

Resilience, power, culture, and climate: a case study from semi-arid Tanzania, and new research directions

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Rapid changes to the climate are predicted over the next few years, and these present challenges for women's empowerment and gender equality on a completely new scale. There is little evidence or research to provide a reliable basis for gender-sensitive approaches to agricultural adaptation to climate change. This article explores the gender dimensions of climate change, in relation to participation in decision-making, divisions of labour, access to resources, and knowledge systems. It draws on insights from recent research on agricultural adaptation to climate change in Tanzania. The article then explains why future gender-sensitive climate-adaptation efforts should draw upon insights from 'resilience thinking', 'political ecology', and environmental anthropology – as a way of embedding analysis of power struggles and cultural norms in the context of the overall socio-ecological system.

Key words: gender; climate; culture; resilience; adaptation; agriculture; anthropology

Introduction

Poverty and vulnerability to climate risks are not the same, but there are significant overlaps. It is very likely that climate change will have different effects on women and on men, exacerbating poverty and existing inequalities. Increased vulnerability is predicted for millions of smallholder farmers in the South, due to the effects of climate change on agricultural production (Easterling *et al.* 2007; Huq and Ayers 2007; Ziervogel *et al.* 2008). This is particularly the case in Africa, although the climate predictions describe a complex and diverse set of potential outcomes for the continent (Christensen *et al.* 2007). The goal of tackling gender inequalities and supporting women's empowerment has been a part of international development for some time, as has the exploration of the gender, poverty, and environment nexus in academia. However, the scale of projected climate change presents challenges on a completely new level.

More attention to gender and power analysis is urgently required in understanding how the impacts of climate change will play out in poor people's livelihoods, but also to identify the secondary impacts of initiatives implemented by governments, NGOs, and the private sector in response to perceived risks. First, this article explores some of the gender and equity dimensions of climate change and some of the concepts that can guide gender-climate research. Second, it applies a gender lens to some initial findings from an agricultural-climate innovation project in a semi-arid area of Tanzania. Third, it sets out some new directions in climate-change research and describes how these relate to gender studies.

Gender, equity, and climate change

The gender and equity dimensions of climate change are likely to be many, as climate change will affect all parts of the world. It is therefore useful to consider the scope of these (interrelated) dimensions: (i) the gender and development inequalities that underpin the functioning of the carbon-based global economy; (ii) the gender impacts of climate change in different parts of the world and in diverse agro-ecosystems; (iii) the gender dimensions of participation in climate negotiations; (iv) the gender impacts of mitigation activities, such as promotion of biofuels, carbon trading, and labelling; and (v) the gender-differentiated impacts of adaptation initiatives and processes (e.g. migration).

To date, there has not been adequate attention given to gender analysis in any of these areas. For example, the impacts of climate-mitigation activities are far from speculative, as the effects are already being widely felt, but the empirical evidence is limited. The expansion in first-generation liquid biofuels creates gendered risks in food insecurity, pressures on resource access and biodiversity, and employment discrimination (Rossi and Lambrou 2008).

Similarly, on adaptation, there is a rapidly increasing amount of research on farmer observations of climate change (see a recent survey of farmers in ten African countries: Maddison 2006, 25) and documenting existing coping and adaptation strategies for managing climate risks (for example, IUCN 2007). But rarely do these give sufficient attention to how these impacts and strategies may be gendered or differentiated along other lines of social difference.

Existing gender norms and ability to adapt to climate risks

Existing gender norms and power inequalities shape the ability of men and women to adapt to climate risks (Rossi and Lambrou 2008). These include: (i) participation in decision-making and politics; (ii) the division of labour, (iii) resource access and control, and (iv) knowledge and skills. Culture and knowledge systems shape all of

these norms, influencing what is deemed appropriate in a particular society – although this is contested and reworked in everyday life (Long and Long 1992).

