

Climate–Urban Nexus: A Study of Vulnerable Women in Urban Areas of KwaZulu-Natal Province, South Africa

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ABSTRACT: The changes in climatic conditions and their associated impacts are contributing to a worsening of existing gender inequalities and a heightening of women's socioeconomic vulnerabilities in South Africa. Using data collected by research methods inspired by the tradition of participatory appraisals, we systematically discuss the impacts of climate change on marginalized women and the ways in which they are actively responding to climate challenges and building their adaptive capacity and resilience in the urban areas of KwaZulu-Natal, South Africa. We argue that changes in climate have both direct and indirect negative impacts on women's livelihoods and well-being. Less than one-half (37%) of the women reported implementing locally developed coping mechanisms to minimize the impacts of climate-related events, whereas 63% reported lacking any form of formal safety nets to deploy and reduce the impacts of climate-induced shocks and stresses. The lack of proactive and gender-sensitive local climate change policies and strategies creates socioeconomic and political barriers that limit the meaningful participation of women in issues that affect them and marginalize them in the climate change discourses and decision-making processes, thereby hampering their efforts to adapt and reduce existing vulnerabilities. Thus, we advocate for the creation of an enabling environment to develop and adopt progendered, cost-effective, transformative, and sustainable climate change policies and adaptation strategies that are responsive to the needs of vulnerable groups (women) of people in society. This will serve to build their adaptive capacity and resilience to climate variability and climate change–related risks and hazards.


KEYWORDS: Africa; Climate variability; Adaptation; Policy

1. Introduction

The climate of South Africa is changing, with frequent episodes of droughts, flash flooding, hailstorms, and extreme heat events. The country's mean annual temperatures have increased by more than 1.5 times, with the observed global average of 0.65°C reported by the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) for the period from 1950 [South Africa's National Department of Environmental Affairs (DEA) 2013]. Moreover, maximum and minimum temperatures show significant increases, in almost all seasons, with overall increases in hot extremes and decreases in cold extremes, in the western and northern interior of the country (Collins 2011; DEA 2013; Kruger and Nxumalo 2017; Mbokodo et al. 2020). Since 1970, there has been increased climate change–induced weather variability, including high inter- and intraseasonal rainfall variability and increasing dryness (Fauchereau et al. 2003; Ndlovu et al. 2021).

Rainfall seasonality has shifted in South Africa, with statistically significant decreases in rainfall and the number of rain days over the central, eastern, northern, and northeastern parts of the country during the autumn and increases in the number of rain days during spring and summer in the southern interior (MacKellar et al. 2014; Kruger and Nxumalo 2017). In many parts of the country, the onset of the rainfall occurs late in the season, while early seasonal rainfall cessations are also common (Ndlovu et al. 2021). In addition, there has been an increase in the number of consecutive dry days, with an increase in intensity of daily rainfall, and an increasing number of daily extreme rainfall events (Kruger and Nxumalo 2017; Ndlovu et al. 2021). Intra-annual, intraseasonal, inter-annual, and interseasonal rainfall variability has led to an increase in droughts in the country, exacerbating water and food security challenges and causing significant socioeconomic interruptions, particularly in the austral summer rainfall region, on the eastern seaboard (Ndlovu et al. 2021). The changes in both surface temperatures and precipitation are projected to have devastating impacts on the marginalized, particularly women and children (Amoah and Simatele 2021).

Climate-related risks are experienced differently across regions, socioeconomic groups, race, generations, age class and

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gender (Lambrou and Piana 2006; Roehr 2007; Satterthwaite 2007; Ribot 2009; Rout et al. 2013). Marginalized groups, in particular, women, children, and the elderly, are often most vulnerable and have inherently low capacity to prepare for, or respond to, observed and anticipated risks [Demetriades and Esplen 2010; United Nations Human Settlements Programme (UN-HABITAT) 2011; Pachauri et al. 2014]. Climate variability and change can amplify gender inequalities, in particular, in key areas that Demetriades and Esplen 2010 identify as being necessary to respond to climate-related changes, thus, increasing the vulnerability¹ of urban women (Kakota et al. 2011; Nkoana-Mashabane 2012; Edvardsson Björnberg and Hansson 2013). Conversely, women are viewed as agents of change who can play a key role in building the adaptation capacity and resilience of households and whole communities (Nurse-Bray 2015). Lambrou and Piana (2006) observe that despite their vulnerability to both external and internal stressors, women, “surprisingly” exhibit significant levels of resilience and agency in the face of climate-related impacts (Lambrou and Piana 2006). They possess valuable knowledge, experience and skills that place them in a unique position to contribute toward the implementation of sustainable and cost-effective adaptation strategies, with the potential of decreasing actual and projected future vulnerabilities to climate hazards (Habtezion 2011; Nkoana-Mashabane 2012). Etale and Simatele (2021) argue that the involvement of women and achieving a gender balance in climate change discussions is a good starting point in formulating and implementing comprehensive and successful adaptation interventions. They further observe that promoting women’s meaningful participation in climate change decision-making processes, is important in contributing to addressing the gender inequalities by raising the profile and status of women and other marginalized groups and facilitating their adaptiveness and resilience to climate induced environmental change (Etale and Simatele 2021).

On this premise, this paper, using a questionnaire survey, examines how marginalized women and female-headed households in urban areas in the province of KwaZulu-Natal, South Africa, are affected by climate variability and change and the myriad of response measures they employ to mitigate the impacts on their livelihoods and well-being. The paper also examines whether gender has been mainstreamed into local climate change policies in the province, with a view to ascertain whether what is written in policy is actually being implemented in reality, within these areas.

Gender inequalities exist between men and women due to their differing roles and positions in society, power relations and access to resources, which combine to affect individual, household and community capabilities and capacities to respond and adapt climate variability and change (Lambrou and Piana 2006; Babugura 2010; Tacoli 2012; Global Gender and Climate Alliance 2014). The historical position of women

in society, as primary caregivers and their lack of political, economic, and financial power renders them vulnerable to climate change as their concerns are rarely considered and/or represented in climate change discussions (Nelson et al. 2002; Demetriades and Esplen 2010; United Nations Development Programme (UNDP) 2010; Kakota et al. 2011; World Bank 2011; Edvardsson Björnberg and Hansson 2013). Existing literature, for example, suggests that women and children are 14 times more likely to die in a climate disaster than men (Nelson et al. 2002; UNDP 2010; Bradshaw and Linneker 2014). Other studies have also established that natural disasters, such as droughts, storms and floods, lower female life expectancy significantly relative to that of males (Jerneck 2018; Kakota et al. 2011). Women compose 80% of those who are displaced by climate change either via extreme weather events or gradual changes such as drought and compose between 70% and 80% of those requiring assistance postdisaster (Rout et al. 2013; UNDP 2015). During the predisaster phase, women, due to existing cultural biases that favor men, are less likely to receive information from early warning systems and weather alerts, affecting their ability to respond and, as such, they find it more difficult to move to safety as they are responsible for the family and community (Roehr 2007; Alber 2011). Postdisaster, particularly in natural resource-dependent households, women’s workloads tend to increase by at least 2–3 times as they are required to compensate for the shortfall of resources and are responsible for the household’s subsistence activities and welfare (Lambrou and Piana 2006; Roehr 2007). However, despite these observations, little has been achieved to mainstream gender into climate change policy, in particular, in developing countries. Moreover, the COVID-19 health pandemic has magnified climate change impacts, adding increasing pressure to food systems, livelihoods, and health (Huyer and Freeman 2020), and exacerbating gender-based vulnerabilities. Women are more affected by this added pressure due to their critical roles in food production, healthcare, and the household (Huyer and Freeman 2020).

