

Systematically reviewing environmental evidence to address priorities for sustainable development in Africa

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2012 Berlin Conference on Evidence for Sustainable Development - Abstract

The Collaboration for Environmental Evidence is establishing centres worldwide to enhance evidence-based decision-making on questions of importance in environmental sustainability. This has included the establishment in 2012 of a Centre at the University of Johannesburg. Our work draws heavily on a model for synthesizing research evidence for decision-making established in health care. This involves identifying and reviewing all the available research evidence relevant to a particular question, which is then critically appraised and summarized within systematic reviews. These reviews are routinely used worldwide to inform health care policy.

The aim of this paper is twofold: 1) to present our initial work to understand the needs and priorities within Africa for evidence to inform environmental decision-making; 2) to reflect on our planned approach to systematically review research evidence for environmental decision-making to address these needs and priorities.

To these ends, we will report the findings of our online review of priorities and our consultation visits to countries in southern Africa. We will map out key issues across five main areas: conservation, agriculture and land, food productivity & security, water, and climate change. Drawing on our multi-disciplinary backgrounds, we will go on to reflect on how our approach to synthesizing research evidence has been received thus far in the region and propose a model for how our work can provide timely, succinct and rigorous evidence for decision-making.

Background: A movement for evidence-based environmental management

The development industry, and in particular government agencies, are calling for greater evidence and a focus on 'what works' (DFID 2011). There is therefore an urgent need to collate and review the available evidence of the impacts of major development programs. Systematic review methodology (see Box 1) provides an ideal opportunity to address this need, providing syntheses on 'the evidence base' to inform decision-making on specific issues (Gough et al 2012). Whilst relatively new in environmental sciences, this approach is standard practice in medicine, health promotion and some areas of social policy, where policy-decisions are not made and new research not commissioned without first understanding the combined findings of the best-quality and most relevant research

evidence as reported in a systematic review (Cochrane 2012; Cook et al 1997; Mulrow 1994; Sebba 2004).

BOX 1: The steps involved in a systematic review

1. Define your question clearly and plan your methods carefully, consulting with a range of stakeholders
2. Work out where you are going to search for all relevant evidence
3. Do your searching, keeping careful records
4. Sort through what you find, filtering to make sure you only include what is relevant
5. Critically appraise the relevant research to make sure the evidence you are using is free of bias
6. Synthesise the findings of the relevant bias-free research to give you 'the answer' as determined by the best available research



Reflecting on the use of evidence in health-care decision-making, Pullin and Knight (2009) note that 'environmental management has, up until now, had no formal shared evidence-base of this kind.' In the last ten years, Andrew Pullin and colleagues at the Centre for Evidence-Based Conservation at Bangor University, UK, have led an emerging paradigm shift towards environmental decision-making based on the systematic collation of rigorous evidence. This shift was formally reflected in the recent establishment of the Collaboration for Environmental Evidence (CEE).

CEE supports wider networks of researchers, decision-makers and funders to commission, undertake and use systematic reviews on questions of importance to environmental management. It publishes these reviews in an open-access journal, *Environmental Evidence*, provides training courses and promotes the approach. More recently, it is extending its work to a wider network of researchers, drawing on the Cochrane Collaboration's model in health care, of international hubs that provide training and support and build networks within their regions, and of editorial groups that develop expertise in systematic reviews on specific subject areas.

Earlier this year the Centre for Anthropological Research at the University of Johannesburg agreed to host CEE's first regional centre – CEE Johannesburg.¹ The Johannesburg Centre includes a team of experienced systematic reviewers who have been using this methodology in health, education and development for many years (Korth et al 2012; Stewart 2001; Stewart et al 2005, 2010, 2012a, 2012b; van Rooyen et al 2012a, 2012b). We are now working to promote the approach throughout the southern African region.

In order to ensure that research reflects the priorities of Africa, our first task has been to undertake a consultation of those working on environmental issues within the southern African region. This paper describes our consultation methods and early findings and discusses the responses we have had to the evidence-based approach more generally.

¹ Another regional 'CEE Centre' has also been formed in Australia.

