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Gendering local climate adaptation

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Empirical evidence suggests that climate change will hit women disproportionately hard. Lack of political power, small economic resources, gender-bound patterns in the division of labour, entrenched cultural patterns and possibly biological differences in heat sensitivity combine to make women and girls particularly vulnerable to extreme weather and other climate-related events. Adaptation responses will likely reduce some of these vulnerabilities. However, just as climate change is likely to impact more severely on women than men, the costs and benefits of adaptation could be unevenly distributed between the sexes. Unless adaptation measures are carefully designed from a gender perspective, they may contribute to preserving prevailing gender inequalities and reinforce women’s vulnerability to climate change. Institutions and decision-making processes need to be remodelled so as to guarantee that gender issues are adequately targeted within adaptation. This article identifies a number of methodologies and decision tools that could be used to mainstream gender in local adaptation planning.

**Keywords:** gender issues; climate impacts; adaptation policy; equality; local policy; mainstreaming

1. Introduction

There is reason to believe that climate change will hit women disproportionately hard. Lack of political power, small economic resources, gender-bound patterns in the division of labour and entrenched cultural patterns contribute to making women and girls particularly vulnerable to extreme weather and other climate-related events (Denton 2002, Masika 2002, Brody *et al.* 2008). This is most evident in developing countries, but even in industrialised countries women generally have less capacity than men to cope with the effects of climate change (Hemmati 2005). In order to reduce long- and short-term vulnerabilities, adaptation policies are increasingly being adopted at local and regional government levels. This trend is expected to continue and will protect against some climate risks. However, just as changes in climate are likely to impact more severely on women than men, the costs and benefits of adaptation could be unevenly distributed between the sexes. Unless properly designed, adaptive responses may contribute to preserving gender-differentiated distributions of power, solidify stereotypical gender roles and reinforce women’s vulnerability to climate change. Given that these are undesired outcomes, institutions and decision-making processes ought to be remodelled so as to guarantee that gender issues are adequately targeted within adaptation at all government levels.

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Gender needs to be mainstreamed throughout the adaptation decision-making process, from the stage where climate threats and vulnerabilities are mapped and adaptation options identified to the stage where options are assessed, implemented and evaluated.

In this article, a gender-sensitive approach to adaptation planning is proposed. The article is organised in three parts. Section 2 summarises some of the research that has recently been reported on the gender-differentiated impacts of climate change. It is argued that unequal distributions of risk and vulnerability can arise from five interacting factors: differences in power, differences in income and economic resources, gender-bound patterns in the division of labour, other cultural patterns and social roles and biological differences.

In Section 3, it is shown how adaptation measures taken by local and regional authorities could reinforce existing gender-differentiated distributions of power. This is done by means of three examples: two from spatial planning and one from healthcare planning. There are several reasons why spatial and healthcare planning are interesting to study in the context of climate adaptation. First, how severe the impacts of climate change will be for humans, buildings and infrastructure is highly determined by urban form. Spatial planning is, therefore, a key public policy area with a potentially strategic role in mitigating the negative effects of climate change (Wilson 2006, Henderson 2010). Second, unlike many other policy areas, spatial planning has sufficiently long time horizons for changes in climate to occur, which makes it necessary to develop adaptive responses. Spatial planning often involves large sums of money being spent on projects that have long lifetimes. Getting it right from the beginning is of vital importance, since subsequent adjustments may turn out to be very costly (Smith 1997). Third, spatial planning has great potential to influence the everyday lives of men and women. Feminist geographers have long argued that, unless specifically heeded, women’s interests and needs regarding the built environment are likely to be neglected by planners, who often perceive spatial planning, in particular comprehensive municipal planning (or strategic planning), as “gender neutral” (Reeves 2002, Fainstein 2005, Larsson 2006). Women are disadvantaged when towns and cities are planned from a supposedly gender-neutral viewpoint primarily tailored to meet the needs of men (Greed 2006). Finally, in industrial countries more women than men are employed in the healthcare sector, including nursing and residential-care facilities and home healthcare services. Any actions that are taken in this sector to counteract the negative effects of climate change are therefore expected to affect a greater number of female than male workers.

In Section 4, a set of methodologies and decision tools are identified that could be used to mainstream gender in local adaptation planning. Up to now, few of these methodologies and tools have been used explicitly to inform the local adaptation process, although many of them are being used in related policy fields. It is argued that existing methodologies and tools could easily be incorporated into the local adaptation process.

