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Procedia Environmental Sciences 1 (2010) 395–404

Procedia Environmental Sciences

The State of Sex-disaggregated Data for Assessing the Impact of Climate Change

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Abstract

Gender mainstreaming is essential when creating approaches and policies that are effective for men as well as women. The impacts of climate change are unlikely to be gender neutral, as its effects will increase the risk of the most vulnerable and least empowered group in the society. This study generates new information that highlights differences, and more specifically, the underlying dissimilar conditions and factors, that men and women may experience while facing the potential effects of climate change.

Keywords: Adult literacy; influence and decision making; education, economic activity; income differences; aggregated exposure.

1. Introduction

Climate change, its effects and its challenges have been on the international agenda for a number of years. There is currently a broad agreement within the scientific community that human activities are increasing global surface temperatures at a rapid rate, and that those temperatures will continue to rise through 2100 and beyond, even if concentrations of greenhouse gases are reduced [1]. There is a consensus among scientists that climate change will have disproportionately harmful socio-economic effects, especially on developing countries. The Stern Review Report [2], on the economics of climate change argues that developing countries are particularly vulnerable because of their topical geography, high population growth, heavy dependence on agriculture, rapid urbanization and their weak infrastructures as well as their lack of resources.

The impacts of climate change are unlikely to be gender neutral, as its effects will increase the risk of the most vulnerable and least empowered group in our society. The stark difference in the number of deaths between men and women in the tsunami of December 2004 indicates that women are more vulnerable to natural disasters due to their lower access to information, life skills and mobility outside the private sphere. According to Oxfam Briefing Note [3], female deaths accounted for 77 per cent of total deaths in four villages from North Aceh district (Sawang, Kuala Keureutou, Kuala Cangkoy and Matang Baroh) in Indonesia. In Cuddalore, India, female deaths represented 73 per cent of the total deaths, while in Nagapattinam district of Tamil Nadu, 56 per cent.

The main purpose in this study is to highlight that both men and women are exposed to climate change but women face much greater risks. Due to a lack of gender-disaggregated data, this study's main aim is to generate new information that highlights differences, and more specifically, the underlying dissimilar conditions and factors, that men and women may experience while facing the potential effects of climate change.

This paper attempts to answer the following questions:

> In what ways does coping capacity enhance or reduce the risks associated with climate change impacts?
>
> How will climate change affect men and women differently, considering existing underlying economical, social and political factors?
>
> How could changes in climate conditions impact men and women in different ways?

We know that men and women have different living conditions and capabilities and that they have different access to resources, and so we have to consider how climate change could affect people differently in terms of gender. The ultimate goal of this study is to create research that aspires to attain sustainable development by incorporating a gender-sensitive approach. Gender mainstreaming is essential when creating approaches and policies that are effective for men as well as women. A wide number of studies have considered the effects and impacts of climate change, but so far a gender focus has been close to neglected. Even though many scientists and organizations emphasize the importance of incorporating the gender lens into the debate, the scarcity of gender-disaggregated data makes it a daunting task.

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1878-0296
doi:10.1016/j.proenv.2010.09.027

2. Political, social and economic impacts

Without a gender-sensitive method of analysis, it is impossible to establish a full set of causes and potential effects of climate change. Analyzing the political, social and economic situations of both men and women highlights the disparities between these two groups.

2.1 Political impacts

In general, women still play a very small role in governments. Statistics indicate that there are very few countries in which there are an equal number of male and female legislators [4]. If females as a group are excluded from the policymaking we automatically reduce their chances to make their voices heard. The lack of female representatives is, from a gender perspective, reflecting a skewed decision-making process, which ensures that issues mostly concerning women fail to be incorporated in the political agenda.

2.2 Social impacts

Education, or the lack thereof, could be seen as an important factor when discussing changes in climate conditions. Access to information and the ability to read drastically affect people's awareness, and thus, human behaviour. If people are aware of how their actions influence ecosystems they might consider acting differently. Thus, education must play an integral role in any mitigation strategy. When it comes to adaptation, the lack of education and access to information can play a basic role for life or death. When people are left out of the political debate and do not have access to scientific research or any public information system, they are most likely to be unaware of the importance of climate change and its potential impacts. Examples include the 1991 cyclone and flood in Bangladesh where the death rate was almost five times higher for women than men [5]. Warning information was transmitted by men to men in public spaces and never reached the rest of their family members.

