Sustainability: a missing dimension in climate change adaptation discourse in Africa?

Sandra Bhatasara\textsuperscript{a} and Admire Nyamwanza\textsuperscript{b}

\textsuperscript{a}Sociology Department, University of Zimbabwe, Harare, Zimbabwe; \textsuperscript{b}Economic Performance and Development Unit, Human Sciences Research Council (HSRC), Merchant House, Cape Town, South Africa

\textbf{ABSTRACT}

The climate change adaptation field has evolved considerably in recent years. Important contributions have been made, with scholars developing methods for assessing vulnerability in different countries and communities, documenting broad strategies for adaptation and identifying opportunities for and barriers to adaptation as well as ways to enhance adaptive capacity. Issues of sustainability are, however, not readily argued and embraced. Predominantly, our analysis exposes that current adaptation discourse, particularly in Africa, offers a narrow conceptualisation of sustainability. The paper argues for a clear framework of sustainability in adaptation discourse which encompasses awareness to contextual aspects in responding to climate variability and change as well as resilience aspects. The paper also calls for an expansion of the knowledge base around the concept of ‘climate-smart agriculture’ towards effectively incorporating sustainability aspects in climate change adaptation discourse.

1. Introduction

The reality of climate change is arguably no longer in question. It has been widely demonstrated that developing countries will be especially hard-hit by the changing climate and new interrelated risks. In most countries, climate change is expected to exacerbate existing development challenges through diminished agricultural productivity and food accessibility, enhanced water scarcity, financial insecurity and incidence of illness. It has been reported that climatic changes are happening in the context of other developmental stresses, notably poverty, fluctuating oil prices and food insecurity (FAO 2006), in combination with environmental change, droughts and land degradation. In its summary for policy-makers, the IPCC (2014) notes that throughout the twenty-first century, climate change impacts are projected to slow down economic growth, make poverty reduction more difficult, further erode food security and prolong existing and create new poverty traps. These facets substantiate questions about what countries and communities, particularly in the developing world, should prioritise in responding and adapting to climate change in a sustainable manner. Adaptation
presents the opportunity to ‘adapt forward’ and work along an aspired development pathway towards the Sustainable Development Goals instead of regressing to the state of affairs before climate change (UNCCS 2017).

Concurrently, it is now widely realised that adaptation strategies could stimulate harmful effects, conjuring up more complex questions around the aspect of sustainability. The sustainability attribute in climate change adaptation, on which this paper is focused, brings to the fore adaptation measures, efforts and policies which add to contextually, socially and environmentally feasible development pathways, and which place both social justice and environmental integrity concerns at the centre (cf. Brown 2011; Eriksen et al. 2011). The linkages between adaptation and sustainability are increasingly acquiring meaning as policy-makers, researchers and communities persist in exploring and ascertaining means and ways of effectively addressing the effects of climate variability and change (cf. Kirrane et al. 2010; Eriksen et al. 2011). The principle for positioning and accentuating these linkages is that interventions required to increase resilience to climate variability and change do advance development aims. Even so, whilst there is realisation that adaptation reduces the harmful impacts of climate change, minor attention has been devoted to the outcomes of adaptation policies and practices for sustainability (Eriksen et al. 2011). Adaptation processes can possibly worsen inequalities in well-being by producing winners and losers (Kates 2000). Adaptation policies and interventions that concentrate on bringing down specific climate tendencies such as anticipated changes in precipitation or hydrological regimes can, even though benefiting some interests, simultaneously adversely affect vulnerable groups and produce social inequity, in addition to incidentally offsetting environmental integrity (Barnett and O’Neill 2010).

This paper timely emerges in the backdrop of the adoption of the international Sustainable Development Goals (SDGs) in 2015 which constitute the roadmap of the post-2015 development agenda. The international community made an unprecedented set of commitments to pursuing a sustainable future (UNCCS 2017). The SDGs extend the sustainability agenda and go a great deal further than the Millennium Development Goals in addressing the root causes of hindrances to development, placing such issues as climate change and variability at the fore. SDG 13, for example, specifically refers to the vital action to combat climate change and its impacts. More so, not only has climate change been afforded its own target, but it has also been embedded into almost all the other goals (Yeo 2015). The post-2015 global development agenda therefore places climate change impacts response action firmly in the context of sustainability and sustainable development (UNEP 2017). Added to that, integrating adaptation with the SDGs can be very beneficial for building resilience comprehensively across societies (UNCCS 2017).