Women are inexplicably underrepresented in national and international climate change discourses and negotiations and in the implementation of measures for facilitating mitigation and adaptation (Demetriades and Esplen 2010; Edvardsson Björnberg and Hansson 2013; Loftus-Farren 2013). An example of this is the United Nations Framework Convention on Climate Change (UNFCCC) where between 2008 and 2013, only 19% of the delegation heads were women and 32% of participants in national delegations were female (Loftus-Farren 2013; Women’s Environment and Development Organization 2013). This trend is reflected at the national policy level where female participation tends to be low (UNDP 2011). Thus, more often than not, men’s perspectives are taken into account in planning, decision-making processes, and budgeting, at the expense of women (Demetriades and Esplen 2010; Edvardsson Björnberg and Hansson 2013; Rout et al. 2013). This underrepresentation perpetuates the vicious cycle of marginalization of women.

Adaptation to climate variability and change is not gender or geographically neutral as women from developing countries

¹ Vulnerability in the context of climate change refers to the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes (IPCC 2007).

are disadvantaged, namely, technology; education; economic security; access to, control of, and ownership of resources; and access to information (Lambrou and Piana 2006; Roehr 2007; Demetriades and Esplen 2010; Rout et al. 2013). Effective adaptation actions should involve the removal of socioeconomic and political barriers so as to allow women to meaningfully participate in decision-making, thereby, increasing their capacity to adapt, reducing existing vulnerabilities and increasing their resilience (Lambrou and Piana 2006; Demetriades and Esplen 2010; Nkoana-Mashabane 2012; Rout et al. 2013). The province of KwaZulu-Natal, which is one of nine provinces in South Africa, was chosen for the study due to its high levels of poverty, inequality and unemployment, and the fact that women form the majority of the low-income groups and those living in low-income households (Statistics South Africa 2011). The province has a population of 11.3 million people, which is the second highest population in the country (Statistics South Africa 2019), and similar to the rest of the country, the population is expected to increase (Kohler and Behrman 2015). The population increase will make any future climate variability more impactful to more people, in particular, women.

2. Urban women under the influence of climate variability and change in South Africa

Climate change consists of short- to medium-term climate variability and gradual long-term change in statistical distribution in weather patterns (i.e., changes in average annual temperature and rainfall) and extreme weather events, such as floods and droughts (Nelson et al. 2002; Rout et al. 2013; Fedele et al. 2019). Multidimensional in nature, it is arguably the greatest developmental challenge, with urbanization, that the global community has faced.

Annual temperatures in South Africa have already increased by at least 1.5 times over the past 50 years, and this is affecting key sectors in the country, namely, water, agriculture, and biodiversity (van der Bank and Karsten 2020). This, in turn, impacts livelihoods, human well-being, food security, health, and infrastructure, posing serious challenges for national development (Ziervogel et al. 2014; Chersich and Wright 2019; van der Bank and Karsten 2020). Furthermore, any negative impacts on the economy will compromise people's access to food, which is predominantly dependent on affordability (Chersich and Wright 2019). In addition to annual temperature increases, droughts, flooding, and extreme heat events are increasing, which are combining to intensify difficult living conditions among the urban poor, in particular, women and children (Midgley et al. 2007; Alber 2015).

The effects of climate variability and change, and our ability to mitigate and adapt to them, are mediated by social factors, including gender (World Health Organization 2014). To fully grasp the impacts of climate variability on marginalized urban women in South Africa, these impacts need to be considered in the context of the development pressures the country is already facing (United Nations Children's Fund 2011; Ziervogel et al. 2014; Chersich and Wright 2019; van der Bank and Karsten 2020). These pressures include international economic shocks and stresses, high levels of poverty,

unemployment, inequality and household food insecurity, governance issues, HIV and AIDS, changes in population, rapid urbanization, and management of scarce natural resources, all of which interact with climate change (United Nations Children's Fund 2011).

South Africa has the highest urbanization rate in sub-Saharan Africa, and it is anticipated that nearly 80% of the nation will be urban by 2050 (Mafusire et al. 2014; South African Cities Network 2016). The absence of systematic and effective urban planning, combined with the rapidly growing population has resulted in the increase of urban poverty levels and unemployment, the proliferation of informal settlements, inadequate service provision and infrastructure, increasing pressure on the environment, and an increased vulnerability to climate-related risk (Boadi et al. 2005; Chikulo 2011; Taylor et al. 2014; United Nations Economic Commission for Africa 2014; UN-HABITAT 2014; Di Ruocco et al. 2015). Furthermore, the failure of policy makers to effectively plan for urban growth has led to inequitable and low levels of economic development, causing socioeconomic divisions within societies (Bartlett et al. 2012; United Nations Economic Commission for Africa 2014).

It is important to understand gender and gender relations in South Africa, with colonialism, capitalism and apartheid policies influencing social relations and dividing society along racial, class and gender lines (Babugura 2010). As a consequence, the country's postapartheid governance has attempted to advocate for gender equality by way of progressive policies and legislation (Babugura 2010; Misselhorn and Hendriks 2017). Gender equality is a constitutional human right that has been enshrined within the country's constitution (Republic of South Africa 1996). However, despite recent reforms, South African women continue to struggle to access resources or to participate in decision-making processes as climate variability becomes more extreme (Babugura 2010; Misselhorn and Hendriks 2017).

Some of the greatest impacts of climate variability and change are to be felt within the agriculture sector where 61% of agriculturalists in the country are women, who are living in a region with a high dependence on rain-fed agriculture (Altman et al. 2009; Ruiters and Wildschutt 2010). Households that are dependent on agriculture for subsistence and income are negatively affected by changing climatic conditions as a result of environmental degradation, water scarcity and the lack of fertile land on which to plant (Nelson et al. 2002). The decrease in crop yields and resulting increase in food prices affect all as more time and money is allocated to acquiring food. The UNDP (UNDP 2011) estimates an increase in food prices by 30%–50% in the coming decades and the worst affected will be the poor in developing countries. It is expected that malnourishment and starvation will become more prevalent as nutrition tends to be sacrificed in favor of survival. Moreover, sea level rise, droughts, heatwaves, floods, and rainfall variation are projected to increase the number of malnourished children by 25 million by 2050 (UNDP 2011), which will indirectly affect women as they are the primary caregivers within the family unit.

