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**Original article**

## **Engendered climate change impact and response knowledge, and its implication for adaptation, vulnerability and resilience in Sub Saharan Africa**

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### ABSTRACT

Gender is a socio-economic variable which can be used to analyze adaptation, vulnerability and resilience of people against climate change and variability in local communities in Sub Saharan Africa (Assan, 2014). Climate change refers to the variation in the global or regional climates over time. It describes changes in the variability or average state of the atmosphere over time scales ranging from a decade to millions of years (Ayoade, 2003). Gender-differentiated impacts of climate change on women and men in developing countries will have detrimental effects on agricultural productivity, biodiversity and ecosystem services. This is because they have the least capacity or opportunity and knowledge to prepare for the impacts of a changing climate given their limited resources (Nelson et al. 2010). According to Nellemann et al., (2011) adaptation, vulnerability and resilience of people to climate change depend upon a range of conditions. These vary from their degree of exposure and dependency upon weather patterns for livelihoods and food security, to varying capacities in adaptation, which are influenced by gender, social status, economic poverty, power, access, and control and ownership over resources in the household, community and society.

Climate change is a global phenomenon, with impacts that are already being experienced on a human level, and around the world, many of the most vulnerable communities are already struggling to cope with the impacts of climate change. Therefore, it is reasonable to suggest that climate change is reshaping human civilization and our knowledge on how we respond to climate change calamities will determine the future of mankind. It is recognised that it is those who are already the most vulnerable and marginalised who experience the greatest impacts (IPCC, 2007), and are in the greatest need of adaptation strategies in the face of shifts in weather patterns and resulting environmental phenomena. There is need for gender sensitive adaptation strategies in the face of existing climate change impacts on human activity and food security, including how these are manifested in different contexts. Men and women experience particular gendered vulnerabilities in climate change induced disasters, therefore there is need to identify the extent to which lack of gender sensitive disaster preparedness action have led to greater risk, and to map out possible gendered strategies for interventions to mitigate the impacts of possible disasters. Empowered with appropriate knowledge, men and women can effectively use this knowledge to advance sustainable use of biodiversity in most communities as a result lessening the impact of climate change. Useful synergies exist which can be used by both men and women for adaptation and mitigation in local communities include conservation agriculture, avoiding deforestation, forest conservation and management, agro-forestry for food and energy, land restoration, recovery of biogas and waste and in general, a wide set of strategies that promote the conservation of soil and water resources by improving their quality, availability and use efficiency. Knowledge on climate change mitigation measures and adaptation strategies should be accurate and available to general populace to accommodate the anticipated changes. The aim of this study is to assess gender disparities in climate change impact and response knowledge in Sub Saharan Africa.

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## 1. Introduction

Climate change knowledge accessibility along gender lines is a social constant, and has profound implications for successful climate adaptation and resilient strategies in local communities, men's and women's responsibilities and privileges vary along socio-cultural and socioeconomic lines specific to a particular time and place. The differentiated roles that women and men play in climate change mitigation and use of knowledge requires additional focus, if women are to continue to be critical actors in climate change issues. Thomas et al. (2007) working with smallholder farmers in South Africa found gendered livelihood patterns impacted climate risk perception; men in the study community, charged with livestock rearing, were primarily concerned with drought, and women in the community, charged with agriculture, primarily concerned with heavy rains. Women's more "risk adverse" behavior may afford them certain benefits when it comes to climate change adaptation (Patt et al., 2009). This implies that women are more likely to seek advice, listen to advice, and learn from experience than their male counterparts. On another note on risk aversion it is assumed that gender-based indigenous knowledge, which and has evolved

through decades with the domestication of animals and crops is critical for responding to climate change related risks at the local level (Agrawal, 1995; Nyong et al., (2007). This is on the background that indigenous knowledge, although new to climate science, has been long recognized as a key source of information and insight in domains such as agroforestry, traditional medicine, biodiversity conservation, customary resource management, impact assessment, and natural disaster preparedness and response. Therefore, climate change knowledge accessibility along gender lines for adaptation is essential to enable actors to anticipate long-term risks and make the appropriate adjustments to increase their resilience.

