African Heritage Knowledge in the context of Social Innovation

Learning contributions of the Regional Centres of Expertise on Education for Sustainable Development

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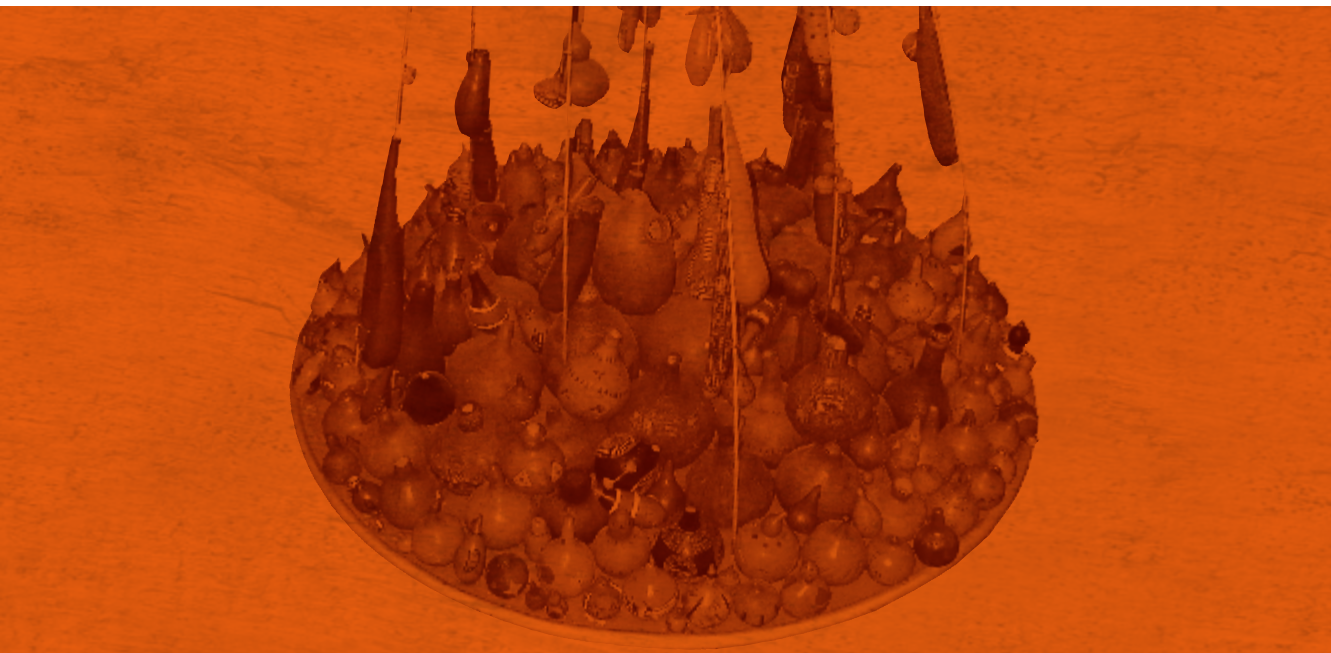

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Experience across generations …

We are entirely ignorant of the conditions under which a species of living beings emerged from an evolutionary process, equipped not only for learning from their elders, but also for storing and potentially for turning to their advantage ancestral experiences made and transmitted in course of time through a continuous sequence of generations.

The mode of intergenerational transmission of experiences is no mystery. Ancestral experiences can be deposited in the concepts of language and can thus be handed on through a line of generations of considerable length. The sequential order of generational experiences itself can have considerable significance for the pattern of experience transmitted from generation to generation.

Norbert Elias,
The Symbol Theory (1991, p.31)

Mijikenda Kaya Forests of Coastal Kenya …

Kaya sites can be clearly identified by local communities, often marked by forest clearings with paths and other signs of historical usage. Records from the early twentieth century indicate that some Kayas were settled at that time, and the ravages of the Galla along the East African coast are well documented. Archaeological excavations of some localities, however, seem to point to even longer continued occupation of the sites than the legends suggest; hence the question of their origins may be more complex.

In any case, many Kayas were preserved as sacred places and burial grounds by the Mijikenda, led by their ritual Elders. Cutting of trees and destruction of vegetation around these sites was prohibited in an attempt to preserve the surrounding "Kaya forest" as a screen or buffering environment for the Kaya clearings.

Anthony N. Githitho,
National Museums of Kenya, p.28

Cover courtesy of the National Museum of Kenya.

Foreword

Africa has rich and diverse forms of heritage knowledge and practices that support social innovation and sustainable development. However, African heritage and practices are least analyzed for their contributions to these areas. A vast majority of efforts to accelerate development on the African continent focus on 'imported' innovations. Furthermore, African knowledge and practice has commonly been diminished and silenced in the trajectories of colonial and modern expansion. Today Africa is still overlooked against the modernizing hegemony of green economy technologies. It is against this background that this book on *'African heritage knowledge in the context of social innovation'* has been published.

The book scopes the contours of heritage knowledge in and across Regional Centres of Expertise on Education for Sustainable Development (RCEs) in Africa. It forms part of an Education for Sustainable Development (ESD) series of publications, produced by United Nations University Institute of Advanced Studies (UNU-IAS), through which RCE actors share case studies, experiences and knowledge for the purpose of cross-boundary social learning. The book provides starting points for mobilizing local heritage and knowledge practices in RCE initiatives towards more equitable and sustainable futures. It reinforces the centrality of heritage knowledge and practices as an essential part of ESD in Africa.

RCEs in Africa and elsewhere are documenting and integrating heritage knowledge and practices into aspects of education and learning to foster sustainability in their local contexts. This is fostering local cultural ways of knowing and also including local voices in the dialogue of addressing sustainable development challenges. Through ongoing recognition and documentation of local heritage practices, RCEs can develop a sense of ownership and identity of local communities as ESD experts, making information on local and indigenous sustainability practices readily available to planners and policy-makers.

Kazuhiko Takemoto
Director, ESD Programme
United Nations University Institute of Advanced Studies

Africa has a wide appeal owing to its vast natural heritage of species and landscapes, the fossil evidence from which places it at the epicentre of human origins. Africa also has numerous ancient sites and literature from some of the earliest and most enduring civilizations on earth. Despite the scope and depth of its legacy, African heritage is seldom seen as providing a vital capital for learning in the face of current environmental degradation and systemic change on a global scale.

This book points to how RCE work with African heritage can make pioneering contributions at the frontiers of global change towards a more sustainable future. It explores how African heritage practices and knowledge can provide a vantage point for critical review of the wasteful ways we do things today. In this way it is a source of inspiration for positive social innovation to address many modern day problems. The text explores how African RCEs are **critically looking back** on indigenous practices in relation to water, energy, health, agriculture, biodiversity and waste. This is allowing those involved to **bring out** and appreciate the social-ecological depth in African heritage practices. The text proposes that, working with the intergenerational wisdom being revealed here, RCEs can then **bring in** much of the latest thinking on impact reduction, effectively **bringing together** a rich capital of past and present heritage for social innovation towards **bringing about** positive change in the world today.

Much of the heritage education work we have been advocating in Africa over the last decade has revealed glimmers of a positive social-ecological perspective that this text is opening up and clarifying for and in African RCEs today. The various contributions from all over Africa are certainly welcome to our understanding not only of past wisdoms but also a critical knowledge capital to help us to address our current challenges in the modern world. This book is a positive step towards the mobilization of heritage knowledge and intergenerational practices as a learning pathway towards a more equitable and sustainable future.

Dr. Webber Ndoro
African World Heritage Fund

Cover courtesy of the National Museum of Kenya.

Contents

Introduction and Overview

This e-book was developed to assemble practical examples of heritage knowledge and social innovation in the context of Regional Centres of Expertise on Education for Sustainable Development (RCEs). The perspectives and examples selected have been organized using an expanded WEHAB (Water, Energy, Health, Agriculture and Biodiversity) framework of the Millennium Development Goals. These locate the situated learning and innovation in RCE homestead and household contexts of heritage-led social innovation. Here shared areas, meeting places and learning spaces like the commonage of a village, (*Idlelo* – Xhosa), community meeting places (*Dare* – Shona) or the hearth in a homestead (*Eziko* – Xhosa) are explored as sites of heritage engagement and innovative learning interaction. RCE initiatives across the region resemble and resonate with these examples of traditional sites of co-engaged deliberation and innovation.

The book sets out to do little more than provide some illustrative starting points on heritage, learning and social innovation in and from the primarily southern African RCE contexts examined. It thus assembles and represents some of the knowledge practices in lived and living heritage that survived and are being recovered and re-discovered after the marginalization of indigenous peoples and many of their livelihood practices in colonial and modern times. The traditional and innovative practices are inspiring in their practicality as a platform for social innovation towards more sustainable livelihoods in response to widening social-ecological risks that are now centred on landscape degradation, biodiversity loss and climate change. Here, African perspectives and practices in relation to communal land management, the conservation of ecological systems and processes and responses to patterns of increasing climate variation are explored as a capital for reimagining many aspects of modern lifestyles and current livelihood practices. The text explores many examples of how work with heritage is producing an inspiring catalogue of African social innovations towards living better and more lightly on the land together.

Chapter 1 notes how African indigenous peoples' heritage practices and innovations are emergent within Mother Tongue, culture, practices and the knowledge generated through interactions within their local environmental contexts. Heritage comprises the tangible and intangible aspects of embodied livelihood practices (some everyday and some occasional), is embedded in culture, located in diverse contexts and carried across time. The continued presence of the indigenous practices and innovations reported and their value as heritage for social innovation is mainly due to their continuing relevance in local community contexts. Indigenous heritage practices and innovations are therefore dynamic and current and not just ancient practices of the past.

However, African indigenous heritage has seldom been represented in formal education and community development processes, primarily due to colonial exclusion, marginalization and subjugation. Against this background, it is important to document and work with indigenous heritage practices and continuing social innovation in response to the rapid changes of the last 200 years and with the anticipated climate change of the 21st Century. Change here is a necessary transformative process, an intellectual and political exercise, a community-engaged process of decolonizing, and an educative opening up of new social innovations to enhance quality of life and sustainability. Processes such as these interrupt many taken for granted western and modern views of heritage and learning. In this way continuing social innovation reclaims indigenous learning spaces in the community, curriculum and academy.

The book develops by tracing some of the contours of heritage innovation around water, energy, health, agriculture, biodiversity and waste management. Each chapter reflects some of the orientating concepts and tools for working with heritage practices as platforms for social innovation that are developing as situated processes of learning to change in RCEs. The book concludes by looking into a context of high climate variation and facing the effects of climate change into this century. Here the emphasis is on how heritage brings necessary traction for responsive learning and social innovation in these times of escalating risk and social-ecological change.

Chapter 1

Heritage in co-engaged social innovation

This chapter probes how innovative work with indigenous heritage practices and inventions is emerging as an environmental learning and research focus in many African Regional Centres of Expertise on Education for Sustainable Development (RCEs). It explores the intergenerational transfer of inherited experiences in learning that produces social innovations which enhance everyday livelihood practices. It also reveals how some indigenous practices and inventions have been adapted, adopted and commodified in a modern world. Here our primary interest has been to explore how heritage practices and innovations are being uncovered, recovered and taken up in innovative learning to change processes in many African RCEs today. This is part of a process of social innovation that involves creating and re-creating relevant knowledge in co-engaged environmental learning. Examples provided in this book include the contribution of indigenous knowledge to sustainable development in water, energy, health, agriculture, biodiversity, waste and climate change, through the application of heritage practices and innovations. Here, sustaining links between indigenous communities and their lived environments is a central focus. The examples that are developed in this text are by no means exhaustive and should be read as situated cases that are emerging and being replicated in diverse sites and in varying ways across the region.

It is important to note how much of the African heritage landscape has been fragmented over many, many decades of colonial intrusion, exploitation, extraction, misrepresentation, marginalization and modernizing exclusion. The sources of heritage inspiration emerging in African RCEs today have been derived from historical records, written and oral, and from those who have continued to practice successful ways of doing things simply in a local context. Much of the depth of indigenous wisdom in heritage practices has been uncovered, recovered and rediscovered through a slow process of local co-engagement and consultation with and amongst those indigenous peoples and representatives who still have intergenerational artifacts, memory traces and stories to tell. This has not been a smooth process and has been accompanied by many uncertainties and tensions that have only been resolved in the context of practice with all involved.

Oral histories and a legacy of community-led rural development have provided much of the practical start-up capital. Surprising sources have been early

Mother Tongue literature and biographies. In the sharing of emerging stories, an interesting momentum is gathering where that which is no longer needed is simply left behind, as depicted in the cascading calabash image on the cover of this book.

1.1 Literature, biography and oral histories in co-engaged research

Literary histories of local knowledge practices

One of the earliest books to provide snippets of the richness of southern African heritage is the diary of Magema Fuse. Writing in isiZulu whilst traveling near Eshowe, he described how smoke from a small fire made from grass and dung was used to protect trek oxen from tsetse flies. At the landscape level, this small window on situated knowledge practices opens up insights into how the grasslands of eastern southern Africa were not only shaped by natural processes like lightning strikes but by the heritage practices of early cattle peoples to maintain pasture quality and decrease risk. Unfortunately, there are few texts that provide these insights, as most early southern African literature is dominated by colonial narratives. These generally provide a superficial understanding of these practices and are often, in fact, mistaken in the perspective applied; African heritage was most often reflected as crude and primitive within a Western ascendency that drove the imperial project in Africa (Shava, 2009). Other texts have idealized indigenous heritage in myths and legends, with the writers mainly outsiders reflecting their ideals and fantasies of African heritage.

BOX 1

Magema Fuse was the first to write a book in isiZulu. An early diary was published as an addendum to Bishop Colenso's "Bringing Forth Light". It is here that he describes the purpose of the small fire to ward off the threat of tsetse flies from infected buffalo. The bishop did not understand how a smoky fire could be of any value but today the depth of wisdom in this simple practice is better understood. The tsetses were not yet known as the source of Nagana (sleeping sickness) and scientific experiments have only recently shown that tsetse flies hunt by sight, fly off at the smell of smoke, and only respond to a moving outline as a target. Making a smoky fire with dung and grass and letting it smoke upon the oxen is indigenous experiential heritage that the bishop could not understand but nonetheless respected in his students.

Biographies of knowledge practices

Another useful text that points to developing knowledge practices in the mid 20th Century is the biography of Kas Maine 1894-1985 (van Onselen, 1996). This is an account of struggle and change within the modern period of colonial and apartheid governance in South Africa. Interwoven in his story of life on the margins of an exclusionary system are traces of innovative struggle in changing times. His indigenous heritage and innovation did not endure and Maine died in poverty on the margins of modernity in the mid-1980s, excluded in an uneven system.

With few written texts available, most of the heritage innovation work in RCEs is developed in local contexts of struggle to enhance livelihood practices and quality of life. Strangely, continuing patterns of economic development in our democracies today still include blind spots and patterns of exclusion

A modern low-cost housing development in Makana RCE (Photo ELRC)

BOX 2

Kas Maine was a sharecropper who knew how to successfully farm in the heavy rainfall conditions and climatic vagaries of the then Western Transvaal in South Africa (van Onselen, 1996, p.41). His story tells of efforts to share seed resources (Mosuelo p.40) and protect his fields with concoctions for keeping sorghum-eating birds away (p.99). He describes failed crops from locust swarms (p.103) and successive patterns of exclusion that he and his knowledge practices suffered in an unequal and unjust social system. His know-how to protect and safeguard seed with herbs and ash (p.121) and his inter-cropping (p.101) practices in the days of animal power are no longer widely evident in our modern times of seed corporations, fossil fuels and large-scale food production.
The heritage practices reflected in his story are a critical capital of fragments for reimagining just and sustainable practices in a world of continuing change, now on a warming global stage of increasing climate variability.

across the region. Here, democratic systems of governance that are intended to foster greater equity and sustainable development are seldom adequately inclusive and the ideals of people-centred rural and state economic development are seldom realized in our globalizing market economies.

Oral histories and co-engaged research

Early research accounts of indigenous knowledge practices as local heritage were rare and often not valued as the approach at the time was one of colonizing dominance. Early anthropologists and naturalists wrote accounts of 'The Other' without allowing 'them' to have a say about their perspectives and practices. Shava (2009) noted how early botanical researchers and, more recently, medical research on plant-use documented knowledge practices to advance scientific authority, appropriating knowledge without recognizing the source and often misrepresenting indigenous practices as quaint, limited, ill-informed or meaningless.

1.2 A primacy of Mother Tongue in co-engaged learning

Mother Tongue knowledge practices

Mother Tongue texts about heritage practices are extremely rare. Most of the work on indigenous knowledge practices or heritage knowledge is thus derived from verbal accounts and oral histories in the present day. In many cases the narratives and practices themselves have been modified or changed. When texts are available, the translations of Mother Tongue narratives into other languages are often fraught with misrepresentations and loss of the original meaning.

In work on indigenous knowledge and health, Jolly (2006) found that some knowledge claims appeared to be erroneous and fell short of expectations that older ways were healthier than modern dietary practices. As an example, contrary to commonsense health practices of the present, the Xhosa women who were exploring indigenous foods in healthy living claimed that the addition of saturated fats to *imifino* (green leafy vegetables) had always been part of Xhosa cooking practice; this was the reason vegetable palm oil (Holsum) was used today.

Consultation with elderly rural women refuted this and allowed the research team to uncover how the addition of fat derived from extreme hunger in earlier times of famine. Here the fat served in foods would stop infants from crying when there was no milk. In these times, having milk and fats was a sign of affluence and a way of paying respect to guests. Using fats thus became an indigenous practice that was carried into the present day where, within a modern diet of refined foods, it contributed to obesity and heart disease.

There are many similar examples where the probing of heritage and practice in Mother Tongues has uncovered details that have allowed co-engaged participants to see problems more clearly and make more informed choices together. Notable here is that fats and sugars were originally relatively rare and from natural sources, not the refined and synthetic products that abound in the modern diet. Similarly, traditional food combinations led to other learning conversations and the realization that a rich capital of indigenous dietary wisdom was still there to be recovered in a modern age of excess.

There are two intermeshed processes that have been central to mobilizing indigenous ways of knowing and doing things (heritage knowledge and practices):

1. From the past: Mother Tongue accounts of situated knowledge; and
2. In the present: doing things together so as to explore the wisdom in how things are best done.

The co-engaged work involved the use of artifacts to stimulate discussion and research with children. This often led to local investigations and sometimes the production of video materials that provided a starting point for Mother Tongue enquiry into local indigenous practices. The Indigenous Knowledge (IK)-Today video clips included at the start of each section of this book have been widely used in southern Africa to encourage exploration in Mother Tongues of rich heritage practices that were marginalized in earlier times.

Here, Mother Tongues are at the centre of work in the local social context where stories (booklets) and moving images (IK-Today video clips) are used as starting points. Creative ways of working in context and with materials include dramatic re-enactments, the practical use of everyday artifacts, and engaging play in present daily realities.

These experiences have helped the editors of this book develop five guiding ideas for work with heritage in RCEs. They propose that heritage knowledge practices are:

- **Place-based;**
- **Intergenerational in scope;**
- **Rooted in the Mother Tongue approach;**
- **Held and verified in collaboration with others; and**
- **Understood as a good approach by the local community.**

The materials produced thus far have created a wide range of story sharing and exploratory opportunities. To take full advantage of these opportunities, one must work within local contexts of change and begin to explore case materials, like those in this resource, which derive from Mother Tongue engagement. Emerging perspectives will need to be verified and developed within the group involved. Summaries and the contours of emerging processes and materials for learning to change should be retained with care as these examples might be useful as models of process for other start-up contexts or for wider sharing within the RCE network and beyond.

A community-based legacy of low impact knowledge practices

If one looks into the margins of the economic mainstream there are traces of widespread localized indigenous heritage practices, similar to the diary of Magema Fuse and the biography of Kas Maine. Many situated ways of doing things have been sustained as local everyday practices as well as grassroots social movements in a local economy. However, some village and homestead craft practices have receded against and been displaced by the modern market economy. Despite this, some village crafts have continued – mainly amongst the rural poor – and entered the tourism craft markets before being replaced by replicas that are primarily made in factories (**see introductory IK-Today video clip**).

There has been a notable focus on the livelihood heritage practices in village-orientated social movements and grassroots development education initiatives. In southern Africa, some of the village production practices and technologies were represented in The People's Workbook (Berold & Caine, 1981) as part of the struggle against rural poverty and the marginalization of sustainable rural livelihoods. This and other rural development education publications were produced in collaboration with NGOs working in village-based development and reflected heritage practices as a core idea. The shift apparent here was an acknowledgement of the practical and innovative endogeny of intergenerational heritage in situated learning to change. More recently, during the UN Decade of Education for Sustainable Development (DESD 2005-2014), the Water Research Commission (2011) in South Africa produced a new publication on conservation gardening in response to the recent loss of food security

A Hlubi hut being renovated (Photo ELRC)

and a growing concern about climate change. Contrary to earlier publications, this now makes reference to many indigenous practices, opening the way to more learning that draws on this heritage.

These community-oriented approaches to development education resonate with Schumacher's Small is Beautiful (1975). Here, there is much more scope for learning together as a process of local innovation, with a focus on common sense approaches lost in times of technology-driven innovation. An emphasis on indigenous heritage practices also resonates with an emerging realization that many village livelihood practices are both innovative and sustainable. This emphasis on community-based innovation was initially popularized through freedom struggles and in postcolonial movements in southern, central and eastern Africa. Among these, some of the most notable were the short-lived Tanzanian movement of Education for Self Reliance after Julius Nyerere and the Education with Production movement that developed across the region, particularly in Zimbabwe and Botswana.

The focus on small-scale village orientated practices in rural development proliferated in widening community development discourses. However, the latter were often sites where village voices receded against the idealizing social imaginaries of development intellectuals and donor agencies. These ideals and shifting power relations are commonly found in community development and more recently in natural resource conservation movements like Community-Based Natural Resource Management (CBNRM). Despite an attendant idealizing of rural Africa and an intellectual dialectical politics that has positioned the indigenous in knowledge systems as different to and often opposing those of the West, the resonance of indigenous heritage knowledge practices and local innovations with modern science is apparent in many RCEs that emerged in the DESD.

1.3 Commons, homestead and school sites of social innovation

Drawing on a framing of social learning after Glasser (2007), RCEs are contemplated here as sites of co-engaged social learning (i.e. a learning commons). For example, guiding principles were developed for the Makana RCE as a site of small-scale experiments in social learning towards sustainability (Lotz-Sisitka, O'Donoghue and Wilmot, 2010). Here, reflexive social learning was modeled (Figure 1) as an open-ended process around authentic stories in and of practice. These, in turn, shaped a foregrounding of heritage practices drawing on the isiXhosa concept of *idlelo*. This developed into the concept of a social learning commons (*idlelo lencubeko lezendalo nabantu*) in the Makana RCE (**see Chapter 8**). At the knowledge generation interface among village communities, homesteads, schools and even university departments, there are many sites of co-engaged work around indigenous heritage practices. These are often rich contexts for co-engaged research, social learning and change constituted from a heritage in customary management systems. Some notable sites are *Kogtla* (Botswana) and the hearth of daily family interactions (*Eziko* – amaHlubi), as well as more formal traditional community-engaged meeting places (*Dare* – Shona). Much of the co-engaged work is being done by development workers, agricultural extension professionals and universities working in partner-ship with villages and homesteads. Here, groups often work as communities of practice (Wenger, McDermott and Snyder, 2002), co-engaged in heritage-informed social innovation and knowledge practices derived from and related to the valued beings and doings (Sen, 1999) of all involved.

