GENDERED APPLICATIONS OF THE CARBON FOOTPRINT: THE USE OF CARBON MANAGEMENT TOOLS TO HIGHLIGHT THE EFFECT OF GENDER ON SUSTAINABLE LIFESTYLES

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Abstract: Discussion on the phenomenon of climate change has bombarded our society within recent times. Scientists are consistently doing research, which shows that many decades of development have caused a rapid increase of greenhouse gases within the Earth's atmosphere. This has exacerbated the natural global warming effect and supports claims that the Earth's climatic cycle is being altered. In an attempt to reduce the percentage of greenhouse gases being emitted in the atmosphere, the concept of Carbon Management and the Carbon Footprint were established. These tools are used to promote more sustainable resource consumption patterns. In order to effectively promote any new pattern of behaviour, however, gender differences should be considered. Due to the first and second waves of feminist theories, gender has been given consideration in public policies and programmes in developed countries. Developing countries are gradually including gender at such levels. Even though gender equality is still a controversial issue, there is the need for gender considerations in all decision-making processes to ensure that sustainable development is achieved. For this study, a gender analysis was conducted on carbon footprint data to identify whether there is a difference in sustainable practices between the male and female gender. The strengths and weaknesses within each sub-group were analysed. Emphasis was placed on how the socially-accepted behaviours of each gender affected their energy usage, consumption and waste management practices. The detailed findings can be used to develop public awareness campaigns and programmes specially designed to fit the needs of each gender, hence promoting equal development opportunities and ensuring that national sustainable development objectives are achieved in a shorter timeframe.

Keywords: *sustainable lifestyles; gender analysis; carbon footprint; consumption; energy efficiency; carbon management; carbon neutrality.*

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INTRODUCTION

Sustainable development can only be achieved through long-term investments in economic, human and environmental capital and the female half of the world's human capital is undervalued and underutilized the world over (Organisation for Economic Cooperation and Development, 2008). This gender difference is a hindrance to achieving holistic development. Climate change issues bombarding our society have increased the need to achieve sustainability at all levels. If sustainable concepts are utilised it will allow human beings to better manage the rate at which resources are consumed. The use of resources result in the production of greenhouse gases and as such sustainable development will assist in the reduction of greenhouse gases in the atmosphere.

In an attempt to combat climate change issues and promote sustainability, Carbon Management principles and greenhouse gas inventories were introduced to assist societies worldwide. The Carbon Footprint is a by-product of both these initiatives. This tool allows the analysis of carbon dioxide emissions for areas such as transportation, electricity usage, material consumption and waste generation. Knowledge of this allows an individual or an organisation to reduce emissions and thus reduce the total carbon footprint value.

The main outcome of carbon footprint analyses is to reduce emissions to the smallest possible value, tending towards zero. A zero carbon footprint means that for every metric tonne of Carbon Dioxide emitted, one metric tonne of Carbon Dioxide is removed from the atmosphere. At this point, an individual or an organisation has achieved carbon neutrality; however, moving towards a carbon neutral lifestyle involves a conscious effort to use eco-friendly transportation options, sustainable energy practices, sustainable consumption and waste management strategies. After implementing more sustainable habits, carbon footprint will reduce immensely. It is impossible to live on the earth and utilise zero resources; a portion is necessary for sustenance. The carbon emitted from utilising these minimum resources is the optimum carbon footprint. A body can then choose to become carbon neutral by investing in carbon offsetting programmes or actions that will further reduce the carbon footprint to zero.

The objective of sustainability is to curtail man's exorbitant consumption habits, manage the use of natural resources and as a result control the rate of greenhouse gas emissions. There are varying patterns of response due to differing roles portrayed by men and women in society. For the purpose of this study, gender is defined as the socially constructed roles of men and women, including expectations of their characteristics, likely behaviours and the roles that each sex is expected to fulfill as taught by society. A gender analysis on the carbon footprint of men and women would yield results that reflect the differences between the role of men and women[1]. Sources show that women tend to have lower consumption patterns and carbon footprints and thus a lower impact on the environment (Organisation for Economic Cooperation and Development, 2008) and this may be due to the conflicting manner in which men and women view the environment.