## **2. Existing norms, roles, and responsibilities and their implications for climate change vulnerability, resilience and adaptation in local communities.**

Men's and women's priorities for adaptation will be shaped by the existing norms, roles, and responsibilities and how adaptation strategies build on, ameliorate, or distort these (Nellemann et al., 2011). It is reasonable to suggest that there will be observable gender differences in priority setting when it comes to group-based climate change adaptation strategies in different communities due to diverse array of existing norms, roles, and responsibilities. Culturally specific gender norms define the roles that men and women play in climate change mitigation strategies and natural resource management. Though these will vary across culture and context, Meinzen-Dick et al. (2010) identify a number of trends observable on a larger scale. In terms of roles, women often have greater responsibility for family food production, processing, and food preparation for the household, whereas men have greater involvement in market-oriented production. In addition, evidence indicates that norms related to dissemination and distribution of foodstuff, nutrient and calories often have gender dimensions. Through the 'gender lens' the climate change mitigation and/or adaptation strategies should take cognizant of the roles, activities, responsibilities, opportunities and constraints of women in which may enhance the achievement of greater equality between women and men within their spheres of interaction in climate change solutions. The glaring gender disparities in climate change knowledge are largely attributable to a range of multifaceted, though often subtle, communities and societal challenges women routinely face that cut across institutional, social, and cultural dimensions. Taken together, these disparities culminate into a bundle of negative effects that can limit women's participation in climate change adaptation. The differentiated roles that women and men play in climate change mitigation and use of knowledge requires additional focus, if women are to continue to be critical actors in climate change issues. The few climate change adaptation programs and projects in Sub Saharan Africa, are unsuccessful because those who design and implement them know little of the differentiated roles that women and men play in most community settings in which they operate. It is assumed that failure to acknowledge and make a distinction in what knowledge is owned by members of either gender, has resulted in misguided climate change intervention resulting in failure of most projects and output to the intended beneficiaries. National governments should devote their attention to the issue of gender role differences and promote climate mitigation knowledge through empowering women. Enhanced climate change adaptation strategies will be a result of full participation of women in all aspects of climate change solutions. Addressing discrimination in land ownership and tenure by taking immediate steps to guarantee equal rights to land, property and inheritance to men and women has profound implications on climate change adaptation. The different forms of discrimination women face makes it difficult to disaggregate the various obstacles they encounter when seeking to participate in climate mitigation strategies in local communities. Imagine how the situation would be like if climate change policies and initiatives actively addressed dominant and often gender blind discourses and the power relations that shape much of gender inequality throughout Sub Saharan Africa. It is imperative to "dig down and pull up the deep roots of the discourses that frame gender and climate politics" (MacGregor, 2010).

Thomas et al. (2007) working with smallholder farmers in South Africa found gendered livelihood patterns impacted climate risk perception; men in the study community, charged with livestock rearing, were primarily concerned with drought, and women in the community, charged with agriculture, primarily concerned with heavy rains. This implies that men and women may actually perceive climate risks differently; a fact that may need to be considered in the development of gender-differentiated priorities. In addition to perceiving different risks as important, the same risk may have different meanings for men

and women (Gustafson 1998). Furthermore, evidence indicates that men and women may have fundamentally differential risk taking behaviors even in climate change related scenarios. Women's more "risk adverse" behavior may afford them certain benefits when it comes to climate change adaptation (Patt et al., 2009). This implies that women are more likely to seek advice, listen to advice, and learn from experience than their male counterparts. This separates the men's and women's relative propensity to adopt ex-post group based adaptation strategies, such as weather insurance, that require foresight and risk aversion.

### **3. Engendered indigenous information systems as a complementary way of dealing with climate change vulnerability, resilience and adaptation in local communities.**