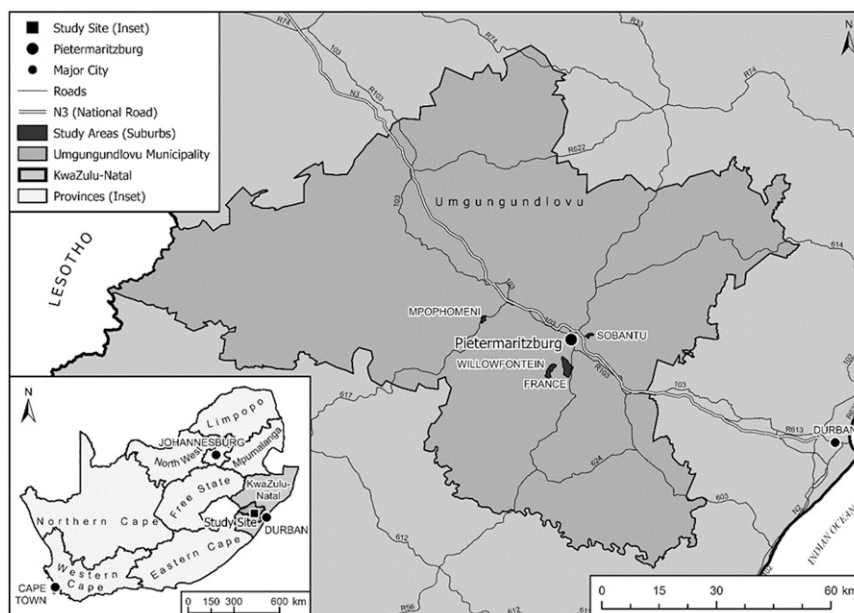


FIG. 1. Map of the study area: France, Mpophomeni, Sobantu, and Willowfontein.

The uncertainty associated with agricultural yield capacity and the limited options available to branch into other livelihoods due to a changing climate environment, will likely have negative impacts on income and food security. Furthermore, this will possibly affect women's health via poor nutrition and decreased resistance to disease (Nelson et al. 2002; Kakota et al. 2011). Moreover, the economic insecurity that is associated with climate variability may force a significant number of vulnerable women to reduce expenditure on health care, nutritional food, and education (UN-HABITAT 2011; World Bank 2011). In some cases, children from poor and vulnerable female-headed households will have to remain at home to assist with the workload, reinforcing the gender roles that have previously kept women vulnerable (Rout et al. 2013).

The increasing financial burdens via the purchase of food and water or the loss of productive assets in a climate-related hazard, can cripple a household forcing women to seek employment in labor-intensive, low-income jobs, generally in the informal economy¹. While the informal economy promotes the survival of the marginalized and those with limited skills to enter the formal sector, it too is vulnerable to climate variability and is the least able to recover after a climate-induced disaster (Boadi et al. 2005; Tacoli 2012). The result of this is the disempowerment of women by affecting their incomes and livelihoods and, inadvertently, locking them within the poverty cycle (Nelson et al. 2002; Tacoli 2012).

3. Methods

a. Description of the study sites

KwaZulu-Natal (KZN) is one of nine provinces in South Africa located along the eastern coast (KZN Provincial Planning Commission 2011). With a population of 11.3 million, the

province has the second highest population in the country (Statistics South Africa 2019) and is the second largest contributor to South Africa's gross domestic product (GDP) (KZN Department of Economic Development, Tourism and Environmental Affairs 2015). The province reports a poverty level of 68.1%, with women forming the majority of the low income groups and those living in low-income households (Statistics South Africa 2011, 2017), and the highest number of social grant beneficiaries in the country, with a total of 4 million recipients, which equates to 22.2% of all recipients in the country (KZN Provincial Government 2017, 2020). Its capital, Pietermaritzburg, is the second largest city in the province with a population of over 700 000, which is predominantly female (52%) (Statistics South Africa 2016a,b). Primarily an urban center, Pietermaritzburg is confronted with growing rates of urban poverty, unemployment, and unequal development (Statistics South Africa 2011; Msunduzi Municipality 2012).

The climate in Pietermaritzburg is said to be temperate, with an average annual rainfall of 863 mm while the average maximum temperatures is 28°C and the minimum temperature is 13°C (World Weather Online 2016). According to climate change projections, the city is expected to experience severe climate-related impacts and increasing threats to food and water security [uMgungundlovu District Municipality (UMDM) 2016]. It will become warmer as average annual temperatures are projected to increase by 1.75°–2.5°C by mid-century, and there will be an increase in rainfall and extreme events such as floods and severe storms (UMDM 2013).

Four locations in Pietermaritzburg were selected for the study. The locations are considered to be urban and periurban and are the residential areas of France, Mpophomeni, Sobantu, and Willowfontein suburbs (Fig. 1). Three are located outside

Pietermaritzburg's central business district, under the jurisdiction of the Msunduzi Municipality, and the fourth is located on the periphery of Pietermaritzburg, under the jurisdiction of the uMngeni Municipality. Both municipalities function under the uMgungundlovu District Municipality. The city of Pietermaritzburg and the sites were selected due to site familiarity as the researchers live in this city and have a clear understanding of the systems in place and scenarios and are well-versed and connected with local networks. The researchers have worked in these communities before and have a good rapport with the community leaders, making it easier to conduct research in these areas. Moreover, Pietermaritzburg is similar to many urban environments in South Africa, therefore it provides a good representation of urban South Africa. The major population group residing in the study areas is predominantly female and black African (86.6%) and their vernacular isiZulu (Statistics South Africa 2011; Msunduzi Municipality 2012). These areas are characterized by high rates of poverty (65%), unemployment, and crime (Statistics South Africa 2011).

b. Data collection and analysis

1) CLIMATE CHANGE POLICY ANALYSIS

A desktop review and qualitative content analysis of climate change policies developed and published by the KwaZulu-Natal provincial government (in 2014), UMDM (in 2013), and Msunduzi Local Municipality (in 2014 and 2016) was carried out to examine if, and how, gender has been mainstreamed into the policies. UMDM and the Msunduzi and uMngeni Local Municipalities were assessed as the study areas fall under the jurisdiction of these municipalities. As yet, uMngeni Municipality does not have a climate change policy. Therefore, a total of four policies were examined.

2) QUESTIONNAIRE SURVEY AND INTERVIEWS

Primary data were collected through questionnaires, key informant interviews, and direct observations. The questions selected for the questionnaire were based on similar studies conducted on climate change impacts and response and were chosen at the authors' discretion. A feasibility study was conducted followed by a debriefing session prior to the questionnaire survey being carried out in November to December 2015; 264 households, 81% of which are headed by females, were interviewed. The households were selected based on their availability and willingness to participate in the study, therefore, a convenience sampling technique was adopted for the study. An individual from each household was interviewed, and each interview was conducted with the self-identified head of the household. Where the head of the household was unavailable, the interview was conducted with whomever was available and above 16 years of age. Before responding to any questions, the respondents were informed of the study and verbally consented to their participation.

To supplement the survey data, in-depth interviews with key informants from the Msunduzi and uMngeni Municipalities were conducted. Quantitative data from the questionnaire were coded and placed into categories for descriptive analysis using the

Statistical Package for Social Sciences (SPSS), version 27.0, software. Descriptive statistics were incorporated into the results to establish trends in the data. The qualitative, open-ended responses and the interview questions were analyzed using inductive thematic analysis (King and Horrocks 2010).

