Understanding climate adaptation and transformation challenges in African cities
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This critical assessment of climate adaptation and transformation challenges, agendas and actions across Africa draws on the principal findings and analyses of the papers in this special issue of COSUST. Situated in the context of the broader conceptual and comparative literature, we structure our analysis around three themes, namely conceptual and analytical approaches; the research environment; and challenges of implementation. African climate change research reflects diverse mixtures of local priorities and international trends, often with some time lag. The research reviewed and represented in this special issue reveals clear gaps and weaknesses in relation to gendered understandings, approaches to environmental valuation, and climate and environmental justice. Implementational challenges range from resource constraints and perceived conflicts between meeting immediate development needs and longer term climate change action to lack of policy integration and effective governance. The potential importance of socio-ecological and technological transformations remains very largely unexplored and a sea change in attitudes and attention is required if the adaptation challenges are to be met.

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Introduction
As noted in our Introduction to this Special Issue [1], one of the limiting features of urban research and publication to date on climate change (CC) challenges in Africa has been its fragmentary nature, being overwhelmingly unilocular, often addressing narrow topics or particular areas or communities within a single city, utilizing diverse conceptual approaches or none, and concentrated within the major publishing linguistic ghettos. In this context, the central objectives of this Special Issue have been to synthesize the current state of research, knowledge, policy and practice in relation to climate change adaptation (CCA) across the continent; to reflect critically on the strengths and weaknesses of this coverage; and to identify key gaps, priorities; challenges and opportunities. Accordingly, this concluding paper seeks to identify and develop the principal themes, gaps, commonalities, distinctions and implications for future research emerging from the Bearing the Brunt of Environmental Change workshop 1 and the papers subsequently produced for this Special Issue.

Whereas the Rockefeller Foundation’s Asian Cities Climate Change Resilience Network (ACCERN) has undertaken a comparative and focused programme in Asian cities and CC adaptation [2–4] and UN-HABITAT’s Cities and Climate Change Initiative (CCCI) [5] covers cities across the global South, there has been no equivalent in Africa, thus exemplifying further the innovation underpinning this special issue. The UN-HABITAT State of African Cities Report 2014 [7] also provides a broader, comprehensive and up-to-date assessment, with mitigation and adaptation featuring prominently (see also Ref [8]).

Conceptually, we emphasise the potential of alternative and innovative approaches (including urban political ecology and socio-ecological systems, urban human security and livelihoods, and teleconnections/telecoupling) [9–11]. At the same time, however, we underscore the importance of empirical rigour, and appropriate policy responses across the full range of urban activities and livelihood strategies (including urban and peri-urban agriculture (UPA)), particularly for the most vulnerable social groups in the most vulnerable locations, in order to distil comparative insights and lessons. Furthermore, in policy and implementation terms, we highlight the importance of considering these against the backdrop of diverse multi-level governance contexts within which environmental

1 This was held at Royal Holloway, University of London in April 2013 and from which this Special Issue is the major academic output. The paper by Adu-Boateng [39] was recruited subsequently to fill a gap in coverage.
or climate action is emerging in African urban areas, and which either hinder or support progress. These three elements provide the structure for this paper, which addresses them in successive sections.

Conceptual frameworks and analytical approaches

The research reported in this Special Issue is signally diverse in the conceptual or theoretical framings deployed. Not unexpectedly, the academic participants tend to have more theoretically honed perspectives, which generally inform research assessing existing situations or interventions already undertaken, with perhaps some recommendations derived from those analyses. Conversely, practitioners vary in the extent to which they assess the evolution of the current situations and implications of historical legacies, and in the degree of holistic perspective, tending to take the present more or less as a given and focusing on forward-looking policy, programmatic or project-based interventions. The most explicit example of this last approach is the architectural design project on African Water Cities [12] but which is at the same time refreshing for its originality, potential appropriateness and practical impact in terms of low-cost floating buildings made from readily available materials.