The main focus will be on adaptation in industrialised countries. Industrialised countries have seldom been mentioned in international research on the gender-differentiated distribution of impacts of and responses to climate change. Although the gender issues in climate mitigation and adaptation in developing countries are more pressing, the effects in industrialised countries are sufficiently serious to warrant more attention than they have so far received.

2. Gender-differentiated impacts of climate change

Although climate change threatens the living conditions of all humans, its effects are particularly serious on those who are most vulnerable. Unequal distributions of risk and vulnerability are caused by different interacting dimensions of disadvantage, among which
gender plays a central role (Morrow 1999).\textsuperscript{3} At least five interacting mechanisms contribute to reinforcing gender inequality in the context of vulnerability to climate change:

1. Differences in power.
2. Differences in income and economic resources.
3. Gender-bound patterns in the division of labour.
4. Cultural patterns and social roles.
5. Biological differences.

Of the five mechanisms, differences in power have a fundamental role in relation to the others (including biological differences), since power relations largely determine whether or not patterns in the division of labour, social roles and biological differences give rise to unequal distributions of vulnerability and adaptive capacity.

\subsection*{2.1 Differences in power}

Several of the public sectors that are most important for decisions on climate policies have an unusually strong male dominance. This applies to the energy sector, not least to the petroleum sub-sector (Dankelman 2002, Skutsch 2002, Carlsson-Kanyama et al. 2010). It also applies to a large extent to urban planning and infrastructure development.\textsuperscript{4} Furthermore, women have been under-represented in international climate mitigation negotiations. This has been most obvious in the representation of business interests in these negotiations; this representation has been described as “[a]n almost exclusively male ‘club’” (Villagrasa 2002, p. 41).

Under-representation of women in decision-making processes is a pervasive democratic problem in modern societies. It is a particularly serious problem in decision-making on issues where men and women tend to have different interests or different viewpoints. There are good reasons to believe that this is the case for decisions on climate policies. One of these reasons is that there are differences in risk perception between men and women. Women are on average more prone to take future risks seriously and opt for measures to cope with these. It has been shown that the ethnic and gender differences in risk perception found in surveys in the USA can be accounted for in terms of about 30\% of the white male population that judges the risks to be very low (Finucane et al. 2000). This effect applies to a wide variety of risks, including environmental dangers, gun accidents and side effects of medical procedures.

There are also reasons to believe that attitudes to climate policies differ between men and women. Literature on risk perception consistently reports that women are less willing than men to accept technologies that are perceived as risky (Flynn et al. 1994, Barke et al. 1997, Slovic 1997, Finucane et al. 2000). Based on this evidence, Miller et al. (2007) hypothesised that there would be gender differences in attitudes to technologies aimed at abating climate change, such as carbon capture and storage. This hypothesis was confirmed in a Canadian survey which showed that women are less favourable than men to attempts to reduce emissions through storage of carbon dioxide in geological formations (Eyzaguirre 2007).

Furthermore, the living conditions of women and men differ in ways that may give rise to different needs for climate adaptation measures. For example, men and women have different work and travel patterns, which give rise to different needs concerning the built environment (see Section 3). In such cases, decision-making processes dominated by men can be expected not to take the needs of women sufficiently into account. To avoid
this, it is essential that women be adequately represented on all levels in the public and private bodies where decisions on climate adaptation are made. This has to include both formal and informal decision-making bodies and should cover all stages of the decision-making processes, not least the early stages in which open-ended discussions of advantages and disadvantages of different options are conducted (Hansson 2006).

2.2 Differences in income and economic resources

People with low incomes usually lack savings, insurance and other resources to cope with natural disasters. In most societies, women are more likely to live in low-income households than men. This also applies to industrialised countries (Casper et al. 1994). In the OECD area, women are 20% less likely than men to have paid employment. When employed, women more often work only part time, and they receive on average 17% less pay than men (OECD 2008). The disproportionate representation of women among the poorest has led some authors to talk of “the feminization of poverty” (Pearce 1978, Pressman 2003) or “gendered poverty” (Tonkiss 2010). Currently, economic inequality between women and men is decreasing, but at such a low pace that its persistence will have to be assumed in social planning, even in the comparatively long perspectives (several decades) that are applied in climate adaptation.