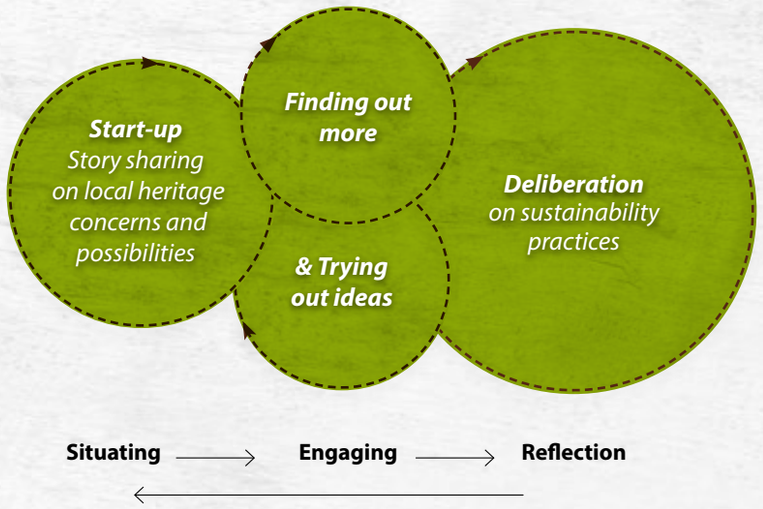

Figure 1
Sustainable practices and reflexive social learning, Makana RCE

This text is concerned with scoping some of this work that is surfacing in RCEs and examining the broad contours of how this is being realized in RCE contexts of learning to change in African communities, families and schools. To this end, recent work on communal land, in village homesteads, and in schools is described in this chapter to give readers a sense of some of the perspectives at play for better situating and strengthening RCE processes of deliberative innovation for a sustainable future.

Commons as a heritage site of learning and innovation

Some of the interesting sites and concepts that have given rise to the case evidence reported in this text are commons areas like the Kaya Forests of Kenya and *idlelo* of the Xhosa in South Africa.

On the sacred Kaya Forests situated on the coastal plains and hills of Kenya, East Africa, Anthony N. Githitho writes:

> *…the cutting of trees and other activities that could potentially cause damage to the forest around the Kaya and sacred spots was strictly forbidden by the Kaya Elders. This included collecting or removing dead logs or twigs or any other forest material. One kept to the traditional paths and avoided wandering freely in the forest – trampling vegetation and disturbing secret sites – and grazing livestock in the forest was forbidden. Uncommon animals, particularly large snakes, were to be left alone if encountered. Any structures built for ritual purposes used materials from the Kaya forest. In addition to these restrictions on physical interactions at the site, there were behavioural controls as well, designed to maintain the tranquillity of the Kaya. They emphasized decorum and respect as well as control of physical and emotional passions. Blood was not to be shed within the Kaya under any circumstances. However, all members of the Kaya community, including women, were entitled to visit the site if they so wished, as well as using the site under the Elders' guidance for ritual and ceremonial purposes.*

This example is merely one illustration of a traditional commons area. New ones are emerging as RCE initiatives engage with wider and more global issues like biodiversity loss, global climate and water quality, for example.

Many of the commons of Africa were the first sites of environmental degradation in the 20th Century. The *Tragedy of the Commons* (Hardin, 1968) dominated late 20th Century narratives of environmental degradation. The metaphor pointed African readers of Hardin to how communal use of a common resource was bound to lead to resource degradation.

Recently, however, Elinor Ostrom's research on governing of the commons through collective action provided tools and a lens through which the tragedy in Africa may be reinscribed; she has highlighted how community governance processes were widely disrupted with the colonial intrusion. In addition, an account of land politics prior to colonization is necessary to dispel the myth of the 'tragedy of the commons' on the African continent and give due acknowledgement to conservation practices related to the strong link between indigenous communities and their lands. The African indigenous heritage of communal approaches to land and natural resource governance needs to be taken into account. This includes rules of harvesting (observance of seasons, sharing, conservation taboos and myths) and natural resource sustenance.

Here, commons, which were originally reflected as a site of environmental degradation, are now being viewed as sites of struggle to deliberate and enact change through better governance, as explored by Ostrom.

BOX 3

Elinor Ostrom found that groups are able to organize and govern commons successfully when:

- Group boundaries are clearly defined;
- Rules governing collective goods are well matched to local needs and conditions;
- Most individuals affected by rules participate in framing them;
- Authority to locally frame rules is respected by external authorities; and
- Monitoring systems are developed by community members themselves, with a graduated system of sanctions, and with members having access to low-cost conflict resolution mechanisms.

These sensitizing ideas point to how the apparent tragedy of the commons that readers of Hardin interpreted in Africa took place at a time when colonizing powers were appropriating the commons and disrupting earlier ways of mediating land management.

The idea of a commons has developed rapidly across diverse learning spaces. In response to this, a commons site *idlelo lenkcubeko lezendalo nabantu* (social learning commons) was established by RCE Makana (**See Chapter 8 p.108**). The commons here is developing as a site for seeing and exploring change practices in response to environmental issues of the early 21st Century. A key focus for this is the Xhosa and wider Nguni heritage knowledge

amaHlubi Eziko (the hearth) (Photo ELRC)

practices of the region, many of which have changed and been lost through the marginalizing trajectories of the colonial and modern political and market economies (**see Chapter 8 for examples**).

Village and homestead sites of cultural learning and innovation

These commons concerns derive from village and homestead contexts, so work on *kogtla* (Botswana), *dare* (Shona), and *inkundla/ isigcawu* (Zulu) are significant, along with *eziko* (Xhosa), the hearth in the home. Emerging from such heritage practices are indigenous theoretical frameworks informed by practices such as *eZiko Sipheka sisophula and Hunhu hunorapanura kunobva ruzivo* described in Box 4 and 5.

As both a heritage space and an innovative process for teaching and research, *eZiko* conjures up and invokes the African spirit of collective and communal living within rural contexts.

BOX 4

A case for eZiko: Heritage space and innovative methodology for teaching and research

Author: Nomalungelo Goduka

The process of *eZiko siPheka siSophula* (*eZiko* for short) or "gathering around the hearth (*iziko*) to cook (*sipheka*) and dish out (*sisophula*)," is rooted in the Nguni language and other African languages, cultures, and relational/ecological worldviews. *eZiko* is a relational theoretical framework coined by Goduka (2005) for teaching and researching for sustainable development within African contexts. It is derived from the architectural Nguni structures of circular mud huts with conical roofs (*rondavels*). African life is understood as a cycle, illustrated as a circle, from the ancestral world to the living and back to the ancestral space. Based on ancestral teachings, life outside one's village for a Nguni person is therefore unfinished until one completes the circle and cycle by returning to one's village; this forms the foundation around eZiko. Ama–Xhosa refer to one's village as a space where one's umbilical cord was buried. Dying in an urban area or a place other than one's village is seen as dying without dignity. This is viewed as 'dying in the state of pseudo-Westernization'. To complete the circle, one's body must be returned to one's foundations in the village for traditional rituals and burial.

Because of its central position in the traditional hut and within the homestead, *eZiko* provides a holistic, feminine, experiential, participatory, collective, communal and integrative process/methodology. It is holistic as indicated by the circle around which spiritual, intellectual and psychological rituals, and intergenerational and intercultural dialogues and teachings take place. It is feminine because of the qualities of caring, loving and nurturing that emanate and radiate from the fire and what is cooked (*sipheka*) and dished out (*sisophula*) around *eZiko*. It is experiential and participatory because it provides all participants opportunities to engage in praxis, action and reflection for the welfare and good of all. It is a collective and integrative process as indicated in the collective prefix "si" or "we" rather than the individualistic prefix "ndi" or "I." As an indigenous epistemology, *eZiko* provides spaces for interactive and participatory learning, research, and methodologies around which to engage participants in activities of *sipheka* (in this case, the cooking is seen as training) and *sisophula* (where the dishing out is the graduation and sending out of learners into the world) to create more *ama-Ziko* (spaces and processes for teaching and researching from an indigenous perspective).

Furthermore, within curricula, pedagogies and research methodologies, *eZiko* seeks to de-colonize Western-based knowledge, and questions the relevance of Western and colonial positivist approaches for addressing sustainable development within rural contexts. Therefore, the goals of the *eZiko* theoretical framework are to recover, restore, recognize, recreate and 'research back' utilizing indigenous African epistemology, axiology, ideology and logic, and relational ontological, teleology and cosmology as methodological constructs. Figure 2 illustrates the seven pillars of the eZiko siPheka siSophula Theoretical Framework.

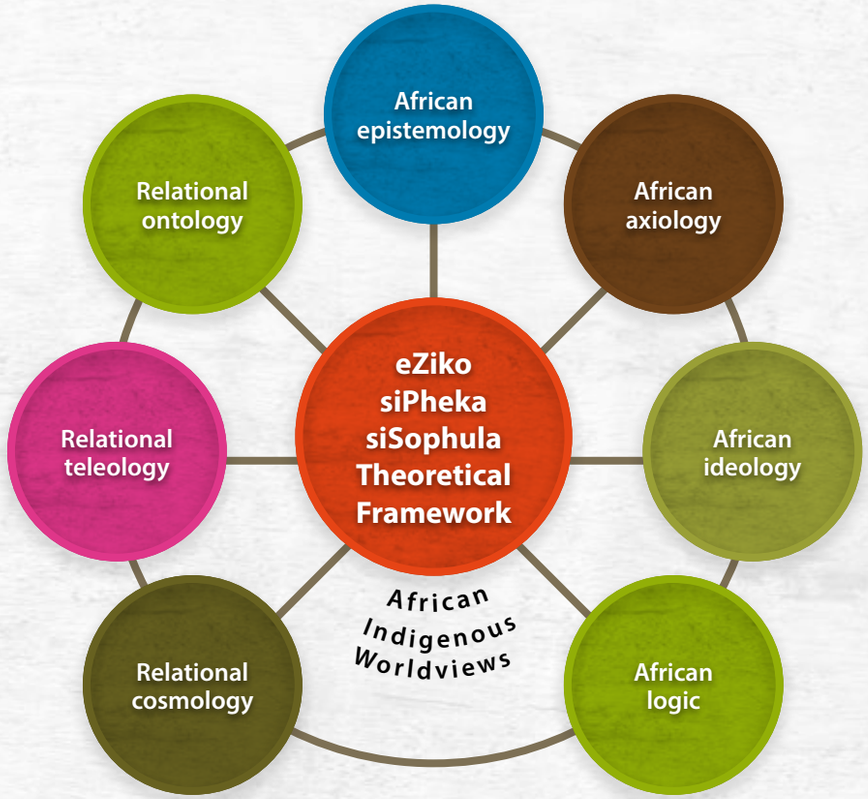

Figure 2
Pillars of eZiko siPheka siSophula Theoretical Framework and Methodological Implications (Model adapted from Carroll, 2008)

Schools and heritage in relevant learning and schooling success

Similar to the community commons (*idlelo*) and hearth (*eZiko*) as sites of learning, relations between home and school were generally exclusionary in the colonial period but have also become sites of research and change. The research has primarily been oriented to work with perspectives and practices that strengthen situated cultural contexts, processes and capital to enhance learning and change. Here knowledge of 'how to be' and 'how to learn' that is embedded in indigenous cultural knowledge processes provides a capital of tools for learning. An interesting example of this is seen in Box 5 and the description of the Shona Hunhu philosophy as it relates to a successful culture of academic achievement.

African commons perspectives, sites of learning and philosophies are diverse, contextual and shared. The three examples reflected here (*idlelo*, *eZiko* and *hunhu*) are for illustrative purposes: primarily, they point readers away from predispositions that might not enable an adequate grasp of the co-engaged capabilities and creative potential that are active in indigenous community contexts and can be integrated into formal educa-tion processes.

BOX 5

Shona hunhu philosophical origins of a successful culture of academic achievement (*Hunhu hunorapanura kunobva ruzivo*)

Author: Leadus Madzima

In 2008, Zimbabwe's macro and micro socioeconomic and political fundamentals had ground to a halt, including its education system (UNDP Human Rights Watch, 2005). Despite the complex risks of debilitating poverty among marginalized communities, a group of Black African learners in the high density location of Mbare, Harare passed their examinations. What is it that propels some learners to do well, enabling them to transcend the embedded poverty barriers while the majority fail? It was found that they drew strongly on Shona (African personhood) cultural resources. These enabled them to become successful despite the daunting conditions in which they found themselves (Madzima, 2010). Hunhu notions of personhood are rooted in an indigenous cultural philosophy that, for more than 35,000 years, inspired and guided *magariro netsika dzevanhu* (humanness). Here the ethical frame reflects love for education and wisdom, kindness, courtesy, love, loyalty, consideration, respect, tolerance, tenacity, patience, kinship, family preservation, sharing, generosity, duty, hard work, diligence, courage, hope, self-discipline, chastity, spirituality, belief in self, and friendliness in day-to-day practices and relationships among people (Samkange, 1980, p.103).

The learners demonstrated this reality through their own local truths and worldviews, which had hitherto been silenced, excluded or unrecognized by the dominant Western perspective (Connell, 2007). Consistent with hunhu philosophy, all learners believed they were made in the image of Musikavanhu or Mwari/Great Spirit who blesses both the poor and rich as long as they pray and work hard to do good, becoming *vanhu chaivo* (people of substance) and not *marombe* (worthless animals). The absence of a strong, moral and coherent subjectivity is conclusively *hapana zvemunhu* (there is no person there). The learners respected and listened to the precepts and stories of hunhu wisdom from their parents and community – loving, working together with, sharing, respecting and protecting *mhuri* (immediate and extended families) and friends. Hunhu, identity formation encapsulates a person's totality; internal, external and moral origins and process of becoming (Samkange, 1980, p.71-72).

Hunhu is the ethnic, democratic intrinsic-drive success model that helps explain how and with which resources marginalized youth manoeuvre through hostile institutions as they choose to generate cognitive structures and the conditions of their success. Although the storylines of their home and upbringing were interwoven within multiple layers of material impoverishment (i.e. finance, food, clothing, accommodation and education), their identities were unfixed. Through strict discipline and conduct, each embodied learner worked hard to cross, straddle and leap over borders and boundaries whether they were conceptual, structural, cultural, spatial, or temporal. They worked hard on their duties at home, including selling wares from door to door to subsidize family income. The self-imposed discipline and hard work phenomenon emerged both as a performance strategy and resource with which to secure other diverse resources (Ladson-Billings, 2003). In turn, these were used in constructing what learners figured were necessary multiple social identities to assist the construction of viable and sustainable academic identities. With teachers on a year's protracted strike, the learners made practical the *nhimbe/mushandirapamwe* (traditional communities of practice); "A man can only be a man through others" (Lovemore Mbigi, 1995: 2). They formed "Groupworks" and pooled intellectual and pedagogic resources without which they would not have passed their examinations.

In another study on relations between home and school, Maqwelane (2011) found that the inclusion of indigenous knowledge practices in interactions with Gogos (grandmothers) enhanced literacy and learning in Foundation Phase learners.

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1.4 An emerging perspective on heritage and social innovation in RCEs

The evidence and perspectives examined in this chapter run counter to a prevailing notion that heritage knowledge practices are primarily ancient and unchanging. To the contrary, this text uncovers heritage work as a creative and generative process where knowledge practices emerge in contexts of learning to change. Bakhurst (1990, p.212) suggests that the act of memory:

> *…requires the ability to engage in the specific practice, social in origin, of the production and interpretation of narrative forms constructed in the most powerful of socially forged symbol systems, natural language.*

Memories, as a heritage of valued doings and beings, commonly emerge through Mother Tongue

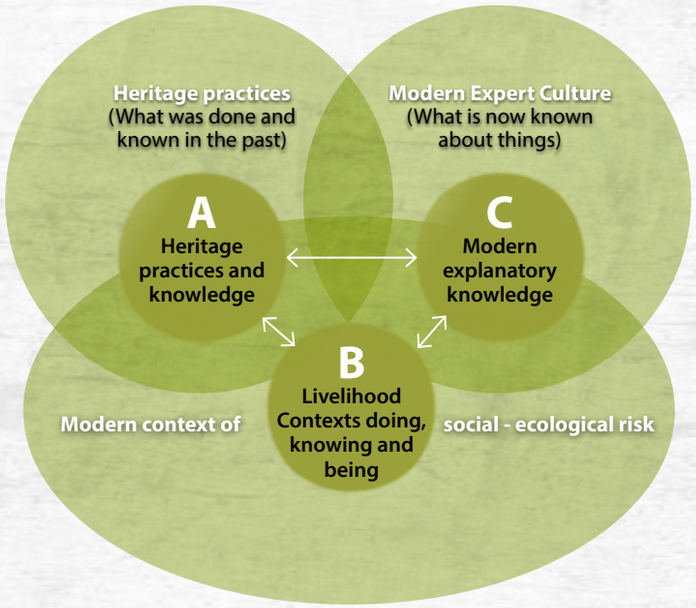

Figure 3
Learning interactions across everyday experience, heritage and what is known in the present day

and alongside everyday life experience so as to engage the tensions and contradictions of the modern day, providing critical and creative capital for innovative problem-solving and change. RCEs are emerging as sites of situated co-engagement that have the potential to operate as sites of co-engaged social learning as well; they can be regarded as conversion centres, where citizens work together to realize change initiatives that are locally possible and relevant.

The **critical processes of co-engaged learning** across heritage practices, innovations, everyday experiences, and what is now known are reflected in Figure 3. Heritage practices and knowledge (A) involve engagement with past action and indigenous practices in the present day. Here praxis is required over text, shaping learning interactions where typologies of memory specify the place, along with related histories and subjectivities. The constellations of situated memory and activity can enable participants to contemplate both absences (often experienced as loss) and continuities, alongside possibilities that can be identified in relation to the conditions of the present (B) and what is known today (C). These critical processes of knowledge construction in learning to change must remain open and contested because, in all of the examples that follow, it is not possible to identify or stipulate a conclusive mediating process informing learning interactions.

Put simply for illustrative purposes, in many cases heritage knowledge practices (A) usefully bring

Soul Shava (top left) introducing the concept of a village *Dare* at the SADC Regional Environmental Centre, Umgeni Valley (Photo ELRC)

modern knowledge (C) and experienced patterns of practice (B) into critical relief. In a similar way, they can also inform and enhance modern practices of the day. In most, there is also a mutual resonance (valorization) across heritage (A) and what is known and experienced today (B and C). The context of everyday life experience (B) can often hold sway and can serve to open up a range of ideas for practical exploration around what is known (A and C). The picture here thus remains open for critical co-engagement towards taking up the challenge of learning to change in order to make things better for people and their environments.

Why heritage and social innovation?

The chapters that follow this first each reflect a collection of heritage materials and examples of social innovations that have emerged as sustainability practices in relation to:

- Water
- Energy
- Health
- Agriculture
- Biodiversity
- Waste

The perspectives and cases documented in each area reflect wide-ranging work with and across heritage, the present context and what is known today. Here, learning and change are best read as reflexive and practical processes of social innovation. The concept of social innovation can be traced back to Benjamin Franklin and 19th Century reformers who developed a perspective where small-scale changes within the social organization and functioning of communities can solve many everyday and emerging social-ecological problems. Any change practices are thus latently socio-cultural and not merely technological. Here social innovation is seen in the widest sense as socio-cultural/ecological and emergent in RCEs and initiated through co-engaged research and social learning in response to risk.

The concluding chapter takes up a regional focus in relation to an area of high climate variation and emerging climate change in eastern southern Africa. This is concluded with an overview of the change-choice-practices that have come to be reflected and social innovation in the Makana RCE learning commons *Idlelo lencubeko lezendalo nabantu* (social learning commons).

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Chapter 2
Water

Amanzi amNandi (sweet water): Nguni water collection practices

The Nguni story of water collection was pieced together over many months and through many conversations with elderly Nguni about their childhood memories . Mba Manqele's mother was both the inspiration for Mba's effort to collect this traditional knowledge and the main storyteller throughout Mba's life. Her mother had told Mba many stories of Malawi, her late husband's home, and had kept Mba spell-bound as a young girl with accounts of rural life from her Zululand youth. As a young woman, Mba's mother made pots and carried them on her head to sell with other curios to tourists outside the Durban Aquarium.

Over many months of work with her mother and an adult literacy class, the details of the traditional water collection practices were uncovered and more fully understood by Mba. (**See biography of Mba**)

The Amanzi amNandi water story (Share-Net, 1994) and the accompanying IK-Today video have many twists and turns, but the basic story is as described in section 2.1. The story has now been widely used with Nguni children and youth as a starting point for them to go home and speak to their parents and elders about their heritage. This approach allowed all members of a class or an adult literacy group, like the one Mba had been working with, to search out and write up their own local stories with many variations and refinements. Working in Mother Tongue, they gathered oral histories of water collection in everyday family and rural life. The oral histories were then brought to class to be shared. With classrooms in South Africa now commonly made up of scholars of diverse languages and cultures, the heritage stories were shared in Mother Tongue with accompanying translations so all could understand. Follow up discussions always brought out much deliberation on the detail that brings out the practical wisdom, along with new insights into and respect for cultural patterns of everyday life.

2.1 Sweet water and the traditional practices of the Nguni people

The early peoples of southern Africa had traditional ways of collecting and storing "sweet" water, not unlike those of indigenous people in other parts of the world. This passage looks at Nguni water collection practices. (Comments and scientific observations are in brackets so that readers might see the practical wisdom behind some water collection myths and techniques of the past.)

Today many people of Nguni origin will sniff, smile and hold up *Amanzi amNandi* (sweet water)

collected from a river, spring or well for their daily household needs. (Water quality scientists today still have people smell and taste household water. Human senses give a refined indication of whether water is good and clean and fresh.)

Historically, water was usually collected in areas where people could hear it running over stones or dripping down rocks. (Well oxygenated water supports natural biological self-purification processes in water ecosystems.) If a spring was for human use, it was normally protected by a circle of rocks with a small outlet. Cattle drank elsewhere.

A water source would always be approached with care, so as not to frighten crabs and other small water animals. When disturbed, movements would stir up sediments, muddying the water and forcing the collector to wait for the silt to settle. The surface film was brushed aside so that the collector could gather the "sweet" water below. (Sediments and surface films have higher bacteria numbers than the middle waters of pools and rivers. Today scientists take water samples below the surface film, taking care not to suck up sediments. In this way scientists can get consistent and reliable measures of bacterial contamination.)