With sustainability and equality as forefront issues, the carbon footprint promotes sustainable usage of resources and is important not only for public awareness but for public implementation. Conducting a gender analysis on these assessments will assist in highlighting the contrasting needs of groups in society. It will assist in determining which programmes should be developed to address the manner in which

women reduce their carbon footprint? What media can be used to encourage men to have a lesser impact on the environment? Similarly, a national study can reap benefits for a nation, as sustainable development will be faster established as citizens adapt to responsible consumption. A transformed partnership based on equality of the genders is pertinent in obtaining sustainable development objectives.

This study will allow the reader to view carbon footprints through a different perspective. Do women generally have a lower impact on the environment than men? Are women more conscious of their lifestyles, therefore sub-consciously performing their routine in a more sustainable manner? Can these sustainable practices be linked to the stereotypical 'gender role' of women?

LITERATURE REVIEW

Men's lifestyles and consumer patterns, whether they are rich or poor, tend to be more resource-intensive and less sustainable than women's (Johnsson-Latham, 2006). Expressing a more feminine footprint would result in a smaller impact on the environment as well as better access to goods and services that take into account the needs of both women and men (Organisation for Economic Cooperation and Development, 2008). In terms of individual footprint analyses,

> "many behaviors that contribute to these emissions could be modified, for example, by purchasing compact fluorescent bulbs (purchasing behaviors), increasing one's refrigerator temperature (non-purchasing, one-time behaviors), regularly shutting off the lights (repeated behaviors or habits), or insulating one's hot water heater (complex behaviors that require expert assistance or are costly)" (Robinson and Armel, 2008).

It is said that changes in these individual-level behaviours can play a major role in slowing down climate change. "Reliable and valid tools for measuring the frequency, duration, or intensity of behaviors such as these, in conjunction with tools that provide accurate information about their Greenhouse Gas footprints, may help reduce emissions" (Robinson and Armel, 2008). With the information obtained by evaluating your personal carbon footprint, behavioural change may occur. This was shown in approximately 40 studies wherein providing individuals with feedback on their residential electricity use, resulted in reductions of 5–15%, with the greater reductions occurring with more frequent or disaggregated feedback (Darby, 2006). One author, Mr. John Cossham described being green as "doing whatever you can. It is not about wearing hair shirts and spending vast amounts of money. You might invest some money...but you save in the long run". "Being a vegetarian or vegan is actually one of the best things you can do to lower your CO_2 emissions. If you have a diet that is heavy on milk, cheese and meat, then you have a much higher hidden carbon footprint – the emissions that are a by-product of the production of those foods" (Cossman, 2009). He further describes being green as not solely based on sacrifices, but enjoying a better quality of life. Personally, he does not fly, he goes on local vacations, he is satisfied with his current vehicle, but would rather walk or cycle to most places. Many measures have been implemented by Mr. Cossman, for him to produce a carbon footprint of 0.45 tonnes of carbon dioxide annually. Ultimately he does not expect persons to give up things immediately, but in general, gradually and consistently, and resultantly minimising their impact on the environment.

Assessment of the carbon footprint is relatively a new concept which encourages individuals and organisations to manage

their carbon output by initially analysing what processes comprise their carbon output, calculating a value for this output and then identifying methods that can be used to reduce this carbon output. Mr. Andrew Hoffman in his book Carbon Strategies: How Leading Companies are Reducing their Climate Change Footprint states that,

> "Nearly all companies measure direct emissions and most measure indirect emissions... Companies can measure actual emissions or develop estimates using fuel- or material-based calculations. The former approach may be more expensive and labour-intensive but the latter is complicated by the variety of methodologies that exist for calculating emissions" (Hoffman, 2007).

There is no fixed method to conduct a carbon footprint analysis, also known as an emissions profile assessment. In light of this, companies have either developed new systems for measuring and tracking emission reductions or hired a carbon management consultancy company to conduct a carbon management programme for their organisation. These assessments usually involve the use of standard calculations, from systems such as the Greenhouse Gas Protocol or the Environmental Management System (EMS) under ISO14001.

Just as sustainability is being introduced into development policies, so also is gender issues. Due to the constant research and lobbying of active feminists worldwide, policymakers are now being pressured to ensure that policies are gender sensitive. "Gender analysis is an innovative process that enables government and non-government organisations to analyse whether proposed and existing policies, programs and services produce equally beneficial outcomes for diverse groups of women and men" (Gender Analysis: Making policies, programmes and services gender aware, 2005). However, on a smaller scale a gender analysis is ideal to map the differences in attitude and behaviour between men and women when analysing various social issues.