Unsurprisingly, the most widely utilized conceptual framework derives from international CC discourses and policy initiatives (e.g. [13]) focusing on mitigation, adaptation, vulnerability and resilience in various combinations. The precise modes of deployment range from rather superficial and instrumental invocations to a central feature. To some extent this also reflects particular contexts: until the recent increasingly close integration between disaster risk reduction (DRR) and CC approaches, they were often associated with distinct vocabularies, with resilience (previously recoverability) more characteristic of the former and vulnerability with the latter. However, these emphases have shifted and urban CC analysts now tend to regard vulnerability assessments as problem diagnoses — which have become very numerous — and adaptation and resilience promotion as seeking to address the problems. Since the workshop and Special Issue address adaptation, mitigation is most often mentioned contextually in relation to cities such as Durban, where both mitigation and adaptation interventions are being undertaken. Although not a central focus of Leek and Roberts’ paper [14], Durban — along with Cape Town [15] — is one of the few African cities to have adopted a holistic approach to CC that integrates mitigation, adaptation, vulnerability reduction and resilience promotion actions [16-21]. More common are fairly superficial and uncritical utilizations of the concepts that do not attempt to examine them deeply or to challenge or transcend the now outdated dichotomous treatment of mitigation and adaptation that fails to recognize or exploit the overlaps and potential synergies between them.

This point is clearly exemplified by the recent Carbon Disclosure Project (CDP) survey of 207 cities worldwide in relation to their CC actions [22]. Focusing on the synergies between city governments and business in promoting a safe business environment and creating business opportunities in mitigation and adaptation, it adopts an emissions inventory approach but does not distinguish mitigation, adaptation and resilience programme elements clearly. Its principal conclusions are that cities do recognize CC threats to business (76% of the reporting cities mentioned this), that city governments and businesses both recognize the risks posed by CC, and that local authority adaptation actions contribute to the resilience of businesses [22]. It is noteworthy, however, that only ten of the 207 reporting cities are African, five of them in South Africa. The reasons for this are not explored but may relate to aspects of the research environment referred to below and especially issues of CC-related capacity in African local authorities. In terms of business-led approaches to greenhouse gas mitigation, Silver [23] offers a critical perspective on emissions trading schemes and related forms of carbon financing, which, because still in their infancy in Africa, should avoid the overoptimistic and unrealistic, often inappropriate, assumptions made with such schemes elsewhere.

Lwasa et al. [24] examine the evidence for urban and peri-urban agriculture and forestry (UPAF) to address both mitigation and adaptation as well as to enhance resilience in tropical African cities. Resilience — sometimes glossed as ‘ability to bounce back’ — features in several of these papers but often normatively rather than being addressed substantively. The now-common juxtaposition with vulnerability is mentioned but the relationship between adaptation and resilience is not explored in depth. The terminology is used in relation to research or policy recommendations on CC mainstreaming but with only a few exceptions (e.g. [25]) in apolitical terms that fail to engage with the distributional aspects of asymmetrical (uneven) power relations and hence the winners and losers from different processes and interventions.

The papers in this collection affirm that the approach comprising ecosystem services (i.e. all the benefits which people derive from ecosystems), often linked explicitly to the conservation and propagation of green infrastructure, is becoming more widely utilized. Again, however, the depth and coherence of engagement with the underlying concepts vary but, whether in response to donor encouragement or through conviction, its use reflects attempts to attach inherent as well as more quantifiable values to elements of the natural environment and to their effective functioning in order to mitigate greenhouse gas emissions, conserve biodiversity and support adaptive
measures that include livelihood activities (e.g. [24, 26]) and lifestyle changes. More generally, greater engagement with the limitations of this approach, not least the implications of the ease with which efforts to quantify environmental and ecosystem benefits and disbenefits displace cultural and aesthetic dimensions, should be assimilated into simplistic neoclassical economic arguments about making trade-offs that ignore more qualitative aspects. Despite the intellectual appeal and considerable commercial opportunities, there are also distinct limitations and potential tensions in deploying the neoclassical economic valuations of the green economy to achieve sustainable development nationally and locally (cf. [26, 27, 28, 29, 30]). Building on their previous work and that pioneered in Durban [31, 32], Gotz and Schäffler study the process of producing and trying to implement the Gauteng Green Strategie Programme [33], focusing on a series of political, governance, economic and practical conundrums to which no easy solutions exist, demonstrating how good intentions and appropriate planning outcomes frequently become diluted or frustrated in implementation.