Achieving greater gender equality and women's voice in decision-making is critical in climate negotiations, and in national/sub-regional mitigation and adaptation planning. More creative ways of supporting women's direct advocacy in this arena should be developed, using community research and communication (e.g. through the use of participatory video, as discussed elsewhere in this issue (Nelson and Braden 1999)). Gender analysis in adaptation plans is lacking. There is no gender differentiation of interests or possible impacts discernable in Tanzania's National Adaptation Programme of Action (NAPA) on climate change – it refers only to 'vulnerable communities'. This is still a plan, and things could change in implementation. But the aim should be to develop more integrated and participatory multi-tiered approaches in adaptation planning, providing space for less powerful voices (Paavola, in Adger *et al.* 2006, 217).

The gender-based division of labour leaves men and women with different levels of exposure to climate risks and opportunities (Rossi and Lambrou 2008). It is possible that there will be whole shifts in agricultural patterns, as the biophysical patterns of feasibility of crop production change. As a consequence, the range of livelihood options open to households may disappear, although others may open up and men and women will be differently exposed to new and existing climate-related risks. Positive outcomes could also occur as gender norms are challenged. But a critical issue for community adaptation will be how rapidly such 'system'-level shifts will occur, and who will be worst affected in situations of sudden change.

Livelihood resource access and control is gendered. This is the case for the whole range of resources (for example, land, water, trees, social networks, income, credit, government social protection and safety nets, infrastructure, education, health facilities, political power, and so on). Men and women are likely to have different options and 'safety nets' for coping with climate change (Rossi and Lambrou 2008). Social safety nets and support mechanisms will become more important, but are also gendered. For example, climate index-based insurance schemes are being trialled in different parts of the world, and while these could provide important support in times of hardship, such market-based mechanisms could also undermine existing indigenous webs of obligation and support. As substantial climate-adaptation financing becomes available, how easily will women and men be able to access these resources or influence how they are invested? Social turbulence could provide avenues for women's empowerment, but increased resource conflicts could have the opposite effect.

Women and men may have both common and distinct forms of knowledge and skills, because of the differing responsibilities they have in production, reproduction, and trade. Women's knowledge about climate and agriculture has often been overlooked in rural development in the past, but social-science studies have amply

illustrated women's role in agriculture. African women's indigenous agricultural knowledge supports household food security, especially in hard times (for example, drought and famine), where they can use their knowledge of drought and pest-tolerant plants (Ramphela 2004 and Eriksen 2005, cited in IPCC 2007, 457) and seed selection to cover diverse conditions in a growing season (Easton and Roland 2000, cited in IPCC 2007, 457).

Recognition of these gendered knowledge systems and skills may provide a rich resource for coping with climate change (Rossi and Lambrou 2008). A Bolivian agricultural development project is building on the specialist climate-prediction and agricultural knowledge of particular men and women in Aymara communities, known as *yapachuris* or 'sowers' (ISDR 2008). The international NGO InterCooperation, a Bolivian NGO called PROSUKO, and UNAPA (a farmers' organisation) are providing financial and technical services to members for agricultural development and risk management, mainly by supporting the *yapachuris* to share their knowledge through farmer-to-farmer extension. The high-altitude plains around Lake Titicaca are characterised by climate hazards (frost, rain, and hailstorms, and conversely, extreme heat and dryness) – all of which are predicted to intensify due to climate change (*ibid.*). Women are usually responsible for storage, and female *yapachuris* store a broad range of potato varieties, grain seeds, and other species, including medicines. They can identify ways to manage risk for other women farmers, as they know the best conditions and locations for sowing each species and variety. They are also being trained in monitoring bio-indicators of climate and weather-related hazards (*ibid.*, 7) and in leading negotiations over long-term market access for local produce (*ibid.*, 5). Positive project achievements include reductions in crop losses from drought, hail, frost, and flooding, plus more stable market access for local crops. This instrumental use of women's knowledge must avoid assumptions that women are necessarily inherently 'closer to nature' than men (Nelson *et al.* 2002), as these kinds of knowledge differences are socially acquired. Climate-related initiatives must retain a solid focus on the dynamics of power relations and the equity impacts occurring – avoiding giving women extra work without additional support.