It is within this context that this paper, grounded in cases particularly from sub Saharan Africa (SSA), intends to provide critical reflections, and draw attention to a subject that scholars and policy-makers cannot disregard anymore: sustainability in the context of climate change adaptation. Yegbemey et al. (2017) concurs on the need to push on the sustainability debate within the climate change adaptation arena. The interest on SSA emanates from the fact that this is a region typified by persistent poverty and socio-economic inequality, low levels of development, high dependence on climate sensitive livelihood sectors, limited economic capacity and countless governance and institutional challenges, resulting in low adaptive capacity and a significant adaptation deficit (Shackleton et al. 2015). Focusing on
SSA therefore, the paper attempts to strengthen the growing conviction that climate change and sustainability issues can no longer be treated in isolation.

Particularly, this paper endeavours to understand how sustainability is considered to further encourage the adaptation agenda in SSA, and interrogates whether ‘sustainability’ has merely become a platform for people preoccupied about climate change to articulate their opinions on adaptation or whether there is indeed some value in calls to assign more distinguished emphasis on sustainability within climate change adaptation processes. To this end, it examines whether sustainability symbolises a ‘new opening’ to address problems emerging from adaptation processes in an innovative way and analyses alternatives for reshuffling incumbent understanding to ensure that sustainable adaptation implies reducing vulnerability, fostering equity and promoting environmental integrity.

The article is based on a thorough review of relevant literature, which includes journal articles, intergovernmental reports, books and manuscripts around sustainability, sustainable development and climate change adaptation in Africa. We sought to explore what has been written on these areas from a broader perspective first, before narrowing down to the literature focused specifically on Africa. Free text searches were undertaken on a number of databases such as Google Scholar, WorldWide Science and Academic Search Premier using such terms as ‘sustainability and climate change’, ‘climate adaptation in Africa’, ‘sustainable adaptation’ and ‘sustainable development and climate impacts’. Information gathered was thereafter systematically analysed towards critically reflecting on how sustainability issues can be firmly integrated into climate change adaptation in Africa.

Following this introduction section, the paper is organised into five main sections. Section 2 expands on the urgent need for reckoning the notion of sustainability in adaptation policy and practice in Africa. Section 3 then discusses a (proposed) ‘sustainability framework’ for climate change adaptation research and analysis upon which arguments in the paper are grounded. This is followed by a review of current adaptation literature focused on specific SSA countries in Section 4, which reveals the ‘sustainability gap’ in the conceptualisation and implementation of adaptation processes in the different country cases. Section 5 advances key propositions towards closing the ‘sustainability gap’ in conceptualising and implementing adaptation processes in SSA. Lastly is the conclusion section.

2. Why sustainability?

Sustainable adaptation, both as a construct and practical action, is attaining importance in debates on how best to respond to climate change, especially in poor countries. Eriksen and O’Brien (2007) highlighted the importance of ascertaining that adaptation is socially and environmentally sustainable, contributes to poverty reduction and confronts the socio-environmental processes driving vulnerability. Hence, the development and implementation of adaptation choices command both short- and long-term visioning besides minimising the harmful impacts of the options implemented. Sustainable adaptation options are to a greater extent expected to concentrate on reducing the cumulative impacts of climate change and variability in addition to ensuring that adaptive measures applied in a specific geographical location do not adversely affect other people or compromise future adaptation efforts (Chikozho 2010).

Notwithstanding, whereas sustainable development has been admitted as a theme in numerous assessments by the Intergovernmental Panel on Climate Change (IPCC)
(Munasinghe and Swart 2000; Yohe et al. 2007), little attention has been devoted to distinguishing principles that produce synergies between adaptation and sustainable development (Eriksen et al. 2011). Fundamentally, until 2015, arguments on climate change adaptation generally took place for the most part outside the broader sustainability. Sustainable development discourse with adaptation a great deal was being conceived as undertaking ‘changes in technology, institutions and managerial systems … instead of disputing prevailing development paths, including the social, economic and political structures that underpin a lot contemporary problems’ (ibid: p. 10). More so, although climate change constitutes one of the most significant symptoms of an unsustainable economic system, the climate change and sustainable development fields have been distinguished by divergences in discourse. For instance, climate change has been mostly constructed as an environmental problem that can be resolved by reducing greenhouse gas emissions, with petty attention to its social, cultural, political and ethical dimensions (O’Brien et al. 2010).