Matsika (2012) defines indigenous knowledge as the traditional and local knowledge that exists and is developed through the experiences of the local community in the process of managing the conditions or context that challenge the people's everyday life. According to Warren, (1991) is that knowledge that is unique to a given culture or society or particular ethnic group. It is generally localized, having been developed through traditional practices for the management and conservation of biological resources on which the society depends. Consequently, it is a complex body of knowledge, skills and technology, which belongs to a particular geographical community (Ndangwa, 2007). This review subscribes to the fact that indigenous knowledge is knowledge outside of the formal scientific realm held by local people in a specific geographic area (Otto, 2008). Since it is based on practical experiences, it can be preserved and harnessed for the benefit of both present and future generations, which live in these communities. The use of indigenous knowledge has been seen by many as an alternative way of dealing with climate change in poor rural communities in many parts of Sub Saharan Africa (Egeru, 2011). Indigenous knowledge, although new to climate science, has been long recognized as a key source of information and insight in domains such as agroforestry, traditional medicine, biodiversity conservation, customary resource management, impact assessment, and natural disaster preparedness and response. Chowdury (2001) shows how women's indigenous knowledge of the charlands in Bangladesh would be useful to incorporate into adaptation strategies; however this knowledge has largely been ignored in development projects. Success has been reported through incorporating existing indigenous knowledge strategies for climate change adaptation at community level. More scope have been achieved by integrating a wide range of actors which takes advantage of existing indigenous knowledge strategies, often the domain of women or other marginalized community members, such as soil preservation and management techniques, biodiversity and foraging for wild medicinal plants for food, medicine and fuel (Denton 2002; Rossi and Lambrou 2008). The last IPCC Assessment (AR4, published in 2007) noted that indigenous knowledge is "an invaluable basis for developing adaptation and natural resource management strategies in response to environmental and other forms of change". This implies that indigenous or traditional knowledge may prove useful for understanding the potential of certain adaptation strategies that are cost-effective, participatory and sustainable. There is need to increasingly seek to incorporate scientific information (Roncoli, et al., 2002) because in certain cases for example, farmers in Burkina Faso traditionally rely on observation of environmental indicators to predict climate patterns, but they have lost confidence in their ability to predict rainfall given increased climate variability. Socio-cultural changes also account for the shift away from traditional practices such as the use of bio-indicators for agricultural production, even when such practices continue to provide useful information (Gilles et al. 2013). Indigenous knowledge is a critical building block in response to climate change mitigation and adaptation, however, mitigation and adaptation strategies or efforts should systematically and effectively address gender differentiated impacts of climate change on men and women in local communities. Gender-based indigenous knowledge, which and has evolved through decades with the domestication of animals is critical for responding to climate change related risks at the local level (Agrawal, 1995; Nyong et al., (2007). Without doubt, there is a conviction in many quarters of the need to tap into the stock of gendered indigenous knowledge if appropriate planning and on climate change adaptation strategies are to be developed in a sustainable way to counteract the effects of climate change. The need for use of engendered climate change knowledge indigenous knowledge emanate from the fact that women are not only vulnerable to climate change but they are also effective actors or agents of change in relation to

both agricultural mitigation and adaptation strategies. Women often have a strong body of knowledge and expertise that can be used in climate change mitigation, disaster reduction and adaptation strategies (FAO, 2008). UNDP (2010) view women as valuable contributors to adaptation work as they can be community leaders and natural resource managers who can help develop strategies to cope with climate-related risks. Indigenous knowledge includes gender defined knowledge of indigenous animal species, especially risk loss of livestock; herd accumulation; use of supplementary feed for livestock; reserving pasture for use by young, sick and lactating animals in case of drought; disease control in livestock, use of indigenous techniques in the management of pests and diseases in animal agriculture; culling of weak livestock for food; and multi-species composition of herds to survive climate extremes. For effective adaptation of animal agriculture to climate change, women need to be supported so as to enable them to become active contributors of indigenous knowledge in developing and designing adaptation strategies which will benefit both men and women in livestock production. It is thus important to identify gender-sensitive strategies for responding to biodiversity and food systems crises caused by climate change. These efforts should focus on: reducing women's vulnerability, in tandem with men's susceptibilities; promoting gender sensitive emergency responses; and enlisting women as key actors in animal agriculture and tapping on women's indigenous knowledge and skills in mitigation and adaptation efforts. Indigenous knowledge, often not documented, should be taken cognisance of in transferring knowledge. The youth at all institutional levels should be targeted as, at present, scant attention is paid to climate change in school and tertiary education curricula.

#### **4. Capacitation of communities through engendered climate change information communications technologies**

Several studies have shown that there is a need to make climate information more accurate, accessible, and useful for rural communities (Ziervogel et al. 2005, Vogel and O'Brien 2006; Hansen et al. 2007). The ability and nature of the adaptation response depends on engendered access to information about climate risks and the appropriate responses. There has been scientific gains in predicting the climate, however, often than not there is a lack of climate information available at the local level due to uncertainty in climate projections and seasonal forecasts, or due to lack of information on particular climate indicators, such as rainfall variability (Hulme et al. 2005). Capacitation of communities towards self-reliance, providing engendered knowledge and measures for both mitigation and adaptation to enable response to short-term, medium-term and long-term effects of both climate variability and climate change are of particular importance. Although we appreciate that many communities have developed their own systems for monitoring climate conditions through local indigenous knowledge systems, this information may not be accurate or adequate to inform adaptation if the climate changes in unprecedented ways. Access to climate information and technologies for adaptation is, therefore, essential to enable actors to anticipate long-term risks and make the appropriate adjustments to increase their resilience. Using innovative information communications technologies, can be used to reach poorer sections of the population who tend to have lower literacy rates or who may be limited in mobility due to cultural norms of seclusion. Radio broadcasts have been used transmit educational content to rural women (Maskow 2000). Despite climate change information availability, incorporation of scientific climate information into local decisionmaking may not often occur because of the way such information is communicated and disseminated (Patt and Gwata 2002). The capacity to respond to the challenges of climate change is coupled to knowledge and means to act through appropriate interventions both pre-emptively as well as post-event such as through disaster management support by all levels of government and other stakeholders concerned. Easily understandable information on climate change and climate variability should also be easily accessible. Developing a Climate Change Information System that will provide platform independent access to timely, accurate, integrated data and products might be useful to vulnerable communities. This complemented with appropriate education, training and public awareness actions and focused research will give communities maximum benefits on climate change knowledge. If funds permeating relevant climate change issues should be included in the educational curricula to facilitate understanding and awareness of climate change. Innovative group approaches could be used to overcoming women's illiteracy, which is a barrier to effective mass communication through written