Gender, climate change, and agriculture in semi-arid Tanzania

A case study from Tanzania¹ draws on findings from an action research project (part of the Climate Change Adaptation in Africa programme (CCAA)). The project aims to strengthen agricultural adaptation to climate change through multi-stakeholder innovation and learning. Participatory situation analyses in two Tanzanian villages in Dodoma (Laikala, Kongwa district; Chibeleda, Bahi district) were conducted, including key informant interviews, focus-group discussions, and individual interviews with men and women from different socio-economic and age groups. The project is at an early stage, but some interesting insights can be gained by analysing

these findings using a 'gender lens'. The findings illustrate some of the complexities of analysing climate-change impacts in areas characterised by climatic variability – where farmers are already coping with uncertainty coupled with ongoing trends (for example, endemic poverty, rapid population growth, etc.), which limit people's capacity to adapt (Thomas and Twyman 2005; Morton 2007).

Climate projections and agricultural scenarios for Tanzania

Generally speaking, it is thought that agriculture is likely to be affected by climate change in a number of ways (for example, reductions in crop yields, size of areas for crop production and grazing, increases in pests and diseases). Predictions for East Africa are uncertain, but suggest that up to 10 per cent of Tanzanian grain production may be lost by 2080 (Parry *et al.* 1999; Downing 2002). In the Dodoma and Tabora central regions, maize yields may decrease by 80 per cent (Mwandosya *et al.* 1998). Below is analysis of the project findings from a gender perspective.

- i) There is a high degree of consensus in local observations of climate change across different social groupings.** Shortened and highly unpredictable rainfall season; extreme winds, which now blow all year round due to loss of vegetation cover; stronger winds forcing the rain clouds across the sky without letting them rain; more intense sunshine and heat. Increased drought was mentioned by both men and women as a result of less predictable and more intense sunshine and heat. Women in both villages identified a much colder period in June and July than in the past, whereas none of the men interviewed mentioned this; this was possibly mentioned more by the women because they lost poultry at this time. These local observations about climate change are consistent with scientific projections (Mwandosya *et al.* 1998; Hulme *et al.* 2001; IPCC 2001) which suggest that Tanzania will warm by between 2°C and 4°C by 2100. Changes in temperature and rainfall are likely to prolong dry seasons, and to worsen periodic droughts, particularly inland.
- ii) The increasing unpredictability of the rainfall season has led to more people having to use oxen ploughs.** Ploughing land using oxen is much faster than by hand, and this speed allows maximum use of the shortened, often intermittent rainy period for crop production. However, the poorest households can rarely afford to plough using oxen, and the wealthier owners prepare their own fields first. While the position of women varies, many said they were struggling with simultaneous increases in demands on their labour and the increased need to hire oxen ploughs.
- iii) There are crop failures, yield variability, migration, and heavy workloads.** Unpredictable rainfall, declining soil fertility, and increased incidence of some pest

and disease problems are leading to more frequent crop failure and increased yield variability. Farmers are being forced to cultivate larger areas of land to obtain sufficient food, and this is increasing the trend for seasonal and (mainly) male outmigration – all of which is increasing the burden on women. Voluntary seasonal migration is not a new coping strategy in this region, but it is reported to be increasing, undermining family relationships and leading to the spread of HIV – particularly affecting women's wellbeing. Young people's perceptions of future rural livelihood opportunities are also being negatively affected. Male outmigration can have positive outcomes for women, challenging existing gender inequalities. It can lead to more freedom in decision-making for women over household cash, which can also increase due to remittances (Cleaver 2000). But, in other situations (echoed in people's accounts of life in Dodoma) more negative gender outcomes may occur.

Gender intersects with age and health as factors in determining vulnerability, according to the women's focus groups interviewed in Chibelela village. As might be predicted, they said that children, women, elders, widows and widowers, orphans, and the long-term sick people were the poorest and most vulnerable to climate change, because of their increasing inability to secure food in times of drought. Women in Dodoma with children are less able to take up labouring opportunities because of their child-care responsibilities and cultural norms. Increased food shortages were reported to be affecting the health of women, because they were eating fewer, poorer quality meals per day. It would appear that, in many ways, existing inequalities – created as they are by social norms and inequitable power relations – are already being compounded by increased climate variability in Dodoma.

iv) There are changes in the crops grown and a need to replant more frequently.