3) TYPES OF CLIMATE CHANGE RESPONSES

There are a number of strategies that people use to respond to the impacts of climate variability and change, and these are loosely categorized into four major responses: inaction, coping strategies, incremental adaptation, and transformative adaptation (Fedele et al. 2019). To map the climate change response strategies of the studied communities, their responses were categorized according to these four strategies. The strategies are described below:

- 1) Inaction indicates a lack of strategies to respond to the impacts of climate variability and change (Fedele et al. 2019).
- 2) Coping strategies are strategies to resist the impacts of climate variability and change with the goal of maintaining a similar state or business-as-usual functioning of people and nature (Fedele et al. 2019). Coping strategies are often reactive.
- 3) Incremental adaptation is strategies to accommodate the impacts of climate variability and change by making minor alterations to existing practices to build resilience of people and nature by sustaining the functioning of existing socioecological systems irrigations (Termeer et al. 2017; Fedele et al. 2019). Examples include diversifying livelihoods, reducing livestock numbers or cultivated areas, using new crop varieties, increasing use of fertilizers or pesticides, or building irrigation systems to reduce future risks of crop failure (Termeer et al. 2017; Fedele et al. 2019). Incremental adaptation strategies are more anticipatory than coping strategies.
- 4) Transformative adaptation is strategies to overcome the impacts of climate variability and change through fundamental shifts in states and interactions of people and nature that address the root causes of vulnerability in the long term. Examples include migration or conversion of land to other uses or changing the characteristics and properties of the land use through the adoption of, for example, agroforestry or reforestation (Fedele et al. 2019).

4. Results and discussion

This section presents (i) a review of literature on climate change policy and women in South Africa, (ii) an assessment on the level of gender mainstreaming within local climate change policies, (iii) the household characteristics of the respondents of the questionnaire survey, (iv) the respondents' perception of climate variability and change, and (v) information on the impacts of climate variability and change on the respondents' livelihoods and the manner in which they are responding to these impacts.

a. National and local climate change policy

1) CLIMATE CHANGE POLICY AND WOMEN IN SOUTH AFRICA

South Africa attempts to mainstream gender into policies and programs through, for example, the National Policy Framework for Women's Empowerment and Gender Equality (established in 2000) to facilitate the mainstreaming of gender in every sphere and sector of government (DEA 2016). Since the country's independence in 1994, it has strived toward ensuring greater representation of women in national, provincial, and local governments and departments, to afford women more access to political power and decision-making roles (Department of Women 2015; DEA 2016). Moreover, various measures are being taken to finance women's empowerment at all levels of government by integrating gender considerations in the preparation and implementation of the national and provincial budgets (Department of Women 2015). The country adopted the 1995 Beijing Declaration and its Platform for Action, is a signatory to the Convention on the Elimination of Discrimination Against Women (CEDAW) and the Convention for Biological Diversity Gender Action Plan (DEA 2016), and regional instruments such as the Southern African Development Community (SADC) Declaration on Gender and Development, the Africa Platform for Action; Women's Rights Protocol; and the national Women's Charter for Effective Equality (UN-HABITAT 2008). South Africa is committed to the fulfilment of the 2030 Sustainable Development Goals 2030 where Goals 5 and 10 call, respectively, for gender equality and the reduction of inequality (United Nations 2016).

Women have been the primary participants of various community-based projects such as the Expanded Public Works Programme (EPWP), further contributing to gender equality the country (DEA 2016). The EPWP is a national government program that was launched in 2003 to provide poverty and income relief by creating temporary work opportunities for the unskilled, unemployed, poor and vulnerable (including the disabled) (Department of Women 2015; Kelobang and Boon 2018). Within the program's various initiatives [Working for Water (WfW), Working for Land (WfL), Working for Wetlands, and Working on Fire (WoF)], female participation was 69% during 2015/16 and youth and the disabled composed 46% and 2%, respectively (Kelobang and Boon 2018).

In response to the call to mainstream gender equality within policies and programs, South Africa's National Department of Environmental Affairs has been working toward incorporating gender into its policies, including its climate policies. The 2011 National Climate Change Response Strategy White Paper singles out women, in particular, rural women as being especially vulnerable to the adverse impacts of climate change (DEA 2011). To address this, the Strategy aims to empower women in the process of designing and implementing adaptation strategies (DEA 2011). In addition, one of the guiding principles of the National Climate Change Adaptation Strategy is gender sensitivity where the Strategy seeks to "promote the participation of women, take gender

differences in vulnerability to climate change into account, address the needs and priorities of both women and men and to not exacerbate gender inequalities" (DEA 2019). However, it remains to be seen how the policy and strategy will be implemented. Paying lip service to these laudable objectives is easy; however, implementation is a far greater challenge. The DEA (2016) acknowledges that there is a widening implementation gap and there are no monitoring and evaluation methods in place to provide evidence and data in support of equitable decision-making in climate change response policy. The Department is currently working to develop a much-needed gender mainstreaming strategy that will transcend the current perception that the collection of gender-aggregated data is "an add-on function and unstructured in the manner of implementation of gender mainstreaming programs" (DEA 2016). This made it difficult to assess the level of gender mainstreaming within all tiers of government, the private sector and civil society (DEA 2016). Furthermore, the lack of a gender policy for the environment sector has made it difficult to identify and implement viable funding for the implementation of gender mainstreaming processes in the country (DEA 2016).

Notwithstanding these challenges, the DEA has the following goals for gender mainstreaming in climate change in South Africa:

- 1) ensuring that women and men participate equally in decision-making with regard to policy and policy instruments aiming to improve the adaptation capacities of communities,
- 2) ensuring that women and men participate equally in decision-making with regard to policy and policy instruments aiming to mitigate the risk of drastic climate change and destruction of ecosystems at all levels, and
- 3) ensuring that all policies and policy measures take into consideration the gender impact of climate change (DEA 2016).

2) INCORPORATION OF GENDER INTO LOCAL CLIMATE CHANGE POLICY IN KWAZULU-NATAL, SOUTH AFRICA

To date, gender has not been satisfactorily included in the KZN Provincial and local governance climate change policies (Table 1). At the national level, South Africa has made an effort to translate the gender mainstreaming norm, this is yet to be realized at the local level. District and local municipalities in the country are currently overwhelmed with institutional and developmental challenges and competing mandates, making it difficult to develop and implement climate change policy, let alone mainstream gender considerations into these policies. They lack the capacity to adequately mainstream gender into their policies and programs. Furthermore, Hlahla et al. (2019) note that there is a paucity of fiscal support for climate change within these municipalities as the phenomenon has not been allocated funding within the municipal budgets of UMDM and uMngeni Local Municipality. This is likely due to competing budgetary allocations and the lack of prioritization of climate variability and change within the municipalities. In the ranking of the seven provincial priorities, environmental sustainability (which encompasses climate

TABLE 1. Assessment of gender mainstreaming within local climate change policies in KwaZulu-Natal, uMgungundlovu District Municipality, and the Msunduzi and uMngeni Local Municipalities. N/A = not available.