Women’s inferior economic positions make them particularly vulnerable to the negative impacts of climate change. Less money means less ability to pay for expensive adaptive measures such as air conditioning. Empirical evidence shows that poverty has a significant effect on women’s ability to survive natural disasters. In the 1995 Kobe earthquake, 1.5 times more women than men died (UNEP 2004). Many of these victims were elderly women living by themselves in poorer residential areas where the houses were more susceptible to damage. Economic factors also affect the ability to recover from climate-related weather events. Studies show that women in low-paid or part-time employment are less likely than men to receive wages during recovery from natural disasters (Enarson 2000). Lack of income makes it more difficult to buy materials and services that are needed to rebuild homes and other damaged property. It also makes it more difficult to pay the costs of alternative accommodation. From this, it follows that it is predominantly women who will be disadvantaged if expensive (anticipatory and emergency) adaptation measures are available only to those who can pay for them.

In practice, it is usually not possible to determine the extent to which the adverse circumstances experienced by women depend on economic factors (Cannon 2002). Gender-based and economic disadvantage tend to be highly integrated and mutually reinforcing. The extent to which women will be disproportionately affected by climate change also depends on how risk-reducing measures are divided between the public sector and the private, market-driven sector. Generally, the public sector has greater capacity to distribute adaptation measures to those most in need, even if they cannot pay for these measures at market prices.

2.3 Gender-bound patterns in the division of labour

Even in the richest industrial countries there are still large differences between men and women in the amount of household work carried out and in their roles in paid labour. For example, time-diary data from Australia shows that in 1992 husbands spent on average 11 h per week on household work (excluding child care), compared to 23 h for their wives (Bittman et al. 2003). These differences can be expected to have a significant
impact on susceptibility to effects of climate change. To take one example, elderly women are expected to perform household work at an age when men are relieved of work tasks. Household work has to be performed even on extremely hot days and, since elderly people are more sensitive than younger people to negative health effects of rising temperatures, this workload could hypothetically have serious effects on elderly women.

Furthermore, women usually bear the major part of the burden of caring for the sick, both professionally and in private. They will therefore be doubly affected by increased levels of sickness that may follow periods of extreme weather or in the aftermath of climate-related weather events (Skutsch 2002, Lambrou and Piana 2006). This burden is further increased if care-giving facilities such as nurseries and day centres for the elderly are closed down or relocated as a consequence of, for example, flooding (Thrush et al. 2005).

2.4 Cultural patterns and social roles

In addition to gender-bound patterns in the division of labour, cultural patterns in other areas influence the roles and social resources of men and women. Empirical evidence indicates that such cultural patterns contribute to making women, and again especially women in developing countries, particularly vulnerable in climate-related disasters. In the 1991 cyclone and flood in Bangladesh, female mortality was several times higher than male mortality in the age group 20–49 (Ikeda 1995, see also Röhr 2005). Some of the reasons for this seem to be related to gendered cultural patterns and social roles. Warning information was posted in public spaces, but did not reach women who were bound to their homes. Furthermore, most women had not learned to swim, which reduced their survival chances (Cannon 2002). Also, cultural expectations regarding women’s clothing may have had a negative impact on women’s survival rates. For example, in Bangladesh, it is customary for rural women to wear a sari – a dress that can hamper running and swimming and hence make it more difficult to escape flood waves (Ikeda 1995).

In industrialised countries as well, cultural patterns and gendered social roles can affect women’s vulnerability to climate change. Due in part to culturally determined gender roles, men use cars to a greater extent than women and consequently women are more dependent on public transportation (Skutsch 2002, Johnsson-Latham 2007). Therefore, inadequate climate adaptation of public transport (e.g. lack of air conditioning on buses and trains) is likely to have a particularly negative impact on women.

2.5 Biological differences

There are indications that the health impacts of climate change can differ between women and men for biological reasons, in addition to the social reasons already cited. The heat wave in France in August 2003 caused an excess of 15,000 deaths, mainly due to dehydration, hyperthermia and heatstroke. Sixty-four per cent of those who died from the heat were women (Poumadère et al. 2005). A study of the relationship between mortality and heat in Germany confirms that mortality among the elderly increases in hot summers and that this effect is greater for women than for men (Flechsig et al. 2000, see also D’Ippoliti et al. 2010). The reasons for the higher mortality among women are not fully understood, but there are indications that biological differences make women less able to tolerate heat stress (Duncan 2007). Pregnant women, particularly those who are in their final trimester, may have difficulties in moving around and will hence be more vulnerable in the event of disaster. Pregnant women and women who have recently given birth are also vulnerable to damages to health-
service infrastructure and basic sanitary facilities. Reduced obstetric care can ultimately increase maternal mortality (Neumayer and Plümper 2007).