The relationship between women and nature is such that there is a similarity between patriarchal violence against women, 'other' people and nature (Mies and Shiva, 1993), hence, the development of eco-feminists and eco-feminism principles. Wherever women acted against ecological destruction, they realised that "in denying this patriarchy we are loyal to future generations and to life and to this planet itself" (Mies and Shiva, 1993). This eco-feminist principle, is also the basis of sustainable development. The Brundtland Report (Our Common Future) defined sustainable development as development that meets the needs of the present, without compromising the ability of future generations to meet their own needs. This concept allows a shift from the previous perception that development is equivalent to economic growth, and as such, this current development challenge "provides a promising momentum for feminist methodology, thinking and practice to fulfill a useful role" (Harcourt, 1994). Since the beginning of the 1990s, feminist environmental researchers have been trying to make visible the ecological, social and gender-specific conditions of global production as well as the consumption of goods and services (Littig, 2001). The importance of sustainable lifestyles became of utmost importance as sustainable development principles came to the forefront. The comparison of women's consumer behaviour and expenses with those of men has so far only rarely been an object of social scientific analysis, even in the newer environmentally oriented studies (Nava, 1992). This study serves as pioneering research

in attempting to quantitatively analyse the effects that male and female behavior have on the environment.

METHODOLOGY

The study incorporated research of both a qualitative and quantitative nature. Initially, secondary data on the Carbon Footprint was collected. Extensive research was conducted on the calculations used in analysing greenhouse gas emissions and carbon footprint analyses conducted on individuals as well as organisations. Standard calculation bodies were examined; some included the Greenhouse gas Protocol and ISO14001 – Environmental Management Systems. After much research into the available standards, the Greenhouse Gas Protocol (www.ghgprotocol.org) was chosen. This body has created a wide range of spreadsheets which allows the conversion of energy into the amount of carbon dioxide emissions in metric tonnes. The questionnaire was then constructed to obtain data for the main sectors that contribute to greenhouse gas emissions. These areas include:

1 Transportation

2 Energy Use at Home

3 Food

4 Waste.

The first two categories are referred to as direct emissions, as energy is burnt when persons use their car, electricity or other fuel types. The latter two are described as indirect emissions, as greenhouse gases are produced in manufacturing food, and transporting it to the purchase point, and energy is also utilised in transporting and discarding waste. The questionnaire was distributed to the sample and data was extracted to obtain values for the amount of carbon dioxide emissions per sector. After the quantitative analysis, the data was separated by gender. A gender analysis was conducted consequent to this in both a quantitative and qualitative manner.

DISCUSSION

It can be said that sustainable development is achieved when the current generation meets its needs without compromising the needs of future generations. At present, man's consumption rates have been rapidly increasing as evidenced in the increase of global warming and climate variability. As highlighted previously, energy usage results in the emission of greenhouse gases. Energy is any form of fuel and resources used in transportation, electricity generation, consumption and waste disposal. If man reduces their consumption rate, it decreases the amount of carbon dioxide emitted over a period. If this reduction occurs progressively the concentration of greenhouse gases in the atmosphere will decrease, thus decreasing the rate at which global warming is occurring. This strategy is two-fold, as the reduction of consumption not only decreases the rate of global warming, but also increases the rate at which sustainable development objectives are achieved. This statement directly shows how the carbon footprint is used as a measure of sustainability, seeing that it measures the amount of carbon dioxide being emitted, less of which indicates closer proximity to sustainable practices.

