climate @ Work* (pp.21-40). Halifax & Winnipeg: Fernwood.

Mackenzie, H, Messinger, H. and Smith, R. (2008). *Size Matters: Canada's Ecological Footprint, By Income*. Ottawa: Canadian Centre for Policy Alternatives. http://www.policyalternatives.ca/documents/National_Office_Pubs/2008/Size_Matters_Canadas_Ecological_Footprint_By_Income. Pd

McFarland, Joan. (2013). "The Gender Impact of Green Job Creation." Toronto: Work in a Warming World, forthcoming.

Metcalf, Gilbert E. 2008. "Protecting the Poor with a Carbon Tax." Presented to the Financing for Development Office. UN Department of Economic and Social Affairs, June 17.

Nelson, V. and Stathers, T. (2009). "Resilience, power, culture and climate: A case study from semi-arid Tanzania, and new research directions," *Gender & Development* 17(1), 81-94.

OECD 2008. *Household Behaviour and the Environment: Reviewing the Evidence.* http://www.oecd.org/dataoecd/19/22/42183878.pdf

Posner, Eric A. and Cass R. Sunstein. (2008). "Global Warming and Social Justice," *Regulation*,14-20.

Riddell, John. (2011). "Montreal Meeting Shows Growing Support for Climate Justice," *The Bullet,* E-Bulletin No. 493, April 25.

Irmgard Schultz and Immanuel Steib. (2009). *Gender Aspects of sustainable Consumption Strategies and Instruments*. Frankfurt/Main: Institute for Social-Ecological Research.

Rees, W.A. (2006). "Ecological Footprints and Bio-Capacity: Essential Elements in Sustainability Assessment." In Jo Dewulf and Herman Van Langenhove, eds., *Renewables-Based Technology: Sustainability Assessment* (pp. 143-158). Chichester, UK: John Wiley and Sons.

Sasvari, A.A. (2010). "Changes in climate negotiations: Gender Equality Towards Copenhagen, *Global Social Policy* 10(1), 15-18.

Sequeria, N. (2001). "Risk Management: an alternative perspective in gender analysis." United Nations Division for the Advancement of Women.

Stephanie Shipp. (1987). "Spending Patterns of Men and Women - Consumer Expenditure Survey conference paper summaries." Proceedings of the American Statistical Association, Business and Economics Section.

Stahl, E. Rees, W. and Blyers, M. (2011). *Achieving Climate Justice: A Framework for Action in a Climate of Chaos*. Vancouver: Canadian Centre for Policy Alternatives

Statistics Canada. 2010. *Labour Force Historical Review 2009* (Table 028). Ottawa: Statistics Canada (Cat. No. 71F0004XVB)

Statistics Canada 2009. *Canadian Vehicle Survey: Annual. (*Cat. No. 53-223-X) Ottawa: Statistics Canada.

Statistics Canada 2011. *Women in Canada: A Gender-based Statistical Report*. Cat. No. 89-503-XWE. Ottawa: Statistics Canada.

Stevens, C. (2009). *Green Jobs and Women Workers: Employment, Equity, Equality*. Madrid: International Labour Foundation for sustainable Development.

Victor, D. (2011). *Global Warming Gridlock: Creating More Effective Strategies for Protecting the Planet*. Cambridge: Cambridge University Press.

Whiteside, Heather and Marjorie Griffin Cohen. (2012). *Gender and Climate Change Bibliography (1990-2011),* http://warming.apps01.yorku.ca/wp-content/uploads/Gender-and-Climate-Change-Bibliography.pdf

World Bank. *Energy Use (kg of oil equivalent per capita). http://data.worldbank.org/indicator/EG.USE.PCAP.KG.OE*