The major mechanisms of gender inequality in climate adaptation that have been identified in this section are summarised in Table 1.

### 3. Gender-differentiated outcomes of adaptation responses

Just as the impacts of climate change may be unevenly distributed between different segments of a population, adaptation measures can reduce vulnerability inconsistently across a population or between generations (Smith et al. 1995). Unless carefully designed and implemented, adaptation measures can reinforce existing social inequalities and hence increase the vulnerability of some groups to climatic events (maladaptation) (McKenzie Hedger et al. 2008). In the industrialised world, this is particularly evident in two public policy sectors: spatial planning and healthcare planning. There are three major aspects of women’s lives that could be affected negatively by climate adaptation measures taken within these sectors: women’s mobility and access, their safety and security and their professional workload. In the following three subsections, which are partly based on the work of Edvardsson Björnberg and Svenfelt (2009), these aspects are dealt with separately.

### 3.1 Mobility and access

Because of the gendered division of labour, men and women generally use public space differently. Women tend to work closer to home and are more often employed part time. Women also have different travel patterns than men; women generally make shorter and more frequent journeys at off-peak hours to collect children from school, to do household business, etc., whereas men undertake more work-related travel (Skinner 2005). Associated with these differences are divergent needs and preferences concerning the planning of the built environment and the construction and design of housing and neighbourhoods.

<table>
<thead>
<tr>
<th>Underlying mechanism</th>
<th>Examples of effects on climate adaptation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Differences in power</td>
<td>Women’s views, interests and needs are not adequately represented international climate negotiations or in national, regional or local decision-making on climate adaptation</td>
</tr>
<tr>
<td>Differences in income and economic resources</td>
<td>More often than men, women lack the resources needed to pay for adaptive measures such as air conditioning or rebuilding a damaged home</td>
</tr>
<tr>
<td>Gender-bound patterns in the division of labour</td>
<td>Women perform most of the household work and the caring for sick people. These are tasks that have to be performed continuously and often under worse conditions during and after extreme weather events</td>
</tr>
<tr>
<td>Cultural patterns and social roles</td>
<td>Women are more dependent than men on public transportation, and they are therefore more susceptible to failures of public transportation due to extreme weather events. In some cultures, women have less access to public information and they are also more often unable to swim, two factors that may decrease survival chances in the case of severe flooding</td>
</tr>
<tr>
<td>Biological differences</td>
<td>There are some indications that women may be more sensitive to heat stress than men</td>
</tr>
</tbody>
</table>
Women’s lives are typically facilitated when cities are planned in a way that makes it easy to combine different types of activities in the same local area: work, domestic care and leisure (Greed 1994, OECD 1995). Today, many urban areas in northern and western Europe are zoned, that is, different land uses, most evidently workplaces and housing, are separated in order to promote efficiency and public health goals (Greed 2006). This separation of different “spheres” of life makes it more difficult to combine activities and functions that are traditionally associated with women. It also increases the travel burden for women.

Before adaptation decisions are made regarding the built environment it should be established as to how these measures will affect the ability of men and women to carry out their activities. One way of reconciling different activities or functions within the city is to mix residential, industrial and commercial areas. There are also other ways to plan the city so that workplaces and services are located close to residential areas. However, sometimes conflicts arise between this goal and the goal of protecting industrial areas and vital infrastructure from the negative impacts of climate change. To take one example, some industries, such as chemical plants, sewage treatment plants, glass-work sites, petrol stations and depositories, are particularly vulnerable to flooding, since this may involve toxic substances being released and transported to places where they can harm human health and biological diversity (Swedish Commission on Climate and Vulnerability 2007). To avoid increased risk of contamination resulting from climate change, decision-makers may wish to relocate these industries to areas not presently inhabited. This will most likely contribute to creating longer travel distances, which in turn may cause particular trouble for female workers (assuming that women are also part of the workforce).