Clay pots were filled with water and covered with a collecting bowl, a piece of skin or mat made from incema (*Juncus kraussii*) grass. The water would thus stay cool and fresh. (Water evaporating through the sides of a porous clay pot cooled the contents. Most water bacteria cannot reproduce in cool, dark conditions. Some micro-organisms envelop themselves in a calcium secretion in the pores of clay pots. The cultural routine of cleaning the pots by scrubbing the inside before filling them with water would have cracked this calcium secretion, thus killing the bacteria and also strengthening the pots.)

There were many other customs and traditional practices surrounding water. Children were told that urinating in rivers, streams or wells would change them to the opposite sex, thus deterring them from such actions. (When people urinate or defecate in water, it increases the spread of harmful diseases such as bilharzia. The bilharzia parasite is passed on from human urine and faeces to small water snails; the parasite multiplies inside the snail before being released back into the water. If people use that water for recreation, washing or drinking, they risk infection from the disease.)

Another traditional practice was not to collect water from a river after a heavy rain at the start of the annual rainy season. Instead, pots would be put outside to collect rainwater. River water would again be collected four days after the rains stopped and the water had cleared. (Heavy rains wash human and animal wastes into rivers. There is thus a rapid increase in faecal bacteria and the possibility of disease outbreaks. In Kwazulu-Natal, health workers have to warn rural people not to collect river water after heavy rains as few still remember this earlier practice of only collecting rain water for four days.)

Farmstead in the Amathola Mountains (Photo ELRC)

BOX 1

Biography of Mba Manqele: Recovering heritage in story

Author: Rob O'Donoghue

Mba Manqele left a job teaching science to become a colleague of mine in environmental education at Ezemvelo KZN Wildlife, a provincial nature conservation authority. Indigenous knowledge and environmental literacy had always been an interest of hers, so her first project in her new job was to develop an easy reading resource with an adult literacy support group in Durban.

Mba's mother had told her stories of village life so to write the literacy booklet, she went to her for all of the information about indigenous ways of collecting *Amanzi amNandi* (sweet water). She found it very difficult to write up the material in ways that were meaningful and made sense to her. She then spoke to an adult literacy class who were all very interested in the project, though few could add any more than fragments from their memories as young women collecting water in rural villages. Intending to abandon the project, she met with her supervisor to discuss the disconnected fragments she had collected. He was excited by the information and asked whether she had done it herself, collected water in a clay pot with the indigenous knowledge in mind. She told him she hadn't, as she did not want to live in traditional ways.

Nonetheless, she took his advice and they worked through the evidence with a clay pot and a water-lifting bowl. Mba said that she was inspired by the depth of wisdom she discovered by carefully thinking about all of the fragments she had collected. In taking the first draft of the story back to her mother and the literacy group, many other stories came out until they knitted together into a tapestry of wisdom that made her proud to have such a rich heritage, which she and most of her generation had forgotten and lost.

Mba was engaged to be married at the time. Part of the engagement process obliged her to visit the rural home of her intended husband for a week where, amongst other things, she would collect water for the family. But Mba saw herself as a modern woman who would live and raise her children in the city, where there were better schools and a better lifestyle as a whole. As such, she did not make the visit to collect water in the traditional way for her intended family.

The first book and others that followed were a great success and now, living an urban life, she shares both stories of her proud heritage and her scientific knowledge of ecological systems and processes in her work as an environmental educator.

SADC workshop participants use Mini SASS to investigate life in a local river (Photo ELRC)

2.2 Galela Amanzi installs a rainwater tank

Xholiswa Plaatjies had a new baby, a son, Kungawu. She had also moved into a new house in the township but it still did not have water. Many days during the week there was no water in the communal taps so her unemployed sister would have to wait in line for the Makana Municipality tractor to come to visit the neighbourhood and fill her bucket with water for the family.

Boiling was costly

Diarrhoea was always a problem and Plaatjies had already had to take her children to the clinic for treatment. The nursing sister told her to boil the water to avoid the disease but boiling water to purify was costly as one had to pay for the electricity. On the farm where she grew up, they had always used the tank for drinking water but she had no money for a tank and no gutters to collect rainwater from her roof.

A spring too far away

A friend warned her that the problem would continue as the water was not always good, adding that she should get water for the baby from the spring on the road to Bathurst (**See Box 2 and Box 3**). There is now a shop in High Street that sells the spring water but it is prohibitively expensive.

Carrying water home

Plaatjies is a part-time domestic worker so on the three days a week that she worked, she would take home a 5 litre plastic bottle of water for the baby. This brought back memories of collecting water on the farm during her youth. She met with women who had babies with similar problems in the neighbourhood. They discussed getting a rainwater tank like the one at the community hall. Everyone was supportive of the idea but no one had any money to contribute.

An idea beyond reach

Every time it rained Plaatjies would see all of the clean water running off the roof. Then she would hear that the pipe had burst again and that she would have to get her sister or a neighbour to get the water that she needed for her family. Her

children would get sick again and she would have to take them to the clinic for treatment. In April there was a period of heavy rain and the baby got very sick so Plaatjies had to stay home to take him to the hospital.

The offer of a tank

After the baby had to go to hospital, Plaatjies' employers offered to help her get a water tank. They sent her to meet with student volunteers who had started a Galela Amanzi water tank project in partnership with RCE Makana. There she was surprised to be reminded about traditional ways of collecting sweet water, where women would 'make a hole' in the surface of a pool of water to collect water from the middle. She was also introduced to new tanks that had two taps, one at the bottom for gardening and one in the middle for sweet water.

BOX 2
The secret of the spring
Excerpted from an interview with Lorraine Mullins

The spring always had an air of mystery about it. It was said to never run dry; not even in the worst drought years. Clear, cool water came out of an old cast iron boiler pipe in a constant and steady stream that would fill a 5 litre bottle in a few minutes. It was clearly made by humans, probably the colonial military given the history of the area. Over a period of about 20 years, locals would collect water from the spring just outside town on the road to Bathurst. In the early part of the the 21st Century, Angela Barberton, a leading member of the Kowie Catchment Campaign's committee, noticed that people were causing some damage to the area. She, working with her gardener Barney Kepe, built up the area surrounding the pipe and the pathways, also supplying and maintaining a rubbish bin.

In 2006 a crisis arose with the town's water quality, when fingerlings in the experimental ponds at the Rhodes University Department of Ichthyology and Fisheries Science died in large numbers. The University warned against drinking tap water and imported large quantities of bottled water. Citizens from all walks were immediately attracted to the spring for drinking water. It was subsequently found that the presence of ammonia and calcium carbonate had caused the death of the fish, and that the town water supply was safe for humans. After the crisis, however, many continued to make regular use of the spring and a safe parking area had to be built to accommodate the increased numbers of users.

There was much speculation and many stories about the origins of the spring. Mark Hazel reported that the spring had originally been contained by the British Army Corps of Engineers as the original wetland disrupted travel to Bathhurst and the coast during wet periods. The engineers apparently dug out a large hole in the wetland and filled it with rocks, with a pipe running under the road to Bathurst. In 1986 there was a landslide and what was left after the road had been repaired was the contained spring with the short pipe that exists today. The water from this pipe now runs under the road through a culvert and the road has been built up so that it is not washed away each season.

Reference:
Mullins, R. L. G. 2008. Grahamstown's Water Supply - a brief History 1812 to 2008. (draft). KCC, Grahamstown.

BOX 3
Water for Dignity Campaign: Makana RCE
Water dignity is a social movement that is monitoring water conditions to mobilize civic action in ways that will stimulate service delivery from the state and agencies to resolve problems at a local level. Working from heritage practices and local capability, some of the practical activities that have emerged are:

- Tippy tap in schools hand washing (**See Chapter 8, section 8.2**);
- Access to a clean, functional toilet;
- Clean water on tap; and
- Hot water to wash children.

These ways of producing immediate health improvement serve both to mobilize existing knowledge and set a bench mark for what needs to be provided for water dignity.

Help with installation

The student volunteers said that they would help by installing the tank for her, but things took time.

> *When the water stopped again, I would have to get a family member to walk to the community hall tank or pay a friend to collect water for me. The water was not always good. I would boil it for the baby but he would still get sick and I would have to take him to the clinic again. This happened at least once or twice a month.*
>
> *The tank arrived and I met with John from Galela Amanzi. He would install the tank for me. I was worried that the empty tank would be stolen so I had to keep it in the house. Luckily it just fit through the door. The empty tank stayed in my front room for about a month and I became worried that it would never be installed. At that time it also rained and the water just ran away without being collected in my tank. The main supply to the stand pipe also failed and we had to get our water from the green tank at the community hall. Bongi came to visit me and went back to see the contractor and he promised to do the installation at the end of the month.*
>
> Xholiswa Plaatjies

2.3 Water harvesting from granite outcrops: Hope from scarcity

For those who can open a tap and get water from a few metres away at any time, issues of water scarcity might be distant. But this attitude of taking water for granted may not exist for much longer, given the increase in seasonal climate variation caused by climate change. Freshwater is a limited resource that is unevenly distributed, and yet essential for a good quality of life and for survival itself. For many people living in rural areas, if the rains do not fall and the rivers and wells run dry, it means there is very little or no water at all for them.

Changing patterns of water use

The history and genesis of human settlements in the central African plateau can be traced along water sources and the wetlands and springs from which they arise. Rivers, lake shores, sea and ocean coastal areas have been strategic areas for rural and urban population settlements. Where limited, water has unfortunately been used as a way of excluding the marginalized through segregation or war. This is because food production systems, industry, energy production, sanitation, hygiene, and daily sustenan-

The long road home with a heavy load of precious water (Photo ELRC)

ce are all based on clean and fresh water. However, these same human livelihood activities have contributed to polluting the same water sources. The increased demand has left 1-2 billion people with no access to improved water supply, and scarcity is increasing daily. Dam and borehole construction have not caught up with this demand, and are not adequate solutions due to high cost, siltation, and salinization.

Emerging farm and village innovation

This picture of scarcity has however not discouraged local inhabitants who live with daily water shortages from improvising and innovating to secure and maintain better water supplies for households and agricultural lands. Water harvesting for household use and farming is important in areas of low rainfall, semi-arid climates and intermittent rivers with no dams. The innovations of small-scale rural farmers and villagers in parts of Africa testify to how such innovations can improve people's lives.

A story of water harvesting

Zepheniah Phiri is a rural farmer in Zvishavane, a semi-arid area in the Midlands Province of south central Zimbabwe. His family is food secure because he transformed a dry landscape into an oasis he calls "Eden". Those who have adopted the innovation that led to this transformation have also benefitted significantly, including those in distant Mutoko and Chimanimani Districts, and in neighbouring Mberengwa District, all of which have the domed granite landscape that inspired Phiri's innovation.

A heritage-inspired vision

Phiri's vision is that of a Zimbabwe that seeks out learning and actions to improve integrated water resource management for food sovereignty, through local water harvesting innovation and peer exchange. The innovations that Phiri installed at his homestead are rich in cultural and political history, which include struggles against subjugation and for local empowerment.

Water harvesting for Phiri was born out of a heritage of self-sufficiency in food production, rainwater harvesting from roofs to supplement water supply in dry lands, and sheer determination to stay out of poverty. He has linked water harvesting with protection of land and soil, and with soil fertility.

A struggle against a conflicting colonial world view

Phiri's innovations arose during the colonial period, when soil and water conservation through use of contours was a government-regulated and compulsory agricultural practice. The deep contours installed by Phiri allowed him to capture runoff water, grow excess food and turn his plot into a green island of hope in the middle of semi-desert land. However, this success attracted suspicion from colonial agents, leading to his arrest in 1964 by a Land Development Officer on a frivolous charge of digging his contours too deep and not conforming to the standard contours required by legislation. After three years of incarceration, he was later discharged as he was found by a magistrate not to have committed any crime. Since 1967, Phiri has developed his water harvesting innovations further by extending the network of contour canals and building underground water storage tanks. This innovative practice has enabled him to ensure sufficient water supply for his household and for agricultural activities throughout the year.

A reflection on heritage practices

In Zimbabwe, areas that hold and supply fresh water, such as springs, wetlands and water holes in river beds, are considered sacred. Various traditional taboos are associated with these water sources and are usually designed to prevent desecration of a common resource. Children are normally not allowed near such places unless in the company of adults and for the purposes of apprenticeship training. Adults, on the other hand, cannot wash cooking utensils or other possible contaminants at a spring, in a wetland or water hole.

Biblical, ecological and personal inspiration

According to Zephaniah Phiri, the motivation to create a wetland at his homestead came from the Biblical Eden where the first humans were charged with a stewardship duty to look after and tend the land, its flora and fauna. His approach was to create deep contours which would hold runoff water, thus preventing any rainwater falling on his property from washing away. Phiri's understanding of the interdependence of soil and water ecosystems led him to conclude that "soil and water must live together but should never be allowed to travel together". Indeed in dry areas, even runoff rainwater should be kept as much as possible on the homestead and farming plot to allow it to sink into and saturate the surrounding soil, before it flows to other spaces. At the same time, soil erosion by runoff water should be minimized. "My aim is that food security in region 4 should not be dependent on waiting for the rain", said Phiri. He took advantage of a sloping terrain to capture water from a rocky outcrop upstream and channel it to his garden downstream. He has also demonstrated that it is possible to harvest rainwater for farming where there is no granite rock outcrop and little slope to the land.

Good practices travel further afield

Many communities in semi-arid mountainous areas of Zimbabwe have since adopted these innovations. These include communities in Mutoko District and Chikukwa Village in Chimanimani District of Manicaland Province; and in neighbouring Mazvihwa District in the same Rural District Council of Runde where the most successful farmers have neither rocky outcrop nor much slope. Schools, agricultural colleges, and universities continue to send their students and teachers to the Phiri homestead to learn about his water harvesting innovations enabling food security in marginalized areas. It gives hope to see young children learning lifelong skills and vocations that give meaning to improving livelihoods. It is hoped that such learning spaces can be brought into the curriculum and replicated in hands-on practice by the learners.

Heritage and social innovation

The three sites and cases of water (or water-related) heritage practice and social innovation are diverse, each reflecting differing start-up imperatives and outcomes. What all three cases share is the way in which heritage practices have been sustained or re-emerge, often while colliding with present day challenges and through the collaborative effort of diverse groups of people sharing knowledge and know-how to produce innovative solutions. In these cases, none have remained unchanged and co-engaged research is producing differing social innovations in differing regional and social contexts. Other associated social innovations explored in the Makana RCE social learning commons (**See Chapter 8.2**) are:

- Jojo Tanks
- Ceramic filters
- Copper vessels
- Water testing kits

Xholiswa Plaatjies catching up on local news as she waits for her bucket to fill from the emergency rainwater tank in the neighbourhood (Photo ELRC)

References

Share-Net (1994). Sweet Water and Traditional Practices of the Nguni People. In the Audit Water Quality Pack, SWAP. Umgeni Valley project, Howick.

Chapter 3
Energy

3.1 *Igoqo* wood piles and hot bags

In many Xhosa rural homesteads today one sees *igoqo*, (firewood for the household), piled up so that time is not wasted gathering the necessary fuel for cooking. The selected wood will be dry so that it is easily lighted and also of a type that will produce flames to boil the water and coals to slowly cook the food. It sends a message that a household is well provided for.

In towns one seldom sees *igoqo*, as people cook on electricity or gas, but the same principles of using flames to boil and coals to slowly cook the food still simmers in people's memories. These memories and the prospect of saving money have become the foundation of cooking with an insulated hot box or cooking bags.

The hot box: An insulated cooking bag

The exclusionary legacy of apartheid indoctrinated the belief that people of South Africa were inferior, as were heritage knowledge and practices; apartheid instead promoted Western and modern scientific knowledge (O'Donoghue, 2012a). Even after 18 years of democracy, patterns of exclusionary practices continue, which demonstrates how ingrained these beliefs are even today. Contemporary practices utilize modern innovations, yet many draw upon practices of the past without giving recognition to those practices. Sustainable practices that are often forgotten have benefited people and the environment over hundreds of years and are more congruent with environmental and social systems than many contemporary practices (ibid). The RCE Makana aims to recover and restore dignity to indigenous heritage practices. "The RCE cases of working and learning together with and from indigenous knowledge practice are centred on an endogenous (learning from within) perspective" (ibid). Therefore each stakeholder has something to learn as well as something valuable to share and is important for rediscovering important practices that have been forgotten. This is the framework from which the Cleaning, Greening & Saving Project was based.

Cleaning, Greening & Saving Project summary

With funding from Makana Municipality and as part of the 2012 Makana 200 Year Celebration, RCE Makana and Rural Eastern Cape and Inqaba Yegolide, a youth cooperative, started the Cleaning, Greening &

Saving Project, which would draw upon amaXhosa heritage practices and lessons learnt throughout Makana history in order to tackle present day issues of food security, energy saving, poverty reduction, waste management, nutrition and climate change. The project began in April of 2012 and ended after seven months, in October 2012. The project consisted of three phases: 1) composters, 2) tree planting and vegetable garden development and 3) insulated cookers (Lenferna, 2012).

Insulated Cookers: Commonly known as KoekSisters

Insulated cookers are a simple innovation using the process of insulation (heat retention) to slow-cook food. Once the pot of food is brought to boil on the stove (using gas, electricity, wood or paraffin), it can then be removed and placed in a bag to continue the cooking process without the need for further energy. This draws upon the traditional heritage practice of the amaXhosa where acacia coals were used to slow-cook food. Insulated cookers come with many names (Wonderbag, Hotbag, Hotbox) and in many designs, but generally they work off the same principles and use similar materials. The KoekSisters method consists of two small bags made up of pure cotton cloth and filled with polystyrene bits, much like a bean bag. These two bags make up a cooking bag set. First, Koek (the first bag) is placed on an even surface, then a pot of boiling food is placed in the centre. After, Sis (the second bag) is placed on top of the pot, covering all exposed parts. The KoekSisters then begin the process of slow cooking through heat retention. The process can be summarized as follows: "boil it, bag it, stand it, serve it" (**www.nb-wonderbag.com**).

Saving is an important concept in using insulated cookers and a few studies have been done in South Africa and around the world in order to discover the social, economic and environmental benefits of cooking in this way. Two studies conducted in 2009 found that regular use of the bags saved a minimum of 15KWH of electricity and 1.6 litres of paraffin per week, which amounts to a significant 500kg of CO_2 emissions each year (ibid). Insulated cooking has even been recognized by the United Nations Framework Convention on Climate Change (UNFCCC) as a Clean Development Mechanism (CDM) and credits can be traded on the carbon market (ibid). There are many benefits to this traditional cooking method, some of which are listed below:

- Slow-cooking is more *nutritious* as it retains more vitamins through a less harsh heating mechanism. This method also uses less water, since water and steam is retained, and reduces food wastage since food does not burn. Many dishes requiring water can be cooked with this method, such as rice, pap, stews, meat, desserts, vegetables and soups. Most importantly, it is a reinvention of an age-old practice (such as the amaXhosa practice).

- *Money* is saved through the consumption of less energy. Households can save up to 75% of energy required for cooking. In South Africa, this is as much as 641 rand per year (ibid) where annual savings range between 5-25 percent of annual household income (STATSSA, 2008).[1] The money saved can help reduce the impact of poverty as individuals using this method may be able to put savings towards more nutritious food, garden development or other areas that need assistance.

- *Safety* is another important aspect that is enhanced. Reducing the amount of time spent using the stove or open fire sources reduces the risk of shack fires and the risk of burns for children. It can also assist with improved air quality since the need for fire and the accompanying hazardous smoke, is significantly reduced.

- It also helps the *environment* in many ways. It saves energy and therefore the demand on fuel sources decreases; in turn, carbon emissions also decrease. The process of recycling is also beneficial. Waste materials such as factory off-cuts of cloth and the re-use of polystyrene helps to turn waste into worth and the use of materials that would go to fill the dumps can instead be turned into something beneficial.

- *Women* can also improve their lives though the use of this cooking method. Women can make the bags as a source of temporary or longer-term income, for skills development or even skills utilization. This can give women self-confidence, a sense of worth and even improved economic and social power. The process also saves time spent in front of the stove, which would allow women time to tend to other things.

Isonka (bread) a 'modern' charcoal oven (Photo ELRC)

The benefits are numerous, improving health, saving money, decreasing risk, helping the environment and transforming the lives of women (**www.hotbag.co.za/pages/home**). Even though this research is approached from a development perspective, the innovation is friendly and applicable for anyone and everyone to use.

The KoekSisters Initiative

The KoekSisters initiative formed phase three of the Cleaning, Greening & Saving Project. Saint Mary's Development and Care Centre (DCC) is an old convent that has been developed into a community daycare facility that cares for disadvantaged children and, by extension, their families (O'Donoghue, 2012b). Many of the families are destitute and numerous social and economic issues plague the communities. Saint Mary's DCC was identified as an ideal partner for the initiative since they could provide the infrastructure (centralized and neutral location to meet), the social capital (the existing relationships and connections with the mothers of

[1] Black Africans make up the lowest household income bracket (4th & 5th Quintiles). The Eastern Cape and Limpopo Provinces are the poorest in the country. Forty percent of the population earns 2590 rand per year, more than half of which comes from social grants.

The project team at the start-up meeting in Hoeggenoeg, April 2012.

Women of Sun City at a weekly meeting, April 2012

the daycare children and a pool of other mothers who were keen to take part) and leadership (by the enthusiastic and passionate manager of the centre who had a good rapport with the families there).

In exchange, the initiative offered paid piecework (40 rand per set of two bags) that would give the otherwise unemployed women a small income and the opportunity for skills development. Saint Mary's DCC was keen to take part and the partnership went ahead. Approximately 20 women formed three groups based on the different geographical wards (Scots Farm, Hoeggnoeg and Sun City). The women were tasked with the production of approximately 40 KoekSister sets (80 bags) that were divided equitably amongst the three groups. The groups were given the materials (factory off-cuts of pure cotton cloth, scissors, needles, thread, masks, and polystyrene sheets, which the women grated into smaller bits) and went to work cutting, sewing and filling the bags.

The approach followed the bottom-up development framework and an endogenous perspective was emphasized. Although the project organizers provided support and materials, the women of the communities were called upon for their vast knowledge and skills. Therefore, the capacities and capital (social, economic and natural) of the local communities that were actively involved in the project emerged.

The idea was that it would be more sustainable and people would be more invested in something they saw value in and actively participated in, rather than something that was forced upon or handed to them. In this way, the women were left to their own devices to form groups, arrange representatives and produce the bags. They could always rely on support from Saint Mary's DCC and from the coordinator of the project whenever it was needed.