Further evidence of the pathways and circuits through which discourses and ideas travel is provided by the striking extent to which the nascent conceptions of the need for transformation or transformative adaptation to transcend the limitations of conventional incremental or reformist mitigation and adaptation interventions is invoked mostly by participants based outside Africa. We are confident that its appeal will lead to quite rapid deployment, although—given the less than accountable and responsive governance systems in many African countries—tempered by a realization that transformative adaptation constitutes a challenge to the vested interests embedded in urban land and property markets, existing land uses, production processes and their supportive legal and regulatory systems.

Political ecology as a framework for identifying the structural forces and processes and hence socio-environmental winners and losers in a situation has the same acceptability problem in terms of ‘reapropolitik’ but readily provides an analytical basis for framing implementable transformative adaptation agendas. Although not a new approach, perhaps for many of the same reasons, it too was utilized mainly by workshop participants based outside Africa (e.g. [25]). Its intellectual ‘parent’ approach of political economy is more familiar to many on the continent but was felt by many to have mainly analytical rather than policy relevance. Related to these conceptual issues, Tanner et al. [34] propose that applying a livelihoods focus to resilience brings important considerations of human agency, rights and transformation to the fore. In so doing, they argue that the notions of resilience and capacities for human transformation can be more meaningful to the daily lives and practices of ‘ordinary’ people.

In a linked manner, Simon and Leck [35] suggest that the combination of livelihoods and political ecological insights facilitates the consideration of structure and agency in a holistic and realistic framework for analysing and understanding responses to CC impacts. While not associated with any particular theoretical approach, several examples of the multi-level governance framework [19, 35, 36, 37, 38] being utilized to elucidate issues of horizontal relations among adjacent local authorities and vertical relations with regional and national institutions [14, 39–41] are included in this Special Issue.

More generally, the workshop papers and especially the discussion sessions brought out widespread consensus around several related issues centred on concerns of bridging the still considerable chasms separating theory, policy and practice in the CC arena. These reflect the deliberate diversity of participants and institutional affiliations at the workshop and the concern to ‘make a difference’ rather than simply adding to the voluminous academic literature on CC adaptation. First, and following logically from some of the points made in the preceding paragraphs, conceptual and methodological hybridity was perceived as generally helpful and very likely to provide the basis for fruitful engagement between academic analysis and practical interventions. Congedo and Macchi’s [42] analysis of the relationships between demographic change and urban sprawl in Dar es Salaam exemplifies this well.

Second, participants were convinced of the value of integrating DRR with CC adaptation and resilience. Rather than being discrete approaches pursued by different communities of practice as so often argued until relatively recently, they are now perceived as strongly overlapping and complementary, with DRR providing valuable lessons of experience in relation to extreme events but adaptation and transformation being more appropriate to addressing slow-onset changes and the political ecologies of exposure (e.g. [43–46]).

Third, there was consensus on the importance of mainstreaming CC policies and programmes into existing institutional practices and budgetary processes so as to avoid the pitfalls of the additionality or shopping list approaches, in terms of which CC agendas would inevitably be marginalized in favour of immediate and more tangible priorities (e.g. [47, 48]). Put differently, such mainstreaming is the most likely tool for avoiding perpetuation of the still widespread perception that tackling CC and promoting development are conflicting agendas [49–52, 53, 54, 55]. That said, the inherent procedural and institutional limitations were also recognized [14, 21], not least in terms of likely dilution or attenuation due to budgetary constraints or political pressure, and ‘climate washing’ (the equivalent of expedient ‘greenwashing’ for environmental creden- tal purposes).
Environmental and social justice, sustainability and related equity issues were frequently noted in presentations and discussion, and can be found in several of the papers within this collection. They were perhaps most explicitly linked to the ecosystem services and green infrastructure perspectives but also emerged more broadly, including in relation to the development versus CC action dilemma discussed above. The importance of avoiding exacerbating the structural vulnerabilities of the poor and other at-risk groups in addressing CC and development challenges and seeking to promote overall urban and community resilience was a key point of consensus at the workshop, just as the difficulties of achieving this were acknowledged (cf. [56,57**]). Despite acknowledged limitations, participatory engagements such as those attempted in very different ways through the community-level pilot project in Maputo [25] and at the city level in Bobo Dioulasso [41] probably represent the best available type of approach. This also reflects the workshop participants’ acknowledgement of the importance of holistic approaches, such that the frameworks and approaches above were often seen as valuable only in so far as they help to address practical challenges.