materials, and a restraint on women's ability to demand appropriate climate change services. Pioneered use of video as the means by which groups of largely illiterate women can record and edit short films about their own climate change experiences and household environment, needs, problems, and solutions on communicating climate change knowledge. Armed with climate change testimonials, can demand and receive attention from climate change related ministries and other organizations. Using videos can be an effective tools for mobilizing and communicating climate change experiences with women in neighbouring communities.

### **5. Gender and climate change dynamics**

It is indisputable that climate change will result in food insecurity, shortage of water, food and changing spread of diseases vectors leading to a greater health and life risk. On the other hand, the impact of climate change is gender differentiated which calls for gender sensitive policies in dealing with the climate change induced calamities. Although the threats of climate change are well publicized, there is a widespread lack of insight into and acceptance of, its reality at all levels of society. Innovative and traditional means of climate change knowledge communication to reach all levels of communities who lack access to communication infrastructure and resources need to be utilized. There is need to improve climate knowledge dissemination because without the necessary knowledge on the impact of climate change at all levels of society, little effective action can be expected. The gender knowledge gap can be bridged by skills development and by gaining knowledge and understanding which will promote the adoption of engendered sustainable best management practices and climate-friendly behavioral changes in communities. Climate change increasingly affects the livelihoods of people, and poor people experience especially negative impacts given their lack of capacity to prepare for and cope with the effects of a changing climate. Among the poor people, there is gender-differentiated impacts of climate change on women's and men's assets and well-being in developing countries (Goh, 2012). Climate change poses great challenges for the majority of the population in developing countries who tend to rely on natural resources for their livelihoods and have limited capacity to adapt to climate change (Smit and Piliphosova 2001; UNFCCC 2007). It is likely to bring to communities in Sub Saharan Africa increasing risk of storms, flooding, landslides, heat waves, drought and water supply constraints. Globally, there is an increasing concern about the impact of climate change on our food system, economies, cities and communities. However, there is paucity of information on awareness of climate change impact on generality of the population in Sub Saharan Africa along gender divide. Gender inequality in climate change knowledge acquisition or possession is a major factor contributing to the increased vulnerability of women in climate change related disaster situations for example floods, droughts, heat wave etc. The issue of climate change being as a key development concern and its integration into gender mainstreaming is a fairly recent phenomenon. Previously there has been lack of focus in considering the integration of engendered perspective in climate change research and responses. Women are more vulnerable to the effects of climate change than men—primarily as they constitute the majority of the world's poor and are more dependent for their livelihood on natural resources that are threatened by climate change. Mitigation and adaptation efforts should systematically and effectively address gender-specific impacts of climate change in the areas of, inter alia, food security, agriculture and fisheries; biodiversity; water; health; human rights; and peace and security. Governments should thus be encouraged to incorporate gender perspectives into their national policies, action plans and other measures on sustainable development and climate change, through carrying out systematic gender analysis; collecting and utilizing sex-disaggregated data; establishing gender-sensitive benchmarks and indicators; and developing practical tools to support increased attention to gender perspectives. Strategies and planning of climate change adaptation models that take account of a gender dimension in policies formulation should be reference guide for future sustainable climate change adaptation programs and projects. The glaring gender disparities in climate change knowledge are largely attributable to a range of multifaceted, though often subtle, communities and societal challenges women routinely face that cut across institutional, social, and cultural dimensions. Taken together, these disparities culminate into a bundle of negative effects that can limit women's participation in climate change adaptation. Although women are disproportionately at risk on many fronts, it is a mistake to think of them only as victims in the face of



climate change. With adequate information, support and protection, women can also be extraordinarily resilient in the face of stresses and shocks. Moreover, there is ample documentation on the benefits of having women active, informed and involved in responding to the challenges in their lives, not only for their own learning and development but also for the energy, resourcefulness and knowledge that they can bring to local climate change issues. Availability of accurate information on climate change supported by gender sensitive policies will seek to reduce vulnerability and enhance resilience in the face of various hazards and risks, and the question to raise is how can the multiplicity of concerns for women be adequately represented without completely overwhelming any agenda?