Recent studies show that

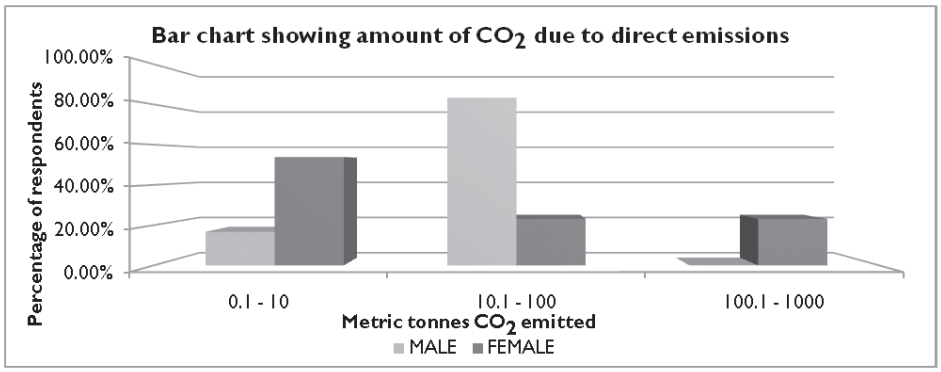
> "sustainable development requires the full and equal participation of women at all levels. It is clearly inappropriate to address problems, identify the appropriate strategies, or to implement the solutions if only half of the people concerned are involved in the process. Gender equity is an essential building block in sustainable development" (Hemmati and Gardiner, 2002).

There have also been clear-cut gender differences when sustainability components were analysed. For example, in consumption analyses conducted, it showed that women generally earn less than men and had less money at their disposal (Organisation for Economic Cooperation and Development, 2008). It is also estimated that while women make approximately 80% of consumer purchasing decisions, men spend over 80% of the household income (Yaccato, 2007). Hence, men both earn and spend more than women, and their expenditure is reflective of large capital purchases, e.g., vehicles, homes and electronics, while women's consumption is more reflective of family consumption as a whole.

During the study, a quantitative analysis was conducted on the data received for direct emissions, while a qualitative analysis was done on the indirect emissions. In summary, the largest proportion of females contributed the smallest range of carbon dioxide due to direct emissions annually. There were females, however, that contributed emissions throughout all the ranges. For males, the largest proportion (83.3%) emitted within the mid-range of 10.1–100 metric tonnes of carbon dioxide, with smaller proportions emitting within the other ranges.

It was seen that respondents that contributed the smallest range of emissions were respondents with minimum local commute and those from Trinidad and Tobago that have not been on flights for the past 12 months. For transportation, these respondents contributed negligible amounts of carbon dioxide into the atmosphere. This is possible for persons that live on the campus, and thus stay within walking distance to all or most of their necessities. In addition, these respondents used minimum electricity due to the pace of their lifestyles.

In road transportation, the majority of females contributed within 0–3.0 metric tonnes of carbon dioxide, with a minority producing within the 6.1–7.0 metric tonne range, however, for men, despite the highest proportion emitting within the 2.1–3.0 metric tonne range, there was a large proportion emitting within higher ranges. This showed the diversity of the respondents' lifestyles. Most of the male respondents live in close proximity to the campus, and should have contributed emissions within the smaller ranges. Males were responsible for transportation of family members, and others travelled to varying locations for leisure activities, e.g., visiting friends, partaking in sports, watching sport events at public loca-



tions, thus having a more active social life than the average female.

The largest amount of carbon dioxide emitted due to local transport was between 8.1 and 9.0 metric tonnes of carbon dioxide, significantly lower than emissions due to the shortest flight, a domestic flight to Tobago. The majority of male respondents did not take flights within the past 12 months; however, for the percentage of respondents that did, it was clearly reflected in their carbon footprint value, as their emissions lay within the two highest ranges.

Quite a number of respondents were citizens of other Caribbean islands seeing that the University of the West Indies is regional. The return flights taken from their home country to the campus contributed immensely to their carbon footprint values. These persons contributed transportation emissions within the two highest ranges. If emissions due to flights were subtracted, the emission values for 92.31% of the female respondents were reduced to the lowest range. This drastic change directly showed the impact that air travel has on the carbon footprint value. For males, the emissions lay between the two smallest ranges. Some respondents contributed within the smallest range due to their proximity to campus, while the majority emitted in the mid range due to their local commute. It was seen that the further the respondents lived from the campus, the greater the amount of carbon dioxide emitted due to road transportation.