Climate change policies		Gender mainstreaming	Context
KZN Provincial climate change policies	KZN Draft Climate Change Action Plan (2014)	No	N/A
uMgungundlovu District Municipality climate change policies	uMgungundlovu District Municipality Climate Change Response Strategy and Plan (2013)	No	N/A
Msunduzi climate change policies	Climate Change Policy for Msunduzi Municipality (2014)	No	N/A
	Msunduzi Municipality Climate Change Adaptation and Mitigation Strategy (2016)	No	N/A
UMngeni climate change policies	N/A	N/A	N/A

change response) is fifth in the list while inclusive economic growth, human resource development, human and community development, and strategic infrastructure are deemed to be more urgent and important (KZN Provincial Planning Commission 2016). Therefore, there is no incentive or political will to urgently address climate change.

UN-HABITAT (2008) states that to successfully implement local initiatives on gender inequality, the following are essential: (i) political will; (ii) capacity building and training of municipal officials; (iii) financial resources and gender budgeting to ensure equal distribution of resources; (iv) monitoring instruments to facilitate the institutionalization of gender equality; (v) campaigns to raise awareness on the significance of gender mainstreaming among municipal staff and citizens; (vi) citizen involvement in the planning, implementation and evaluation of initiatives; (vii) involvement and participation of external stakeholders such as civil society groups, women's organizations, and nongovernmental organizations; and (viii) a community of practice to allow for sharing of ideas, knowledge, information, and good practices. These factors can help to facilitate gender mainstreaming in climate change policy within KwaZulu-Natal, UMDM, and the Msunduzi and uMngeni Local Municipalities in manner that is suitable for the context of each municipality.

The vulnerable and marginalized groups need to be prioritized and included in any climate change adaptation initiatives and should be allowed to participate in all stages of the local adaptation process (Edvardsson Björnberg and Hansson 2013). The resulting adaptation measures that are adopted should be unique to the women who are impacted as climate variability and change impact women differently depending on the location, region, and cultures. This needs to be taken into account when finding adaptation measures (Roehr 2007; Pachauri et al. 2014). Targeting adaptation actions in this manner will not only contribute toward the political legitimacy of the policy process but will empower women by providing them with a pivotal voice during climate-related hazards. This new influence should help reduce the number of climate hazard injuries and fatalities and decrease the level of assistance required for postdisaster relief (Ribot 2009; Alber 2011; Edvardsson Björnberg and Hansson 2013). The level of expertise that women can bring to climate policy cannot be taken for granted. Failure to integrate gender into climate change policies and plans will result in unsustainable and ineffective solutions (Demetriades and Espen 2010; Alber 2011).

b. Household surveys

1) HOUSEHOLD CHARACTERISTICS

The respondents' age varied from 16 to over 65 years of age, with 75% of households earning an annual income of approximately ZAR 15,000 (USD 972.26; 1 November 2021), with more than one-half of the households catering for at least 4–6 dependents. The primary sources of income were employment (formal 29% and informal 38%) and government social grants (child grant, orphan grant, pension grant, and disability grant) (75%).

2) PERCEPTION OF CLIMATE CHANGE

Approximately 74% of respondents had some understanding of climate change, with some respondents stating that it refers to “a hole in the ozone layer” or “changes in weather that cause illnesses” and “it's getting hotter—the weather forecast is becoming more inaccurate over time.” One participant insisted that “it's a condition that we don't understand and God is responsible,” and another, when asked about the cause of climate variability and change, stated that “it's because God is angry at the world because we do not praise him well.” A similar finding was found by Simatele (2010) in a study in Zambia in which the change in climatic conditions was attributed to God's anger at humanity for sin (Hlahla and Hill 2018). Respondents mentioned that God is the only one who can change the weather; therefore, climate change cannot possibly be anthropogenic (Simatele 2010). Debela et al. (2015), in a study in south Ethiopia on the perceptions of smallholder farmers² in pastoral and agropastoral systems, record that the majority believed that supernatural forces were the driving force of climate change, in particular drought. They perceived drought to be divine punishment for deviating from God's rules. This illustrates the level of knowledge and awareness about the causes of climate change, with respondents aware of the impacts of climate variability and change due to direct impact, however, they are unsure of the causes. They do not believe that anything other than a supernatural force is changing the weather and climate. It is, therefore,

² Smallholder farmers are defined as those farmers that own small-based plots of land on which they grow subsistence crops and one or two cash crops, relying almost exclusively on family labor (Department of Agriculture, Forestry and Fisheries 2012).

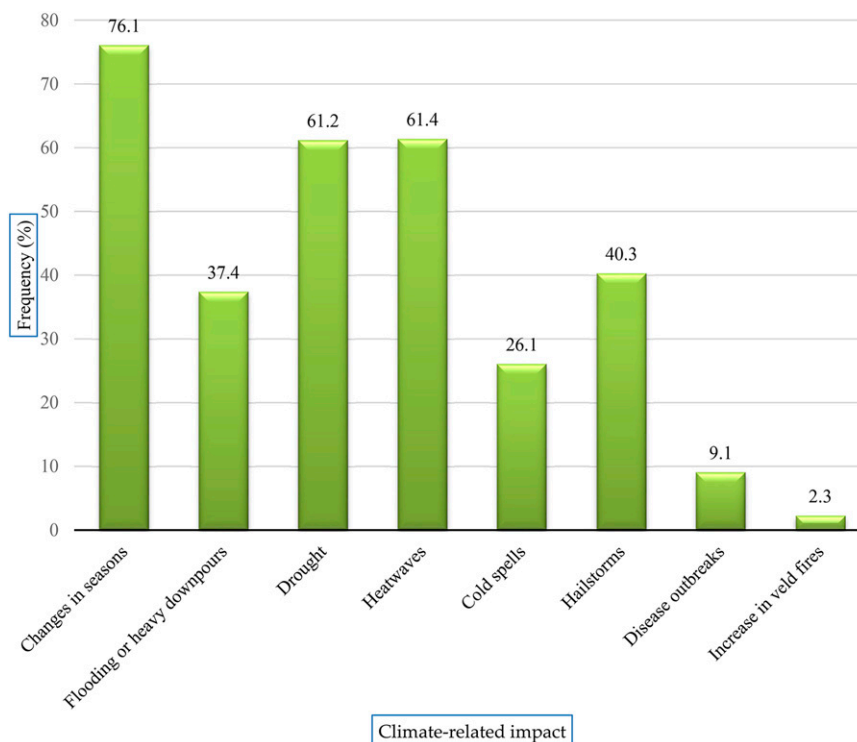


FIG. 2. Climate-related impacts experienced by the respondents.

imperative for the level of awareness to be increased within these communities as this will influence how women respond to climate variability and change and how they can work to prevent further environmental damage.