The groups decided that it would make sense to pool financial earnings into a group savings scheme instead of earning individual wages. In time, it became apparent that the women were using the strengths and skills that already existed in the group to make it run smoothly, rather than developing new skills within each individual woman. It worked out naturally in each group that at least one person was able to use their sewing skills and resources while others cut patterns and stuffed bags. The groups each decided to meet twice per week at central locations to work for a couple of hours each time. The manager at Saint Mary's DCC suggested a vegetable box for soups for the groups of women. This way, each week when the women met, they could have a meal while they worked.

It is interesting to note that two of the women from the groups already knew of hotbags and had even used them at home. Their knowledge was crucial in explaining to the other women how effective the bags were and helped to add excitement to the initiative. It is also interesting that the more the project was talked about within the community, the more this idea resonated with women who either had heard of cooking this way, were excited to try it or had even invented their own version. There was one woman in Joza who made her own version by using a cardboard box lined with polystyrene sheets and towels. This all added to the excitement of the initiative.

Challenges and lessons learned

Like any initiative that involves the community, problems and challenges did arise but many positive lessons were learned in response. One challenge was sourcing material for the bags. With the help of the local Masihlule Project (a recycling project based at the Makana dump), a partnership was developed that would provide sustained access to polystyrene. With the fabric off-cuts, an initial donation came from a private, out of town donor. With that supply soon to be exhausted, it was discovered that the local factories, while more than willing to assist, did not have the right type of material (pure cotton that can withstand heat). The project continues to look for partnerships with other more suitable factories.

Even though the women in the project were able to source the polystyrene, it did not come in little bits but rather in large sheets. The women decided they would grate the polystyrene to form little bits, which worked perfectly except for the fact that it added significantly to the time of production and was very labour intensive. In this case the original offer of 10 rand per bag (20 rand per set) no longer seemed fair and the price paid per bag was doubled to 20 rand per bag (40 rand per set) to help offset the added work of grating the polystyrene. It was also discovered that working with small polystyrene bits was a health hazard. Even though masks were provided, particles still floated in the air and stuck to most things in the room. Many women com-

Bags and vegetable box for soup

Sewing the bags

Putting on masks for grating polystyrene

Grating the polystyrene

Urban settlement with low cost housing, water and electricity (Photo ELRC)

plained of respiratory problems after grating the polystyrene. The project team is currently working on a way to chop the polystyrene more effectively using machinery.

One of the major challenges stemmed from group dynamics, with issues among group members and group leadership emerging, as is natural whenever people interact. There were also many issues (personal and otherwise) that arose, making it difficult for some women to carry out their commitment. Issues that women in the community faced included, but were not exclusive to: poverty, domestic violence, alcohol, drugs, depression, and suicide. In winter, with bad weather and often freezing conditions, production slowed. It is understandable when working with communities that face such challenges that progress may be slow. To resolve some of these issues, it was decided to have group meetings at Saint Mary's DCC, a neutral location, in the hopes that the move would resolve some of the conflict within the groups.

Lastly, some of the bags (approximately 20) went missing from one of the groups and were never returned. In order to avoid such a situation in the future, it was decided that only materials for six bags would be given out at any one time. Once the bags are completed, they would be handed in and more material for another six bags would be distributed. This initiative has been a learning process in and of itself, with revisions taking place as participants discovered what worked and what did not (truly an endogenous perspective). Thanks to Saint Mary DCC's support, assistance, connections and rapport, and thanks to the women in the groups, much valuable information was learned.

Ways forward

Thus far, 14 sets of bags have been fully completed. Six of those sets have been loaned to people working on the initiative to test them and to use for demonstrations. Eight sets need small repairs (sewing the hole closed) and 11 sets need to be filled with polystyrene. Ten sets have gone missing. With the lessons learned and listed in the previous section, the group is now hoping to begin on a new phase of bag production. The project coordinators have met with group representatives who are keen to motivate the groups to complete work on the remaining bags. Once all bags are finished, a ceremony will be held with the women from the groups where a meal will be cooked using the KoekSisters and a handover of funds will be carried out. The three groups will open a group bank account so that they can manage the earnings together. Once this is done, the next phase will begin, where the KoekSisters will be loaned free of charge to the women of the initiative, the houses from Ward 7 (from the composting phase), and team members.

The agreement is that the households can keep the bags on loan for as long as they use them; anything not used must be returned. There will be a training session and demonstration on how to use the bags and savings from the use of the bags will be monitored over a period of three months to determine the effectiveness of the bags in that regard (using time as the unit of measurement in the study). It is hoped that families will be encouraged to invest their savings into vegetable gardens and more nutritious food, thus into longer-term food security, financial savings and improved health.

3.2 Fire garden woodlots and fuel-efficient stoves

Over the last 20 years, much of Malawi has become a wood scarce area. People have had to adapt to cooking with grass and other biomass fuels. Andrews Nchssie and his students at Kasungu College of Education have taken up the challenge of looking into fuel efficiency and biomass fuel production. A surprising outcome of their research was that locally made tin stoves (*mbawur/la*) are surprisingly more fuel-efficient than traditional and commercial clay stoves. The clay in the clay stoves initially absorbs much of the heat, whereas tin stoves more efficiently transfer this into cooking, still providing coals for slow cooking.

Nchessie points out that the work on fire gardens was in many ways more significant. Here the students returned to exploring the practice of harvesting from, rather than chopping down, an entire tree. These old ways of harvesting retained wood-producing trees near villages. The practice disappeared with the advent of larger axes, bow saws and chain saws. The harvesting practices then involved felling a tree and leaving it to dry for a season. The entire tree could then be used as a source of wood for cooking, with the bulk being used to make of charcoal. The charcoal would be sold in towns and cities where fuel was scarce and expensive.

Malawi has been a site of many development projects that are trying to restore habitats and biodiversity through the introduction of woodlots, for example. These have met with limited success. Nchessie surmises that there may still be hope that villages will develop fire gardens, harvestings these in the old ways. He is currently looking into ways of drying firewood using the African sun, scrap metal and drums that are painted black.

In recent years RCE Zomba has been encouraging 'fire gardens' and more fuel efficient stoves in rural villages.

3.3 Heritage and social innovation

The texts in this chapter are centred on one urban case of co-engaged research in RCE Makana and another, primarily in rural con-texts in Malawi. Alternative wind turbine and solar cell energy options have not been covered, as there is little in the way of heritage to give traction for social innovation. This is important as it opens up an often overlooked human skill of engaging with something new and taking it up into use. These technologies are thus represented in the social learning commons and change-choice-practices to be explored at a small scale. Other simple practices that have stronger heritage roots for social innovation (**See Chapter 8.2**) are:

- Wood stoves
- Ceramic plates
- Volcano kettles
- Charcoal ovens
- Hot-bags
- Fire gardens
- Black dryer-drums

Cobb oven with clay, heat sink' and cast iron bread pot (Photo ELRC)

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Chapter 4
Health

4.1 A heritage of traditional food plants in southern Africa

Indigenous food plants as heritage

Traditional food crops and wild food plant resources comprise the food systems of indigenous peoples. They are the ingredients of indigenous peoples' food traditions, their cuisines (traditional dishes) and diets. They reveal the direct relationship between indigenous communities and their lived landscapes, as well as their co-evolution, evidenced by people's knowledge of the different edible plant species in their locality, their availability and their food preparation or processing. Such specialized knowledge has been accumulated over generations of living and adapting to particular places and has been passed down as a significant component of indigenous food (natural and cultural) heritage.

Indigenous food plants and nutrition

The nutritive value of most indigenous food plants has yet to be investigated. However, for those that have been popularized through domestication and cultivation, many have been found to have significantly high nutritional values.

Indigenous food plants as a source of food security and sovereignty

Indigenous food plants constitute the local agro-biodiversity (food crops) and a source of local food security and sovereignty. They are the indigenous food wealth of local communities. Due to their adaption to local conditions, these indigenous food plants have the potential of being food crops of the future, especially against the background of negative effects of climate variability and change on commercial crop varieties. Local farmers that have continued the traditional practices of mixed cropping are the custodians of traditional agrobio-diversity heritage. Their fields are a mosaic of food plant diversity comprising traditional food crops as well as selected 'weeds' left to grow as a source of food, such as pigweed (*Amaranthus* spp.), black nightshade (*Solanum nigrum* and other *Solanum spp.*), black jack (*Bidens pilosa* and other *Bidens spp.*), singing nettle (*Urtica dioca* and other *Urtica spp.*), goosefoot (*Chenopodium album* and other *Chenopodium spp*). This food plant variety has been documented in some case studies in the Eastern

A rural village scene in Hamburg on the Easter Cape coast (Photo ELRC)

Cape of South Africa and in Zimbabwe (Shava et al 2000, Asafo-Adjei 2004, Shava 2009). Indigenous custodians of wild food plant knowledge are also very adept at knowing growing conditions of such food plants, including on anthills, litter piles, and wetland areas. Such a rich heritage of agrobiodiversity resources, knowledge and practices can help sustain local communities during periods of climate variability and change, such as droughts (Shava et al 2009).

Traditional agrobiodiversity heritage has been sustained through the careful selection of good varieties of the food crop. For example, in some cases the best heads of sorghum and finger millet, the best cobs of heirloom maize, the seed of the biggest or sweetest melons, the best magaka or spiny cucumbers (*Cucumis metuliferus*), pumpkins, gourds, beans, nyimo or cowpeas (*Vigna unguiculata*), tsunga (*Brassica carinata*), groundnuts, nyimo or round nuts (*Voandzea subterranea*), nyevhe (*Cleome gynandra*) and others, and cuttings of the best varieties of sweet potatoes were spared the pot and preserved for use as seed in the next growing season. Exchange of seed among local farmers was also a common practice.

Indigenous traditional diets

Indigenous diets were characterized by a wide variety of foods, eaten in season. Indigenous food plants in southern Africa include cereals (pearl millet, finger millet, sorghum, indigenous/wild rice), leafy and/or stemmed vegetables, pulses or legumes, indigenous fruits, edible nuts and seeds, edible bulbs, edible roots, tree sap, and gum. Most of these are gathered in the wild and in fallow lands, while some have been domesticated as crops and are cultivated.

Research shows that following traditional diets leads to better health compared to eating a typical westernized modern diet. In a traditional southern African diet, snacks and sweets are usually fruits and nuts, and traditional cereals and vegetables are generally higher in fibre. The emergence of food related diseases such as high blood pressure, diabetes and obesity is attributable to the modern diet (Ballick & Cox 1996, Shava 2000). Currently many global movements are emerging that advocate for a return to more localized traditional diets and protection of agricultural heritage, such as the Slow Food International movement (www.slowfood.com).

Traditional food processing

Traditional foods plants are either eaten raw (especially fruits, nuts, bulbs and sap), cooked (especially vegetables and cereals), dried and stored (e.g. cereals, some fruits, some vegetables), pounded and ground (e.g. cereals), or fermented (especially cereals). Some of the traditional food processing practices, such as fermentation, enhance the nutritional value of the food.

Factors influencing the continued use of indigenous food plants

The dietary, nutritional, culinary and cultural value of indigenous food plants has gradually eroded through the introduction of exotic commercialized food crops, marginalization through systematic discrimination against them as "poor man's food", urbanization, and lack of access (Shava 2000). To this end, indigenous food plants are becoming a 'lost heritage' of indigenous peoples, symbolizing 'the way things were'.

However, several indigenous foods are re-entering the urban consumer market as processed commercialized food products. These include the traditional sorghum fermented brew Amar/hewu, which is now sold in many flavours; traditional sorghum beer which is now sold as packaged beer; canned traditional legumes and leafy vegetables; and indigenous teas such as rooibos and honeybush tea.

4.2 Cholera and hand washing

Socio-ecological background

Cholera and diarrhoea are diseases that are commonly associated with sanitation, occuring usually amongst the poor who lack access to potable water and hygienic toilet facilities. To many people, cholera is a waterborne disease like typhoid, which is spread by ingesting food or water contaminated by the faeces of an infected person. In truth this was a misclassification by health and medical officials working to eradicate these diseases in Europe in the medical sciences of the early 20th Century. From its natural habitat in the brackish estuaries of western India, early forms of cholera emerged on the east coast of Africa long before Western European colonization. Cholera probably arrived with the earliest dhow trade that made use of the monsoon winds that switch between India and Africa. It proliferates in village conditions and commonly contaminates water supplies for the duration of an epidemic. Cholera does not originate in fresh water and laboratory experiments show that it cannot survive long in fresh water conditions. Today, the World Health Organization notes:

> *Although toxigenic, V. cholerae has been isolated from surface waters, no study has yet demonstrated water as a reservoir of toxigenic V. cholerae in the absence of a person with cholera using that water.*
>
> *… The overall body of evidence suggests that faecal-oral transmission is of primary importance, and long experience has shown basic water-supply and sanitation measures to be effective in controlling secondary spread of the disease.*
>
> (WHO 2002: 142)

Evidence of an early sanitation measure to control the disease are found in the hand washing practices of African communities. These testify to them having learned to manage the disease over hundreds of years of seasonal migrations to the coast.

An isolated village in the Wild Coast near Hamburg (Photo ELRC)

Nguni hand washing

The Nguni have a rich heritage of washing their hands when they return to a village homestead after being away in the fields or elsewhere. When strangers arrive they are always welcomed and are given food to share after everyone washes hands together. Women are always extremely fastidious when it comes to washing, before preparing food, or on return from the fields and before they feed their young children. These patterns of practice are extremely effective to combat a hand-to-hand and hand-to-mouth disease.

School sanitation campaign

Today, unsanitary conditions exist at most rural and township schools in southern Africa and there is little or no provision for hand washing. As a result of these conditions, diarrhoea is one of the most common reasons why children do not attend school, with many children leaving school in the morning if they need to use a toilet. A community activism network has started a 'Water Dignity' campaign to monitor absenteeism and to repair school toilets to create sanitary conditions for children.

Eco-School support

In concert with this campaign, Eco-Schools support school groups to audit the health risk in their school. Eco-Schools reported data that reveals that school children have a very good grasp of diseases like diarrhoea and cholera as well as the associated health risks. There is, however, little sense of what they can do about those problems, so they tend to wait for a solution to come from authorities.

The story of indigenous heritage knowledge

Learners worked with the story of Nguni hand washing practices that had enabled the early indigenous inhabitants in the region to solve problems related to these diseases. They had done this for many hundreds of years before the colonial intrusion, cholera being a natural organism in estuaries that were commonly visited during the winter period when food was short and communities gathered much of what they needed from natural systems. Based on this information the learners were asked to find out more about what was and could be done to improve sanitation and resist the problem.

Developing hand washing technology for school use

In township schools where information and ideas that have been discussed about sanitation, these discussions have been led by an Eco-School teacher who challenged students to design hand washing solutions in a series of technology lessons. Learners had to clarify the problem, and research and brainstorm possible solutions before coming up with a design for a hand-washer that they could then build and try out in their class. The tippy hand-washer and tippy-tap are two successful designs that the learners were shown for the development of their design and management systems. They had to innovate around these, master the manufacturing techniques and develop management systems that could be tested.

Iselwa

BOX 1

Testing a rainwater tank for bacterial contamination

Author: Roman Tandlich

Water from a rainwater tank containing faecal matter is potentially dangerous for human consumption. The test strip determines if hydrogen sulphide (H_2S) producing bacteria (faecal bacteria) are present in a rainwater tank.

The H_2S strip test is made up of a bottle with a piece of paper impregnated with nutrients inside it. The paper will release the nutrients into the water once the sample has been added and the kit hand-shaken. This will allow the bacteria to grow at room temperature in a sunlight protected box.

To use the H_2S strip test one has to:

- Allow the water to run for thirty seconds.
- Then let the water run slowly, before opening the bottle
- Without touching the inside of the bottle, half fill the bottle with water to a specified volume.
- Close the bottle and shake the bottle.
- Place in a sunlight protected box in a warm place.
- Check the bottle for a colour change.
- Check the bottle every 12 hours for 72 hours (3 days).
- Colour changes after 72 hours are not positive results.
- If the water turns a black colour then the test shows that bacteria are present. (Positive result).
- All the water in the bottle must be discarded into the sewage system. Hands should be washed thoroughly and the bottle should be discarded with the refuse.

When the test is positive, the water is not suitable for drinking without first boiling or treating with disinfectant. If the rainwater is being used for irrigation of food that is cooked before being consumed, then no action needs to be taken. However, if it is being used for drinking or washing, then 5ml of sodium hypochlorite or jik (not perfumed) should be placed into the tank for every 1000ml of water. No more than 25ml should ever be placed into the tank. The tank should stand unopened for at least 12 hours before the water is used. Preventively add 150 ml of bleach into a 5000 litre or standard rainwater tank once or twice a month.

Who has the cleanest hands?

A simple colorimetric test for e-coli was used to introduce the challenge of having clean hands at school. The tests, double sealed in a plastic bag with a bleach barrier, were incubated by the students who carried the samples against their skin day and night to keep them warm. This activity was a lot of fun for students and provoked thoughtful responses, particularly when the test results showed shocking evidence of faecal matter on students' hands (the students were tested in groups to avoid embarrassing any individuals). Thereafter, the testing process was refined to test the efficacy of the tippy tap instead of testing the hands of individuals.

4.3 *Amar/hewu*, a healthy fermented food

The fermentation of maize porridge developed from the African heritage of fermenting sorghum and millet to optimize nutrition. It is a good example of how a culture was able to take up a new crop and develop new foods at the onset of the colonial era. Today the making of *amar/hewu* has changed and brewer's yeast is used instead of extracting the yeast from sorghum.

Amar/hewu in the daily working life of a village homestead

When soft porridge was made to feed children in the morning, the remainder was left to cool and then taken to the fields in a calabash to be made into *amar/hewu*. It was usually hung on a shady tree, away from ants, and left to slowly ferment during the warmth of the day. As the family tired in the afternoons with work still unfinished, they would call a temporary halt and sit down together to drink *amar/hewu*.

Lost in translation

Before colonial times, sorghum was used with the malt prepared through a process of amylase fermentation. This way of preparing a starter produces sugars that hasten the fermentation process and are used for making both *amar/hewu* and *umqombothi* (sorghum beer).

The colonial, native administrators would write of the natives being lazy and sitting around drinking beer at every opportunity but the Xhosa, for example, did not see their *umqombothi* as a beer as they do today. One of the best explanations of this is offered by Ken Ngcosa, a Xhosa:

> *To us umqombothi is not something that is made but a process of preparing a drink for everyone in a village community to get together and evoke the ancestral spirits. When early colonists asked what the drink was that was part of this process, and why a small amount was spilt on the ground in honour of the ancestors, it was not an easy question to answer. The translation became 'beer' because of it being a drink made with a ferment and a grain, this being the word for the popular alcoholic beverage (beer) amongst the colonists. Through this natural 'accident in translation' and with labour on the early wine farms being part-paid in alcohol, much of the refinement in Xhosa fermentation practices was lost and people who derived sustenance from a variety of fermented foods and drinks were, in the main, labelled as indolent drunkards.*

Crushing grain to make up a sourdough starter; note how the grain is lightly crushed in the traditional way (Photo ELRC)

A hidden sophistication in fermentation practices

Ngcosa went on to explain that Xhosa fermentation culture was practical in its sophistication, allowing for the efficient extraction of nutrients from a number of grains used in foods ranging from sour porridge, *amar/hewu*, and *isonka* (bread) to *umqombothi*, the drink for ancestral celebrations.

With the advent of maize, soft porridge was used as an alternative to sorghum for the making of *amar/hewu* but the cultural practice remained much the same. A soft porridge was made, cooled, mixed with malt and left to hang in a tree or to stand on a rock in the shade near a place of work. The heat of the day would unlock all of the nutrients and by the afternoon, when people were tired and low in energy from the labour of the day, it would be ready to drink. Someone in authority would call a halt and everyone would have a refreshing drink of *amar/hewu*. The sugars would give immediate energy with which to continue the work, and the more complex carbohydrates would be slower to digest and would thus give energy to keep going until the work for the day was done. Further to this, having an enzyme-rich drink in the afternoon would prepare the stomach to digest the evening meal of meat, vegetables and some form of starch, *pap* (maize-meal or potatoes). Diets varied and there were times of shortage and hunger, particularly when the fields were being prepared for the new season, but this simple picture of *Amar/hewu* points to the sophistication of the Xhosa fermentation culture.

The modern shift from process to product

The sorghum malt has now been replaced by dried yeast and there are commercial varieties of *amar/hewu* sold in supermarkets today. The modern convenience of buying fermented grain drinks has changed the cultural landscape of southern Africa and today few but those in rural villages and the older members of communities still make traditional fermented foods.

A composite photograph to invite conversations around heritage practices related to food and health (Photo ELRC)

4.4 *Amar/hewu* and enzymes in Mutare Teachers' College

Seeking relevance by teaching the concept of enzymes using *mahewu*

A lot of literature points to the irrelevance of scientific concepts to learners when they are taught theoretically or straight from a book. Conventional laboratory experiments, which are usually predetermined and routine procedures, at times fail to provide adequate connections for learners with their daily life experiences. If learners can make adequate connections, it should be easier for the educator to scaffold development of the concept. The preparation of *mahewu* was used in a research to explore possibilities of enhancing the relevance of the concept of enzymes, a topic in the Biology Department at Mutare Teachers' College.

Exploring the topic with local expertise

The lesson was introduced to learners initially with an explanation of how *mahewu* could be prepared at home. Many students pointed out that they could buy a commercially prepared mix that they could mix with water and leave to stand overnight. A local elder was invited to describe how *mahewu* was made traditionally. She brought a grinding stone and about two kilograms of dry germinated rapoko grains to demonstrate how she germinated and dried the seeds. A small packet of ungerminated seeds were soaked in water and left for observation. She went on to demonstrate how the seeds were ground to powder. After her demonstration, students took turns re-enacting the grinding process. Most female students recognized the process and were keen to act it out. Male students, however, expressed hesitation since grinding was a feminine chore. Meanwhile a pot of porridge was boiling on a fire. The demonstrator constantly sniffed the boiling porridge to determine if it was done.

Science alongside traditional preparation

When the porridge was done and allowed to cool, it was poured into a clay pot. Samples of the porridge were taken and tested for starch and reducing sugar using the Iodine test and the Benedict's Reagent test, respectively. Only starch was present. Malt was added by hand and the mixture was left to stand for observation as well as consumption on the following day. It was emphasized that the mixture must be kept warm, not too hot or too cold. The clay pot was covered with a dark sheet, standing on small stones that raised the clay pot above the cement floor, and left in a warm place. Students were given the task of explaining the importance of enzymes in the making of *mahewu*.

Making connections across science and tradition

The next few lectures were used to explain how enzymes were responsible for germination. Students presented their findings on enzymes and seed germination together with lecturer input. This knowledge was used to explain that drying germinating seeds stops the process of germination at a time when amylases and enzymes, which digest starch and turn it into to sugar (maltose), are abundant. The powder that makes malt is made of small grains that have amylases. Breaking grains into tiny pieces creates a larger surface area for enzyme action. Amylase acts on cooked starch, so the porridge is boiled until it is done. Enzyme action depends on temperature; at low temperatures, enzymes are deactivated, while they are denatured by high temperatures. Because of this, the porridge is allowed to cool until warm. Warm temperatures are optimum for amylases. Sitting the clay pot on stilts lifts it from the cold floor which reduces the temperature of the mixture and reduces enzyme action.