In this context, two workshop contributions were solicited in order to provide insights from experiences in other parts of the world where research-into-policy initiatives or the effects of unprecedented extreme events had led to important rethinks of prevailing standards and procedures. Jarvie et al. [47] reflect on how insights from the Indonesian element of the Rockefeller-funded ACCCCN might be useful as African cities plan and seek to implement their CC strategies. Similarly, Solecik [58] provides fascinating perspectives from his personal experience as a leader of the team assessing the implications of Hurricane Sandy on the New York City region in terms of the need to revise upwards flood severity frequency predictions and thresholds for building standards.

**Research environment**

Part of the interest generated by the workshop, and reflected in this collection, reflects the novelty and importance of having brought together researcher and practitioner insights from across the African continent, literally from Algiers to Cape Town and Dakar to Dar es Salaam. As such it has contributed significantly to widening participants’ networks and has fostered enhanced understanding of commonalities and divergences of focus, approach and perspective being deployed in different settings. To date, research, knowledge and policy work across Africa in relation to CC has remained both fragmentary and fragmented, being focused very much within the continent’s four major historically entrenched linguistic communities of practice (Anglophone, Francophone, Arabophone and Lusophone) and on a handful of mega- and large cities, including some conspicuous ‘leaders’ in the CC field, invariably driven by the energy and connections of one or two champions in each case, and a handful of smaller and intermediate cities, often through policy-oriented networks such as UN-HABITAT’s CCCI, represented in this collection by Ricci et al.’s study of Bobo Dioulasso [41]. Such networks, of which the South African Cities Network (SACN) linking that country’s metropolitan and large city authorities, or the C40 network that brings together a growing number of large cities in all continental regions represent other examples, often provide vital access to resources and information-sharing platforms for otherwise isolated officials and local researchers. ICLEI Africa is another major networked initiative which has an office in Cape Town and is undertaking regional support, as well as a sub-Saharan Five-City Network to Pioneer Climate Adaptation through Participatory Research and Local Action. The five mostly intermediate cities are Walvis Bay, Cape Town, Port Louis, Dar es Salaam and Mauritius [59].

One of the welcome trends widely evident at the workshop and in the authorship of papers in this Special Issue is the increasing evidence of collaborations among local officials, researchers, academics and consultants — in the latter case sometimes employed by local firms or by local subsidiaries of global consultancies. While some of these arrangements are formal [39-41], many rely on relations of trust and personal networking to overcome institutional rigidities or provide access to required skills and capacity — as exemplified by Leck and Roberts [14]; Guèye et al. [60] and Riise and Adeyemi [12]. Such innovations highlight potential pathways to overcome constraints and move beyond the ‘helpless victim’ stance that reflects a lack of initiative and often either seeks or results from undue external aid dependence. Not just in Africa but across the global South in varying combinations, this is essential to meeting CC and broader environmental challenges [61].

**Challenges of implementation**

Many of the principal challenges facing city administrations and other agencies in relation to the implementation of CC policies and programmes identified in the workshop discussions and in this Special Issue (see also Ref [21]) are not unique to African contexts. Indeed, in different combinations they exist across the global South and beyond, the key difference between most Southern and most Northern contexts is the greater relative importance of financial, human and implementational capacity constraints. Although identified individually here for the sake of clarity, they are frequently interlocking in practice, making it difficult to break the web without a multifaceted approach that requires considerable political will that is perhaps best exemplified by the remarkable way in which the outgoing governor of Lagos State, Babatunde Fashola, has ‘turned around’ governance,
developmental deficits and CC interventions during his two terms of office (see e.g. [62,63]).