Consultation methods - establishing priority areas for Africa

We are using a range of approaches to begin to ascertain environmental priorities within Southern African Development Community (SADC) from NGOs, advocacy groups, government agencies, and policy documents.

Phase 1: In our first phase of data collection, we conducted online searching (between February and April 2012) to create a database of organisations working on environmental issues across the SADC region. Key sources included earthdirectory.net, as well as NGO and government websites. Data were extracted from webpages on key priority areas and themes identified within these. These were grouped loosely into six categories: water, climate change and energy, conservation, food and agriculture, land and forestry, and 'other'. Systematic reviews and published protocols on environmental issues with relevance to Africa were then identified from: www.environmentalevidence.org, eppi.ioe.ac.uk, www.3ieimpact.org, www.povertyactionlab.org, www.idrc.ca, www.dfid.gov.uk/r4d, www.thecochranelibrary.com, and www.campbellcollaboration.org. Systematic review evidence and organizational priorities were mapped against one another in a matrix to highlight common themes and gaps in the current systematically reviewed evidence base. A poster representing the initial findings was presented at the Campbell Collaboration Colloquium in Copenhagen in May and feedback received from the systematic review 'community'.

Phase 2: In our second phase of consultation, all organisations on our database were emailed telling them about our new CEE Johannesburg Centre and inviting them to contribute their priority questions for review. As well as an emailed form that recipients could use to record and submit their priorities, we proposed a number of meetings across the region. In the end, emails generated limited responses (see Table 1) and we had to send out three rounds of messages, as well as a round of phone calls to organisations within four cities, selected because our online searching suggested they contained the largest number of environmental organisations in the region: Harare, Cape Town, Pretoria and Johannesburg. In total, we had written responses from seven organisations, three of whom also took part in meetings. We conducted a total of nine face-to-face meetings in Johannesburg and Harare, as well as two telephone discussions with organisations in Cape Town. Three of these also completed written responses, and four other organisations submitted only-written responses – 15 responses in all.

Of these fifteen responses, three came from national conservation organisations, a renewable energy advocacy group, four agricultural and/or food security organisations, a group that champions indigenous resources, three community advocacy groups, an environmental law association, a regional development NGO, and a university research group. Of these five operate internationally, four nationally, and four locally.

All priority issues, whether shared by email or in person, were recorded and analyzed. Responses were organized in to our same six themes. The team met to discuss our data and identify our key findings.

Table 1: Consultation efforts and response rates

	Round 1	Round 2	Round 3	Round 4
	Intro email sent from generic account	Follow up email sent from personal account	Specific emails to organisations in 4 cities (Harare, Cape Town, Pretoria, Johannesburg)	Specific phone calls to organisations in 4 cities
Sent / called	186	186	63	45
Dead-ends / bounced	46	46	13	
Replies	8	3	9	
Contributions to the consultation	4	3	8	11
Total number of written responses to consultation	7 (3 of whom also participated in discussions below)			
Total number of face-to-face / phone discussions	11			

Our intention is that this consultation work will be an ongoing exercise over the coming years as we gradually establish an online database of unanswered questions of importance to the region, which will be updated as new environmental reviews are published and as more stakeholders feed in info to our consultation on priorities.

Consultation findings

We have brought together the environmental issues identified from government and NGO websites, and from emails and discussions, with what we know about current systematic review evidence (see Table 2). Brief observations on the similarities and differences between regional priorities and the current systematic review evidence-base are noted below in relation to each of our key themes.

Water: We can see that under the theme of water, there are consistent issues across the stated priorities of NGOs and government agencies (from Phase 1 of our consultation), and those who responded to our email request and discussions (in Phase 2), specifically concerns about providing clean water to enable good health and avoiding contamination. The evidence-base in this area is small, but consistent with current priorities in the region as garnered in our consultation.

Climate change (including energy): There are fairly consistent issues and questions are raised across our consultation, some of which are addressed in the current evidence-base. However, concerns from advocacy groups about climate justice are not considered in list of systematic reviews. ‘Fracking’ and the environmental impacts of this method are of particular concern in South Africa, yet these are not addressed in the research

base. There are also several as-yet unanswered priority questions about climate change and future impacts / models, and about alternative energy sources.