With flights, the largest proportion of respondents in both sub-groups contributed zero emissions, however, there were still smaller proportions contributing within larger emission ranges. As seen in Table 1, men contributed emissions within the mid ranges. In this study, the male respondents either took domestic or short-haul flights within the Caribbean region, hence, their emission contributions were significantly lower than the respondents who took long haul flights. Females travelled more, in addition to regional flights, which accounted mostly for trips back to their homeland, there were also long haul flights to North America, which served as family vacations and shopping experiences. A small proportion of females contributed emissions within the two largest ranges, with 7.7% in the smallest range due to domestic flights. Thus, overall, male emissions lay equally within the two mid ranges, as compared to females whose emissions varied due to the diversity of flights taken across the sample. When air travel emissions were removed, all respondents contributed 10.0 or less metric tonnes of carbon dioxide.

Despite persons taking flights for leisure, the majority of students' flights were to return home. Even if some individuals made an effort to travel locally as opposed to internationally to reduce the carbon footprint, some persons still need to fly. To combat the impact of flights on total greenhouse gas emissions, sustainable travel practices need to be implemented. For a number of airline carriers, the option of carbon offsetting is

Table 1 Showing emissions due to air transport (in percentage of respondents)

Air	0	0.1–10	10.1–100	100.1–1,000
Male	50.00	33.33	16.67	0.00
Female	61.54	7.70	15.38	15.38

available for any flight taken. This cost may be included in the cost of a ticket and is usually between USD1 and USD10. The money is used to financially support carbon offset programmes throughout the world. Every metric tonne of carbon dioxide emitted will be accounted for by the investment made to these carbon offset programmes.

When evaluating emissions due to electricity, the largest proportion of females contributed within the lowest range, with decreasing contributions in the higher ranges, hence, females possess relatively low electricity needs. On the other hand, men contributed emissions across the entire range evaluated. The largest proportion, as seen in Table 2, contributed within the 4.1–6.0 range. This is the optimum range associated with the average electricity use per individual within a household of approximately 3–4 persons; however a number of respondents contributed within the larger ranges. This was due to the varying efficiency factors of household appliances, along with the length of time they were used daily.

Residential air-conditioning units in operation for the larger portion of the day resulted in a significantly higher amount of electricity usage, when compared to situations where only basic appliances were used. The male respondents contributing emissions within the lowest ranges were men who possessed a fast-paced lifestyle and utilised sustainable energy practices. In comparison, the larger proportion of male respondents did not. Many large energy utilising activities are associated with male patterns of behaviour, e.g., watching television for a long period of time, or leaving the television on, playing video games with a setup which requires large amounts of power for a long period of time, leaving the air-conditioning and other electrical devices running throughout the day and so forth. This contributed immensely to their energy costs and usage.

In general, the largest percentage of females contributed within the smallest range of carbon dioxide emissions per annum, with approximately one-quarter of the respondents in the two larger ranges, while for males, the smaller proportion contributed to carbon dioxide emissions within the smallest range, with the remainder in the mid range. If the amount of carbon dioxide emitted due to flights were subtracted from the value of total direct emissions, all respondents' total values will be reduced to the two lower ranges, with 92.31% of females and 50% of males possessing emissions in the smallest range. This clearly showed that the largest proportion of direct emissions was due to flight emissions (Table 3).

Mitigating strategies are used to decrease the amount of carbon dioxide emissions due to any one factor. For road transport, quite a number of options are available to reduce emissions in this sector. For example, persons can car-pool with neighbours who work in the same area. This will reduce individual emissions by the number of persons involved in the

Table 2 Showing carbon dioxide emissions due to electricity usage

CO_2 emissions	0.1–2.0	2.1–4.0	4.1–6.0	6.1–8.0	8.1–10.0	10.1–12.0	12.1–14.0	14.1–16.0	16.1–18.0	18.1–20.0
Male/%	16.67	0.00	33.33	0.00	0.00	16.67	16.67	0.00	0.00	16.67
Female/%	38.46	23.07	23.07	15.38	0.00	0.00	0.00	0.00	0.00	0.00

Table 3 Total direct emissions from both male and female sub-groups

Carbon dioxide emissions	0.1–10	10.1–100	100.1–1,000
Male/%	16.67	83.33	0.00
Female/%	53.85	23.08	23.07

car-pooling network daily. Another option is the use of public transportation, which also has the same effect on individual emissions. Others may take a more direct approach, by purchasing environmentally friendly, hybrid vehicles which use renewable energy sources to fuel them, or make changes to their existing vehicle to accommodate usage of an environmentally friendly fuel, e.g., Compressed Natural Gas. One can also evaluate the distances driven throughout the day and attempt to walk or cycle to some of these places as opposed to using a vehicle. All these options will immensely reduce the amount of carbon dioxide emissions due to transportation.