Women are the primary caregivers in households, and to children, the elderly and the disabled, but are considered only the secondary source of income. Men are, in general, considered the main provider in a family, and as such females consequently are considered the secondary source. According to standardized roles of men and women, women are considered responsible for the household, children, the elderly and the disabled. These roles significantly influence their decision-making abilities and how men and women live their lives. Different roles create different needs and involve different responsibilities. In terms of climate change, these roles could influence how people are able to adapt to changes in climate conditions. Gender roles and responsibilities are closely interlinked with economic factors, and changes in climate conditions expose women to a higher degree of risk than men. For example, men may migrate for work, while women may spend more time collecting water, food and fuel.

2.3 Economic impacts

In general, men tend to have high-income work, while females tend to have low-income work. Gendered division of labour involves socially determined ideas and practices that define what roles and activities are considered appropriate for men and women [6]. Such division of labour, in context-specific patterns of who does what based on gender, greatly affects how different work is valued. Typically designated female roles are almost consistently less valued than those designated as male. Women are generally viewed as assuming the reproductive role of bearing and raising children, caring for other family members and household management tasks, as well as home-based production. Men tend to be more associated with productive roles, particularly paid work, and market production. In many cultures, women are responsible for agricultural work and often undertake activities that need less capital. Globally, women occupy almost 40 per cent of all paid employment jobs outside of agriculture, although huge differences exist across and within regions. In sub-Saharan Africa, females are responsible for 70 to 80 per cent of food production, 65 per cent in Asia, and 45 per cent in Latin America and the Caribbean [7]. Since women, as a group, earn less money than men, they also have diminished bargaining power and fewer resources to cope with climate change.

Access to resources will be an important factor when it comes to climate-change adaptation. There is a considerable difference in income generation among men and women, and thus the majority of people living in poverty are women. Women's lack of access to and control over resources, technologies and credit lower their possibilities to adapt to seasonal and periodic weather conditions and natural disasters. Men and women also have different access to physical resources like land, and social resources like networks. Due to these conditions, men and women will have different options and safety nets to deal with changes.

Women's land tenure rights are insecure. Much of women's work remains "invisible" because it is not counted in surveys and censuses, although it often still counts as work even though it is unpaid. This unpaid labour is also troublesome since without resources, women are often denied access to effective technologies and credits, seed supply and labour-saving devices that would increase their capacity to invest in environmentally sustainable practices.

3. Methods used: how to interpret the data and to create new statistics

The first set of data used in this study is based on the Organization for Economic Co-operation and Development (OECD) study "Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes" [8], which focuses on port cities around the world with more than one million inhabitants in 2005. The reason for choosing this study is simple: so far, it is one of the most precise studies ever done related to the areas most vulnerable to climate change.

According to previous research, coastal cities are among the most exposed areas around the world for several reasons. They are the most sensitive places when it comes to sea-level rise, they are vulnerable to marine-related natural hazards and approximately 41 per cent of the global population is concentrated in the coastal zone [9]. Small Island States, countries with deltas and low-lying coastal areas will be subject to inundation, and risks of flooding and wind damage in coastal areas will increase. Many of the world's largest cities are close to coastal areas and densely populated areas are located on major river deltas. As the OECD study highlights, we can expect that cities in richer countries have, and are more likely to acquire, much better protection levels than those in the

developing world [8]. Three different categories from the OECD report are used in this study: country, city (urban agglomeration) and estimated exposed population from 2005.

A second set of data is based on statistics from the United Nations Development Programme (UNDP), Human Development Report 2007-2008 and from the United Nations Statistical Commission (2007). Rather than statistics on women, statistics on both women and men have been used to outline basic differences.