3) IMPACTS OF CLIMATE VARIABILITY AND CHANGE ON THE COMMUNITIES

The majority of women (76%) (Fig. 2) reported experiencing a change in the weather or seasons to the extent that some respondents reported that they “could no longer tell the difference between the seasons as they are all the same.” More than half the respondents stated that they have experienced drought (61%) and heatwaves (61%) while 40% have experienced hailstorms and 37% flooding or heavy downpours. Fewer respondents have experienced cold spells (26%) and less than a tenth have faced disease outbreaks and wild grass fires (Fig. 2). The most significant flooding events mentioned by the respondents were the floods of 1985, 1986/1987, 1989, 1995, 1997, and 2005. There were two floods in KwaZulu-Natal in 1995: January and December. The latter, aptly named the Black Christmas floods, resulted in 169 deaths and displaced 6000 families (Eveleth 1996; Hlahla and Hill 2018). This incident spearheaded efforts to address environmental issues in the region.

Climate variability and change has impacted the livelihoods, either directly or indirectly, of more than half of the respondents (54%). The direct impacts have manifested in the form of property loss due to flooding and hailstorms, which are perceived as being more frequent. Indirectly,

climate-induced change has affected agricultural activities; health and general well-being; income, water and food security; and education. The majority of women acknowledged that their agricultural activities were affected by the increasing temperatures and decreased and/or delayed rainfall, with many expressing concern about their food security as their food supplies are diminishing, forcing them to purchase more food. This places an increasing financial burden on the household. Female-headed households within the Msunduzi Municipality presently spend 53% of their incomes on food (Dodson Chiweza et al. 2012) leading some respondents to complain that they now have to use their “small incomes” to purchase more food, which some have observed to be becoming increasingly expensive.

Urban food insecurity in South Africa is becoming a critical development and governance challenge (Battersby and Haysom 2016; Battersby 2017) and in the face of such challenges, the women are forced to make decisions about the types of foods that they consume, in some cases sacrificing nutrition in favor of greater quantities of cheaper, less nutritious foods, which can increase the incidence of noncommunicable diseases such as diabetes and cardiovascular diseases. This is compounded by the fact that the food system in urban areas is already compromised due to nutrition transition, which is defined as a shift in dietary consumption and energy expenditure predominantly due to modernization, urbanization, economic development, and increased wealth (Popkin 2006). These shifts in diet are toward more processed foods that are high in sugar, fat, and salt, low in fiber, and less nutrient dense (Walls et al. 2018).

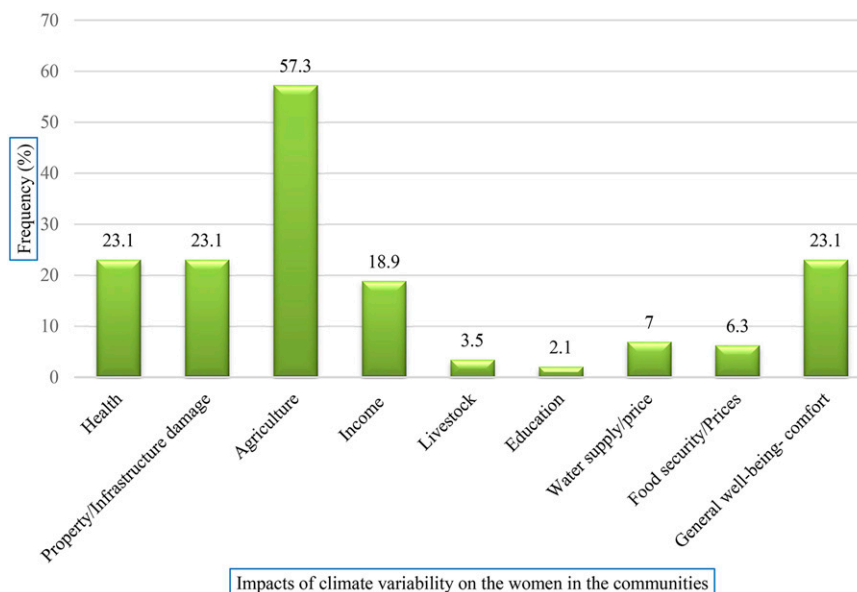


FIG. 3. Impacts of climate variability and change on the women in the communities.

Dodson et al. (2012), in a study on gender and food insecurity in southern African cities noted a direct correlation between the level of household expenditure on food and the level of poverty and food security. The need to fulfil the household's immediate dietary requirements will take precedent over other longer term needs such as education and leaves little room to prepare for price or income shocks associated with worsening climate-driven weather variability (Dodson et al. 2012). In addition, water is becoming a scarce resource within these communities, causing a few respondents (7%) to be fearful that they may have to purchase water in the future, further diminishing their incomes.

Twenty-three percent of the women stated that the perceived changes in weather and climate have impacted their health, damaged property and infrastructure, and caused them discomfort, making day-to-day activities difficult (Fig. 3). Many raised a concern that their children are of ill-health while others stated that the unpredictable changes in the weather have given them skin rashes, influenza, and headaches and worsened their blood pressure, diabetes, and epilepsy.

Education is mentioned as being negatively impacted as extreme events such as floods "damage schools and children's books and roads networks that the children use to get to school." Nineteen percent of women stated that climate change had a negative impact on their incomes as agricultural yields declined. Furthermore, additional costs are incurred within the household as a result of the need to purchase food and water and to pay for additional health/medical care costs that may arise. A decrease in household income can result in the participation of women in risky behaviors such as transactional sex for food or income (Ziervogel 2016). In other cases, the elderly may be forced to forfeit their old age social grants to support the household. The use

of social grants was identified by some women within the communities as a coping response.

Respondents commented that the increasing temperatures make them lethargic, decreasing their work output and 23% complained that climate change and variability is affecting their general well-being and causing them discomfort (Fig. 3).

4) RESPONSES TO IMPACTS OF CLIMATE VARIABILITY AND CHANGE

Despite these negative impacts, only 37% have identified means of responding to the changes, with 60% of those with response strategies (Table 2) considering the methods as relatively ineffective.

The community members identified 27 strategies to respond to the array of climate risks that they identified. The majority of the responses (16) were coping strategies while six were incremental adaptation, one was transformative adaptation, and four were inaction. The most popular strategies were the use of grant money and reliance of funding from NGOs, illustrating the need for financial resources to assist with coping with climate variability and change (see Table 2). A similar finding was made by Babugura (2010), who note that access to social grants is an important coping strategy for rural women in the uMzinyathi and uMhlathuze District Municipalities in KZN. Some respondents referred to how they can mitigate climate change by reducing their waste footprint. Various methods were identified such the "use of grey-water to water plants to recycle water," "the limiting of the burning of waste or using CFCs [chlorofluorocarbons]," and "using buckets to bath and do the dishes in order to save water." These responses are transformative in nature and are indicative of the fact that though many respondents do not understand the causes of climate change, a few acknowledge that the accelerated rate of climatic change is a result of

TABLE 2. Response strategies adopted by women in the communities in response to climate variability and change, as a percentage. The key for the impacts is 1 = changes in seasons, 2 = flooding, 3 = drought, 4 = heat waves, 5 = cold spells, 6 = hailstorms, 7 = disease outbreaks, and 8 = increase in veldfires.