Another way to facilitate the reconciliation of different activities and functions when taking adaptive action could be to locate and relocate developments according to a grid pattern. Grid patterns are believed to promote the flow-through of people and traffic (Cozens and Hillier 2008) and result in more numerous service institutions (Bohl 2000), which could benefit women as a group (Swedish National Board of Housing, Building and Planning 2006). However, not all planning specialists agree that grid patterns promote gender equality. Reviewing the grid in history, Grant (2001) concludes that there is no simple correlation between urban form and social objectives; grid patterns can serve many different purposes, some of which are associated with central authority dominance and repression rather than decentralisation, (gender) equality and social cohesion. More research is urgently needed to clarify how women’s lives are affected by different placements of housing, workplaces and service areas in the urban environment. In the absence of information from such research, it is particularly important that local planners involve women living in the affected areas in the decision-making process so that their knowledge and experiences can inform the process.

3.2 Safety and security

Spatial planning also critically affects the safety and security of women. Numerous studies have confirmed that women are more fearful of crime (particularly sexual violence and harassment) than men when visiting public places (Pain 2001). Furthermore, women more often than men take safety and security precautions when engaging in outdoor activities, especially after dark. For example, a study by Pain (1997) showed that when women go out they take various precautions to avoid sexual violence, such as not going out alone, being watchful when walking, avoiding certain streets, areas and times of the day and avoiding certain means of transportation. The insecurity that women feel when using public places has implications for their physical and emotional well-being; it restricts
their ability to work and earn a living, engage in educational and leisure activities and socialise with other people (Whitzman 2007). Fear of engaging in outdoor activities after dark could have particularly severe consequences for women living in northern Europe, North America and Russia, where this could mean that in winter women stay indoors all evening after 3 or 4 p.m.

Based on these empirical findings, it could be argued that carelessly designed urban environments are likely to have particularly limiting impacts on women’s freedom of movement. Therefore, when taking adaptive action such as relocating bus stops, bicycle paths and other infrastructure, for example to avoid flooding, the impacts of these measures on women’s safety and security must be given specific consideration. Studies show that many women are concerned about the dangers of pedestrian underpasses, tunnels, dead-end streets, lanes and blind corners, particularly if they are located in places that are dark, isolated and deserted (Koskela and Pain 2000). If a bus stop is relocated to a shadowy, less frequented place, it may not become particularly attractive to women. Similarly, an underpass or tunnel that has been designed to make room for water during flooding could contain hiding places that create fear and insecurity among female users.

Green and blue areas, which are often considered attractive from a local adaptation viewpoint because of their multifunctional nature, can hamper women’s freedom of movement if not appropriately arranged. Studies have showed that forests, parks, recreational areas and footpaths are among the places women fear most (Koskela and Pain 2000). In a study of the use of public parks in the city of Leicester (Britain), Madge (1997) showed that, although fear levels were high for both men and women, important differences existed in terms of how the parks were used; 75% of the women compared to 50% of the men stated that fear of crime restricted their use of parks. When using urban greening measures, for example to mitigate the negative effects of high temperatures and heavy precipitation, local governments must therefore take measures to ensure that lighting, open areas around walkways, etc., are arranged in ways that make parks and other green areas available in practice to women.

Furthermore, research indicates that men and women differ in how they perceive risk and safety of environments for children (Murray 2008). For example, a study by Lam (2001) showed that mothers were significantly more worried than fathers about pedestrian injury for their children. There is therefore a risk of male planners choosing planning solutions that will not satisfy women with children. To avoid this, we propose that all new walkways, bus stops, etc., should be evaluated from the viewpoint of safety and security against criminal assault. The local police could have an important role in such evaluations, as could local women’s organisations.

3.3 Professional work load

In the future, heatwaves, flooding, hurricanes and other extreme weather events are expected to become more common, causing increased mortality and morbidity, particularly among vulnerable groups of people. A number of adaptation measures will have to be taken to cope with the negative health effects of climate change. The number of staff and beds available in hospitals and emergency units may have to be raised during certain periods. Contact schemes may have to be established for elderly people living alone and for people with physical or mental disabilities. More extensive health services for vulnerable groups will likely place a particular burden on healthcare workers such as nurses and home health aides. Women still make up a majority in these professions. According to the United States Census Bureau, women represent 92.4% of all registered nurses in the
USA, 93.0% of all licensed practical and licensed vocational nurses and 87.8% of all nursing, psychiatric and home health aides (see also Montgomery et al. 2005). Similar statistics can be found in New Zealand (Grant et al. 2004). Even in a country like Sweden, which is often pointed out as a forerunner with regard to gender equality and has been leading in gender development issues for a number of years, there are large sex differentials in many healthcare occupations. Statistics from Statistics Sweden (Statistiska Centralbyrån) show that in 2009 women represented 90.5% of all nurses in Sweden and 93.1% of all nursing assistants. In some countries, female dominance in care-giving professions is (slowly) diminishing, but the global picture is one of a persistent pattern that will have to be taken into account also in medium- and long-term planning.