3.1 Existing data disaggregated by gender

The lack of gender-disaggregated data makes this study important but also challenging. As we can see in this study and in many previous ones, there is a need to collect a wide range of data that highlight gender differences (Figure 1). Gender statistics is a relatively new field and cuts across all traditional fields; it describes social progress from the perspective of gender equality [10]. According to the United Nations Statistics Division and the Department of Economic and Social Affairs, there has been limited progress in the reporting of official national statistics worldwide [11]. Because of this insufficiency, we cannot fully understand how climate change will affect men and women differently. However, this study provides an insight into some of the basic differences between men and women, and at the same time gives an indication of how to move forward in this debate. The scarcity of gender-disaggregated data has resulted in the incorporation of only five of these factors. The factors that are described as having "Insufficient Data" are good indicators for where more research is needed within this field of study.

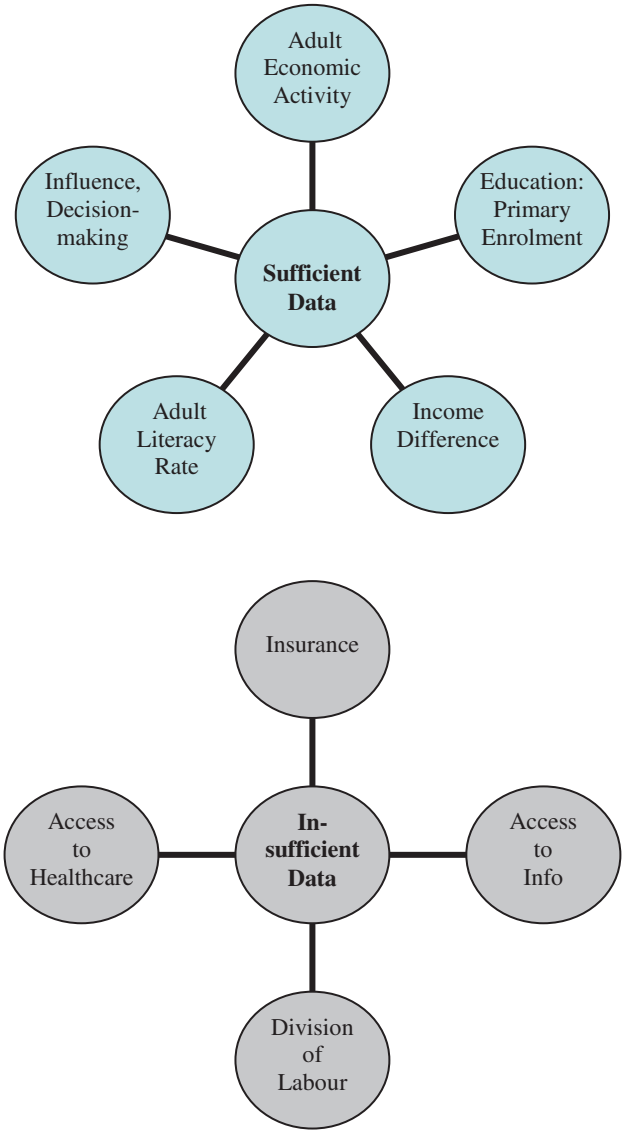

Figure 1. Gender disaggregated data (women/men)

All of the factors outlined and discussed below are considered to be of importance since each of them alone, and more specifically when combined, provide an understanding of how climate change could affect men and women differently.

3.2 Sufficient data and the statistics used

3.2.1 Category 1: adult literacy

The United Nations Educational, Scientific and Cultural Organization (UNESCO) defines a literate person as someone who can both read and write with understanding, a short, simple statement on his or her everyday life. A person who can only read but not write, or can write but not read is considered illiterate. A person who can only write figures, his or her name or a memorized ritual phrase is also considered illiterate [4].

3.2.2 Category 2: influence and decision-making

The percentage of parliamentary seats occupied by women is calculated for the lower chamber in countries with a bicameral assembly only [4].

3.3.3 Category 3: education; primary enrolment

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) compiles statistics on primary enrolment from data provided by national Governments. The 1997 International Standard Classification of Education (ISCED) [12] defines primary education as programs that are normally designed on a unit or project basis to give students a sound basic education in reading, writing and mathematics along with an elementary understanding of other subjects such as history, geography, natural science, social science, art and music. In principle, this level covers six years of full-time schooling. The primary-level net enrolment ratio (NER) is the number of boys and girls of primary-school age who are enrolled in primary education, expressed as a percentage of the total population in that age group [4].