Response strategy	Climate-related impact								Type of response
	1	2	3	4	5	6	7	8	
Addition of more fertilizer to hold the soil	3								Incremental adaptation
Storage of water in large containers (for plants and household use)			19						Coping
Staying indoors (during hot and cold weather)	8	15		5	20	17			Inaction
Staying hydrated- drink more water				52					Coping
Placing lightning conductor in the yard									Coping
Increasing frequency of watering of crops- at least twice a day	24		25	11					Coping
Creation of drainage furrow		15							Incremental adaptation
Movement of property to a safe position and closing of windows, including car windows		4				8			Coping
Minimization of waste to reduce impact	11		11	5	20				Transformative adaptation
Planting of trees around the yard to protect the house from damage									Incremental adaptation
Keeping livestock indoors and covering crops to protect them from hail and heavy rain		4				8			Coping
Insurance		4		1		4			Coping
Planting more crops	8	11	8	4		13			Coping
Adjustment of planting times	8								Coping
Placing buckets under leaks in the house during heavy rains		4							Coping
Purchasing of food	8	11	8	4		13			Coping
Cessation of all planting activities	14	15	14	6		17			Inaction
Making changes to the way buildings are constructed, for example, from a flat roof to pointed one		4				4			Incremental adaptation
Use of sunscreen				1					Coping
Use of fans or wearing of hats	5			5					Coping
Use of heaters or making fire	8				50				Coping
Restricting planting of nonindigenous trees	3		3						Incremental adaptation
Reliance on funding and seeds from NGOs	3	4	3	1	5	4	33	50	Inaction
Dependence on social grant money	3	4	3	1	5	4	33	50	Coping
Working early before it gets too hot	3			1					Coping
Seeking medical attention, especially for children who fall ill							33		Inaction
Seeking alternative means of earning income		7	6	3		8			Incremental adaptation

human influence and as such they contend that they have a responsibility to reduce their environmental impact. This knowledge was gained from the radio, television, and newspapers, which many of the respondents have access to; however, only a few have taken an interest in climate change issues. This highlights the need to incentivize climate change mitigation responses as was reported by Hlahla et al. (2016) in a study carried out in Pietermaritzburg on the use of green economy to alleviate urban poverty and safeguard the environment. The study found that a financial incentive motivated women in the study to recycle waste rather than burn it, and to grow indigenous trees as part of a reforestation project to contribute toward the creation of carbon sinks, which are necessary for carbon sequestration (Hlahla et al. 2016). Such incentive may prove necessary to garner mass interest in climate change issues in the urban developing world where climate change is competing with other more pressing and immediate concerns such as poverty and food security. Such incentive schemes can create new opportunities for women and give rise to new enterprises to empower them.

A few women had insured their movable and immovable property, and this should help them to replace anything lost or

damaged during a climate-related event. The option to insure is only plausible for those who can meet the basic needs of the household and can save some money. In this case study, only 16% of women were able to put some money into their monthly savings, making insurance difficult. Moreover, climate change insurance is relatively new to insurance companies in South Africa; therefore, there is no guarantee that all property lost will be replaced as the uncertainty of climate change makes it difficult for insurers to underwrite the extra costs that climatic change could incur (Cliffe Dekker Hofmeyr 2014).

In response to extremely hot days and cold spells, to ensure their comfort, many respondents opted to use fans and heaters (Table 2). However, the prolonged use of electricity is not only costly to the household but contributes to environmental degradation through the use of fossil fuels. The respondents may not be aware of this, which enforces the call for dissemination of locally relevant environmental information.

A lack of financial resources hinders people's ability to purchase and install more expensive, environmentally and energy saving adaptive equipment (Edvardsson Björnberg and Hansson 2013; Hlahla and Hill 2018). Some of the respondents, dependent on subsistence agriculture for their livelihood and food

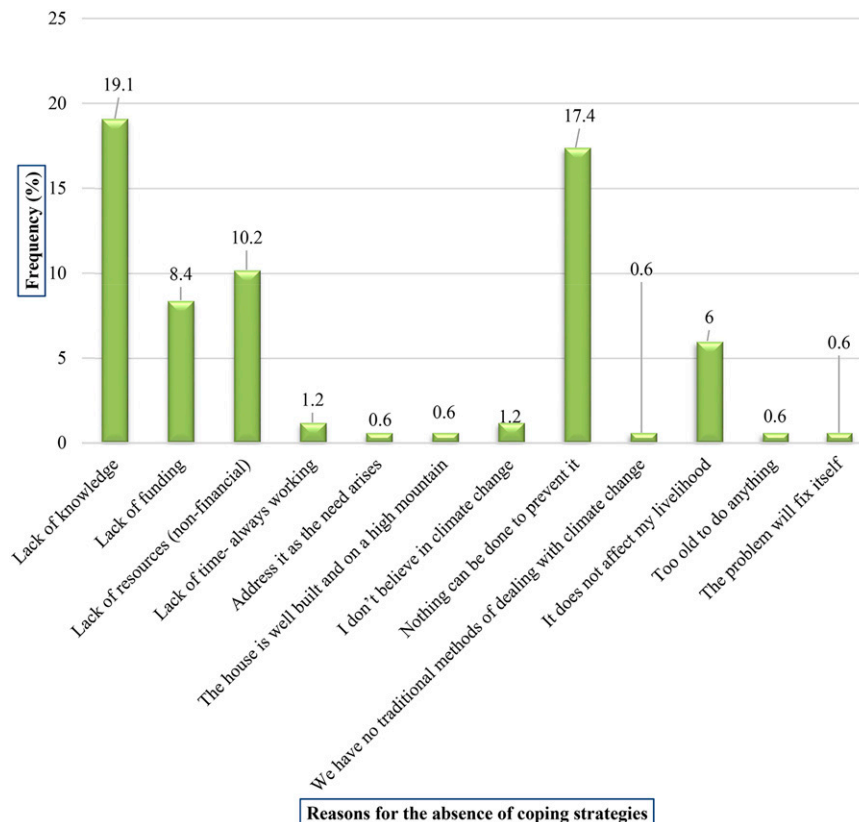


FIG. 4. Reasons provided by respondents for not adopting measures to respond to climate variability and change.

security, opted to plant more crops to replace the ones that have been lost through flooding, drought, seasonal changes, hail, and heatwaves, and to “water the crops more” to ensure their survival, especially, in times of drought. This is a short-term and unsustainable solution as water shortages are an ever-increasing threat in South Africa and likely to worsen (Adam 2021). Moreover, planting more than once requires additional time and resources. Therefore, the participants will be forced to buy food rather than plant it, leading numerous households to reduce costs to ensure that households meet their necessary dietary needs. Hence, given women’s role in food provision within the household, the impact of climate change on agriculture affects their livelihoods. In the face of reduced agricultural yield, food prices are likely to increase, further crippling households. Harvey et al. (2014) reported that while smallholder agricultural farmers in Madagascar had adopted coping strategies to manage the effects of climate-driven events such as flooding, droughts, and hail, the strategies were ineffective as farmer crop yields remained unpredictable. Their strategies ranged from seeking off-farm employment, to harvesting different crops to supplement food supplies to a reliance on social networks (Harvey et al. 2014). All of these strategies are limited in their capacity to protect women from climate risks.