The main responses of climate change vulnerability elements mentioned in the framework have been focussed on the interplay between the four thematic issues (gender divide, information accessibility, institutional support systems, socioeconomic and biophysical environment). These are based on literature documentation, on practical experiences and on personal opinions and observations. The impact of climate change on the well-being of individuals, households, and communities and their ability to respond to those changes depends on the context in which climate change occurs (Adger et al. 2009). The framework categorizes the main components of the vulnerability as influenced by socioeconomic and biophysical characteristics, gender divide, climate change information accessibility, and institutional support systems. All of these components are interrelated, as indicated by the arrows connecting them. The assumption is that there is gender differentiated vulnerability to climate change impacts given their individual roles, livelihood activities, assets, social characteristics, cognitive ability and lack of access to climate knowledge. Accelerated resource depletion and environmental degradation, due to drought, desertification, deforestation, natural disasters, and polluting substances induced by climate change and variability in communities have worsened the vulnerability of women in most local communities. The long standing conventional way of handling climate change induced disasters has been to just prefer an aggregate view of climate change impacts, without paying attention due regard to gender dynamics. In most cases women, are still largely absent from public decision-making in environmental management, protection, and conservation while being critical resilience actors at household level. Rights to natural resources are extremely important for women in the context of vulnerability. First, women's livelihoods crucially depend upon them, especially in Sub Saharan Africa. Second, the nature and extent of these rights affect women's bargaining power within the household (*vis-à-vis* husbands and male family members), as well as in the community and society at large. On institutional support within natural resource legislation, particular attention is devoted here to land law, both because rights to other natural resources (e.g. water) may depend upon land rights, and because land legislation usually affects women's rights more directly (while other natural resource legislation rarely contains gender related provisions). On the other hand, the ability and nature of the adaptation response depends on an individual's, household's, or community's access to information about climate risks and the appropriate responses. Access to climate information and technologies for adaptation is, therefore, essential to enable actors to anticipate long-term risks and make the appropriate adjustments to increase their resilience. Within the actors the study identifies men's and women's priorities for adaptation being shaped by the existing norms, roles, and responsibilities and how adaptation strategies build on, ameliorate, or distort these (Nellemann et al., 2011). Gender has proven to be an essential variable for analysing the roles, responsibilities, constraints, opportunities, incentives, costs, and benefits in climate change knowledge accessibility. This theoretical framework demonstrates that the improvement of women's access to climate knowledge must begin with an analysis of men's and women's participation in socio economic activities along two related dimensions: their role in climate change adaptation and their role in the household. In other spheres of socio economic activities, It is now widely demonstrated that women, as well as men, throughout the world are engaged in a range of productive activities essential to household welfare, agricultural productivity, and economic growth. Yet women's substantial contribution continues to be systematically marginalized and undervalued in socio- economic analyses and policies, while men's contribution remains the central, often the sole, focus of attention. However, while it is useful to draw attention to the fact that climate change knowledge accessibility along gender lines is a social constant, and has profound implications for successful climate adaptation and resilient strategies in local communities, men's and women's responsibilities and privileges vary along sociocultural and socioeconomic lines specific to a particular time and place. Experience has shown that complementary strategies to bring about changes in

attitude and behaviour within institutions are required (Poats, 1991). Institutional gender sensitization knowledge accessibility should be developed to initiate the task of attitude change within male-dominated public information domain. Institutional adjustment is critical, which can increase women's access to and the relevance of climate change information delivery system, even where most field agents are male.

## 6. Conclusion

The glaring gender disparities in climate change knowledge are largely attributable to a range of multifaceted, though often subtle, communities and societal challenges women routinely face that cut across institutional, social, and cultural dimensions. Therefore, it is imperative that institutional gender sensitization knowledge accessibility should be developed to initiate the task of attitude change within male-dominated public information domain. The long standing conventional way of handling climate change issues has been to just proffer an aggregate view of climate change impacts, without paying attention due regard to gender dynamics. This need to change because the gender component has proven to be an essential variable for analyzing the roles, responsibilities, constraints, opportunities, incentives, costs, and benefits in climate change knowledge accessibility.

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