3.3.4 Category 4: adult economic activity

This category refers to the percentage of the population aged 15 and over that is economically active. Data on adult economic activity are compiled by the International Labour Organization (ILO) from a variety of national sources including labour force sample surveys, household surveys, population censuses and official estimates provided by national statistical services to ILO in publications and questionnaires [4].

3.3.5 Category 5: income differences

This statistic is based on the United Nations Development Programme (UNDP) Human Development Report 2007/2008. UNDP made estimated calculations in cases where sufficient data were lacking; thus, in some cases, the results can only be used as a guideline [13].

4. Creation of gender-disaggregated data

Rather than statistics on women, gender statistics are statistics on both women and men; it is thus equally important to highlight statistics concerning both genders. When we assume that changes in climate conditions would affect men and women equally, the exposure is relatively evenly distributed between men and women, also assuming that the population composition of both sexes is similar. As a case study here, we focus our analysis on the city of Algiers in Algeria. As shown in Figure 2, out of the 21 000 exposed people in Algeria, 10 395 (49.5 per cent of the total population) are women, and 10 605 (50.5 per cent if the total population) are men [4].

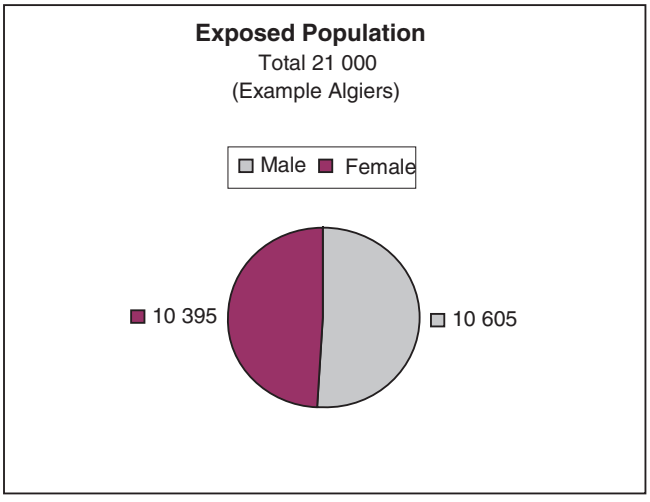

Figure 2. Exposed population without incorporating gender differences

When incorporating underlying social, political and economic factors, the exposure rate found in Figure 2, shifts significantly. The statistics used are based on a mean value from each country. When looking at specific areas within a country, as in this study, we

need to assume that the statistics used also are directly applicable and representative for specific cities. As an example, when highlighting the exposed city Algiers, we are using statistics that are representative for all Algeria, and local exceptions are left out in the discussion. The following tables and figures indicate how the exposure rate changes when underlying differences between men and women are considered.

4.1 Adult illiteracy

Upon considering literacy rates in the case of Algiers, the underlying difference between women and men is evident at first glance: 40 per cent of women are illiterate, or double the proportion of men [4].

Table 1. Male and female illiteracy rate

Male Illiteracy Rate	*Female Illiteracy Rate*
Percentage: 20	Percentage: 40
Illiterate: 10 605 x 0.20 = 2 121	Illiterate: 10 395 x 0.40 = 4 158
Of the 21 000 exposed people in Algiers, 6 279 (2 121 + 4 158) are illiterate, the total number of illiterate people in the population.	
Illiterate men/total illiterate population	Illiterate women/total illiterate population
2 121/6 279 = 0.344 or 34.4%	4 158/6 279 = 0.662 66.2%

What does this table tell us? We can clearly see a shift towards higher risks from climate change for females. Previously, in Figure 2, the exposure rate was 1.020 (10 605 men/10 395 women). In other words, if we do not consider underlying differences between gender, men are approximately 2 per cent more exposed to changes in climate conditions than women since there are proportionally more men than women in Algiers. However, when we consider illiteracy as an underlying factor that affects people's ability to adapt to changes in climate conditions, the exposure rate is 0.52 (0.344 men/0.662 women). Men are now approximately only half as exposed to changes in climate conditions compared to women. Figure 3 illustrates the different exposures of men and women.