In the context of urban Africa, the first two challenges are that the embedded nature of government structures and boundaries often inhibits change and innovation for effective CC action; and that urban local authorities have key roles and responsibilities given increasing urbanisation and the growing contribution and/or impact of CC but often inadequate power and resources, as indicated above. These challenges relate principally to local authorities, where large or megacities are commonly covered by multiple municipalities without an overarching strategic authority (Dar es Salaam — see 40 this issue — being a notable exception, making a strong contrast with Dakar, for instance) or a single urban municipality that does not cover the entire built-up area and peri-urban interface, the latter of which is often covered by more rural-orientated authorities with different priorities and lower levels of resources and capacity. Durban (eThekwini), the Ghanian metropolitan assemblies [39], and even Lagos [63] represent good examples.

Following from these two challenges is the third, namely that urban — peri-urban — rural interconnections are increasingly accepted as important features of dynamic urban regions and which have major implications for urban policy and planning, not least in relation to CC actions. Account of them can rarely be embedded in the practice of urban local authorities, however, because of the spatially bounded institutional nature of municipal powers and responsibilities as indicated above.

Fourth, each organization seeking to act on CC needs a champion to lobby for change and resources, to garner support and lead initiatives strategically. However, such key personnel are often lost after relatively short periods through promotion and/or staff turnover. The informal networks utilized for this purpose within eThekwini Municipality are examined by Leck and Roberts [14] and turnover is often held to be a particular problem in public sector institutions, but it is often little better in the NGO and private sectors, especially in African and other contexts where skilled and experienced personnel are in strong demand.

Fifth, and although underrepresented in the studies in this Special Issue, it is now increasingly acknowledged that the private sector — long invoked in singular terms as if it comprised homogeneous firms and actors but is actually highly diverse and heterogeneous on all variables — represents a key sector in meeting CC challenges [22,23]. The ability to mitigate emissions, trade in emissions credits, retool or to invest in innovative technologies and production of appropriate products for mitigation and adaptation varies immensely and this needs greater recognition. Linked to this is the sixth challenge we identify, namely an increasing emphasis in many African cities and city regions on public-private and multi-sectoral partnerships (MSPs) as fruitful avenues for the promotion of appropriate CC actions in which local authorities adjust the regulatory environment, NGOs exploit their often closer relations of trust with target communities and community-based organization partners, and private firms or enterprises (including small and informal local operators) undertake the actual interventions, possibly with training and assistance provided by the other partners.

Local specificity of conditions and social relations are crucial, requiring sustained engagement and the maintenance of relations of trust and confidence. This raises the seventh challenge, namely the related issues of scale (spatial and temporal) and scalability of community-level interventions or innovations; and that the timeframe for most local participatory/co-produced adaptation interventions exceeds most local election and donor funding cycles. This means that it can often be difficult to persuade elected leaders and donor agencies to go along with the slow, convoluted processes required for successful participatory and co-produced project formulation and implementation. They tend to favour standard processes and products, often delivered by larger, formal firms as contractors.

Attention to gender concerns is a further major challenge [64]. While not a key theme in the studies in this Special Issue, workshop participants supported increasing calls for gender mainstreaming in climate change policy and actions. While there has been growing rhetorical attention to gender and climate change issues, women, who represent a large portion of African urban poor populations, remain underrepresented with inadequate participation in vulnerability analyses and DRR strategy development [7].