BOX 2

No-knead, slow-fermented pot bread

Ingredients:

- Two measures of bread flour
- One measure of tap water
- Quarter teaspoon of instant yeast (catalyst)
- Teaspoon of salt

Before going to work in the morning, sift 2 measures (a mug or a tin can) of bread flour into a lightly oiled mixing bowl. Fill the same measure to the brim with cool water, tipping a small amount (2-3cm) into a glass; just enough to easily dissolve a teaspoon of salt. Set this to one side.

Sprinkle a quarter teaspoon of dried yeast onto the water remaining in the measure and stir to make the yeast and water mix for blending with the flour. The art of hand-made (artisan) bread is in the way that the yeast and water mix are slowly blended with the sifted flour so that each cell is hydrated and catalyzed with enzymes.

To blend, make a volcano in the bowl and use the tips of three fingers to mix small amounts of the yeast and water with the flour, taking care to always stir in the same direction. Continue blending, widening the blend circle, until all of the yeast water is used. Finally, blend in the salt water until there is no dry flour and you have a moist, stringy dough in the bowl. Bread experts describe how the strands are gluten and yeast strings, where the breakdown of complex carbohydrates into more digestible energy foods begins.

The next stage is to leave these to do their work. Cover the bowl with a moist cloth and rest at room temperature for 10-12 hours. In the evening, move the bowl of a now risen mess to the fridge to stand over night. Yeast works during the warmth of the day and ferments during the cool of the night. The combination of warm and cold fermentation reduces complex carbohydrates to more readily digestible forms.

Preheat a bread pot in an oven to 220 degrees. Carefully tip the dough into the pot and bake with the lid on for 15-20 minutes. Remove the lid and bake for a further 30-40 minutes at 220 degrees until golden brown. Remove from the pot and tap the base crust to see if it is fully cooked. Allow to cool for about an hour before cutting.

Healthy bread should have a crunchy/chewy crust, lots of variously sized holes, a shiny crumb and a complex nutty flavour. All breads are more satisfying and best digested with a thin spread of butter.

Preparing vegetables for drying in the University of Fort Hare Agri Park, Alice, Eastern Cape (Photo ELRC)

Putting the whole picture together

Once the *mahewu* was made, it was tested again for starch and reducing sugar. This time, both starch and reducing sugar were present. The sugar came from the action of the amylase in malt, which digested starch in the porridge.

4.5 Heritage and social innovation

The social innovations rooted in the rich Xhosa heritage around fermentation are also reflected in **Chapter 8**, namely:

- Artisan Bread
- Hand washers
- Honey
- Amahewu

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Chapter 5
Agriculture

5.1 Recovering traditional agricultural knowledge and practices

Introduction

The work Regional Centres of Expertise on Education for Sustainable Development(RCEs) have done with southern African knowledge practices and innovations in agriculture is now seen as critical for tackling the challenges of genetic diversity, pest and disease control, soil erosion, soil fertility loss, agricultural productivity and climate change. Acknowledging these values in traditional agricultural knowledge, the United Nations Food and Agriculture Organization (FAO), recently noted "The promotion and protection of traditional and local food and agricultural knowledge will require international, intercultural and interdisciplinary approaches, communication and cooperation," (FAO, 2009, p. 9). While traditional agriculture is still being practiced in many parts of the world today, the main focus of this chapter is southern Africa. The discussion is largely located in the pre-colonial period, before the introduction of modern agriculture and other non-agricultural practices, such as displacement of local populations and their practices.

Traditional agriculture in southern Africa

Traditional agricultural practices in southern Africa were characterized by shifting cultivation and livestock-keeping (Harry, 1938). Livestock provided food, clothing, transport and manure. In mainland southern Africa, the main crops were finger millet, sorghum, pearl millet, groundnuts and other minor crops. Shifting cultivation involved the use of axes to clear bushes and hoes for digging. Crops were planted in a piece of land from three to 10 years before moving to another area and leaving the land fallow. Wetlands were cultivated in drought years.

Traditional agriculture utilized genetic diversity, and produced ecological services and enough food for consumption and social functions, such as traditional ceremonies for people in southern Africa. In one survey of Northern Rhodesia (now Zambia), as many as 100 varieties of subsidiary crops were identified in an agro-ecosystem (Harry, 1938). Food production was supplemented by hunting wildlife and gathering fruits and honey, especially in the semi-arid regions. The indigenous crops that were grown included sorghum and bulrush millet.

BOX 1
Features of traditional farming practices

- High species numbers and structural diversity in time and space;
- Exploitation of a full range of micro-environments;
- Effective recycling of plant nutrients;
- Reliant on biological interdependence, resulting in high productivity and biological pest control;
- Reliant on local resources,
- Intercropping, including wild species in production systems, and trees, shrubs and herbs for food, fuel, timber and medicines;
- Risk minimization through planting several species and varieties of crops;
- Farmer seed saving, multiplication, sharing and trading; and
- Ecosystem conservation through extensive and rotational grazing, with mixing of cattle, goats and sheep that prefer different plant species and parts (Altieri, 1999, Platform for Agrobiodiversity Research, 2011).

Livestock included cattle, goats and sheep. Bananas, wheat, and sugar cane were introduced by Arabs who settled in the East coast in the 7th century and traded with India. Portuguese enriched Africa's agriculture with ground nuts, sweet potato, cassava, and maize introduced from the American colonies. Cassava provided a famine crop, which would flourish under conditions unfavourable to grain. The Portuguese later (from 1820) introduced coconuts, cloves and cotton (Harry, 1938). In Madagascar, traditional farming methods vary according to location, population density, climate, soil quality and water availability. In the central highlands, where population density is high, intensive rice production is practiced. The Betsileo people who live and farm in the central highlands plant several rice varieties that are sown at different times – and grow some rice varieties during the rainy season and others during the dry season.

BOX 2
Zambia: *Chitemene*

Traditional rules governed the use of natural resources and prohibited the burning of trees. When bushes were cleared in practices such as *chitemene* (slash and burn), ash from burnt bush was spread in the field for manure. For example, in Zambia, where *chitemene* was practiced, ash was used for enriching the soils with phosphate and potash, and changing soil from slightly acid to alkaline. In non-forest areas *chitemene* involved the mounding of weeds and trash to form the foundation on which plants were grown (Harry, 1938, pp. 879-880).

Soil loosening was minimal because the hoe allowed shallow cultivation, thus reducing sheet and rill erosion. Intercropping was commonly practiced and allowed the growth of good ground cover, which protected soil from erosion. Soil fertility was built through mulching of weeds, burnt crop residues and construction of soil bunds, stone bunds and ridges. The farmers also used crop rotation for soil and pest management. For example, in Tanzania the Matengo people who live in highlands have cultivated steep slopes for over a century using a grass-fallow tied ridge systems to grow grain, legumes and root crops followed by a fallow period in a rotational basis (Platform for Agrobiodiversity Research, 2011).

Food security and trade

Food security was ensured through various means, one of which was to have food reserves at family and community levels. Traditional leaders were the custodians of community reserves and the food came through three streams: traditional leaders' fields that were cultivated by his subjects; grain offerings from subjects; and cultivation of special fields near his capital, Zunde raMambo in the Munhumutapa Kingdom, which covered the whole of Zimbabwe and some part of Mozambique,

BOX 3
Lesotho: Machobane

The traditional Machobane Farming System ensured more than two harvests per year. Its features include:

- Use of organic fertilizer, which is locally produced;
- Ensuring perennial vegetation cover;
- A seasonal cropping pattern which includes nitrogen fixing legumes, cash and food crops; and
- Natural pest control and preservation of natural pest predators (Machobane & Berold, 2003).

Malawi and South Africa (Harry, 1938; Mudenge, 2011). One of the most important post-harvest technologies that was employed by the Munhumutapa people were air-tight, stone-raised granaries, which enabled the small grains to last between three and 10 years. This was long enough to maintain food security during the nearly-once-every-five-years minor droughts, and the about-once-every-decade severe droughts (Mudenge, 2011).

Many scholars note that during the 19th and 20th centuries, indigenous populations produced enough food to meet the needs of new mines and towns. For example, during the second half of the 19th century the Basotho were exporters of grain to the Kimberly mines in South Africa. In 1873, they exported 100,000 bags of grain alongside other agricultural produce such as mohair and wool (Boehm, 2002). A Portuguese named Antonio Bacarro notes that during the 17th century the people of Munhumutapa Kingdom had abundant food in the form of "millet, some rice, many vegetables, large and small cattle, and many hens" (Mudenge, 2011, p. 162).

Marginalization of traditional agriculture and erosion of knowledge

The introduction of a market economy and taxation drove many indigenous farmers to abandon farming and seek employment. The change took away able bodied men who traditionally climbed trees and cut off branches to be burned for ash. Those who remained were less able to do those jobs and new tools brought the cutting of whole trees, habitat change and soil erosion. For example, the migration of men from Lesotho to work in the South African mines caused a decline in agricultural production in Lesotho, leading to the country's

Rural homesteads in the Eastern Cape near the coast (Photo ELRC)

transition from a "granary to a labour reserve" by 1930 (Boehm, 2002). The other reasons for the widespread decline of agriculture were soil erosion, population pressure, maize mono-cropping, and pests.

Traditional agriculture also lost traction among many farming communities in the region because it was stigmatized by colonial governments, who wanted labour in emerging industries. Similarly, the provision of agricultural inputs to increase productivity and the grabbing of land from the local farmers by colonial settlers did the same. The appropriated arable land was largely used for commercial agriculture (Woodhouse, 2012). The limited land for shifting cultivation was a further restriction (Harry, 1938) and growing populations and increased demand for agricultural raw materials further undermined the practice and development of traditional agricultural practices. All of these changes contributed to traditional knowledge – which was historically passed on orally and by shared practical experiences between generations – being lost due to modern society's demands of the market economy.

However, despite the loss of traction in the relentless drive of change, some important traditional knowledge and patterns of practice have survived. In some social and ecological environments, it survived because high-input external modern agriculture that was being promoted to replace it became too expensive for the resource-poor farmers and began to fail as it was not suited to the agro-ecological conditions. At the same time, the disruptions did not touch every community and some of the traditional agricultural knowledge was passed on anyway. In many cases, women who remained in villages and rural communities assumed greater roles in keeping, developing and passing on knowledge, practices and innovations. Local agricultural innovators such as Machobane in Lesotho (**See Box 3**) and Dr. Chinkhuntha in Malawi kept traditional knowledge alive. Agricultural researchers and social scientists have also drawn attention to and supported the survival of traditional agricultural knowledge and innovative practices.

A revaluing of traditional agriculture

There are many drivers behind the revival of traditional agricultural knowledge and practices in southern Africa and beyond. These include and are not limited to:

- Social and ecological sustainability interests, including self-reliance and improvement of the ecological resource base, and the re-introduction of local and indigenous species and varieties back into the genetic pool of domestic crops and animals (Machobane & Berold, 2003; Mukute, 2010);

BOX 4
United Nations CBD

Internationally, the United Nations Convention on Biological Diversity (CBD) of 1992 was a critical turning point for the recognition of different forms of traditional and indigenous knowledge heritage practices. It encourages signatories to respect, preserve and maintain indigenous knowledge, innovations and practices for the conservation and sustainable use of biodiversity

- Cognitive justice, which underlines the right of different knowledge systems and their associated practices, livelihoods and ways of being to co-exist (Visvanathan, 2006). This has also been augmented by the rise of agricultural research and development orientations that value multi-disciplinary, and multiple culturally rooted practices where local farmers are viewed as co-generators of knowledge and innovation, not as mere consumers; and where the intended outcomes are not technology transfer, but increased capacities to learn, innovate and change (Scoones, Thompson and Chambers, 2008);

- Climate change and adaptation strategies show that communities have been using agro-biodiversity to manage climate change (Platform for Agrobiodiversity Research, 2011). This has been accompanied by the realization that a narrow range of agricultural species that are being promoted by modern agriculture increases vulnerability to climate change (World Bank, 2004);

Urban garden in RCE Makana (Photo ELRC)

- The recent push for Food Sovereignty as a pre-condition for Food Security has also raised the importance of recognizing and building on traditional agricultural knowledge. The Atitlan Declaration of Food Sovereignty describes it as the right of peoples to define their own policies and strategies for the sustainable production, distribution and consumption of food, with respect for their culture and their own systems of managing natural and rural areas (Diaz, 2005); and

- Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS), which has resulted in the search for nutrition-related and medical solutions, some of which have been found in traditional foods. Traditional and neglected crops have been tapped into as an agricultural asset that enriches local diets in the fight against HIV/AIDS. For example, Small grains such as millet, which were grown under traditional agriculture, are rich in nine kinds of amino acids that are important for maintaining and improving human immunity, which are critical for addressing HIV and AIDS. The amino acids include leucine, valine, lysine, theonine, methionine and cysteine (Acquaah, 2002).

Some of the main principles of traditional agriculture that are being drawn on to improve current agricultural practices include: the use of renewable resources; conservation of soil, water, energy and agro-biodiversity and recycling nutrients; managing

African green covu kale from Zimbabwe (imifino)
(Photo ELRC)

whole ecosystems and ecological relationships, diversifying landscape use and adapting farming practices to farm ecology; agro-forestry; indigenous crops; and placing value on local knowledge and on the health of people and their environments.

It is important to point out that the survival and development of traditional agricultural knowledge in southern Africa has been inspired by many factors and groups of people. At the centre of this retention, appreciation and even enrichment is a growing realization that accumulated wisdom is a critical resource upon which to build solutions to tackle current and emerging issues. Those who believe in the African renaissance have been making this point for decades. The challenge, which is also an opportunity, is to keep looking back in order to march forward along an enlightened path of agricultural learning, research, practice and development.

5.2 Traditional vegetable harvesting and processing

Traditional leafy vegetables comprise a major dietary component of indigenous families in southern Africa, accompanying the main staple starchy carbohydrate of the everyday meal, usually *sadza*, *isitshwala* or *ipapa* (Shona, Ndebele/Zulu and Xhosa terms respectively for stiff porridge of the cereals maize, sorghum and millets). In concurring with this observation, Van Wyk and Gericke (2000, p. 63) contend that "green vegetables are not far behind the cereals in terms of their importance as sources of food in southern Africa". Traditional leafy vegetables include a diversity of wild, cultivated and weedy plant species whose leaves are consumed by local communities. They are called *muriwo* (Shona), *umbhida* (Ndebele/Zulu), *imifino* (Xhosa). Fresh vegetables are preferred when available in season. However, for the drier off-season winter months and for the drought periods, vegetables are processed for long-term storage and used when required as a contingency measure. Traditional leafy vegetables contribute significantly to household nutrition and food security, particularly during droughts and against the current background of increasing climate change effects (Shava et al 2009).

Harvesting wild leafy vegetables

Wild leafy vegetables are either harvested from the wild or retained as selectively conserved 'weeds' in the fields for their value as food plants. Most of these wild leafy vegetables are broadly distributed and abundant during the wet rainy season. They are therefore used by many indigenous communities as food.

The collection and preparation of wild leafy vegetables was and is currently still mainly done by women and children; hence, in many communities, the custodians of this heritage are women. However, the heritage of wild leafy vegetables is under threat due to the fact that they are now shunned as 'poor man's vegetables' associated with poverty and a low status (Chweya & Eyzaguirre 1999, Shava 2000). This is despite their preferred tastes and good nutritional value. However, the popularity of some of them is growing due to the onset of HIV/AIDS and their recommendation as good sources of nutrition, though this comes with some stigma of the disease. Also, the drive towards traditional diets and herbs is a positive contributing factor to the continued use of traditional leafy vegetables as it enables conservation of such heritage through use. Some of the popular traditional leafy vegetables are finding their way into urban markets, thereby providing a means of livelihood subsistance for rural communities.

BOX 5
Wild leafy vegetables include the following:

Local Names	Scientific names	Use/Preparation
Mowa (Shona); imbuya, utyuthu (Nguni); pigweed (English)	*Amaranthus hybridus* and *Amaranthus thurnbergii*	Leaves cooked.
Mhuu, kanzota, nhungunira (Shona); ucucuza, umhlabangubo (Nguni); blackjack (English)	*Bidens pilosa*	Leaves cooked.
Mubvuzandadya, mudyandakahwara (Shona); imbilikicane (Nguni)	*Chenopodium album*	Leaves cooked.
Mutsemwatsemwa, musemwasemwa, mutyangetyange (Shona); spindle pod (English)	*Cleome monophylla*	Leaves cooked.
Derere renyenje, gwisha (Shona); idelele, isileleda (Nguni);	*Corchorus tirdens* and *C, trilocularis*	Leaves cooked.
Purselane (English)	*Portulaca oleracea*	Leaves eaten raw.
Igwanisha/e (Xhosa), spekboom (Afrikaans)	*Portulacaria afra*	Leaves eater raw.
Musungusungu (Shona), umsobo (Nguni)	*Solanum nigrum*	Leaves cooked. Ripe fruits/berries eaten raw.

Cultivated traditional leafy vegetables

Some traditional vegetables (both indigenous and naturalized) are cultivated crops. These are normally eaten fresh, but can also be dried and preserved for longer periods. Knowledge of cultivated leafy vegetables and the sustenance of traditional leafy vegetable agrobiodiversity (through maintenance and exchange of seed varieties) is the domain of women.

BOX 6

Eastern Cape stampot, isigwamba or bubble 'n squeak

Ingredients:

- Selected green leafy vegetables
- Mashed potato or maize meal
- Cheese and/or sausage
- Salt and pepper to season

Directions:

Pick a selection of leafy vegetables from the garden. Wash thoroughly and chop finely to fill a thoroughly cleaned iron pot, taking care to recycle any stalks in a compost bin or worm farm. Spinaches and kales are often used, adding a few celery leaves or parsnip tops. At times some *imifino* (wild greens) can be added, the spontaneous leafy plants that often germinate from a scattering of dry kraal manure as compost.

Most greens are traditionally well steamed in their juices and in an iron pot. Modern science illustrates that this practice produces high levels of metabolic iron (Fe^{++}).

Concluding the dish is a simple matter of adding mashed potato or maize to the steaming leaves. Season to taste and stir slowly with a wooden spoon until well cooked. For a one-pot meal, top with some grated cheese as a great vegetarian dish or stir in some diced sausage.

In modern days, more leafy vegetables are grown. However, most of these belong to the mainly exotic cabbage family (varieties of the species *Brassica oleracea* and a few other *Brassica spp*.) such as broccoli, cabbage, kale, mustard, spinach and lettuce. This however reduces the species diversity of available vegetables and has negative implications on traditional vegetable diversity and nutrition.

Preservation of traditional leafy vegetables

Sun-drying is a traditional food processing approach that was mainly used against a background where there were limited modern technologies for preserving vegetables, such as refrigerators and canning. However, it is still applicable in most rural areas even today. The vegetables are blanched in boiling water, spread out and sundried (*kufusha muriwo* in Shona, *ukucaya* in Ndebele) on a flat rocky outcrops (*ruware* in Shona, *idwala* in Nguni) for later use. The resultant dried vegetables product was called *mufushwa*. The dried vegetables can be preserved and stored for long periods of time and were the main vegetable source to tide families through the dry seasons.

Modern sun-drying approaches include use of small wire or plastic mesh netting on a constructed platform to spread the vegetables. Vegetables can also be dried through exposure to controlled heat. Sun-drying is also being applied to exotic cultivated vegetable varieties.

BOX 7

Traditional cultivated vegetables in southern Africa include:

Local Names	Scientific names	Parts used
Derere rechipudzi (Shona); idelele, isileleda (Nguni); Okra (English)	*Abelmoschus esculenta*	Green fruits cooked with soda or 'hundi' (ash) into slimy relish. Green fruit can also be cut and sun-dried for later use.
Tsunga	*Brassica carinata*	Leaves cooked as vegetable on their own, with peanut butter or with meat. Leaves also sun-dried for later use. Plant cherished for its slightly bitter/ pungent taste.
Nyevhe, nyovhi, rune/i, tsuna,suna (shona); ulude (Ndeabele); spider flower (English)	*Cleome gynandra*	Leaves cooked as vegetable on their own, with peanut butter or meat. Leaves also sun-dried for later use.
Mugaka, mushonja, mutete (Shona); amag/ kaka (Nguni; spiny cucumber (English)	*Cucumis metuliferus*	Young leaves cooked as a relish. Spiky green or ripe fruit eaten raw.
Moboora, mutikiti (Shona), ibhobola(Ndebele); pumpkin, squash, marrow (English)	*Cucurbita pepo and Cucurbita maxima*	Leaves, flowers (*mangare*) and and young fruits cooked in cream (*ruwomba*) or mixed with peanut butter. Leaves and flowers also sun-dried for later use. Ripe fruit cooked as a meal. Seed roasted as a meal.
Mapudzi (Shona), ikhomane (Nguni); bottle gourd, calabash gourd, butternut (English)	*Lagenaria siceraria*	Young leaves cooked and eaten as a relish. Fruit cooked as a meal. Seeds roasted as a snack.
Munyemba, nyemba (Shona); indumba (Ndebele): cowpea (Engish)	*Vigna unguiculata*	Leaves cooked as a relish. Leaves sun-dried and stored for later use. Green pods cooked fresh or sun-dried for later use. Dried bean seeds cooked as a relish, usually after soaking until the seeds imbibe water.

Traditional fishery using dug-out canoes

5.3 Traditional ways of managing the fishery

The Malawi fishery is classified into small-scale fisheries, called traditional or artisanal fisheries, and large-scale (commercial) fisheries with large capital investments (GoM, 2007). The small scale sector usually uses traditional methods of fishing but contributes to more than 85% of the total fish catch and makes up around 90% of the fishers. The history of formal fisheries management in Malawi dates back to before the colonial era and can be divided into three main forms: the traditional fisheries management system, the centralized management system and the participatory fisheries management system (Donda and Njaya, 2007). The management systems have been evolving over a long period of time in fisheries management paradigms. During pre-colonial times (before the early 1900's), exploitation of most fish stocks was limited only by a fisher's access to the labour needed for the construction, maintenance and use of fishing gear (Russell et al 2007).

They used traditional nets made of tree fibres. These had several advantages as compared to manufactured nets: they were heavier and controlled the speed of the net as it was dragged manually; the nets were handmade and the mesh sizes were bigger thereby allowing more small fish to pass through, compared to machine-made nets; and people could use manpower to paddle from one point to another. This type of fishing resulted in limited distances being covered during fishing. In addition, dugout canoes could only carry a certain weight of fish, thereby limiting the amount of fish one could catch.