Conservation: The current evidence-base is clearly limited on conservation issues of relevance to Africa. The questions from the second phase of our consultation reflect a national-level practical/implementation issues which are not covered by the current reviews in this area.

Land (including forestry): Current priorities gathered in our consultation reflect ownership and land-use issues, but these are not currently reflected in the evidence-base.

Food security and agriculture: Whilst some themes related to agriculture arising from our consultation are reflected in the systematic review evidence-base, in particular around farming, wider issues about food security are not explicitly covered.

Other: It is clear from this 'other' category, that there is a need to consider cross-cutting issues in research, not only across environmental issues, but also in relation to other fields such as health and the economy. Whilst there is some evidence on these cross-sector issues, more is clearly needed.

Through our discussions with stakeholders a number of cross-cutting questions were raised highlighting the complexity of environmental issues and the importance of considering the inter-relationships between the social and environmental spheres. These included discussion of access to resources and power structures in a region where the poor are often marginalized socially, economically and environmentally. Conflicts arising from competing environmental and social priorities were also cited, where the co-existence of wildlife and humans can be challenging. Issues of equity and gender were raised as important, as were the relationships between the poor and powerless, the state, and corporates. Environmental justice, empowerment, advocacy and accountability were highlighted. There were calls for transparency and accountability in the generation, use and management of revenue and other benefits from the natural environment.

Health was also raised as an important consideration in relation to environmental management, given the relationship between human health and our environments, biodiversity, conservation and climate change. Furthermore, our built environment was mentioned and the need to better understand the links between the built environment and natural resource management.

As well as issues arising from the inter-relationships described above, respondents discussed cross-cutting issues of regulation and governance and the need for political and institutional support for environmental management. Concerns were raised about the competing demands of local and global priorities and how best to balance these.

Table 2: Key issues raised in our consultation mapped alongside current and ongoing systematic reviews, grouped into six environmental themes

Theme	NGOs and Advocacy Groups working across SADC (Phase 1)	Government agencies across SADC (Phase 1)	Key issues and questions highlighted by respondents (Phase 2)	Systematic reviews undertaken on environmental issues with relevance to Africa
<p>Water</p>	<p>46 major national or international groups working on water issues across SADC</p> <p>Key themes include:</p> <ul style="list-style-type: none"> • Sustainable water and sanitation provision • Cooperation between countries over shared water resources • Working in partnership with communities • Knowledge-sharing and capacity building • Protection and maintenance of ecosystems • Poverty, equity and justice • Health and hygiene 	<p>12 government agencies across SADC with specific focus on water</p> <p>Priority issues include:</p> <ul style="list-style-type: none"> • Research and development • National policy development • Stakeholder engagement • Sustainable management and utilization of resources • Provision of drinking water and sanitation and waste water services • Rural water supplies • Water provision for industry including agriculture and mining • Flood prevention and response • Beach water quality and protection of coastlines • Aquatic and marine ecology 	<p>How can mines improve their clean water separation and water management in general?</p> <p>The impacts of contaminating groundwater in the Karoo?</p> <p>Water quantity and quality through the maintenance of ecosystem services is fundamental.</p> <p>How can we harvest water at household levels?</p> <p>Can we increase the efficient use of agricultural water?</p> <p>How can we replenish and increase water reservoirs/bodies and preserve their diversity?</p>	<ol style="list-style-type: none"> 1. A systematic review of the health outcomes related to household water quality in developing countries [CEE Review] 2. Interventions to improve water quality for preventing diarrhoea [Cochrane Review] 3. Water, sanitation and hygiene interventions to combat childhood diarrhoea in developing countries [3ie Review] 4. Treating water with chlorine at point-of-use to improve water quality and reduce child diarrhea in developing countries: a systematic review and meta-analysis [independent review] 5. What factors determine the performance of institutional mechanisms for water resources management in developing countries in terms of delivering pro-poor outcomes, and supporting sustainable economic growth? [CEE Review Protocol] 6. What is the evidence that scarcity and shocks in freshwater resources can cause conflict instead of promoting collaboration in arid to sub-humid hydro-climates? [CEE Review] 7. Are interventions to reduce the impact of arsenic contamination of groundwater on human health in developing countries effective? [CEE Review Protocol] 8. Groundwater resilience to climate change in Africa [series of reports based on systematic review methods] 9. Household water treatment in developing countries: comparing different interventions types using meta-regression [independent review]