Farmers in the two areas studied have changed the balance of crops grown, with greater cultivation of drought-tolerant crops. Farmers are choosing different faster-maturing sorghum varieties, because the rainy season is now so short that their traditional varieties cannot mature in time. Sesame and sunflower have been introduced following market demand and government advice – because they are more drought-tolerant. Cassava production has increased, because it is a drought-tolerant food crop. Farmers are changing the balance of crops grown due to climate, but also government advice and market signals. Chibelela women said that some crops (maize, groundnuts, bambara nuts, and cowpeas) are being grown more widely to earn cash, and because women received training on improving storage.

Changes to the mix of crops grown can alter men's and women's access to and control of the income, as well as workload, but the picture is mixed. Grain is typically sold by men, and women are less likely than men to control the cash that is received. Increased marketing of food crops (for example, sorghum and maize) which are grown by women is increasing their workloads, despite the fact that they do not benefit from the profits. Conversely, the increased sale of groundnuts, bambara nuts, and cowpeas – traditionally sold by women – is providing women with more access to, and control of, income. While the division of labour and norms about sale and control of income are relatively fixed for some crops, this is not the case for others. Also, the norms are negotiated differently from household to household. The introduction of sesame and sunflower may have led to more household income, but control of this cash is not always shared and these crops have led to more weeding work for women.

A more frequent need to replant annual crops is widely reported. Farmers have to replant bulrush millet and groundnuts more often, as rains are unpredictable, coming and then stopping abruptly, meaning that time and seeds are wasted, and the quality of the crops affected. The gender impacts are mixed: women tend to be responsible for groundnut cultivation in Dodoma, so they bear the brunt of having to replant, but, at the same time, women tend to have control of the groundnut income, so increased cropping and sales tend to benefit them.

- v) **It is important to explore poverty and system resilience over time.** In times of hardship, such as prolonged extreme climatic events (for example, drought), people are forced to sell assets to get food. Men in both villages reported reduced crop yields and had sold off assets (for example, livestock) at low prices in hard times. This can lead to the inability to invest for the long term, and contributes to the inter-generational transfer of poverty (Tanner and Mitchell 2008). More analysis is needed of how climatic changes will interact with and possibly compound other trends affecting rural populations over time. Beyond cropping, other activities such as collecting firewood and water, which tend to be seen as 'women's work', are likely to be adversely affected by a changing climate, especially where this is compounded by localised environmental degradation. Decreased access to fuelwood was reported in the Dodoma studies – suggesting the probability of more work for women as they search further afield, leaving them less time to earn income, let alone rest or relax. As climate change occurs, there may be changes in the natural resource base upon which people rely for their livelihoods, and this will work in conjunction with social patterns of resource use. It is important to understand how localised environmental degradation, resource rights, and a changing climate will interact, while avoiding

the over-simplifications of the past about environmental degradation by poor people.

How resilient is the agro-ecological system? Will the rich indigenous knowledge and coping strategies which exist in many places be enough to enable people to survive? In Dodoma, will the coping and adaptive strategies outlined above (such as replanting, crop switches, use of oxen ploughs) be sufficient to deal with climate change, particularly as the workload and responsibilities of (some) women increase? New directions in climate-change research highlight the fact that social and ecological changes will not necessarily occur in incremental ways.

New directions in climate-change research and gender

The scientific study of human-induced climate change has emerged from meteorological and biophysical sciences. Only latterly has there been greater engagement by (non-economic) social scientists and development practitioners in more interdisciplinary approaches. As a result, technological responses to climate change have been at the fore, with little thought given initially to the ways in which climate change affects human relations, or its impact on equality. Much of the early adaptation modelling and planning was quite top-down, but this is beginning to change, with greater emphasis now on participatory planning and action (Huq and Arendse, cited in Nelson *et al.* 2008). Some equity analysis is emerging in the climate-change research field (see for example Adger *et al.* 2006), but rarely is gender a central focus.