Traditional chiefs used to enforce regulations focused mainly on the protection of the breeding season of fish (e.g. yearly spawning areas where some fish species migrated from lakes to streams to spawn or a general breeding season for all fish species). People were advised to stop fishing during the rainy season from November to February to concentrate on farming. All the fishing nets were withdrawn from the lake until the next fishing season. After four months, when the breeding season was over, the chiefs allowed fishers to start fishing again. Any fisher contravening the rules and regulations set by the village leaders was disciplined and charged by the traditional leaders (Donda and Njaya, 2007). People were only allowed to fish during the off-season when there were traditional gatherings, celebrations, or funerals. People would be given the opportunity to gather food but would then be required to return all their fishing gear to their homes. The systems controlled entry to the fishery during fish breeding season. Chiefs also controlled people coming from other areas to fish and land in their areas. Fishing activities were monitored by local leaders who controlled illegal fishing and entry to the fishery.

The use of traditional fishing gear (e.g. fish traps "mono"; hand line) is enforced by the fishermen on their fishing grounds. They protect the area from gear that is not environmental friendly (e.g. motorized boats as they risk spilling oil on littoral fishing grounds used for breeding and young fish feeding).

BOX 8

Leguminous species in agroforestry

Authors: Marlene Chikuni and Sosten Chiotha

The belief that crop farming is not possible where there are trees was proved false by farmers in Africa who have been practicing agroforestry for time immemorial through integrating nitrogen-fixing trees, such as certain acacia species (especially *Faidherbia albida*) into their cropping system. Building on this approach and through collaborative efforts in Malawi, RCE members worked with farmers to plant crops such as maize in an area that had been earmarked for afforestation. Instead of waiting for trees to grow up into a woodlot or a forest area by excluding crop production, the experience from Zomba is that tree seedlings and crops can be planted at the same time. For fast growing trees, such as certain acacia trees the farmers have one year to grow crops; for slower growing trees such as *Faidherbia* (locally known as 'm'bawa'), the farmers would have to wait for a minimum of five years before the trees were established and wouldn't interfere with crop production.

This arrangement, conducted in collaboration with farmers, would help maximize land use in a country like Malawi where population density is high and there are competing land use demands. Farmers have found themselves producing high maize yields from their small plots as they inter-planted their crops in between rows of tree seedlings. Skepticism turned into enthusiasm for these small-scale farmers, who normally face challenges of inadequate land, degraded soil fertility and the harsh realities of deforestation, as they experienced more food production for their families from their own efforts.

Chancellor College, a constituent college of the University of Malawi (UNIMa) through one of its research centres, Leadership for Environment and Development (LEAD) Southern and Eastern Africa (SEA), has been collaborating with other RCE stakeholders, such as the Forestry Research Institute of Malawi (FRIM), Worldfish Centre, local farmers, local schools, local NGOs and local government departments, to realize these achievements.

Through this collaborative work the Zomba Regional Centre of Expertise is involved in community action on afforestation, reforestation, sustainable small-scale farming, improved fish processing and marketing, and briquette making as well as research, policy briefs and capacity building in cross cutting issues such as climate change. The Malawi Institute of Education (MIE) can also play a key role in ESD training, curriculum innovation and materials development as it is involved with teacher education, curriculum development, and teaching and learning resources production.

BOX 9

Permaculture and indigenous farming systems innovation

Author: John Nzira

In the natural environment food plants grow and develop in communities of other plants, within an ecosystem in which species interact with each other in beneficial ways. Plants provide biomass and protect soils, improving the soil nutrients, texture and structure. Legumes are an excellent plant to feed the soil, providing specific nutrients like nitrogen and repelling pests like nematodes. The following innovations have emerged from traditional methods in small-scale farming:

Ground Covers – Mulch is a natural blanket for soil. In a natural system the soil is covered by plant canopies, dried leaves, grass, and creeping plants. Vigna unguiculata, Cowpea, is a drought-tolerant and warm-weather ground cover crop. It fixes atmospheric nitrogen through its root nodules, and it grows well in poor soils. This makes cowpeas an important component of traditional intercropping systems, dried stalks of cowpea is a valuable by-product, used as animal feed or stored as natural fertilizer.

Station planting – Some crop residue is left in the field after harvesting crops. If there is enough grazing, livestock are not allowed to come into the field to eat them. Just before rains arrive, small pit beds of about 20cm3 are prepared in the field and fed with compost. With the first rain, the seeds are planted on the edge of the pit. The plant sends roots into the compost zone; water is trapped there as well. The soil is not turned and the crop residue acts like a blanket for the soil. It holds moisture, returns nutrients to the soil and sustains crop growth even with the increased rainfall variation that is being brought about by climate change.

5.4 Indigenous knowledge as a key to sustainable aquaculture

Indigenous knowledge is the unique knowledge confined to a particular culture or society. It is also known as local knowledge, folk knowledge, people's knowledge, traditional wisdom or traditional science. This knowledge is generated and transmitted by communities, over time, in an effort to cope with their own agro-ecological and socio-economic environments (Fernandez, 1994; Costa-Pierce, 2002). It is generated through a systematic process of observing local conditions, experimenting with solutions and re-adapting previously identified solutions to modified environmental, socio-economic and technological situations (Brouwers, 1993). Indigenous knowledge is passed from generation to generation, usually by word of mouth and cultural rituals, and has been the basis for agriculture, food preparation and conservation and the wide range of other activities that sustain a society and its environment in many parts of the world for many centuries. Indigenous knowledge plays a very big role in sustainability of agro-systems since it is viewed as an institutionalized social responsibility of the whole society.

Aquaculture has traditional knowledge systems and cultural, family and community roots. There is a saying which states: aquaculture has a philosophical base in the East and a scientific base in the West (Borgese 1980). Most publications on aquaculture refer to this long history of fish culture in Asia. For example, the "Classic of Fish Culture" was written around 500 BC by Fan Lei (Pillay, 1990). This long history points to fact that in the East aquaculture is part of daily life and is intertwined in social and economic development. Therefore, science must make this culture more effective as a way of improving daily life by providing food and employment.

In Africa, most especially the sub-Saharan region, small-scale fish farming is a rather recent activity. The effective start of aquaculture in most of sub-Saharan Africa was in the 1950s under the impetus of the various colonial administrations (FAO, 2004). Despite being a recent venture, African fish farming within this century has several innovations as regards to indigenous knowledge and fish farming practices.

Many rural farmers have developed technological innovations and applied indigenous knowledge in order to meet livelihood necessities. In the aquaculture seed production sector, some examples include: hatchery technology (bamboo-based fry rearing technology), self-recruiting broodstock of catfish species during rainy season, nursing techniques such as the removal of egg stickiness by washing with milk prior to nursing, application of fermented manure including oil cakes, stunting fish technology, and local methods for fish collection and transportation. Many of these innovations and indigenous ways of doing things still remain undocumented.

Brood fish is considered to be at the heart of the hatchery, management of broodstock is the key of quality seed production. In sustainable aquaculture broodstock are recruited through subsequent generations using natural breeding techniques. Other farms recruit brooders from natural rivers and lakes and stock them in ponds for natural seed production. Traditionally farmers have knowledge of breeding seasons and parent fish migrations to breeding areas. The breeding grounds are conserved traditionally through custom by-laws in respective villages. In case of catfish *Clarias gariepinus*, farmers wait for the rainy season and the self-restocking of parent brooders to their ponds. The African catfish uses atmospheric oxygen as part of its breathing mechanism, therefore during the rainy season these species migrates from one water body to another. This is more effective in areas like the lower Shire River, which is prone to floods.

Maintenance of broodstock is mainly done through natural feeding regimes, whereby brooders are reared using the application of compost manure from agriculture farm residues. Most farmers construct a compost crib at the corner of their ponds, to ensure direct supply of nitrogen nutrients into their ponds. This technique not only supplies the farmers with the much needed protein but also maintains their ecosystem in balance. The fertilized water in the ponds is used as irrigation water for the vegetables during the winter months, when most of the farmers have enough time for non-rain-fed crops. Predation of brood fish is mainly done using scarecrows made out of used clothes and grass. Other farmers also construct a bamboo fence in the middle of their ponds; this mainly prevents otters from crossing one part of the pond to the other.

While almost all the development actors have now recognized the value of participatory approaches, it is not always noted that indigenous knowledge provides the basis for grassroots decision-making. Furthermore, this knowledge offers new models for development that are both ecologically and socially sustainable. Therefore, it is a well known fact that development activities that work with and through indigenous knowledge have several important advantages over projects that operate outside of them. One classic example is "non-scientific" polyculture (mixed cropping) versus "scientific" monoculture. The benefits of traditional polycultures were ignored by agricultural researchers for years, though recently research concerning polycultures has blossomed and some of their benefits are clear. These lessons the local people have learned through millennia of accumulated experience and survival are invaluable in designing modern development plans. Therefore, policymakers should pay greater attention to indigenous knowledge in the development process at policy level.

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Chapter 6
Biodiversity

6.1 Conserving and growing indigenous plants in southern Africa

Useful indigenous plants (herbs, shrubs and trees) are commonly found in the vicinity of people's homes and in their fields. This is mainly a result of their selective conservation or cultivation for use by community members.

Indigenous conservation of fruit trees and shrubs

In Zimbabwean communal farming lands, for example, desirable fruit trees are spared when clearing land for crop cultivation (Campbell 1987). This practice has been sustained despite advice from agricultural extension officers to the contrary. Such trees and shrubs include: mutamba, umkhemeswane or monkey orange (*Strychnos cocculoides* and other *Strychnos* species); the mutohwe, uxakuxaku or snort apple (*Azanza garckeana*); mutufu or crooked false medlar (*Vangueropsis lanciflora*); munhunguru, umqokolo or batoka plum (*Flacourtia indica*); mutsvitsvirondo or kei apple (*Dovyalis caffra* and *Dovyalis zeyheri*); muzhanje, umqokolo or wild loquat (*Uapaca kirkiana*); munhengeni, umthunduluka or sour plum (*Ximenia caffra*); musawu or jojobe (*Zizyphus mauritania*); munyii, inyiye or bird plum (*Berchemia discolor* and *Berchemia zyheri*); mutsvubu, umtshwankela or chocolate berry (*Vitex payos*); muwuyu, ukhomo or baobab/cream of tartar (*Adansonia digitata*); mukute, umdoni or water berry (*Syzigium guineense*); muroro, ububese or wild custard berry (*Annona senegalensis*); musika or tamarind (*Tamarindus indica*); and muhacha/muchakata, umbola/umkhuna or mobola plum (*Parinari curatellifolia*). The conservation of these indigenous fruit trees and shrubs is directly related to their dietary (nutritional) importance. These species have become part of the modified cultural (agricultural) landscape.

The development of fruit tree cultures

The presence of these plants near the home or in the field served to educate youth on the identity and seasonal availability of edible plants in the wild. In the case of marula trees, picking the fruit by breaking off branches stimulates larger fruit size. In this way people have inherited knowledge of wild fruit trees with the selective conservation of wild fruit species often having been an initial step towards their domestication. Most indigenous fruits are rich in fibre, reducing sugars, minerals and vitamins. Indigenous fruit trees and shrubs, with their varying fruiting seasons, can provide us with a continual supply of fruit throughout the year.

Yellowwood‚mother tree' outside Makana Meadary (Photo ELRC)

Indigenous conservation of sacred and useful plants

Some indigenous plants are considered sacred and it is taboo to cut them down. Some of them are associated with myths that their use will lead to death, family destruction, arguments and bad luck (Shava & Mavi 1999). The rain tree, *muriravanhu* or *icitha-muzi* (*Lonchocarpus capassa*) has been preserved even on cultivated land because cutting it down and using it for firewood is believed to bring family disputes. *Mukonde*, *umdlondlo* or the tree Euphorbia (*Euphorbia ingens*) is not cut down because it is believed to protect the home or field from lightning strikes.

Growing of indigenous plants in local community areas

The practice of growing indigenous plants has been in existence among indigenous communities over time. Various methods have been employed in this practice, including growing from seed, collection of seedlings and vegetative propagation. Below are some examples of such practices in some communities.

1. **Live fencing**
   A number of indigenous plants are grown as live fences around homes, around kraals and around gardens. Some of them are so used because they are inedible, for example *urimbo*, the rubber hedge euphorbia (*Euphorbia tirucalli*), which is easily cultivated from cuttings. *Gavakava*, *ikhala* or the bitter aloe (*Aloe ferox* and other Aloe species) is similarly used as a low live fence because of its bitter taste which is deterrent to livestock. Mugan'acha, *isigangatsha* or the live-long tree (*Lannea discolor*) is used as a live fence because it is easily propagated from shoot or branch cuttings and has edible fruits that are used as a snack and also attract birdlife.

2. **Medicinal plants**
   Some medicinal plants are grown around the home for easy access, such as the aloes used to treat wounds and burns; *umhlonyane* (*Artemisia afra*) used to treat fever; and *zumbani*, *inzinzini-ba* or *umsuzwane* (*Lippia javanica*) used to treat fever.

3. **Fruit trees**
   Some trees are grown around the home for their fruit. An example is the *muzhanje* or wild loquat (*Uapaca kirkiana*). This is a particularly difficult tree to grow due to its strong association with its natural habitat. After several failed attempts to multiply the tree at the botanic garden in Zimbabwe for distribution to local communities as a fruit tree, a local man was found to have been growing it successfully. His advice was to use soil from the tree's natural environment or, alternatively, to dig seedlings from their natural environment with their surrounding soil (˝bringing the forest into the home" in the words of the local men). It was later learned that the plant has an association with specific social mychorrhiza that forms a sheath around its roots and supplies it with essential nutrients for its establishment and successful growth (Rhamachela 2006).

When growing indigenous plants it is important to remember that many indigenous plants are area

specific, which is to say they only grow in certain environments and may not successfully thrive outside their natural ecological habitat. Indigenous plants are influenced by climatic conditions (rainfall availability), terrain and soil types.

The culture of growing indigenous fruit trees from seed is also common practice among indigenous community members, especially for those that easily grow. Such trees provide a source of fruit for future generations to come.

The emergence of indigenous plant gardening and landscaping

Gardening and landscaping with indigenous plants as an alternative to exotics is becoming more popular in the urban context, both in homes and in institutional settings. This is increasing with the drive for environmentally friendly gardening and in support of conservation. Indigenous plants are adapted to local conditions and therefore can thrive on natural rainfall without additional watering, as well as on local soils without any additional fertilizers or use of pesticides. They therefore need minimal management once established. This is especially essential for water conservation in a time of water shortages and climate change effects. Besides adding natural colour, scent and seasonal variety, indigenous gardens contribute towards conserving the natural environment in that they add to the existing natural conservation areas and attract indigenous wildlife (birds, small animal life, insects, etc.). Indigenous plants also have the advantage of generally being non-invasive and not spreading beyond the area in which they are grown. As discussed above, some indigenous plants provide edible fruits as well as natural herbal medicines.

6.2 Turning a yellowwood tree into a forest in RCE Makana

An RCE Makana project was established to encourage people to plant trees in township gardens. RCE Makana team members get trees from the municipality to give to families. Two RCE members in particular, Pikisile Zondane and his colleague Thandoxolo Lungile, teach members of each family how to look after the tree. After a year they go back to the same family to see how the tree is growing. By the end of 2007, RCE Makana had helped families plant more than 400 trees and many of these have survived. The next step was for RCE Makana to establish a tree nursery of its own.

Garth Cambray is a scientist and entrepreneur who works on the outskirts of Grahamstown, producing honey mead and bio-diesel. He is well known in Grahamstown and his face often appears in local and national newspapers. Cambray also knows a lot about yellowwood trees, which happen to be the national tree of South Africa. Zondane was particularly interested in meeting Cambray to hear about his story about mother-tree seedlings. On meeting, Cambray shared with Zondane: "I was always fascinated to see so many little yellowwoods growing beneath the single yellowwood tree on our plot without any other visible tree to cross-pollinate with." He gave Zondane a page of information on the yellowwood tree (*Podocarpus latifolius*).

Zondane, who is a local champion in Grahamstown after initiating the Millennium Tree Planting in 2004, shared his own experiences with Cambray: "I realized that the seeds under my tree had come from somewhere else, and had been brought there by the rameron pigeons who would come to roost in the yellowwood tree and would drop their faeces on the fertile ground below." Zondane was surprised

Islathi (Photo ELRC)

Propagating seedlings in milk cartons

when Cambray gave him another page of information, this time not about trees at all, but about the rameron pigeon.

Cambray continued: "Yellowwood seeds have an inhibitor in the skin that prevents them from germinating until they have been digested by an animal, as this removes the skin. Birds like the rameron pigeon thus play an important role in the germination of new seedlings. I would see the rameron pigeons flying from the direction of a small grove of yellowwoods in the valley to the west of where I live. It was seeds from this grove which were germinating beneath my yellowwood tree. In the past the whole area used to be a yellowwood forest and you can still see the old logging pits for cutting the yellowwoods."

Cambray went on to note how the pigeons brought a variety of other seeds too, like knobwoods, wild plums and loquats. "It's always a surprise to see what's growing," Cambray noted. He and his gardener had been pulling up tree seedlings as if they grew like weeds so he was very willing to let Zandone collect some to propagate for his nursery. Zandone propagated about 40 seedlings in milk cartons.

Zondane had read that it is important to use some forest soil in the potting soil mix when propagating seedlings. He asked Cambray about this and he explained that forest soil contained *Mychorrhizal* fungi. These fungi play a very important role in supporting the intake of plant nutrients by roots. Zondane did some research to find out more about this fascinating relationship and made sure he added *Mychorrhizal* fungi to the potting soil for his seedlings.

Zondane's enthusiasm inspired Cambray to propagate some of these seedlings for planting around his plot: "I am excited about growing these trees as they will have some important benefits. We experience strong westerly winds from Cape Town on our plot because we are on a plateau. In about three years, if we look after the trees well, they will have grown tall enough to provide us and our livestock with shelter from the wind. Another problem is that our cellars keep flooding. This is because the water table is very high on our plot, only a metre below the ground. Because trees take up a lot of water, in some cases as much as 190 litres per day, they should lower the water table and our cellars should no longer flood as frequently, if at all. The most important benefit for me though is that this is a mini reforestation project. There used to be many more yellowwoods growing here, but they have been over harvested. My hope is that in 10 years time we will have another yellowwood forest."

6.3 amaXhosa culture and the dynamics of learning beekeeping

Background to early human/bee interaction

There is very little documented evidence on the early history of beekeeping except in relation to the San people. Historical records used the term 'honey hunting' when describing early interactions of San people with bees. Honey hunting was also depicted in rock paintings at a number of sites in southern

BOX 1
What are *mycorrhiza*

Mycorrhiza describes the mix of micro-organisms in soil that have close associations with plant roots. This relationship is symbiotic. The *mycorrhizal* affect a plant's growth, health and also strengthen the plant against environmental stress. The fungi benefit from the relationship by gaining nutrients from the tree.

Almost all plants need *mychorrhiza* as they release soil resources to the plant and in exchange get energy and nutrients from the plant. The symbiosis means greater productivity under stress for the plant and a steady energy supply for the fungus.

Mycorrhizal associations play important roles in the ecological functioning of ecosystems, as they form an important part of the nutrient cycle. *Mycorrhizal* fungi break down organic nutrients, absorb inorganic nutrients and transport these to the plant. This is necessary for the survival of more than 90% of all flowering plants.

Plants grown in bare soils often perform poorly without the addition of spores of *mycorrhizal* fungi to colonize the plant roots and help with the uptake of soil mineral nutrients. If there are no *mycorrhizal* fungi in the soil (e.g. if the landscape is degraded), this lack can also slow down plant growth.

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Source

Handprints for Change Series, Howick Share-Net

Africa such as Matopos hills in Zimbabwe and Anchor Shelter and Eland Cave in the Drakensberg mountains in South Africa (Crane, 1999).

The rock paintings in these sites show several bee hunting techniques which were learned by the San people in their own social contexts as they were interacting in nature and co-evolving with it. San people used ladders and smokers to harvest honey. Some other artifacts that were noted in written records include trekking bees using droppings, tying a string to a bee, and the use of certain species of birds, such as the honey guide, to find a wild bee nest (Crane, 1999; Marchand & Marchand-Mayne, 2003). Within this early history of honey hunting, bees were considered to be an important source of food, as honey was tastier than wild fruits and a good season of honey production would not coincide with famine (Crane, 1999). People learned these means of survival and passed them on to the next generations, in such a way that some cultures in southern African, including the San in the Kalahari in Botswana, used the traditional honey hunter's prayer, song and dance to depict these cultural practices (Crane, 1999; Marchand & Marchand-Mayne, 2003).

Early honey trade and bee tending

The San reportedly used bags made from antelope skin to carry honey across a pass over the Outenique Mountains (*outenique* being a Khoi word meaning a man loaded with honey or bags of the honey people), to barter it for other goods from the Khoi people (Peagam as cited in Crane, 1999;

Marchand & Marchand-Mayne, 2003). There is evidence of some rudimentary early beekeeping that could have been learned by the San people and Tongas, who lived North of Zululand, by tending and marking natural bee nests and hive sites (F. Gomna, personal communication, October 15, 2009; Crane, 1999). It is interesting to note that some people still considered these forms of bee tending practices to be honey hunting. Even though bee tending and marking hive sites to claim ownership had been widely accepted amongst both San and Khoi people, there were some recorded tensions as some people would rob hives. Crane (1999) highlighted the use of different types of penalties depending on the tribe which had robbed a marked hive. If robbing was done by a San person, it was punishable by death; however, if it had been done by a Khoi person the San man would carry off one of the Khoi's cow or sheep as he believed that his hives were as important as the value the owner attached to his livestock (Marchand & Marchand-Mayne, 2003). The Khoi people were believed to be honey robbers and this form of revenge was acceptable to them as livestock owners, as noted by Crane (1999).

BOX 2
Honey Hunter's Prayer

I am weak from thirst and hunger.
Abo Itse, let me live...
Let me find sweet roots and honey,
let me come upon a pool.
Let me eat and drink. Ho Itse,
give me that which must have.
Great father.

Crane, (1999, p.53).

BOX 3
Honey Hunter's Dance

Look! The people carry honey,
also flesh. They bring it home
to the women who are hungry,
that the women may have food

Crane, (1999, p.53).

Challenges to the adoption of commercial beekeeping

It is important to note that, in amaXhosa culture in the Eastern Cape Province, there are a number of forces that influence the dynamics of learning honey harvesting and trade in honey and its products. The first force of influence that will be discussed in this chapter is the driving away of San people to drier parts of the Kalahari, whilst the second force of influence was the coming of the Europeans.

In addition, cultural beliefs may have influenced the further development of learning beekeeping. There were various beliefs among the amaXhosa culture about bees: some people considered bees to be relatives, and some considered them to be ancestors. Therefore, if a swarm of bees came to their homestead they would brew *umqombothi*, slaughter a cow or a sheep, and conduct a cultural ceremony to appease the ancestors (bees). The ancestors were supposed to leave soon afterwards, as they were not supposed to stay at the homesteads but instead live in the wild. This cultural belief slowed the learning of beekeeping practices in the amaXhosa culture, as ancestors (bees) were not supposed to be boxed and kept at or near to homesteads.