These figures suggest that if adaptation measures put a heavy load on the healthcare sector then these will be burdens primarily borne by women. To the authors’ knowledge, there have been no empirical studies to date confirming this hypothesis. Nor have the suggested adaptation measures been subjected to any gender impact assessment (GIA). However, current statistics provide a reason for decision-makers to pay attention to the existing gendered division of labour when deciding on climate adaptation policies.

In our contacts with Swedish municipalities, we have seen that the social sector usually has a very small role in climate adaptation. Instead, adaptation is dominated by more technical competence areas such as urban planning and rescue services. We propose that planning of healthcare activities be given a much larger role in municipal climate adaptation.

4. Incorporating gender in local adaptation planning

Adaptation to climate change is not usually a separate decision-making process, but is incorporated into pre-existing local government planning processes. In a simplified form, the local climate adaptation process (whether a separate decision-making process or part of a larger decision framework) involves five independent but closely related decision stages (cf. Willows and Connell 2003, Horrocks et al. 2005):

(1) Identification of risks, vulnerabilities and opportunities.
(2) Identification of adaptation goals and criteria.
(3) Identification of adaptation options.
(4) Evaluation of adaptation options (including identification of conflicts and synergies).
(5) Implementation, monitoring and review.

Gender needs to be mainstreamed in each of the five stages of the local adaptation process. The following subsections describe how this has been done or could be done. The account is largely based on the work of Röhr (2009), which contains an easily accessible toolkit for mainstreaming gender in adaptation planning.

4.1 Identification of risks, vulnerabilities and opportunities

At the first stage, changes in climate and associated risks for humans, buildings and infrastructure are formally identified. This requires access to climate predictions made by specialists in the field. Furthermore, physical, social and economic vulnerabilities at local and regional levels have to be mapped. This can, for example, be done by going through the initial stages of local risk and vulnerability assessments (RVAs) or by carrying out Local Climate Impacts Profiles (LCLIPs) (UKCIP 2009). An LCLIP highlights a municipality’s or a region’s current
vulnerability to climate change. It is based on interviews with local authorities and on surveys of local media and local service data (e.g. air quality records, records of emergency responses, hospitalisations and public telephone enquiries and records of overtime costs). By comparing the information provided by an LCLIP about a community’s current vulnerability with existing climate projections, risks and vulnerabilities in future periods can be identified. The information obtained through RVAs or LCLIPs can also be used to draw up vulnerability maps that tell decision-makers where at-risk groups are concentrated (Morrow 1999). These maps in turn can be used for making evacuation plans, deciding on humanitarian relief distribution and prioritising different adaptation actions.

When assessing the risks and vulnerabilities associated with climate change, for example, through RVAs or LCLIPs, it is important to keep in mind that the collected data could be gender-biased. For example, media may favour reporting on large life-saving operations that are carried out by firemen and ambulance personnel to the exclusion of less visible (but perhaps equally life-saving) actions taken by nurses and carers in hospitals and retirement homes. If this is the case, then an LCLIP based on local media surveys could give a distorted picture of the vulnerability of a community. To gain a gender-sensitive picture of the current situation, gender-disaggregated data may need to be collected. In the case of LCLIPs, data gathering could, for example, be supplemented by interviews with local representatives geared towards detecting any significant gender (or other) biases in local media reporting. It could also mean that public telephone enquiries, overtime costs, etc., are recorded on the basis of gender. It is also important to keep in mind that vulnerability categories often interact in important ways and that data may therefore need to be further disaggregated; for example, it is not enough to identify poor households and elderly people as independent categories, but also necessary to look at the ways in which they overlap (Röhr 2009).

4.2 Identification of adaptation goals and criteria

At the next stage, a set of adaptation goals and criteria are identified. Goal-setting is an essential part of the adaptation decision-making process, since it is only when goals and targets have been set that adequate adaptation options can be generated. In addition, goals and targets constitute important criteria on the basis of which the adaptation measures implemented are assessed and evaluated at a later stage. Adaptation goals are typically set for selected priority sectors, based on an assessment of the sector’s economic and social impact, vulnerability and potential for adaptation. The goals are operationalised on the basis of estimations of acceptable risk levels and on the basis of what is considered achievable in terms of cost, timescale and political will (Horrocks et al. 2005).