In spite of problems highlighted above, reckoning sustainability in adaptation practice and debates is urgent. This is because adaptive strategies might fail not because people’s ability to adapt is overwhelmed (Mavhura et al. 2013), but because such factors as alterations in the size of the population and the economy, changes in the local markets and the environment, modifications in the sources of livelihoods of each household and shifts in characteristics of climate impacts can make adaptive mechanisms obsolete. Others argue that understanding adaptation from a sustainability position is an elaboration of the three fundamentals of adaptation namely: (a) reducing the sensitivity of the livelihoods system to climate change; (b) modifying the exposure of the system to climate change; and (c) expanding the resilience of the system to deal with changes. Approaching and reading adaptation from a sustainability perspective, therefore, challenges scholars and development practitioners to identify and address the root causes of both environmental change and poverty, which may require re-thinking current dominant ideas and practice in development (Brown 2011; Burns and Johansson 2017).

3. A ‘sustainability framework’ for climate change adaptation research and analysis

There is no universal definition of sustainability or sustainable development. The term ‘sustainable’ (which is the root word for the ‘sustainability’ concept) ordinarily pertains to positive actions and processes that are ‘durable,’ ‘perpetual,’ able to ‘keep up’ or ‘keep going’ (Oxford English Dictionary 2011). In intellectual debates, it has, however, evolved primarily in livelihoods discourse to identify livelihoods which are capable of responding to and recovering from stresses and shocks besides sustaining and/or raising their capabilities and assets currently and in the future without counteracting the natural resource base (Chambers and Conway 1992; Scoones 2009). Then again, a classical definition of sustainable development posits that it is ‘development that meets the needs of the present generation without compromising the ability of future generations to fulfill their own needs’ (World Commission on Sustainable Development 1987).

Researchers and practitioners in emerging fields, such as ‘sustainability science’, multi-scale decision analysis and ‘sustainomics’ (Munasinghe et al. 2003) have, over the years, attempted to increase our understanding of how societies can react and adapt to stresses and shocks (Yohe et al. 2007). Essentially, three pillars of sustainability have acquired
acceptance, which are economy, ecology and society. The economic dimension underscores human welfare (including poverty), the ecological dimension environmental integrity and the social dimension human relationships (including social equity and justice). These pillars integrate the notion that for continued human progress, development must determine pathways that both attain economic goals while simultaneously finding a balance with the physical environment and social well-being in varied contexts.

With the realisation that we need to be critical of how people and communities adapt in terms of effects for poverty and environmental challenges confronting the world, sustainability has been connected to climate change adaptation (Eriksen and Brown 2011). As noted in the introduction section, sustainable adaptation is that which ought to lead to socially and environmentally feasible development pathways in context, with an eye for both social justice and environmental integrity (Eriksen et al. 2011). Eriksen et al. delineate four cardinal factors in directing climate responses towards the two principles of social justice and environmental integrity to the centre of sustainable adaptation, and this paper espouses these factors and precepts in coming up with a ‘sustainability framework’ for climate adaptation research and analysis (Figure 1). The first factor is the holistic acknowledgement of the vulnerability context (including the fundamental interaction of different stresses and shocks); secondly is the recognition of the differing values and interests that bear upon adaptation outcomes; thirdly is incorporating local knowledge into adaptation responses; and fourthly is the consideration of possible feedbacks between local and global processes. A dynamic notion of adaptation which promotes building resilience to enhance adaptive capacity is also linked to this sustainable adaptation framework.

Such a sustainable adaptation framework to interpreting and analysing responses to changes in climate functions can be a platform for the propagation of ideas that lead to the survival of livelihoods, lives and cultures during environmental change. It, consequently, can be seen to aid progress in development in varied circumstances by enhancing resilience to environmental fluctuations. It essentially treats issues of vulnerability, the environment,
knowledge systems and climate change as linked in a web of interacting causes and effects and draws attention to the dynamic, non-linear and often surprising nature of climate hazards (cf. Agrawal and Lemos 2015; McNeely 2017).