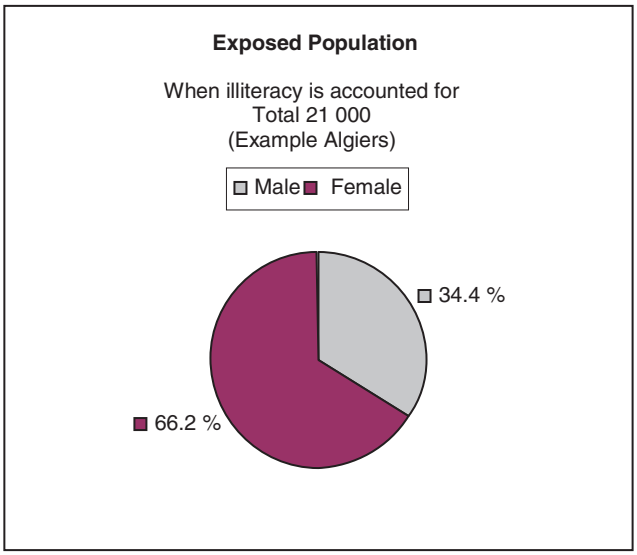

Figure 3. Exposed population when illiteracy is accounted for

4.2 Influence and decision-making

The approach for analyzing the second category, male and female influence and decision-making, is somewhat different from the previous one. It translates statistics based on entire countries' populations into the assumed exposed population in a city or urban agglomeration by assuming that the exposed population is statistically representative of the population in the whole country. Thus, the numbers used in this category provide only a rough indication of gender differences in terms of exposure to changes in climate conditions.

When considering women and men in politics by noting their share of legislative and managerial positions in Algiers, we find the data given in Table 2 [4].

Table 2. Male and female decision-making rate

Male Decision-Making Rate	*Female Decision-Making Rate*
Percentage: 94	Percentage: 6
Total male population with no influence over decision-making: 10 605 x 0.06 = 636	Total female population with no influence over decision-making: 10 395 x 0.94 = 9 771
Of 21 000 exposed people in Algiers 10 407 (636 + 9 771) people have no influence over the decision-making process. The absolute number of people without influence over the political agenda is 10 407.	
Men not involved	Women not involved
636/10 407= 0.061 6.1 %	9 771/10 407 = 0.944 94.4 %

This table indicates an overwhelming shift in exposure rate compared to the original one in Figure 4 where the original exposure rate is based solely on the population's gender composition: 1.020 (10 605 men/10 395 women), indicating that men are exposed approximately 2 per cent more than women, However, when considering decision-making and influence over the political agenda as a measure of ability to adapt to changes in climate conditions, the new exposure rate is 0.06 (0.061 men/0.944 women). Hence, men's share of the exposure is only 6.5 per cent of the total exposure, while women are 15.4 (0.944/0.061) times more vulnerable than men in their capacity to adapt to a changing climate. Figure 4 illustrates the different exposures of men and women after accounting for decision-making.

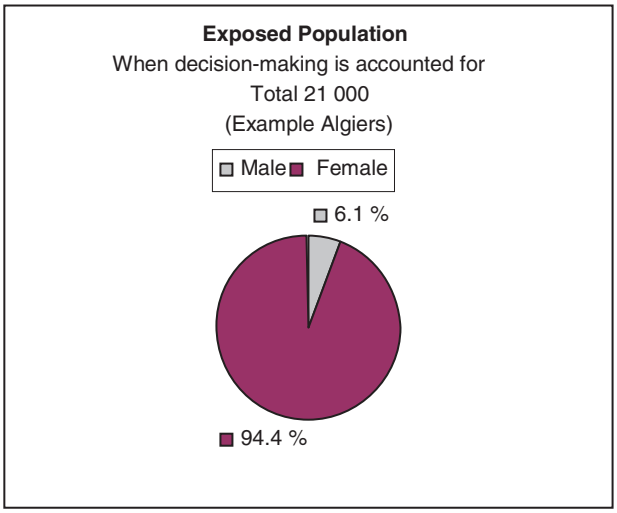

Figure 4. Exposed population when decision-making is accounted for

4.3 Education: primary enrolment

When interpreting the third category, we have to assume again that the exposed population is statistically representative of the population in the whole country. When considering education in Algiers [4], the data given in Table 3 are found.