Table 2: Key issues raised in our consultation mapped alongside current and ongoing systematic reviews, grouped into six environmental themes

Theme	NGOs and Advocacy Groups working across SADC (Phase 1)	Government agencies across SADC (Phase 1)	Key issues and questions highlighted by respondents (Phase 2)	Systematic reviews undertaken on environmental issues with relevance to Africa
Climate change (incl energy)	<p>21 major national or international groups working on climate change issues across SADC</p> <p>Key themes include:</p> <ul style="list-style-type: none"> • Sustainable environmental development • Capacity building • Community awareness and engagement • Climate and environmental justice • Promoting low carbon energy economy • Knowledge management • Advice to govt on international responsibilities 	<p>12 government agencies, 10 of which are meteorological monitoring bodies.</p> <p>2 agencies specify climate change in their priorities, specifically:</p> <ul style="list-style-type: none"> • Support for mitigating / adaption strategies • Monitoring of climate change to support these activities 	<p>How do we reduce greenhouse gas emissions to help prevent climate change? Which energy development scenarios best serve this purpose?</p> <p>What is driving climate change? What are the consequences for biodiversity?</p> <p>Policy is a key area for research.</p> <p>There is a need to develop an effective climate change simulation model. We need better predictive models to determine how the impacts of climate change will manifest on a local scale. Improved models that can identify the drivers of climate change are needed.</p> <p>What are the risks associated with hydraulic fracking for various environmental entities? What alternative energy sources exist in lieu of fracking? What is the evidence coming from the US about the impacts of fracking on water resources, air pollution, and long-term sustainability of rural livelihoods and what lessons are there for South Africa?</p> <p>How should local communities be incentivized to bear the local impacts of wind energy development to create benefits for the global population?</p> <p>How do we balance the vocal local NGOs who often oppose green power?</p>	<p>10. What are the major barriers to increased use of modern energy services among the world's poorest people and are interventions to overcome these effective? [CEE Review]</p> <p>11. How effective is 'greening' of urban areas in reducing human exposure to ground level ozone concentrations, UV exposure and the 'urban heat island effect'? [CEE Review]</p> <p>12. What are the projected impacts of climate change on food crop productivity in Africa and S Asia? [DFID review]</p> <p>13. What is the evidence of the impact on net carbon sequestration from REDD+ (with a focus on tropical forests)? [CEE Review]</p> <p>14. What are the enabling or limiting factors influencing the large-scale uptake by households of cleaner and more efficient household energy technologies, covering cleaner fuel and improved solid fuel cookstoves? [EPPI Review Protocol]</p>

Table 2: Key issues raised in our consultation mapped alongside current and ongoing systematic reviews, grouped into six environmental themes

Theme	NGOs and Advocacy Groups working across SADC (Phase 1)	Government agencies across SADC (Phase 1)	Key issues and questions highlighted by respondents (Phase 2)	Systematic reviews undertaken on environmental issues with relevance to Africa
<p>Conservation</p>	<p>112 major national or international groups working on conservation issues across SADC</p> <p>Key themes include:</p> <ul style="list-style-type: none"> • Species specific protection • Region specific protection • Education and awareness • Capacity building • Community awareness and engagement • Indigenous knowledge • Working with agriculture industry 	<p>20 government agencies across SADC have a specific focus on conservation</p> <p>Priority issues include:</p> <ul style="list-style-type: none"> • Sustainable environmental management • Protection of social and economic livelihoods • Conserving wildlife and their habitats • Engaging and empowering local communities • Repair to previously damaged natural environments • Sustainable fisheries to protect lake and marine life • Management of national parks and other protected areas 	<p>How to ensure sustainable use of ecological services, not just protection?</p> <p>How to unlock and increase arable land through sustainable management?</p> <p>How can we sufficiently fund government conservation departments?</p> <p>How can we standardise conservation management, policies, and legislation?</p> <p>How can we elevate the strength and status of conservation?</p> <p>How can we coordinate and standardise anti-poaching issues and conservation legislation?</p> <p>How can we build and retain competent experienced conservation expertise at all levels?</p>	<p>15. The effect of local cultural context on community-based conservation interventions: evaluating ecological, economic, attitudinal and behavioural outcomes [CEE Review Protocol]</p> <p>16. Development as a conservation tool: evaluating ecological, economic, attitudinal and behavioural outcomes [CEE Review]</p>