### 4. The sustainability gap in current adaptation literature

Over the years, the climate adaptation community has attained substantial strides towards pushing the boundaries of research and analysis around exploring workable adaptation measures and strategies in different contexts; opportunities for and barriers to adaptation; in addition to the politics of and institutional dynamics in adaptation planning. There has been, nonetheless, diminished systematic endeavour to demonstrate the nexuses between climate change, sustainability and/or sustainable development especially in developing societies. Kates (2000) rightly pointed out that analytic thinking of successes (or in rare cases failures) of adaptation has been confined to industrialised countries. From a conceptual point of view, adaptation and sustainability have for the most part been considered as separate. The literature on the connections between adaptation and sustainability remains thin, unfocused and fragmented. This section therefore brings to the fore the areas and particular cases from the literature on adaptation in Africa exhibiting the ‘sustainability deficit’.

First of all, from a general perspective, disparate definitions on adaptation have impacted how the concept has been applied and measured in a practical way. Apparently, climate change adaptation has predominantly been defined outside of the broader discourse of sustainable development (see Table 1). This ignores the intricate, context-specific and multidimensional challenges of sustainable development (Eriksen et al. 2011).

| Source                          | Definition                                                                                                                                 |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------|
| Smit and Wandel (2006)          | A process, action or outcome in a system … in order for the system to better cope with, manage or adjust to some changing (climate) condition, stress, hazard, risk or opportunity |
| IPCC (2014)                     | Adjustments in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities |
| Pielke (1998)                   | Adjustments in individual, group and institutional behaviour in order to reduce society’s vulnerability to climate change                      |
| Smith et al. (1996)             | Adjustments in behaviour or economic structure that reduce the vulnerability of society to changes in the climate system                        |
| Stakhiv (1993)                  | Any adjustment, whether passive, reactive or anticipatory, that is proposed as a means for ameliorating the anticipated adverse consequences associated with climate change. |

These definitions seem to prioritise technical over social responses, draw attention away from fundamental causes of vulnerability and from the wider context in which adaptive responses occur and exclude discussions of inequality, justice and transformation (cf. Wise et al. 2014). Yet, as Schipper (2007) reasons, a viable adaptation process would unquestionably demand a shift in policies, institutions and attitudes first, which would then be accompanied by ultimate technological modifications and responses. There is also no interrogating the premise that every adaptation to climate change will be beneficial in the current definitions. What ensues is that sustainability persists at the backdrop in evolving climate change debates.

Apart from the above, specific other problems and inadequacies also exist in adaptation discourse particularly in Africa. The following discussions cite examples from studies in Zimbabwe, South Africa, Mozambique and Tanzania to highlight these problems and
deficiencies. A number of scholars have made assessments of the sustainability of diverse adaptive strategies without regard to any sustainability dimensions. For example, in their work on livelihoods adaptation to climate change disruptions in rural Mozambique, Osbahr and colleagues (2008) proceed from an institutional analysis of scalar dimensions of livelihood practices that connect climate change adaptation. The study considers such elements as the holistic identification of the vulnerability context and recognises the effects of different values and concerns on adaptation outcomes. However, in some way it does not more directly address sustainability facets vis-à-vis livelihoods adaptation and institutions (thereby leaving different analytical ends around environmental integrity, social justice and equity loose). The reason for this goes back to the failure to link issues under discussion to a particular sustainability framework. Below et al. (2010) also build an insightful discussion on versatile aspects of adaptation in small-scale African farming but neglect to raise equity and social justice issues. Reckien et al. (2017) echo that climate change, adaptation and mitigation raise equity and justice concerns. Other scholars merely opt to concentrate exclusively on infrastructural and technical alternatives in their analysis of climate change adaptation in different African communities (e.g. Eguavoen and McCartney 2013), without raising arguments on any implications for sustainability.