Upon analysis of statistics based on enrolment rates in primary education, the new exposure rate is 0.90 (0.475 men/0.525 women). Hence, women are now 1.1 (0.525/0.475) times more exposed to changes in climate conditions than are men. Once again, this is a significant shift from the original exposure rate of 1.020 (10 605 men/10 395 women) based on the population's gender composition, where men were exposed by approximately 2 per cent more than women. Figure 5 shows the number of men and women exposed after accounting for education.

Table 3. Education, primary enrolment

Male Primary Enrolment Rate	*Female Primary Enrolment Rate*
Percentage: 53	Percentage: 47
Not enrolled in primary education: 10 605 x 0.47 = 4 984	Not enrolled in primary education: 10 395 x 0.53 = 5 509
Of the 21 000 exposed people in Algiers 10 493 (4 984 + 5 509) are not enrolled in primary education. The entire population not enrolled in primary education is 10 493.	
Number of men not enrolled in primary education/total not enrolled	Number of women not enrolled in primary education/total not enrolled
4 984/10 493 = 0.475 47.5 %	5 509/10 493 = 0.525 52.5 %

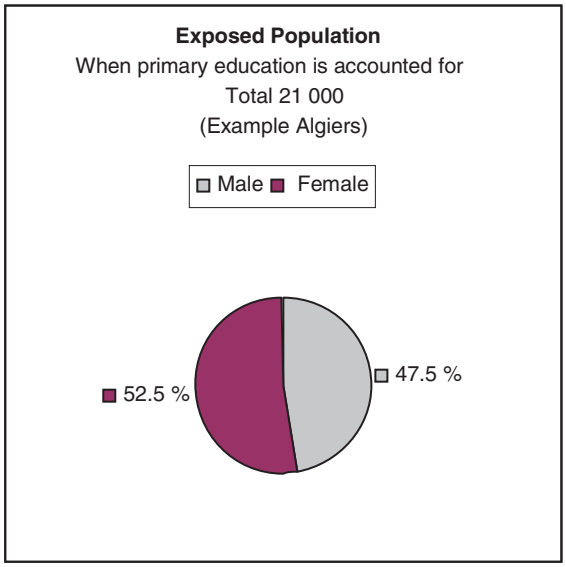

Figure 5. Exposed population when education is accounted for

4.4 *Adult economic activity*

The fourth category, Adult Economic Activity, follows the same pattern as category one, Illiteracy. When taking the Adult Economic Activity rate [4], into account in the case of Algiers, the data given in Table 4 are found.

Table 4. Adult economic activity

Male Economic Activity Rate	*Female Economic Activity Rate*
Percentage: 80	Percentage: 37
Economically inactive: 10 605 x 0.20 = 2 121	Economically inactive: 10 395 x 0.63 = 6 549
Of the 21 000 exposed people in Algiers 8 670 (2 121 + 6 549) are economically inactive. The entire economically inactive population is 8 670.	
Economically inactive men/total economically inactive population	Economically inactive women/total economically inactive population
2 121/8 670 = 0.245 24.5 %	6 549/8 670 = 0.755 75.5 %

Once again, upon incorporating data pertaining to economic activity, a dramatic change in exposure rates is evident. Compared to the original exposure rate of 1.02 (10 605 men/10 395 women), women are now 3.09 (0.755 women/0.245 men) times more exposed to changes in climate conditions than are men. Figure 6 shows the number of men and women exposed after accounting for economic inactivity.

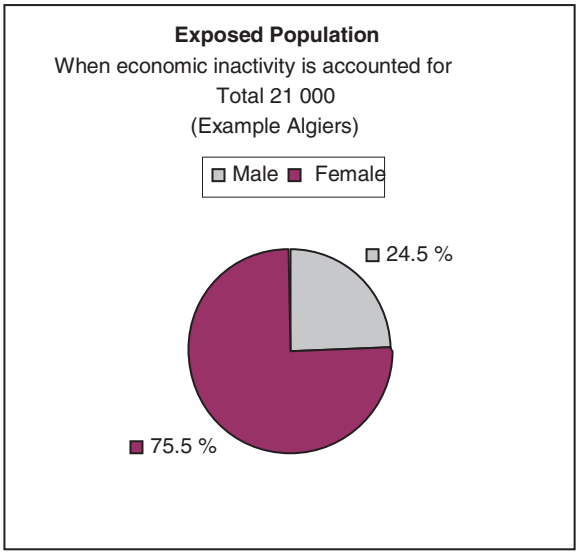

Figure 6. Exposed population when economic inactivity is accounted for

4.5 Income differences

To make a valid conclusion concerning the last category, Income Differences, statistics from the previous factor, Adult Economic Activity, must be considered. When taking income differences [4], into account in the case of Algiers, the data given in Table 5 are evident.