Table 2: key issues raised in our consultation mapped alongside current and ongoing systematic reviews

Theme	NGOs and Advocacy Groups working across SADC (Phase 1)	Government agencies across SADC (Phase 1)	Key issues and questions highlighted by respondents (Phase 2)	Systematic reviews undertaken on environmental issues with relevance to Africa
Land (incl forestry)	<p>7 major national or international groups working on land issues across SADC</p> <p>Key themes include:</p> <ul style="list-style-type: none"> • Land ownership • Land redistribution • Advocacy for change • Protected areas 	<p>5 government agencies across SADC have a specific focus on land</p> <p>Priority issues include:</p> <ul style="list-style-type: none"> • Soil conservation • Land-use planning • Land policy and administration • Surveys to monitor land use, settlements etc • Forestry management 	<p>Degradation and deforestation.</p> <p>Rangeland management through attempting to control erosion, managing landscapes that impact on animals.</p> <p>Managing stock levels, ensuring that farmers move away from traditional practices that are harmful and instead allow landscapes to recover from livestock effectively.</p>	<p>17. The evidence base for community forest management as a mechanism for supplying global environmental benefits and improving local welfare [CEE Review]</p>

Table 2: key issues raised in our consultation mapped alongside current and ongoing systematic reviews

Theme	NGOs and Advocacy Groups working across SADC (Phase 1)	Government agencies across SADC (Phase 1)	Key issues and questions highlighted by respondents (Phase 2)	Systematic reviews undertaken on environmental issues with relevance to Africa
Food security and agriculture	<p>33 major national or international groups working on food security and agriculture across SADC</p> <p>Key themes include:</p> <ul style="list-style-type: none"> • Health, especially HIV/AIDS and nutrition • Disaster response, hunger and famine • Establishing foodbanks and seedbanks • Civil society and governance • Education and awareness • Capacity building • Infrastructure development 	<p>10 government agencies across SADC have a specific focus on food security and agriculture</p> <p>Priority issues include:</p> <ul style="list-style-type: none"> • Growth and development of agriculture industry • Stable and sustainable agriculture • Working with the agriculture industry to support food security • Research and development • Early warning and crop monitoring systems • Management of livestock and fisheries • Adaptation of crop and soil technologies to increase and diversify food production • Equitable social and economic development 	<p>How can small scale and organic farming be promoted at a household level?</p> <p>How can we monitor the use of genetically modified crops and how can the public be educated about these?</p> <p>How can we make enough water and land available for organic and small-scale farming?</p> <p>How might diversifying agricultural markets change the production behaviours of producers?</p>	<p>18. The Impact of Agricultural Extension Services [3ie review]</p> <p>19. Farmer Field Schools for improving farming practices and farmer outcomes in low- and middle-income countries: a systematic review [Campbell Review]</p> <p>20. What are the environmental impacts of the global cultivation of GM crops? [CEE Review]</p> <p>21. What are the farm-level economic impacts of the global cultivation of GM crops? [CEE Review Protocol]</p> <p>22. A review of the effectiveness of agriculture interventions in improving nutrition outcomes [independent review]</p> <p>23. A systematic review of agricultural interventions that aim to improve nutritional status of children [EPPI Review]</p> <p>[Climate change and food production - DFID Review – see under ‘climate change’ above]</p>

Table 2: key issues raised in our consultation mapped alongside current and ongoing systematic reviews