A country focus on adaptation work in Zimbabwe for example demonstrates that whilst scholars interrogate the sustainability of certain livelihood and adaptive strategies, they do not anchor their analyses on a clear sustainability framework and/or principles. For instance, in their study in the Gokwe area of the Midlands province, Gwimbi and Mundonga (2010) observed that adaptation strategies adopted by farmers to deal with the negative impacts of climate change are by and large reactive, selective and protective, and not sustainable in the long term. Bola et al. (2014) also concluded that coping mechanisms assumed by households in Mbire district of the mid Zambezi Valley region north of the country were rigid and ill-disposed to adapt to floods and droughts. Mtekwa (2009) noted that the sustainability of sources of income (such as gold panning) in Zvishavane district of the Midlands province is equivocal since these activities are illegal and environmentally degrading. Again in the case of Muzarabani district, Mavhura et al. (2013) contend that adaptive strategies utilised seem to be short-term measures which are not sustainable, whilst Murendo et al. (2012) mentioned crop diversification, conservation agriculture and fodder conservation conflicts as well as conflicts between conservation agriculture promoters in Masvingo as jeopardising the sustainability of adaptation strategies.

As shown in the preceding paragraph, adaptation work in Zimbabwe highlights a number of ‘unsustainable’ adaptive strategies. Nevertheless, there are numerous missing facets with respect to a pointed focus on sustainability dimensions in analysis. As noted earlier, most of this work alludes to the lack of sustainability without reference to any guiding principles. We argue that the consequence of such an ad hoc approach in a particular country is a loose coalescence of studies that do not contribute systematically to addressing the ‘sustainability deficit’ in climate change adaptation discourse. Apart from that, the majority of the scholars fail to appreciate equity and justice issues.

It is however critical to question the polarisation of well-being and marginalisation that may occur because some people are able to adapt whilst some are not able to devise any strategy thus conjuring the need to reckon the equity dimension. Adaptations assumed to benefit one sector or group might as well undermine the security and well-being of others. For example, by influencing access to resources and the integrity of ecosystems that many
people depend upon for their livelihoods (Eriksen et al. 2005). In that regard, most adaptation analyses in Africa are myopic in that regard. It is, however, of essence to note that adaptive strategies do not inevitably produce inequity, but they may equally create different spaces in which it is more probable for winners and losers to polarise. This is well captured by Kates (2000, p. 16) who noted that ‘one group’s adaptation can be another’s hazard’.

Therefore, to understand the justice implications of adaptation, it is crucial to distinguish how decisions on adaptive responses are constructed, how adaptive responses are timed with respect to climate change impacts and what the consequences of adaptation decisions such as welfare shifts and disease burden might be. This stands out in work by a few scholars focusing on adaptation in African communities such as, among others, Osman-Elasha et al.’s (2006) work on adaptation practices and policies in Sudan, and Berman and colleagues’ (2015) work identifying drivers of household coping strategies to multiple climatic hazards in Uganda, and their significances for adapting to future climate change. Only with such analyses can the full attributes of sustainability be seen, permitting full attention to be paid to corroborating strategies that will enhance viable livelihoods and aid poverty reduction, besides advancing our understanding of fairness (Thomas and Twyman 2005).

In the same vein, the Sustainable Livelihoods Framework (SLF) has over the years been particularly popular with scholars and researchers in assessing adaptation. The SLF devotes attention to how people develop livelihood strategies to attain particular outcomes in response to a specific vulnerability context. For example, Paavola’s (2004) analysis of vulnerability and adaptation to climate change in the Morogoro region of Tanzania is anchored in the SLF. Mutami and Chazovachii (2012) also embraced the SLF to explore livelihood strategies in distressed environments in Mashonaland East province area of Mudzi in Zimbabwe. In mapping the vulnerability context in both studies, the scholars highlight that stresses and shocks stimulated by climate variability mainly include extremely high temperature, late onset on rains, uncertain rainfall, mild and severe droughts and dry spells, crop failure and livestock losses. Hence, households are diversifying their livelihoods (through petty business, crop production, market gardening and rural based industrial activities) to adapt.