Table 5. Income differences

Male Estimated Earned Income	*Female Estimated Earned Income*
Percentage Economically Active: 80	Percentage Economically Active: 37
Economically Active: 10 605 x 0.80= 8 484	Economically Active: 10 395 x 0.37 = 3 846
Average Annual Income: 10 515 US$ (2005)	Average Annual Income: 3 546 US$ (2005)
Average Annual Income (Male, Female) x Economically Active Population (Male, Female)	
10 515 x 8 484 = US$ 89.2 m	3 546 x 3 846 =US$ 13.6 m

Analysis of the average annual estimated earned income highlights the stark difference between men and women's vulnerability to climate change and adaptive capacity. Income generation of men as a group is 6.5 (US$ 89.2 m/US$ 13.6 m) times higher than that of women (Figure 7).

4.7 Aggregated exposure

Before further analysis, it is essential to consider the aggregated exposure of all the factors presented in this study. The categories are compiled as follows:

((Illiteracy) + (Decision-Making) + (Primary Education) + (Economic Activity)) /4 = Aggregated Exposure

Within the scope of this study, this equation indicates the aggregate difference in exposure to climate change between men and women. Continuing with the case of Algiers, the female exposure to climate change (as compared to that of men) is given in Table 6.

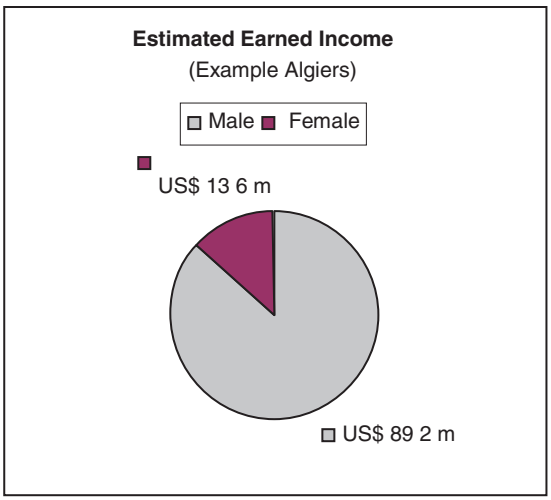

Figure 7. Exposed population when income differences are accounted for

Table 6. Women exposed to changes in climate conditions (in relation to men)

Example Algiers	
Illiteracy rate:	1.9
Decision-Making:	15.6
Primary Enrolment:	1.1
Economic Activity:	3.1
Total Exposure Rate:	21.7/ 4.0 = 5.4

The total exposure is calculated according to the equation outlined above, where the number 4.0 (or 400 per cent) represents the aggregated exposure of the four different categories. As this table indicates, the aggregated value is 5.4. In other words, in Algiers, women are 5.4 times more vulnerable to changes in climate conditions than are men.

5. Conclusions

This study provides statistical evidence to highlight the significantly greater exposure to climate change that women will face, and their resulting vulnerability to its impacts compared to men. In doing so, the study brings to light the stark differences in political, economic and social circumstances between women and men that result in this gender-biased situation. Furthermore, the purpose of the study is to demonstrate the limitations caused by data scarcity. Availability of such data could be extremely beneficial in undertaking an in-depth analysis of climate change through a gender-based lens. This would avoid the need for generalizations and other such inaccuracies. Ultimately, the study calls for the inclusion of gender-based approaches and policies related to climate change.

Disclaimer and Acknowledgements:

The views expressed in this paper are not those of the United Nations Environment Programme (UNEP). Anushka Kalyanpur and Jenny Svensson worked as interns on this study. Special thanks to Arshia Chander and Jane Barr for their help in editing the document.

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