Early risk/hazards literature assessed biophysical threats and the exposure of specific places or sectors to those risks, but in the 1990s political economy/ecology approaches showed that sensitivity and exposure to climate risks is shaped by socio-economic and political processes (Eakin and Luers 2006). Social research has shown how processes of negotiation, decision-making, and action shape development outcomes (for example, Long and Long 1992). Resilience-based thinking can complement this analysis by showing how these processes influence the rest of the social and ecological system. Resilience thinking, an important new direction in climate-change research, emerged in the 1980s, with antecedents in the 'systems thinking' of the 1970s. It presents a fundamentally different view of how change occurs in complex and linked socio-ecological systems – and this has implications for development and gender policy and practice.

Change does not necessarily happen in a linear, incremental fashion, in ways intended by actors; yet development planners plan insufficiently for turbulence (Roche 1994, 1999). Change can be unpredictable and sudden, because of the ways in which complex systems work – via feedback processes and thresholds (Walker and Salt 2006, 32). Resilience is the ability of a system to absorb disturbance (for example, market changes, fires, conflict) and maintain function, structures, and feedback processes. Socio-ecological complex systems can exist in different states or regimes (Eakin and

Luers 2006), and their resilience is measured by distance from a threshold. The closer you are to a threshold, the less it takes to be pushed over. Sustainability is all about knowing if and where thresholds exist, and having the capacity to manage the system in relation to these thresholds (Walker and Salt 2006, 63). Once a system crosses a threshold (or multiple thresholds) it can behave in a different way, often with undesirable and unforeseen outcomes. Such a transition from one system state to another can be sudden and painful for vulnerable groups. Turbulent times can throw up opportunities to challenge constrictive social norms, but rapid system-level shifts bring real risks for all, particularly the least powerful.

This is not just an abstract field of enquiry. Such rapid shifts in systems from one state to another often come with unwelcome surprises (for example, when a lake changes from clear water to persistent murky water – Walker and Salt 2006, 32). Those with least resources and power are obviously the least likely to be able to adapt rapidly, to change their livelihoods and survive. Resilience analysis seeks to provide some pointers as to how to manage for resilience at a system level, although predicting where and how change will occur in a system is often impossible until it has already happened (Walker and Salt 2006).

Following through the principles of resilience requires a change in environmental governance from the traditional, 'managerialist', 'command-and-control' methods (optimising efficiency in particular parts of the system and failing to consider the bigger system), to managing for uncertainty and building adaptive capacity. However, this may mean trade-offs, for example between reducing vulnerabilities now to specific perceived risks (as much adaptation currently aims to do), and developing sources of resilience and maintaining sufficient flexibility in the management system to cope with sudden surprises and shocks (Nelson *et al.* 2007). Resilience thinking does provide space for the agency of actors (*ibid.*), as 'desired outcomes' (the state in which a socio-ecological system is or should be) can be deliberated upon and worked towards. Yet who has a say in this process is clearly an important matter: 'Who decides what should be made resilient to what, for whom resilience is managed, and to what purpose?' (Lebel *et al.* 2006, cited in Nelson *et al.* 2007).

The understanding of development futures and gender in the light of climate change should also seek to draw upon the insights of environmental anthropology (for example, that the Western notion of nature and society as separate entities is *not* a universal given – Croll and Parkin 1992). In fact in many societies around the world, people's conceptions of how they relate to each other and the environment are much more complex. A key principle of resilience-based thinking is that we are all actors playing a role *in* socio-ecological systems; that we are all part of nature, with social and ecological systems linked in complex and dynamic ways. However, resilience scholars have not yet gone further in exploring how different societies construct ideas of climate, society, and environment, and what this means for adaptation decision-making.