Certainly, the SLF is a powerful framework in mapping the vulnerability context. Notwithstanding, most studies which utilise this framework are somewhat narrowly conceptualised as they overemphasise contextual factors and stressors than other principles of sustainability. There is no recognition of the fundamental interactions and connections between poverty and social justice, and environmental sustainability. Adhering to one of the principles exclusively is unlikely to inform socially equitable and environmentally sound forms of adaptation. Indeed, assuming a narrow focus can result in inadvertent or maladaptive consequences. More so, scholars who solely rely on the SLF in adaptation analysis have a disposition to list adaptive strategies without explicit mention of their outcomes in terms of equity, environmental integrity and human welfare. How these strategies transform into sustainable adaptation is not clear. There seems to be an implicit assumption that sustainability is self-evident.

Evidently, the conceptualisation of adaptation is limited to detecting symptoms and proximate causes of vulnerability; hence, these studies are mostly unsuited for informing and initiating innovative transformational changes to address sustainability. The utility of these studies to inform policies that advance sustainability in adaptation also becomes limited. For instance, marginalising equity matters in assessing adaptation strategies might lead to policies fitted to the status quo instead of novel solutions being engendered to
produce desirable conditions that may question or challenge the status quo. Effectively, there is also danger that adaptation itself can perhaps be used to justify existing policies and approaches that are not sustainable.

A sustainable adaptation process would therefore hinge upon the ability of livelihoods (including such facets as social networks, cultural traditions, and activities that supply food and income), to be sufficiently adaptable so that no harmful impacts of climate change are discernible on the social system (Schipper 2007). Such enabling conditions would understandably facilitate a sustainable development process. These conditions will also help eradicate elements that cause vulnerability to climate change to persist, such as differential access to resources based on gender, age, belief systems or other characteristics (ibid.).

5. Closing the ‘sustainability-gap’

This section puts forward propositions that we identify as key towards closing the ‘sustainability gap’ in conceptualising and implementing adaptation processes in SSA. The discussion zeroes in on the notion of resilience and rethinking current measurements of adaptive capacity, as well as expanding the knowledge base on the concept and practice of ‘climate smart agriculture’.

5.1. Sustainability, resilience and current measurements of adaptive capacity

The notion of resilience plays a pivotal role in ensuring the sustainability of adaptation processes and buffering additional stresses and shocks, yet it has been marginalised in mainstream literature on understanding and assessing adaptive capacity in Africa. Resilient strategies should mean that communities are not only able to cope and recuperate but also change and thrive to reflect distinct priorities arising from different vulnerabilities (Gwimbi 2009). Presently, a few scholars skate over the concept of resilience in adaptation analysis; thus, its utility is not clear. Kirrane et al. (2010, p. 15), for example, argue that although such terms as Climate Resilient Development and Climate Compatible Development have emerged in the climate adaptation discourse, these terms are for the most part donor driven and they have not been distinctly enunciated on what they mean in practice, and what synergies and trade-offs they involve.

Resilience alludes to a process connecting the capabilities of households and communities to predict, respond to, recover and learn from changes, disruptions and uncertainties (cf. Marschke and Berkes 2006; Wilbanks 2008). The term speaks to the capacity of social, economic and environmental systems ‘to cope with hazards and disturbances, responding or reorganising in ways that maintain their essential function, identity and structure, while also maintaining the capacity for adaptation, learning and transformation’ (Karani and Kariuki 2017, p. 271) The resilience construct links with the sustainability concern in climate adaptation because resilience’s primary facets include such dynamic and contextual elements as institutional flexibility, livelihoods diversification, social justice in addition to the ability of a system to innovate and to self-organise (Kirrane et al. 2010). Jones et al. (2010) posit that conventional frames to conceptualise adaptation and adaptive capacity especially at local levels have concentrated for the most part on assets and capitals as indicators, being informed, in most cases by Sustainable Livelihoods Approaches. They further contend that although being valuable in assisting to understand resources at the disposal of a system to
grapple with and adapt to a changing environment, these asset-oriented framings and approaches in essence mask and understate the role of structures, mediating processes and institutions in shaping, and supporting adaptive capacity.