Theme	NGOs and Advocacy Groups working across SADC (Phase 1)	Government agencies across SADC (Phase 1)	Key issues and questions highlighted by respondents (Phase 2)	Systematic reviews undertaken on environmental issues with relevance to Africa
<p>Other</p>	<p>In addition to the major areas above, the following themes are consistently present within the priorities of environmental NGOs, Advocacy Groups and governments across SADC:</p> <ul style="list-style-type: none"> • Poverty • Economic development • International and regional co-ordination and co-operation 		<p>How do we balance an inclusive environmental impact assessment (EIA) process with a requirement that questions asked of the developed should be relevant and fair? How do we prevent spiteful and spurious EIA appeals?</p> <p>Diseases related to environmental factors, with the unjust use of outdated pesticides and other toxic chemicals that then have severe health consequences. A major factor in this is the disjuncture between policy and practice in South Africa.</p> <p>Inter-sectoral and cross-sectoral issues should be a focus. For example, what's happening to agriculture and consumption in relation to XYZ? The real challenge is looking at environmental issues, and trying to address them, in a holistic way. In such a way that both environmental issues and socio-political issues are addressed. The socio-economics of sustainable development need to be understood thoroughly for any transformation to be sustainable.</p>	<p>24. The importance of nature for health: is there a specific benefit of contact with green space? [CEE Review]</p> <p>25. Is the use of renewable natural resources in the developing world more or less sustainable, pro-poor and profitable under controlled access compared to open access? [CEE Review]</p>

Reflecting on our consultation methodology

We found that relying on the internet and email for our consultation was not sufficient. Websites were out of date and a large proportion of email addresses 'bounced'. Whilst phone calls were more effective, these also required more resources. On reflection, when conducting further consultations, we will telephone organisations first to confirm the name and contact details of key individuals and then contact them via email. We also acknowledge that snow-balling techniques may be more effective in reaching interested parties, although these approaches may systematically exclude individuals and organisations which are not so well networked. Future consultations should therefore use a range of approaches.

Reflecting on how evidence-based approach has been received

Thus far, we have received considerable interest in and support for the evidence-based approach in general and for systematic reviews in particular when engaging with environmental organisations in the region. They have supported the drive for a rigorous approach that attempts to review the evidence-base without bias. Respondents have highlighted the proliferation of myths in environmental knowledge and the need to 'sort fact from fiction'. The strength of 'factions' and the need to establish 'vested interests' have also been cited as reasons in support of systematic assessment of the biases within the available research.

It is worth noting however, that systematic review methodology is not universally understood or accepted. In related work, reviewing the evidence of impacts of microfinance, we have met with opposition to the 'positivist' paradigm of experimental evidence, and the concept of 'hierarchies' of study design. The processes, inherent in systematic review methodology, of critically appraising research, and of excluding that which does not meet strict relevance or quality criteria, have been criticized as too narrow, generating unhelpful 'empty' reviews and excluding potentially useful research.

We suspect that others who have supported the production of rigorous summaries of research evidence may not have grasped the extensive process required, or the high-standards usually demanded of included research. Whilst this lack of awareness is not a problem in and of itself, respondents to the consultation may not have been as supportive had they understood the cost of undertaking these reviews in terms of both funding and time.

Conclusion

We are encouraged by our consultation findings and the response from stakeholders to our new centre and proposed approach to addressing (some of) their priority issues through systematic reviews of the available evidence. However, we are aware that, despite only having responses from 15 organisations in southern Africa, the issues highlighted are numerous and complex and the current systematically reviewed evidence-base is very small. We accept that our consultation efforts must be ongoing in order to establish a more complete research agenda for

environmental issues in the region. There is a need to target more grassroots organisations and communities to ensure their voices are heard amongst the more powerful national and international agencies. Furthermore we acknowledge that the questions of importance to stakeholders will change over time, and a responsive approach is therefore required. As we begin to address the issues raised using systematic review methodology (both ourselves and by supporting others in southern Africa to undertake reviews), we envisage ongoing discussions about 'the evidence' and its role in environmental decision-making.

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