The majority of coping strategies identified in the present study (Table 2) are reactive adaptation strategies as they were

undertaken in response to climate change impacts already perceived (Ravindranath and Sathaye 2002; Hlahla and Hill 2018). Few strategies are proactive and anticipatory, that is, actions taken in preparation for potential or anticipated impacts. However, the fact that the respondents have adopted some strategies acknowledges there is a perception of climate change and that they have some capacity to respond, though limited. Assistance from local government and community-based organizations could encourage strengthening self-reliance and elevate basic reactive coping strategies to proactive, transformative, and sustainable approaches.

When asked why they did not have coping strategies, the community members cited a myriad of reasons, the primary concerns being a lack of knowledge (19%), lack of resources with which to adapt (10%), and economic insecurity in the form of no access to funding (8%) (Fig. 4). Approximately 17% of respondents consider climate change to be inevitable and little can be done to prevent it. This is illustrated via the following comments: “No one can control the weather but God.” “People do not comply with the methods of adaptation and prevention.” “We live next to the river and this doesn’t give us a choice or advantage.” “The impact of climate change on the household is not enough to take action.” “We cannot access water so there’s nothing that can be done to provide for the crops.” “We can’t change what’s happening.” “I am renting so I do not have the right to misuse the owner’s property.”

Six percent of respondents expressed that they felt no compulsion to respond yet as climate variability and change have no negative impacts on them or their livelihoods: “We have not yet experienced extreme events such as floods and it’s difficult to adapt to the changes.”

These may be their perceptions, however, but it is likely that they have not yet linked climate change to some of its indirect impacts such as the increase in food prices or water shortages, which can be blamed on poor service delivery by local government.

5) DISPROPORTIONATE IMPACTS OF CLIMATE VARIABILITY AND CHANGE

The study respondents were asked whether they felt they were disproportionately affected by climate change. Interestingly, the majority of female respondents (77%) did not feel they bore the brunt of climate change impacts, citing that children are the most impacted as “they are weak and vulnerable.” This echoes the findings of Hlahla and Hill (2018) and was a perception shared by female environmental officials from the local municipality. On the contrary, the male municipal official felt that women were more impacted as they form the majority of the agricultural labor force. In a study by Klasen et al. (2011) on the vulnerability of the rural poor households to environmental shocks in Thailand and Vietnam, very little evidence was found to suggest that female-headed households are more vulnerable than male-headed households. Though this study found similar results, gender inequalities still exist in South Africa and these differences will manifest in greater magnitude as the effects from a changing climate increase in frequency and intensity. Within the communities, female-headed households were more numerous, which heightened their vulnerability to the effects of climate change in the absence of appropriate and cost-dependent safety measures. It is possible that the women are unaware of this and have become immune to health and financial hardship. They have accepted their traditional roles within the household, making it less likely that they feel disproportionately impacted. With increasing climate variability and change, resource scarcity has become a part of their landscape such that they have “adapted” to the climatic changes. However, within these communities, there is little evidence of increased resilience to or a decreased vulnerability from climate-driven events.

Ribot (2009, p. 47) asserts that “vulnerability does not fall from the sky”; therefore, it is necessary for policy makers to address the causes of vulnerability, namely, poverty and access to resources. What is needed in the effort to overcome challenging gender vulnerabilities, is to find nontraditional communication and outreach methods that act to increase awareness of how climate change impacts these communities, and to integrate poverty and gender in climate change policy. Furthermore, there is a need to recognize how climate change impacts gender inequality within KwaZulu-Natal and to involve the poor, particularly women, in all stages of development and implementation of local adaptation plans and strategies if the strategies are to be empowering and responsive to their interests (Nelson et al. 2002; Edvardsson Björnberg and Hansson 2013). “Measures are

needed that promote increased resilience of poor peoples’ livelihoods and that tackle gender inequality now, whilst increasing climate change ‘preparedness’ for the future” (Nelson et al. 2002).

5. Conclusions

The climate of South Africa is changing as evidenced by increasing temperatures, drought, flash flooding, and severe storms. Women’s livelihoods are increasingly impacted; however, they did not personally feel that they were disproportionately impacted. Instead, they suggested that children were more vulnerable to climate variability and change given their inability to take action and adapt independently. It is important to note that while the women correctly observed that children were unable to adapt, the women, themselves, also have low adaptive capacity. The primary reasons for this include a lack of knowledge and resources and a sense of helplessness to deal with the impacts of climate change and variability. Women’s livelihoods, health, property, agricultural activities, and water and food supplies have already been impacted by the increasing intensity and frequency of climate-driven events. The most significant of these weather hazards include increased temperatures and lower precipitation amounts in shortened rainfall seasons that adversely affect rain-fed agriculture. This will further impoverish the marginalized and exacerbate existing gender inequalities.

The majority of response strategies were coping strategies, which ranged from measures to minimize impact, such as digging drainage furrows during floods and moving property to safe positions; to measures to improve agricultural output, such as adjusting planting times or irrigation; to measures to decrease discomfort, such as the use of heaters and fans. These piece-by-piece traditional measures, however, are not transformative and, unsurprisingly, were found to be ineffective for long-term adaptation as many households lack the resources to adapt effectively, in particular, as existing impacts are expected to intensify. Coping strategies, unless carefully planned, tend to have trade-offs with long-term adaptation.

The majority of the households in the study were female-headed, with high rates of poverty and unemployment. They lack formal safety nets and access to necessary resources to adapt to climatic shocks and are likely to be more impacted in the future as the impacts of climate change become more severe. Given the sizeable risks and vulnerabilities these households face, transformational adaptation to climate change is required. It is necessary for local government and the private sector to facilitate the creation of enabling conditions for the adoption of such strategies and ensure that they are sustained. However, the local governments in the study are lagging behind with regard to pro-poor³ climate change adaptation and with the mainstreaming of gender into these policies. Bartlett et al. (2012, p. 2) warns of the dangers of this as “in the absence of pro-poor policies, economic growth, inequality and

³ “Pro-poor” refers to actions that directly target poor people to improve their assets and capabilities while reducing poverty. These actions should allow for the direct involvement of poor people.

continued levels of absolute poverty can easily co-exist” (Bartlett et al. 2012). Therefore, local governments need to invest more in poverty alleviation, involve both men and women in decision-making, and mainstream gender into pro-poor climate change responses so as not to exacerbate gender inequalities or vulnerabilities. Furthermore, gender-sensitive practices that are capable of transforming the current policy and governance landscape need to be promoted, while building capabilities for women to adapt to climate change and build resilience.

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Data availability statement. The questionnaire data are to be kept solely in possession of the first author. The authors have not disclosed any personally identifiable information within the paper, and all records of participants and transcripts are housed within the University of KwaZulu-Natal. The UKZN Ethics Protocol Reference Number for the research is HSS/0522/0150.

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