There are at least two reasons why women as well as men ought to be included in the goal-setting process, including the processes of selecting priority sectors, developing adaptation objectives and operationalising objectives into precise, realistic and time-bound interim targets. First, women and men may perceive the goals and means of adaptation policy differently; women may define acceptable risk differently to men; they may emphasise different goals and targets than men; and they may have a different outlook on what goals and targets are achievable. To make the policy process politically legitimate, it is important that the perspectives and needs of both men and women are taken into consideration. Second, by making the goal-setting process participatory, goal achievement could be more easily achieved. Through participation in the goal-setting process, a sense of “ownership” of the goals is fostered. This could lead to more goal-directed performance, which in turn could lead to better goal achievement. Hence, the inclusion of women in adaptation
policy setting serves two ends; it brings legitimacy to the adaptation policy process and it can render adaptation policy goals more effective.

4.3 Identification of adaptation options
At the third stage, a set of adaptation options are identified. Several methodologies can be used to assist in this work: for example, systematic surveys of examples of policies and practices that have been implemented in other locations; socio-economic scenarios used to generate adaptation options under different possible futures; and various participative procedures that elicit proposals and assessments from the public. Here also, ensuring that both men and women are part of the adaptation process is of vital importance in order to capture novel approaches and to ensure legitimacy.

4.4 Evaluation of adaptation options
At the fourth stage, the identified adaptation options are evaluated on the basis of a number of criteria, such as effectiveness, cost-efficiency, equity, robustness, coherence and legitimacy (De Loë et al. 2001, Adger et al. 2005, McKenzie Hedger et al. 2008). This includes assessing how different adaptation options will impact on other policy goals (economic and non-economic) and evaluating and prioritising options based on that knowledge. At present a number of impact assessment methods and tools are available that could be used to identify impacts of proposed adaptation strategies or options on gender equality, most notably health impact assessment, GIA and equality impact assessment. All of these tools can be applied to determining how impacts of different adaptation options are distributed across a population, including between men and women. Sometimes the impact assessment tools are part of larger integrated impact assessment processes, such as strategic environmental assessment or sustainability appraisal, which must be performed in some European countries before land-use plans are adopted.

Socio-economic scenario analysis could also be used to identify and evaluate impacts of proposed adaptation strategies on gender equality. This methodology allows decision-makers to explore the adequacy of different adaptation options (for example, in reducing vulnerability to climate change consistently between men and women) given a set of possible futures or scenarios (Berkhout et al. 2002). Being able to analyse possible impacts of suggested adaptation options in different time-frames and for a range of different climatic and socio-economic futures is particularly important in relation to spatial planning and large infrastructure projects, which often have long planning horizons and are not easily adjusted to subsequent changes in climate, demography, government expenditure, etc.

Formal decision methods that can be used to evaluate and prioritise adaptation options include cost-benefit analysis, cost-effectiveness analysis, multi-criteria analysis and expert judgment (Brouwer and van Ek 2004, Lim and Spanger-Siegfried 2004, Adger et al. 2007). When performing multi-criteria analyses, gender equality could figure as one among several values or criteria against which different adaptation options are considered. In expert judgment processes, that is, processes that aim to solicit informed opinions from experts that can then be fed into various policy responses, individuals with expertise in gender-related issues could be included.

4.5 Implementation, monitoring and review
At the final stage, the implemented adaptation measures are monitored and evaluated to check if established goals and criteria have been met. Information is then fed back to the
first four stages of the process, thus creating a circular decision-making process where
decisions are continuously revisited in the light of new information and knowledge.
Among other things, this involves deciding on which indicators should be used to
measure how successful different adaptation measures have been in delivering expected
benefits. These parts of the adaptation policy process could be gendered through gender
budgeting, that is, attempts to scrutinise the organisation’s mitigation and adaptation
budgets (if there are separate budgets for these policy fields) according to their impacts
on men and women, and gender equality audits, that is, structured examinations of
whether an organisation is complying with its own gender equality goals and standards
or with national or international gender equality goals (Röhr 2009).