An adequate appreciation of a system's adaptive capacity ought, however, to acknowledge the importance of diverse institutional and impalpable processes such as those involving decision-making and governance, innovation and experimentation, opportunity exploitation and the evolving structure of entitlements (ibid.), which is where the resilience component comes in. The sustainable adaptation framework presented in this paper (Figure 1), for example, affords greater attention to processes, instead of a snapshot picture of a system at a single point in time. This repositions focus from merely considering and emphasising on what a system has to recognising what it does in enabling adaptation processes. Such an (sustainable) adaptation framework (integrating resilience aspects) bestows practical institutional and dynamic dimensions of adaptive capacity into the entrenched capitals and resource-based components presently dominant in measurements of adaptive capacity. The logic in elaborating resilience elements within sustainable adaptation thinking is that the characteristics of a system with a high capacity to adapt to a changing climate might largely overlap with those of a system that is resilient to broader and multiple stresses, shocks and trends.

Reflecting on the wider literature on adaptive strategies, the common strand is that scholars are inclined towards measurements of adaptive capacity (people’s ability to cope), presumed to be the primary stimulus for successful or effective adaptation. What is ostensible is that no links are made between adaptive capacity and resilience. For instance, a case study focus on Zimbabwe again divulges the fact that scholars tend to list factors influencing adaptive capacity and a few refer to the aspect of resilience to understand adaptive capacity (see Gwimbi and Mundonga 2010; Unganai and Murwira 2010; Mutasa 2011; Mubaya and Mafongoya 2017). Concurrently, scholars also connect farmers’ responsiveness to adaptive capacity. The perception driving such analyses is that not all those affected by climate change and variability take action, and decisions to assume certain actions are not autonomous of contexts. To that end, such scholars as Zivanomoyo and Makarau (2013) for example highlight that the cardinal determinants of selecting sorghum crop variety as climate change adaptation choice in arid regions of Zimbabwe are: the cost of existing crop variety, level of education of farmers, the size of the farms; government policies; and incentives and availability of credit. Likewise, Mavhura et al. (2013) from their study in the same country articulate that the adoption of a particular set of adaptive strategies hinged on the characteristics of the flood, socio-economic conditions, level of education, accessibility of external assistance and distance from river bank.

Elsewhere in Africa, there are quite a number of scholars who engage various models (such as the logit model) to quantitatively evaluate adaptive capacity and factors restricting the choice and determinants of adaptive strategies. For instance, Gbetibouo et al. (2010) investigated the factors bearing on the choice of adaptation strategies by farmers in Limpopo Basin, South Africa, in the same way that Tazeze and colleagues (2012) examined climate change adaptation strategies of smallholder farmers in the Oromia Regional State of Ethiopia. From their studies, household characteristics, institutional factors and farm characteristics were seen to determine adaptation. In a related manner, utilising a probit model, Bryan et al. (2009) demonstrated that factors shaping farmers’ decision to adapt include wealth, and
access to extension, credit and climate information in the case of Ethiopia; and wealth, government farm support and access to fertile land and credit in the case of South Africa.

Arguably, the preceding efforts are important and quite compelling in understanding adaptive capacity in relation to climate change adaptation in rural Africa, but they mostly overlook the complex dynamics of sustainability as they do not make a deliberative effort to critically analyse how these diverse factors raised link vis-à-vis households and communities anticipating, responding to, learning from and thriving in the context of climatic and other pressures and challenges. As shown above, adaptation is a great deal operationalised in practice through changes in technology, institutions and managerial systems. However, in sustainability discourse, the intent and outcome of adaptation strategies should also be addressing the systemic drivers of vulnerability and building resilience. As McManus et al. (2014) concluded, the known institutional barriers to climate change adaptation should be broadened to include equity concerns. This propagation recognises the importance of equity in hampering physical aspects of climate change adaptation as, perversely, low-income people are likely to be disadvantaged (ibid.).

5.2. Expansion of the knowledge base on the concept and practice of climate-smart agriculture

There is no doubt that adaptation to climate change demand that incumbent systems, models and practices of production and consumption be transformed. This has led to the emergence of such concepts as ‘sustainable consumption,’ ‘green economy,’ ‘post-carbon society’ and ‘climate-smart agriculture’. What is of interest to this paper is climate-smart agriculture (CSA), particularly in view of the predominantly agro-based economies that characterise almost all countries in Africa. Indeed, Africa’s agriculture must undergo a significant transformation to meet the challenges of food security, poverty, climate change and environmental degradation (Nyasimi et al. 2014). Climate-smart agriculture is that which increases productivity and resilience, reduces greenhouse gases (GHGs) and enhances the achievement of national food security and development goals (FAO 2010). It is therefore agriculture that leads to a cross-cutting array of not only adaptation, but also sustainable development goals. The CSA concept combines the economic, social and ecological dimensions of sustainable development by addressing challenges related to food security, ecosystems management and climate change (Suleman 2017). Examples of CSA practices include conservation agriculture, agroforestry, improved livestock and water management and ecosystems approaches to fisheries and aquaculture.