On the other hand, early beekeeping practices by Europeans – the Dutch subsistence farmers called the *'Boers'* in South Africa – were reported by November 1878 in Port Elizabeth (Crane, 1999). It has been suggested that this practice could have been brought from Europe, as the technology of the hives found was the same as the technology developed there (Crane, 1999).

Modern-day beekeeping, its challenges and way forward

Against this cultural backdrop, the practice of commercial beekeeping brought in by Europeans was therefore ignoring cultural norms and beliefs. Modern-day beekeeping faces other challenges. A trainer from Makana Meadery has described her experiences and challenges in training commercial beekeepers in Eastern Cape Province, such as the wide variety of amaXhosa dialects. This made it difficult to produce a single training manual as words like *Phukula*, for example, could mean either honey harvesting or honey hunting. Because of the lack of cultural norms around sustainable harvesting of honey in amaXhosa culture, *Phukula* was generally interpreted as honey hunting. Other cultural beliefs conflicting with the practice included the rule that widowers wear black even though bees hate dark colours; and the destruction of hives in Qoqodela as people believed that bees (their ancestors) were not supposed to be boxed and domesticated but should live in the wild.

During an engagement workshop with locals and some participants from the beekeeping intervention in Hluleka, it was agreed that a strategy of working with local mentors to help deal with such cultural dilemmas was ideal. Local mentors were identified as successful beekeepers who came from a similar heritage and had managed to deal with the cultural challenges to their own commercial beekeeping. These mentors were expected to work with trainers from contracted companies such as Makana Meadery in providing day-to-day coaching.

Mentors also help mediate the challenge of distance between contracted trainers and local communities that were learning beekeeping. That distance had created a gap between the immediate needs of some trainee beekeepers and their ability to get hands-on advice about technical problems, such as bees absconding the hives.

This chapter reveals the significance of understanding cultural, socio-economic and socio-political complexities when trying to implement livelihood improvement interventions in the southern African context. Understanding and tracking historical backgrounds that influence behaviour in particular groups is important. For amaXhosa people, their early interaction with San people, the early coming of the Europeans, the apartheid legislations, and their strategies to resist legislation all have a bearing on their learning of sustainable commercial beekeeping.

BOX 4
Honey: Harvesting or Beekeeping

In our relationship with bees you can either get bee harvesters or bee keepers. Bee harvesters do nothing to improve the productivity of honey, but rather just harvest honey from the bees. Honey can only be harvested to a certain point, after which the whole bee colony will collapse because there is not enough honey left to feed the bees. This can change whole ecosystems because bees are keystone species in flower-dominated ecosystems. Without bees, one loses one of the main pollinators. This has happened in the Transkei; people were harvesting too much honey and this significantly reduced the bee population. This changed the ecosystem from being an insect pollinated, flower filled landscape to a wind pollinated grassland.

Garth Cambray, notable in Makana for his honey projects, has a plan to change bee harvesters into beekeepers.

Bee harvesters, as he explains it, are like thieves – they take what is not theirs and destroy ecosystems in the process. This ultimately negatively affects them, as they will no longer live in land that produces honey.

Beekeepers are more like stewards. Using knowledge of how bee colonies work they can actually increase the production of honey. They then take only the excess honey, like a commis sion, and leave the rest for the bees. The Iliqilika website that explains Garth Cambray's work: http://www.iqhilika.co.za/beekeepingguide2.htm.

"Beekeepers provide rental apartments and cluster housing to bees," notes Cambray. "These homes are called beehives and are designed to be better than wild real estate, as far as the bees are concerned. Bees like to be close to flowers, hence beekeepers often move the beehives from one place where there are flowers to another, so that the bees always have work.

"By working with the bees, beekeepers help the bees lead a better quality of life than if they did not have help. As a result they are able to make more honey, propolis and pollen. The beekeeper can then take a certain percentage of this as rental income in exchange for looking after the bees. If the beekeeper takes too much, the bees are being cheated and they will leave - and then the beekeeper is not a beekeeper as the bees have left."

Reference

Cambray, G. Personal Communication, PhD in Biotechnology, Rhodes University and owner of the Makana Meadery

Micro nursery at RCE Makana (Photo ELRC)

6.4 Traditional pest control

Local communities have employed a variety of ingenious traditional mechanisms to control and eradicate common pests around the home, in their fields and on livestock. Such traditional cultural mechanisms include mainly environmentally friendly mechanical and chemical control. Agriculture is the main livelihood sustenance means for most rural communities. As a result, rural communities have devised a variety of mechanisms to protect their crops, food stores and their seed. These pest control methods form part of the indigenous knowledge and heritage practice.

Pest control for the home

Most traditional homesteads comprised several huts made from thatch, pole and *dagga* (clay). Clay was used to cover the poles in the walls as well as to make the floor. The clay cover provided a layer that deterred wood borers from attacking the wooden poles. The floors, the interior and, at times, the exterior walls of these huts were regularly smeared with a semi-solid mixture of dung, water and clay, called *kudzira nendove* in Shona or *ukusinda ngobulongwe* in Ndebele. The dung, besides serving as an insulating layer to maintain warmth in the hut, also served as an insect repellent. The smoke from the wood fires, especially in the kitchens, also served as an insect repellent as its sooty tar accumulated on the walls and on the grass of the thatched roofs. While this did not serve as a permanent deterrent, it provided protection to sustain the huts when they were in continuous use.

Pest control for seeds

During selection of seed for storage, farmers carefully eliminated any seed that showed pest damage. This mechanical control was a crucial first step that ensured that the stored seed would not be hosting any pest that would then wreak havoc on all the stored seed, rendering it unusable for the next cultivation season.

Seed for most crops, for example maize cobs and sorghum seed heads, was dried and then stored. Traditionally for maize this was done by peeling the cob without removing the sheath and then tying the leaves of the sheath on to a wooden hanging pole positioned across the fireplace, called the *mutariko*. The exposed cob gradually becomes covered by accumulated soot (*chingai*) from the wood fire and thus is protected by the soot against pests, such as maize borers. The same process was also applied toe seed heads of sorghum and rapoko, which were also tied to the mutariko.

Pest control for harvested grain

The bulk of harvested grain and nuts was stored in a compartmentalized grainstore hut called a *dura*. The hut itself was specially designed to store grain. It is built on stone stilts, with huge boulders strategically placed at the corners and centre of the structure. The hut was then constructed over the stilts, with a foundation made of termite resistant wooden logs laid close to each other. The space between the logs was then filled with saplings from termite resistant trees called *mbariro*. Species of choice included the indigenous hardwoods mupane, musharu or mopane (*Colophospermum mopane*), the mitsviri or leadwood (*Combretum imberbe*), the muvanga, umbanga or muwanga (*Pericopsis angolenis*), and the mubavamaropa, umvagazi, kiaat, bloodwood or mukwa (*Pterocarpus angolensis*). The sidewalls and roof were then built around this wooden pole floor structure. The floor and inside walls were then covered with a clay mould. Space was deliberately left between the walls and roof to allow for free air circulation to control humidity and keep the grain dry. The inside of the granary was divided into compartments to store different types of crops (grains, nuts, etc.) using pole and clay. The compartments were then smeared with dung and left to dry before the grain was added. Each compartment would have a small opening on one of the horizontal walls that could be accessed by people.

The grain or groundnuts would normally be covered on top by branches and leaves of insect repellent plants such as zumbani, umsuzwane (*Lippia javanica*); mbarapati, umhobe/ubuhobe or tickberry (Lantana camara); mbanda, imbanje yonxiwa or Mexican marigold (*Tagetes minuta*), zinhuwenhuwe,

Composite picture of the creative possibilities that arise from an understanding of Ishalti practices

umnunkane, inkunzane enkhulu Mexican tea or wormseed (*Chenopodium ambrosioides*), and tsine, umhlabangubo or blackjack (*Bidens pilosa*), as well as gavakava, ikhalo/icena or aloe leaves (Aloe spp.). These plants have chemicals that deter insect pests such as borers, weevils and termites. Plant ash from the fireplace is also mixed with stored grains as an insect deterrent.

Mice and rat control

Mice (*mbeva*) are common pests in the fields while rats (*gonzo*) are common pests around the home. A variety of strategies are used in their control. For rats, the main strategy has been to keep cats that keep them under control. Mice, on the other hand, are a considered a delicacy and they are trapped by tracking their pathways, stopping their burrows, digging them out, or pouring lots of water down their burrows and catching them when they try to exit. Mice are also caught using traditional mice traps or *riva* set on paths to trap the mice (*kuteya mbeva*). The traps are made up of a large flat rock placed at an angle with a stick at its mouth on which peanut butter has been smeared or on which peanuts are tied to; the stick is used as the trigger holding the flat rock up. When the mice nibble on the stick, it is displaced and the rock comes down, crushing the mice.

Pest control in the field

A combination of various methods are used to control pests in the field. Mixed cropping is a common traditional farming practice. Mixed cropping reduces attacks on the main crop by shielding them. Some of the crops in the mixture also serve as insect repellents due to their chemical properties.

Animals such as baboons and monkeys usually attack crops around harvest time. Similarly, flocks of birds attack crops around the harvest, especially small grain crops such as pearl millet, finger millet and sorghum, whose colours change towards harvest, thereby attracting birds. Young boys are usually sent to guard the ripening fields. A small hut is erected in a tree or high place for shelter and as a vantage point from which to see the approaching threat (*kurinda*). The boys are equipped with drums or tins that they beat to scare way the invading

animals or birds. Some use catapults to do this and the stoned birds provide meat if killed. Birds are also trapped with twine attached to seeds (for bigger birds like guinea fowls and sand grouse) or by using *urimbo* or *inofi* (bird-lime) for smaller birds, whose feet or beak gets caught in the sticky lime. For huge flocks of birds such as the red-billed quelea, vertical nets are usually set up at one end of the field and boys scare them off from the other end of the field into the nets. These caught birds all provide meat for the family.

Ripening crops may be exposed to termites or flying ant attacks. Termites are eradicated by digging down into the core of the nest and breaking it up to expose the young and the queen. Once the nest is broken and the queen disposed of, the termite colony is forced to migrate. For the ants, a pot or calabash of water is left open next to the anthill and all the ants fall in and drown. The ants can be fried and eaten as a protein snack.

Beer is used to eliminate some small pest animals such squirrels and bush babies (*mpungunyoni* or *mpukunyoni*). A calabash of beer is placed in a tree next to their burrows. The animals drink the beer and, becoming drunk, either drown in the calabash or are picked up when intoxicated and eaten as food. Small deer such as membwe or duiker, which attack groundnuts and roundnuts, are tracked down and hunted with dogs for meat.

To prevent carryover of insect pests into the next year, the crop residue is burnt in the field, a process called *kupisa mavivi*. This kills any insect pests that were attacking the crops. Fallowing is also practiced for the same reason.

Thorn hedges

Traditional fields and gardens are normally fenced with branches of thorn trees and bushes to deter livestock and wild animals from eating the crops. The branches are closely knit to each other so as not to leave any gaps, a process called *kusosa*. Acacia species (*minzwa* or *ameva*) such as *Acacia karroo* and *mupangara* or *ugagu* (*Dichrostachys cinerea*) are favoured for this purpose.

Pest control for cattle and other livestock

One method of pest control for cattle, particularly for ticks, is to burn bundles of grass and let the smoke waft around the body of the animal. The smoke suffocates the ticks and they fall off from the cattle.

Hornet and bee control

If wasps or hornets build their nests in or near the huts in the field, they pose a threat to human life, as do bees. The most effective traditional way to eradicate them is to tie a bunch of dried grass at the end of a long stick and fire it. The smoke from the burning grass suffocates the insects.

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Chapter 7
Waste

7.1 Wastewater and rubbish dump challenges in RCEs

Wastewater and rubbish dumps are characterizing features of modern societies that reflect and produce much of the environment and health risk in everyday modern life. Sewage, wastewater treatment and waste dumps (i.e. landfills) have thus been given a lot of attention through education for sustainable development (ESD) campaigns to reduce the waste stream and contamination of river systems.

Solid waste management and water quality were amongst the first focus areas to be given attention across African RCEs. In RCE Makana, for example, solid waste problems were pressing, so recycling and the creative use of waste materials were taken up in early ESD initiatives. Waste separation to enable glass, paper and plastic recycling was vigorously promoted along with the development of composting and a small-scale plastics recycling plant. These were set up as small-scale local enterprises in an attempt to privatize waste collection so that a self-supporting waste economy might displace the collection and dumping practices that were costly to the local ratepayers and environment.

The ideals of self-supporting and partially subsidized waste economies were short-lived as initiatives to recycle and establish small enterprises went through cycles of failure. Makana is a small town where the market economy was not supporting collection of recycled products, their fabrication, or transport and sale of recyclables into the national paper, glass and plastics economies. The outcome was a series of failed and struggling small businesses and the accumulation of waste that was not being collected from township households.
With the failure of solid waste businesses and wastewater treatment being similarly stretched by a failing infrastructure, the emphasis on public education increased, with a number of community-engaged initiatives displacing economic initiatives as a strategy to reduce and manage the waste stream and associated ground and water pollution. Some of the ESD waste management activities were inspired by evidence that pre-colonial African societies had effective ways of managing waste. An interesting feature of these small-scale experiments in social learning and change is how they are rooted in heritage practices that were better aligned with natural processes of matter cycling.

Izala: Recycling organic waste at source
In early village homesteads most of the waste was organic so the waste stream and matter cycling

Youth installing a compost bin in RCE Makana (Photo ELRC)

were closely aligned. The daily sweepings and other waste would simply decompose, creating compost, and wild leafy vegetables (*imifino*) would seed on the waste dump (*izala*). With increased urbanization amongst the Xhosa in the 1920s, home composting (*ethutwini*) practices were banned due to health risks. The banning was first initiated in Port Elizabeth where an outbreak of plague had communities living near the harbour relocated to Red Location where refuse collection was instituted.

With the recent failure of small enterprise-driven waste management owing to increasing costs of transporting waste to the city dump, iNqaba yeGolide, a youth activist group, came up with a proposal to reduce the volume of the waste stream. This involved the production of compost for kitchen gardens. They received monthly stipends to re-introduce traditional composting and support the development of kitchen gardens. Their strategy involved the separation of organic materials at source and the development of garbage drop-off sites so that municipal trucks had fewer collection points, significantly reducing the costs and effort to remove waste. Since the start of the project, more than 34 composters have been installed throughout the Grahamstown community (mainly in Ward 7, Saint Mary's Development and Care Centre, and Rhodes University). The composters are made from corrugated iron off-cuts and the design allows aerobic composting, which cuts down on greenhouse gas emissions. Their successes were modest but their initiative became widely known through the name iNqaba yeGolide (finding of discovering the gold), the latter being the identity and satisfaction that they found by realizing that their heritage held the understanding to begin to solve part of the waste problem and bring the benefits of kitchen gardening back into everyday livelihood practices.

The group has now extended their efforts into developing a small business to produce vegetable seedlings. Alongside this, an Eco-School group is exploring waste reduction using wormeries.

7.2 Worming Waste at Kuyasa Primary School

The coordinator of the Eco- School programme supported efforts to develop a project at Kuyasa Primary School during one of the school years. The coordinator shared a background resource on the benefits of the worm castings and worm tea. Further research led to more discoveries about the animals that make worm tea and how to build a wormery. 'Learn with the worm' describes in detail how to set up a wormery; other research describes the biology of earthworms and what kinds of worms are used in wormeries (*Eisenia foetida* or the red wriggler). Teachers at the school adapted this information and prepared a lesson for the learners. Though commercial wormeries were available, the class made its own wormery out of recyclable or cheap and easy to find materials. It was an entrepreneurial project where children could easily build wormeries at home and sell the worms to fishermen. Three different wormeries were set up and experiments are ongoing to see which ones work best.

Kirkwood Wormery

This wormery consists of a tire, placed on a stand. Wire mesh is placed underneath the tire and covered with newspaper to hold the compost in place. A hessian sack acts as a cover for the top. The bedding consists of torn-up newspaper. The problem with this particular wormery is the difficulty with controlling moisture; as such, the compost gets dry very quickly. During winter the compost would be watered once a week, but as the temperatures rise so must the frequency of watering. On humid days, or a day after it has rained, earthworms can be seen trying to escape. The problem is likely related to the materials used, as a lot of evaporation takes place

through the wire mesh at the bottom. However, what began with nine earthworms has multiplied to 30 after just three months, so it is working despite the room for improvement.

Rhodes Wormery

The second wormery is called 'Rhodes Wormery', because a member of the Environmental Education and Sustainability Unit, at Rhodes University, helped build it. It consists of a plastic basin, covered with small stones and a layer of newspaper. A hessian sack covers the whole wormery, with holes at the

BOX 1
Growing vegetables using filtered grey water

The Eastern Cape is a water scarce area. A woman from the local community, Pat, grew her own vegetables at home. Because of the water shortage, she used wastewater. She soon noticed that there were white streaks in the soil and that vegetable production started to decline. The soap and chemicals in the wastewater seemed to be polluting the soil and inhibiting plant growth.

By chance she talked to a friend and community member who was having similar problems with his soapy wastewater. He had recently seen a video by Robert Swan on how they filtered water at the 2041 E-Base in Antarctica. Their system filtered out soaps and other contaminating chemicals so that the waste water could be drained from the drum to become Antarctic ice.

Her friend contacted E-Base for the details on their drum and decided to make a similar filter to reduce the soap and other contaminants accumulated in his garden. He had also read a report on the safe use of grey water. This concluded that kitchen and washing machine water was too polluted for use on food but that shower and bath water could be used.

The filter was made using a plastic drum similar to that used at E-Base. The filter bed was made up of a layer of crushed stone and filter sand topped by charcoal and wood ash. Together, Pat and her friend deduced that the wood ash and charcoal would probably absorb the oils whilst the sand and stone filtered out the particulate matter. It was also of note that the Xhosa used wood ash to sprinkle on water to clean it and a water scientist had advised that wood ash acted as a flocculant, clarifying water by sedimenting out particulate matter.

The vegetable garden at the Environmental Learning Research Centre was successfully watered with filtered shower wastewater by the science students. The grey water drum is now on loan to a local Eco-School. Pat and her friend are replicating the experiment conducted by the science student teachers and seeing how the heritage knowledge and vegetable production can be included in the school curriculum.

Equipment for making waste-paper pads from recycled paper for use in local schools of RCE Makana

BOX 2
Making waste-paper pads

Equipment needed

- Paint brush with end cut off
- Wood glue
- Heavy object (e.g. a brick wrapped in a cloth/ newspaper or a railway sleeper)
- Tray for paper
- A wad of scrap paper used on one side only

Instructions:

1. Collect enough one-sided paper to make a pad.
2. Make sure the paper is all the same side up and is lined up.
3. Put the pad of paper on a tray, right to the edge.
4. Place a heavy object on the pad of paper. It could be a railway sleeper or a brick wrapped in a cloth or newspaper.
5. Cut off the end of a paintbrush to give it hard bristles.
6. Put some wood glue on the brush and then paint the edge of the paper. Also jab/stipple the brush to the paper so that glue goes inside.
7. Put extra glue on the edges of the paper as this is where the paper most easily comes undone.
8. Scratch the paper when the glue is still wet as it will give you a stronger bond.
9. Leave it for about two hours.
10. Repeat the gluing process if required.

bottom of the basin to catch the worm tea as it is made. The compost in this wormery is much more moist and looks a lot healthier because water doesn't evaporate as quickly.

Wizard Wormery

The most successful wormery is called the 'Wizard Wormery'. It consists of a plastic basin bottom and a plastic basin to cover the top. PVC piping is placed on the bottom of the plastic basin, to hold up the wire mesh, which is covered with a layer of newspaper. The plastic bottom has holes drilled in the bottom to collect the worm tea. The whole wormery is placed on a stand and straw is added every few months for bedding. This gives the soil its different layers and helps the air circulate which improves oxygen levels.

One thousand worms were purchased to help start the wormery. This, the straw and the moisture levels all helped to produce excellent soil. It is rich, dark, crumbly, moist and looks very healthy.

The learners involved in the project became increasingly excited as they counted the increase in worms. They were also interested to learn that small white cocoons held between two to six little red wrigglers. The rich earthworm castings from the wormery have already been used for planting a trea near the school and for vegetables.

7.3 Heritage and social innovation

The immediate heritage of failed waste management innovations and the heritage relating to past heritage practices are all an important part of community-engaged waste management. RCE Makana has been working on a variety of projects, notably

- A grey water filter;
- Wormery boxes;
- Fire bricks; and
- A urine separation toilet.

At this stage, some of the practices are in their early stages whilst others are being tested and circulated through an expanding network of co-engaged social learning. None have wide traction yet but all are providing starting points for learning to change.

Izala Mpopomeni Township

Rural farmstead in the Amathola (Photo ELRC)

Chapter 8
Climate change heritage and a learning commons

With scientists agreeing that changing environmental factors and social practices will continue to drive global climate changes, the expectation for the 21st Century is global warming with increasing climate variability. Areas like the Eastern Cape of southern Africa are sites of high variability, whether this be in sea level change and climate variability over thousands of years of hominid existence or in the pattern of the seasons during the last few hundreds of years where we have historical accounts and climatic records of seasonal variation.

This concluding chapter on heritage knowledge practices and learning to change explores some of the historical evidence on how indigenous peoples, specifically the Xhosa of the Eastern Cape, lived in an area of high climatic change from season to season. It then reviews RCE Makana's social learning commons to discuss how the rear-view mirror of indigenous practices is a key image and source of inspiration to contemplate a more sustainable future. Here many of the heritage innovations explored in the earlier chapters are re-examined and left open for continuing change choices that might inform better livelihoods for all of us.

8.1 The Xhosa climate migrations

The Eastern Cape in South Africa is a site of high climate variability. Read with the modern scientific insights that the El Niño and La Niña oscillation in the southern Pacific cause episodic drier and wet periods, there is now a more object congruent grasp of climate variation today. Historically, the regional climate variation was experienced as times of drought and plenty by human figurations who are described as being in ceaseless movement owing to patterns of drift, migration and the cyclic processes of transhumance (Mostert, 1997:71). Despite the apparent fluidity here, Noel Mostert notes that:

> *Apart from some seasonal transhumance between more or less permanent grazing grounds, the Xhosa were in fact remarkably fixed in their residence (Editor's note: In the Eastern Cape grasslands around the Amatola / Fish River and the Zuurveld). (Mostert 1997:80)*

It thus seems that the cattle peoples of the area were both firmly on the land and in responsive flux in an area of high variability. History records describe how this flux translated into frontier clashes between two shifting groups at the outset of the

European colonizing migrations. In the Eastern Cape the indigenous San and Xhosa peoples, and the trekboers (an offshoot from the European colonists in the Cape) would compete for space, food, water and grazing in times of shortage.