In attempting to reduce emissions due to electricity usage, more sustainable energy practices can be attempted, which include switching off lights and appliances when not in use, as opposed to leaving them on or in the idle mode. A more direct approach would be to analyse all household appliances and ensure that they are all energy efficient. If some are not energy-efficient they can be replaced for more energy efficient models either immediately or when they are no longer functional.

For indirect emissions, the data received was analysed to identify trends of sustainable consumer habits and waste management practices. For food, males and females purchased a similar percentage of local food as opposed to foreign goods. The purchase of local foods instead of foreign foods decreases the footprint, as more carbon dioxide is emitted in transporting the food from a foreign country to the local supermarket. Local food, in comparison, is transported from the area where it was produced to the public's supplier. It was perceived that males were more rational, and made more economical decisions as opposed to females that were more influenced by external factors such as advertisements, live marketing which cater to the senses of touch and taste. Females, on average purchased approximately 65.83% of foreign goods per grocery trip as compared to males that purchased approximately 61.84% of foreign goods. These values are still relatively close which show that men's purchasing habits may be driven by other factors which affect their rationale. Some of these habits may include their salary; these consumers are budget-driven, hence, the amount of money they make influences the amount of money they are prepared to spend on food. In addition, men tend to purchase items that they have been purchasing for years even though the price may appreciate greatly. The proportion of local food versus foreign food purchased may also reflect the manner in which persons view local goods. In previous times, the market was saturated with more foreign goods than local goods, however, with the increase in local entrepreneurial activities, there is now more local produce on the market. As reflected in the data, this has not significantly affected the percentage of local produce purchased by consumers.

When the percentage of organic food purchased by each sub-group was analysed, a larger proportion of females purchased

organic food. Females, in some cases, tend to be more informed, and were more willing to make healthier choices, even if they were more expensive. This, when compared to males who were more focused on purchasing affordably or habitually, may have been less willing to purchase organic food if more expensive, even though it reduced their carbon footprint.

The cultivation of a vegetable garden also reduces the carbon footprint, as food is grown in the back yard and no vehicular emissions are generated for its transportation. In evaluating the respondents' production of a vegetable garden, 50% of males indicated having a garden as opposed to 38.46% of the females. It appeared to be more convenient for males in this study to cultivate a garden as they possessed a larger living space, when compared to females that lived in rooms or apartments with little to no backyard space or land area. Furthermore, males had a greater capacity and need to produce the gardens as most of them lived with their immediate family as opposed to the young predominantly single women. A few females, however, managed to cultivate vegetable gardens, especially those who lived with their families or those with balconies that allowed the cultivation of a seasoning garden. This contributed to a small portion of their food needs.

In terms of waste, females possessed on average, a lower amount of waste generated per month when compared to males. This was due, once again, to the female's lifestyle, where most time was spent on campus and as such, waste generated was disposed of on the campus and absorbed as the institution's waste generation as opposed to a personal waste generation. Males, however, possibly purchased more, had a more integrated family life, spent more time at home hence producing a higher waste average per person. For compost heaps, a larger proportion of females used their organic waste to develop a heap at home. It was seen that all respondents possessing a compost heap also possessed a vegetable garden thus, it can be assumed that the compost heap was used to fertilise the crops being nurtured in the gardens. As a result, the nutrient cycle was continued through recycling of waste. The development of these compost heaps, also aided in decreasing the overall carbon footprint. Reducing waste involves the reduction of overall consumption, along with reusing and recycling material regularly. As such, the amount of emissions due to disposing personal waste will decrease as the amount of waste generated decreases.

From the overall findings, no respondent conducted a carbon neutral lifestyle, that is, no one operated at a net zero carbon footprint. It is recommended that all respondents implement mitigation measures to further reduce the carbon footprint value and account for the remaining metric tonnes of carbon dioxide being emitted.

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NOTE

[1] A Gender analysis is defined by Vibrant Communities, Status of Women, Canada as a tool for examining the differences between the roles that men and women play, the different levels of power they hold, their differing needs, constraints and opportunities and the impact of these differences on their lives.