Notwithstanding the obvious importance of the concept and practice of climate-smart agriculture in reconciling climate adaptation and development goals towards sustainable adaptation, it has not been adequately explored in adaptation literature in Africa. There have been isolated cases, however, from the fragmented literature; for instance, analyses on how the practice of sustainable land management links with climate adaptation. Sustainable land management strategies and practices have been demonstrated to enable farmers and communities to adapt, in addition to becoming more resilient to climate change by increasing food production, conserving soil and water, raising food security and restoring productive natural resources. In countries such as Benin, Burkina faso, Mali and Tanzania among others, a system of rice intensification has led to improved soil fertility, increased rice yields, reduced carbon dioxide from rice paddies and improved water management (Nyasimi et al. 2014). It
has also been discovered that the average duration of crop growing period in semi-arid Kenya is predicted to wither to 101 days from 110 days under an average climate change scenario; nevertheless, by utilising maize residue mulch, the growing period can be extended to 113 days with a positive impact on yields (Pender et al. 2009). In Malawi and Zimbabwe, conservation agriculture has been increasing yields and building resilience. Similarly in Kenya, Mozambique, South Africa, Tanzania and Uganda, food security and improved livelihoods have been realised through water efficient, drought and insect resistant maize.

Having been put forward by the United Nations’ Food and Agricultural Organization only in 2010, the climate-smart agriculture concept is a noble philosophy towards sustainable climate adaptation; however, it can be said to be comparatively in its infancy within climate adaptation discourse. As Neufeldt and colleagues (2013) write, although this new construct now dominates prevailing discussions in climate adaptation and agricultural development because of its capacity to link the agendas of the climate change, agriculture and development communities under one banner, it still needs critical evaluation as the relationship between the three dimensions continues to be poorly appreciated ‘such that practically any improved agricultural practice can be conceived as climate-smart’. Therefore, although climate-smart agricultural practices already exist in diverse communities in different countries, there seems to be need within the climate adaptation community especially in Africa to document and bring to the fore cases and lessons. In the same vein, there is need for a systematic capturing of synergies around climate-smart agriculture in varied contexts and at different scales pertinent for adaptation planning and decision-making, through analytical tools, models and scenarios. An effective scaling up of existing climate-smart practices in different countries and communities as well calls for serious investments in building the knowledge base and developing technologies is also urgently required.

6. Conclusion

Adaptation to climate change presents formidable dilemmas to sustainability and sustainable development in Africa. Yet the climate change adaptation community in this region still has a long way to go in effectively incorporating sustainability concerns in climate change adaptation discourse. Current climate change impacts are likely to continue into the future hence we call for the exploration of adaptation with an eye on sustainability dimensions. We suggest that this shift should involve conceptualising adaptation as an element of broader sustainable development. There is need to question the prevailing assumption that adaptation is beneficial. This calls for a broadened definition of adaptation as a process rather than a list of actions and measures, so as to capture sustainability aspects. Coherent sustainability frameworks and perspectives should be deployed to be able to systematically assess adaptive strategies. As a departure from traditional sustainable livelihoods approaches for example, we suggest that new and broader resiliency framings be adopted. These framings require the consideration of climate adaptation within the context of multiple stressors and vulnerabilities, and with concern for intra- and intergenerational equity, environmental integrity and poverty eradication. These framings will ensure that policy makers more readily recognise that various desirable and undesirable pathways can emerge from adaptation interventions thereby threatening sustainability. The paper lastly raises the need to expand the knowledge base on the (relatively new) climate-smart agriculture concept towards advancing the sustainability perspective in climate adaptation research and analysis in Africa.
Disclosure statement

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