Finally, there is a widespread tendency within public sector authorities and private firms to treat development and CC problems and processes as apolitical and technical, including adaptation, ecosystem services and their implications. The rationale is that this provides officials with the ‘space’ to undertake their professional assessments and interventions in line with political directions and policies formulated or approved by elected representatives. To do otherwise would mire everything in politics and slow down processes. However, the danger with this approach is that visible symptoms rather than underlying causes and processes are often tackled, with the result that the source of the problem is never addressed, with the result that the palliative measures may be ineffective or even counterproductive, masking the build-up of pressure or tension within the system. In the CC arena, for instance, attempts to promote environmental or climate justice beyond superficial interventions generally require an understanding of the factors which determine
structural inequalities, so that undue mitigation or adaptation burdens are not placed upon those least able to afford them and who are probably contributing least per capita to the problems but probably already bearing a disproportionate burden or level of exposure and risk to extreme events and changing conditions.

Conclusions
Addressing the implications of, and possible unprecedented challenges posed by, CC meaningfully requires a sea change (a revolution of sorts) in approaches and behaviour by urban managers, planners, political leaders, firms, residents and other stakeholders, yet the capacity and tools to do this are not yet well understood and even less adequate for meeting the challenges. Ongoing urbanisation trends across Africa present new opportunities and problems or ‘challenges’ in the context of pressing climate change concerns. Poverty reduction, ‘development’, redistribution and justice remain priorities.

There is more CC research on and in African urban areas than often realized but — as the papers in this Special Issue demonstrate — it remains concentrated disproportionately in mega- and large core cities, with far less attention to secondary/intermediate cities. This underlines the value of UN-HABITAT’s CCCI and similar smaller ventures. Reflecting wider regional trends in Africa, CC research is commonly conducted in isolated geographical and linguistic contexts apart from global urban networks such as the C40, ICLEI or the Commonwealth Planning Association.

Cities’ CCM and CCA activities are often poorly articulated and integrated with national initiatives such as National Adaptation Plans of Action (NAPAs) and supra-national initiatives, which remain overwhelmingly general and sectoral. Individual adaptation initiatives in a particular city are thus generally limited in scope and resourcing, hence often being reformist rather than catalytic in nature, unless an exceptional institutional champion is able to influence agendas by means of leverage wielded through international membership bodies.

CCM and CCA essential for long term sustainability but how far can they go, especially for the poor and vulnerable, without holistic approaches? Notwithstanding the efforts within individual leader cities like Cape Town and Durban, and of networked initiatives such as UN-HABITAT’s CCCI and the C40, overall, African cities are some way behind the norm, and are strongly underrepresented in global assessments of successful adaptation initiatives [22,65,66]. As a result, the potential importance of socio-ecological and technological transformations remains largely unexplored in African urban contexts. Awareness of the need for change is increasing but considerable ignorance, resistance and counter-initiatives from corporate, elite and other vested interests through NGOs and public authorities are still evident. Since CCM and CCA, as well as resilience building and adaptive transformation are long term processes, a key hurdle in meeting this challenge is overcoming short-termism and self-interest by individuals, households, firms, city governments, regional and national institutions. Such tendencies have often been reinforced by invoking the global financial crisis as evidence that immediate economic recovery is more urgent than often intangible future environmental considerations.

References and recommended reading
Papers of particular interest, published within the period of review, have been highlighted as:

- of special interest
- of outstanding interest


African urban climate adaptation and transformation


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A seminal paper that draws the experience of pioneering cities in bringing forward climate change adaptation agendas.


The authors go further than in an earlier version of this chapter in examining the perceptual, political, institutional and resource constraints to undertaking systematic adaptation actions in Cape Town and Port Elizabeth (Nelson Mandela Bay Municipality).


Examines how the analytical lenses used to assess urban and peri-urban agriculture have changed over time and are now increasingly coming to appreciate the potential roles in urban greening, food security and both mitigation and adaptation.


One of the most theoretically informed assessments of the pitfalls as well as the opportunities in using ‘green economy’ promotion to support sustainable development. The focus is general rather than urban.


A systematic assessment of discourses, policies and the potential for urban greening in African contexts, with examples of still-limited implementation, which is most advanced in large South African cities.


A benchmark volume providing a systematic and multi-level approach to the governance challenges of addressing climate change.


48. Boughezal S: Disaster risk management and climate change adaptation in Greater Algiers: overview of a study assessing