The 'cultured climate' refers to how the meanings attached to climate vary across cultures and contexts (Roncoli *et al.* 2003; Strauss and Orlove 2003). This affects how they interpret scientific information (for example, seasonal forecasting predictions). Religion and cosmologies can play an important role in shaping how people in different parts of the world view the landscape: 'Mountain communities in Costa Rica, Tibet and the Peruvian Andes see mountains as living beings or gods' or 'worship mosaics of landscapes consisting of rivers, peaks, valleys and agricultural landscapes' (Fabricius *et al.* 2007). Spirituality can shape landscape management, as sacred lakes, forests, and grazing areas can be protected and provide a reserve in times of crisis (*ibid.*). The causes of unfavourable climate events, such as failure of the rains, drought, or storms, can be seen as due to a failure by humans to appease deities. While religion and spirituality shape decision-making, statements about beliefs and practice can sometimes appear contradictory; forecasting can be seen in some religions as being an act of human vanity as the future is pre-determined, yet farmers also pray and take concrete, purposive actions to reduce risks (Roncoli 2006, 88).

Research on local observations of climate change is increasing, but social memory of climate is very unreliable from a scientific point of view. People remember what is important to them, which is influenced by their occupations and experiences. Discussion of weather and climate is a mechanism for constructing a shared understanding of the past and can have moral overtones and purposes. Cultural constructions of climate memories are as much to do with working out proper moral conduct as they are about economic goals and commemorating climate events. The British discuss the weather to avoid tensions and embarrassments related to strong social class divisions, and Tanzanian rainmaking rituals have gendered and symbolic meanings (Sanders, in Strauss and Orlove 2003).

Seasonal forecasting is one area of increasing focus in climate-change research, but scientific information cannot be pre-packaged. As it is delivered it inserts itself into existing power relationships and can catalyse these dynamics – for example, ethnic, gender, and seniority hierarchies were found to shape the processing of climate information amongst groups of Ugandan farmers discussing climate information (Orlove and Kabungo, cited by Roncoli 2006, 87). Local farmers will interpret the information they receive depending on their own worldview, concerns, culture, and accumulated experience of climate events (Roncoli *et al.* 2003, 197). Farmers in Burkina Faso were retaining only part of or completely different messages from those intended by scientific forecasters. Their interpretations depended largely on how they view rainfall, what they are interested in knowing about rainfall, and the risks they perceive – all of which may be gendered.

Perceptions of risk – including climate risks – can be gendered (Davidson *et al.*, cited in IPPC 2007, 457), and women's risk perceptions can be given less attention than those of their male counterparts. Understanding the cultural and gendered

construction of climate, environment, and risks is thus an important part of climate adaptation – and has implications for climate and development policy, equity, and gender.

Conclusion

More empirical evidence from particular locations is needed to enable us to understand how the climate is changing and how this is interpreted and experienced in gendered ways. The case study from Dodoma gives a number of indications of how increased climate variability is influencing livelihood strategies, as well as the potential gender impacts, although the picture is still sketchy. A critical question is how far adaptation adjustments will suffice if there are rapid shifts in the socio-ecological system; who will be most affected; and what can be done in order to promote climate resilience in the overall system, in an equitable way. More gender-sensitive action research is needed as an integral part of adaptation efforts to find appropriate responses to climate change.

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Note

- 1 The Tanzanian research was analysed by the authors. The original Tanzanian research was conducted by the CCAA project – led by Dr A. Majule and Dr E. Liwenga of the Institute of Resource Assessment, University of Dar es Salaam, Tanzania, with support from T. Stathers and R. Lamboll of the Natural Resources Institute, University of Greenwich. The project studies which have been analysed were: Stathers, T.E., Ngana, J.O., Katunzi, A., Swai, O.W., Kashaga, S.B., 2007. Climate Change Adaptations in More and Less Favoured Areas of Tanzania: Local Perceptions, Vulnerability and Current and Future Adaptation Strategies in Chibelela Village, Bahi District, Dodoma Region. Institute of Resource Assessment, University of Dar es Salaam, Tanzania. 81 pp. Stathers, T.E., Ngana, J.O., Katunzi, A., Swai, O.W., Kasanga, F.P.M., 2007. Climate Change Adaptations in More and Less Favoured Areas of Tanzania: Local Perceptions, Vulnerability and Current and Future Adaptation Strategies in Laikala Village, Kongwa

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