5. Conclusions
There is empirical evidence to suggest that the impacts of climate change will be more
severe for women than for men. This gendered vulnerability is most evident in developing
countries, but also exists in industrial countries. Policy responses in the form of adaptation
will likely reduce some of the risks associated with climate change. However, this article
argues that, unless they are carefully designed, adaptation measures could contribute to pre-
serving existing gender inequalities and reinforce women’s vulnerability to climate change.
To avoid such maladaptation, gender-sensitive approaches to adaptation planning should be
developed. Building on an adaptation policy framework developed elsewhere, it is shown
how gender can be mainstreamed in each stage of the adaptation decision-making process.

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Notes
1. By adaptation policies, we mean “[a]ctions taken by governments including legislation, regu-
lations and incentives to mandate or facilitate changes in socio-economic systems aimed at redu-
cing vulnerability to climate change” (Burton et al. 2002, p. 146). There are many different
types of adaptation measures. In this article, we focus on planned adaptation measures taken
by local governments. Examples of such measures are: spatial planning and infrastructure devel-
opment measures (reinforcement of roads and bridges, building sea walls, regulation of water
courses, etc.); regulatory measures (review of local building regulations/plans/permits, enacting
public funding/compensation schemes, land-use changes, etc.); communication and education
measures (vulnerability mapping, implementing local early warning systems, etc.).
2. By mainstreaming gender, we mean “[t]he process of assessing the implications for women and
men of any planned action, including legislation, policies or programmes, in all areas and at all
levels” (United Nations General Assembly (1997)).
3. Other dimensions of disadvantage include age, ethnicity, health status, socio-economic position
(e.g. employment, income and household composition), place (e.g. housing tenure and geo-
graphic location) and time (Thrush et al. 2005). In this article, women will be referred to as
a unitary group, although it should be recognised that this is clearly an over-simplification.
Women are not a unitary group, as gender interacts with other categories of disadvantage in creating vulnerability to climate change.

4. Although there is a significant number of women planners in some countries (e.g. in Sweden, where at least 50% of students in spatial planning and architecture have been female since the late 1970s), most chief planners in municipalities are men (Larsson 2006).

5. It is an open question whether equal representation is a necessary or a sufficient condition for women’s needs and interests to be adequately taken into account in public policy-making and planning. Male dominance may persist due to deep-rooted informal structures even in a decision-making body whose majority are women. Arguably, the physical presence of women would not be required as long as sufficient gender expertise is available (provided by either men or women). See Celis (2009) for a discussion of whether more descriptive (equal in numbers) representation leads to more substantive representation.


7. Ikeda (1995) uses data collected by Chowdhury et al. (1993) and compares this data to data collected by two NGOs operating in Bangladesh. The three studies report consistent findings. In the age group 20–49 female mortality was four to five times higher than male mortality, with the biggest difference in the age group 35–39. These findings are consistent with findings by Neumayer and Plümper (2007), who show that natural disasters lower the life expectancy of women more than that of men. Although social norms and role behaviour can provide some explanation for the higher mortality among women, Neumayer and Plümper argue that what is likely to matter most is women’s lower socio-economic status.

8. In some contexts, social norms and role behaviour can put men at greater risk than women. For example, men and boys are to a greater extent than women and girls expected to perform “heroic” actions that put them at risk during disasters (Brody et al. 2008).

9. Oudin Aström et al. (2011) argue that although women appear to have a higher relative risk of mortality during and in the aftermath of heat waves, socio-economic factors could be more decisive than gender itself.

10. However, it is important to note that due to changes in the attribution of gender responsibilities, such as men taking a greater responsibility for child-rearing, these (gendered) travel patterns are likely to change. Presumably, in the future as men take on responsibilities that have traditionally been associated with women, their needs and preferences concerning the environment will likely transform. However, these changes in male behaviour patterns are currently so slow that they cannot be relied on in social planning, not even in the relatively long time perspectives of climate adaptation.

11. However, a study of the experiences and perceptions of safety of different groups of city centre users in Newcastle upon Tyne showed that among all groups that were interviewed young men took most precautions while visiting the city centre (Pain and Townshend 2002).

12. In addition, more frequent extreme weather events are likely to put a particular burden on women in their private lives, since women usually bear the major part of the burden of caring for ill or injured family members (see Section 2.3).


14. These statistics can be found at the webpage of Statistics Sweden (2009).

15. See also the UKCIP Adaptation Wizard, 2012 (UKCIP 2009).

References