With conflicting groups with the same needs, the flashpoint of more than a hundred years of conflict became the Zuurveld. Mostert describes how this small parcel became contested:

> *The rectangular territory known as the Zuurveld now began its history as a central arena of conflict and tragedy for all. It is, as already described, the country contained between the ocean and the Bushman's and Fish rivers. It is some eighty miles long and around fifty miles wide. It had, in those days, two distinctive aspects. Around the several rivers that cut across it on their courses down from the escarpment it was covered by trees and spiky bushes, so dense that they often seemed impenetrable to humans. Beyond these, along the coast, offered some of the finest-looking pastures to be seen in South Africa. Time and again British visitors would describe it as English parkland. But its fresh greenness contained a hidden menace for graziers. The Zuurveld grasses provided excellent grazing in summer, but lost their nutritional value after about four months. They could then be fatal to cattle .*
>
> (Mostert, 1993:236)[1]

The four months of highly nutritious sour veld grasses of the Zuurveld had some of the trekboers take up residence in the Bruintje's Hoogte. Here they had arable lands and sweet veld grazing within easy reach of the Zuurveld in times of need. In effect the arbitrary boundaries set between the trekboers and Xhosa cut off access to the Zuurveld that was then occupied by colonial farmers. Mostert notes:

> *What the Zuurveld Xhosa had become accustomed to doing was to move their herds to winter grazing on so-called sweet veld, which remained nutritious throughout the year but could not support continuous heavy grazing, and then return them to the Zuurveld in summer[2]. These transhumance patterns were cut and dislocated by any attempt to impose arbitrary boundaries to the colony that included the Zuurveld and excluded its occupants.*
>
> (Mostert, 1993:236)

Here changing patterns of agriculture developed with the removal of valley thickets, opening up other forms of productivity. As the land became more settled, particularly by colonists, another contested resource was water. Free access to natural spring water for a passing herd on its way to and from the Zuurveld also became a contested matter, particularly in dry times. History tells the story of more than 100 years of frontier wars in the early colonial period, where migrations were disrupted and habitat change developed on a massive scale, making the rural areas some of the poorest and degraded regions of southern Africa today (Westaway, 2012).

The migrations continue in another form today, as some farmers still truck cattle in and out of the Eastern Cape as the stocking rates vary radically across the continuing dry and wet periods in a time of expansive (global warming accentuated) climate variation. There is little certainty as to how patterns of human induced climate change will continue to play out but there could be future migrations of cattle and people on the same scale as reported after the 1780 drought. Mostert notes that:

> *In 1789 one traveller saw several thousand Xhosa and 16,000 cattle on one (Zuurveld) farm alone.*
>
> (Mostert, 1993:243)

The southern areas of sweet and sour grasslands cut through with valley thicket and coastal dune forest make the Eastern Cape a site of high endemism and biodiversity. The historical mixing of cultures from the original San gatherer–hunters and Xhosa pastoralists to the intrusive trekboers and colonial settlers who followed also make the area highly culturally diverse, producing a wide range of challenges to sustainable living to be addressed within the partners working in, with and through the emergent and shifting structures of RCE Makana.

Responding to increasing climate variation is not an easy matter, as in an area of historical climate variation. Historical patterns of seasonal rainfall can only be mined to a certain extent, as the issue is more one of rainfall distribution than variation on a seasonal basis. What seems to offer interesting possibilities is the cultural capital of the Xhosa, most of which has been lost owing to the changes that now find much of the population in urban settlements. Some of the interesting fragments that have come to light are:

- *Imifino*: Gathering wild leafy vegetables;
- *amazi* and *Amar/hewu*: Making fermented foods that keep well and provide more nutrition extraction in hard times;
- Drying vegetables for use in hard times; and
- Working together to get heavy manual labour tasks done collaboratively.

All of these have been taken up into the commons projects, initially with little recognition that the Zuurveld history and the climate migrations of the Xhosa are a story of common struggle from which a lot might be learned towards making provisions for hard times together. This still remains a challenge ahead.

[1] Editor's note: This is somewhat of an over statement, although there are species of plant that are fatal to cattle in a poor condition. The main problem with sour veld is that the grass species take all of the nutrients into their roots over dry, cool periods, so that cattle eating their fill will get thin and sick owing to a lack of nutrients in their fodder.

[2] Usually in the years that the expected summer rains failed on the upland sweet veld grasslands.

8.2 A social learning commons

Social learning in a context of climate change with high seasonal variability can be seen as co-engaged interactions where people learn from and with one another and, as a result, collectively become more capable of living with seasonal food production setbacks and dealing with insecurity and associated risks. These are likely to increase and manifest in a higher frequency of extreme events owing to emerging patterns of climate change is the current challenge of RCE Makana and Rural Eastern Cape.

A social learning commons is emerging as a site that invites and resources learning interactions to re-imagine practices and initiate social interventions to mitigate risk. The learning commons is primarily concerned with small-scale, exploratory activities that are practical, deliver quality of life enhancing benefits and – where the heritage that participants bring and encounter are both relevant – catalytic in the change-choice practices that people make.

Many of the livelihood practices that are found in RCE Makana's social learning commons (See Figure 1) reflect both Nguni heritage (Xhosa, amaHlubi, maPondo) and what is now known in modern times. The commons as an open and inviting space for social learning is beginning to reflect the stories and artifacts for change that invite conversation. All of those that have come into use in the RCE commons as a site of small-scale experimentation in social learning are compiled into an image for each WEHAB (water, environment, health, agriculture, and biodiversity) and waste category of resource use practice. These are then placed in historical relief with earlier Nguni heritage practices represented in a rear-view mirror.

The visual representations that follow make it possible to see creative possibilities to work with heritage knowledge practices by learning to enhance quality of life whilst challenging ourselves to:

- Reduce resource use (saving money and resources)
- Restore some of the impacts on ecosystem services
- Reduce use of fossil fuels (carbon footprint)

Each of the areas of daily resource use and better practice is built around a themed collage of practical artifacts that invite exploration and conversation. This approach was inspired by 'Handprints for Change,' a practical exploratory learning perspective to make things better that has been signified by the handprint of Sirija, a 10 year old girl from Hyderabad, India, as developed and shared internationally across RCE sites, from the Centre of Environmental Education in India.

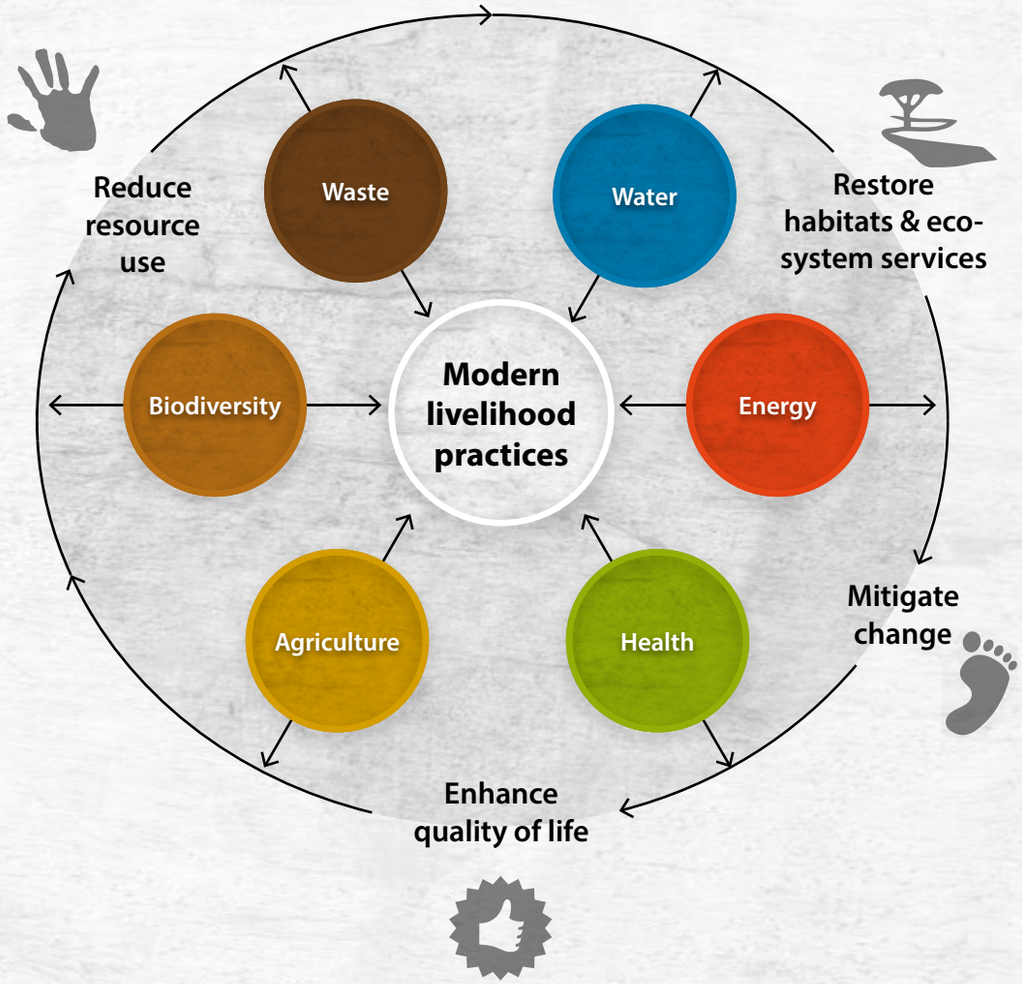


Figure 1
Co-engaged work to mediate **sustainable livelihood practices**

In no time at all, the learning commons had an extensive collection of articles and practices (See Figure 2), the majority of which both reflected and were derived from African heritage.

Each of the composite photographs of working exhibits in the RCE Makana Commons presents as a conversation piece that invites questions and the sharing of personal experiences, heritage stories and critical reflections on the consequences and possibilities of positive change in how we do things today. The combinations are experimental around the WEHAB and waste themes of earlier chapters and are part of a Stepping Up to Sustainability

Handprints for Change: Community engaged change-practices

Water ***(H: imbiza)***
- Rainwater tank
- First flush
- Ceramic filters
- Filtering grey water

Energy ***(H: igoqo)***
- Clay stove
- Cobb charcoal oven
- Volcano kettle
- Sun stove
- Hot box
- Solar water heater
- Solar cell
- Wind generator

Health ***(H: iselwa)***
- Tippy hand washer
- Soured milk
- AmaRewu
- Sourdough bread
- Hand mill

Agriculture ***(H: imifino)***
- Flip composter
- Worm farm
- Wire-tie shade house
- Chicken tractor
- Biochar drum
- Sun dryer

Biodiversity ***(H: ihlathi)***
- Acacia fire woodlot
- Micro nursery
- Micorrhyzal
- 3 step potting soil

Waste ***(H: ethuthwini)***
- Reuse padding
- Hand made paper
- Making fire-bricks
- Urine separation toilet

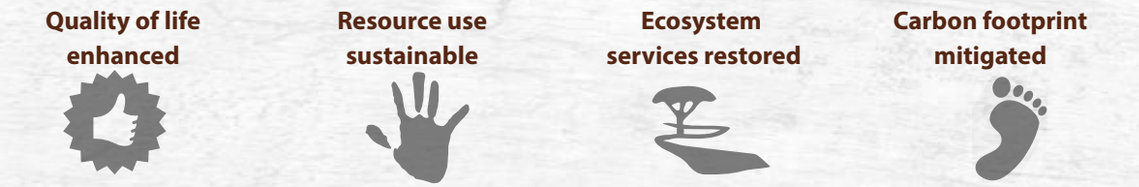


Figure 2 RCE change choice practices

programme for stimulating adaptation to climate change. The programme is run by WESSA, the Wildlife and Environment Society of South Africa, which is being supported by a funder to develop commons learning sites across South Africa. Both RCE Makana and close RCE collaborators in Pietermaritzburg are working together in the programme, challenging participants to take up 'change-choice-projects'. Participants tell their stories of learning to change through sharing their heritage and history reflections, documenting current practices and planning their 'change-choice-projects'. The heritage rear view mirror on the side of each image is an interesting way of reminding us that looking back and asking about how things have changed is a useful way to start a conversation. In this way practical deliberation can be built around what people have and are often able to do together and for themselves, with very few resources and external help. All of the innovations that are currently being worked with in the RCE's co-engaged small-scale experiments in social learning are commented on in turn.

The notes provided on the practices represented in each picture are the working perspectives that have come out of the RCE Makana social learning commons. Here heritage knowledge practices are often the best reference for identifying problems and guiding new change choice practices.

BOX 1
Recovering and expanding pottery heritage
Author: Cryton Zazu

Martin Masixole Mahlongo, a potter working in Khayelitsha Township in the Western Cape, was born and bred in the Langa community, although his family roots can be traced to Queenstown, Eastern Cape. It is his family's cultural and historical background that has influenced the kind of pottery that Mahlongo produces. In an interview, Mahlongo described his vivid memories of Hlubi traditional pottery, which he now seeks to revive through his contemporary artwork. Mahlongo produces pottery that has a Hlubi orientation but reflecting an evolution in terms of functionality, shape and size that pottery has undergone.

Mahlongo's work can be of great use for heritage education, reminding those now living in urban areas of the rich functional agency in Nguni cultural heritage.

The stacked pots shown are a desktop drinking fountain with a drinking bowl on top. Here the top pot is filled with water and it slowly drips through a ceramic filter, in the same way that water would emerge from sandstone at a spring. The filter can be lifted with one hand whilst the other is used to pour refreshing water into the drinking bowl.

Water tank

Filter bucket

Copper pot

Test kit

Filter candle

WATER

Tanks Testing and Filters

imbiza

Water

What is emerging in co-engaged innovation practices:

Water tanks for domestic use and gardening now have two taps and traps that exclude organic matter; however this does not produce adequately safe drinking water, so water quality needs to be monitored.

Ceramic filters reduce the risk further and tests conducted on filtered tank water are free of coliform bacteria.

Copper vessels and copper coils have been shown to take the production of drinking water one step farther, eliminating most other waterborne diseases and rotovirus.

Water testing kits allow activist groups and households to check their water; chlorine bleach can then be used to maintain sanitary conditions without risk to river systems since, by standing the water for 12 hours, the chlorine evaporates.

Overall tanks, guttering, filters and testing have a high environmental impact and are an expensive option to buy but they do have the advantage of bringing more water security and encouraging home food production on a small scale.

Acacia fire garden

Drying drum

Pot on
ceramic plate

Volcano Kettle

Hot bags

Cobb oven

wood stoves

ENERGY

Fire gardens Stoves and Cooking bags

igoqo

Energy

What is emerging in co-engaged innovation practices:

Wood stoves bring respiratory diseases but are an economical means of cooking.

Ceramic plates reduce burning and promote slow cooking.

Hot bags reduce cost and promote slow cooking while still being economical.

Iron pots retain heat for slow cooking but have to be oiled to reduce rust, which can increase risk of kidney disease.

Fire gardens are a useful option that can bring back insects and birds, restoring local biodiversity.

Black dryer drums reduce drying time and promote dry smoke-reduced burn and better coals for slow cooking.

Hand washers

mahewu

Honey

Slow bread

HEALTH

Hand washing
Honey and
Fermented
foods

iselwa

Health

What is emerging in co-engaged innovation practices:

Tippy tap hand washer is easy to make and effective in reducing disease; however it needs a good management system for it to be an effective strategy in schools.

Artisan bread is the health food of the rich as modern breads have produced allergies and intolerances to gluten. Bread now having displaced maize as the staple diet in South Africa and now industrial giants having had punitive fines for collusion of pricing.

Honey is also a luxury item that is becoming less available locally as habitats are changed and more toxic substances are used in daily life.

Amar/hewu is seldom made at home in urban areas and many buy fruit flavoured varieties in cartons from a supermarket.

Vegetable dryer

Acacia fire garden

Mulch dryer

Flip composter

Chicken tractor

AGRICULTURE

Small-scale Organic Food Gardens

imifino

Agriculture

What is emerging in co-engaged innovation practices:

Flip composters are cheap and effective for small-scale food production, with good breakdown rates and soil softening effects that make gardening in harsh conditions easier.

Chicken tractors are effective for reducing pest transfer from compost and for increasing nitrogen for green leafy vegetables. They also have the added benefit of the occasional chicken egg, without too much cost for layers of mash and grain.

Mulch dryers are a great benefit as they bring water holding without the nitrogen reduction that comes with green mulching.

Vegetable dryers are a forgotten practice but are vital for small-scale production, where people want to sell a surplus at a time when the fresh vegetable market is saturated and prices are low.

Micro nurseries

2:1:1 Potting soil

Recycled trays

Mycoroot

BIODIVERSITY

Micro-nursery Potting soil and Mycorrhiza

ihlathi

Biodiversity

What is emerging in co-engaged innovation practices:

Nursery trees are not always available and live-stock can wander into a property and eat seedlings in a matter of seconds. A 30-40 percent shade cloth creates the ideal shade for tree seedlings to grow whilst providing protection against wandering livestock. The micro-nursery cage can also be used to cover newly planted vegetable seedlings until the plants are established and can cope with full sunshine.

Potting soil is easy to make with soil, compost and well dried and matured cattle manure. It is satis fying to see trees and vegetables grow in a home-made potting mix but care has to be taken to remove any competing weeds. Weed growth can be controlled by the use of mulch when transplanting seedlings.

Mycorrhiza occur naturally in compost and forest floor humus, unless it is heat sterilized, a common practice in modern nurseries. The soil fungus and bacteria can be added with commercial products but these are not necessarily those from the local area. In RCE Makana there is a local option, a pro-duct called Mycoroot.

Worm farm

Grey water filter

Urine separation Dry toilet

Fire bricks

WASTE

Grey water
Fire bricks
worm farms &
Dry toilets

ethuthwini

Waste

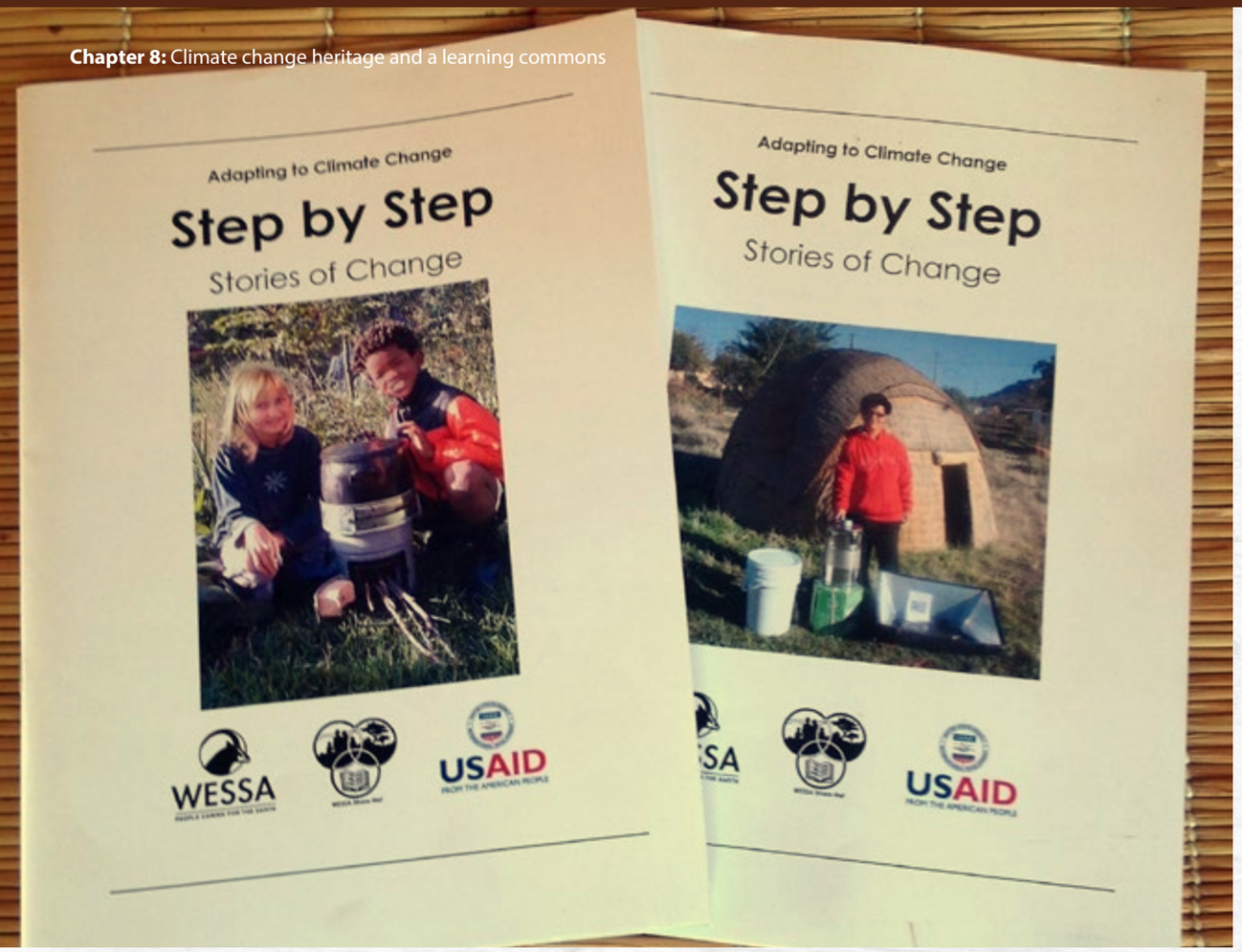
What is emerging in co-engaged innovation practices:

Grey water drums can be used in times of water shortages to water garden plants; shower, basin and bath are best. Kitchen sink and washing machine waters should be avoided as the chemical contents are too high.

Fire bricks are an excellent idea but are rather prone to delivering more smoke than flames unless added to a vigorous fire. Pinecones and needles can be added to make an effective starter. The common practice of using plastic to start fires should be avoided as the fumes are toxic.

Worm farms are a great learning tool and many households are using them for household organic waste. They often fail when not tended with care and many are finding that compost bins are easier to manage. The worm tea is a follar feed that is good for controlling aphids in the wet season.

Dry toilets are similar to the bucket system that urban residents in townships had to endure in apartheid times. The struggle for an ideal system continues.



WESSA 'change-choice-practice' stories of change publications produced through Share-Net

8.3 Concluding reflections

Intergenerational stories bring heritage and experience into RCE processes of learning to change. These approaches are emerging as a process of community-engaged research and exploratory change practices that involve the sharing of stories in critical conversation in order to find better ways of doing things together.

The compiling editors of this book have tried to outline a perspective on heritage and learning in Chapter 1 and to share the rich heritage of African innovation in Chapters 2 to 7 before exploring a context of climate variation in southern Africa today. The heritage practices of Africa are rich and diverse but the stories are simple, practical and open, with many common features that resonate with a positive approach to learning and change. These positive dispositions are reflected in this book that offers start-up visual materials that invite conversation and case evidence where African heritage is inspiring local change.

The book is intended as an exploratory and illustrative text, and an invitation to others in Africa and elsewhere to join in by sharing start-up stories. The composite pictures are another emergent strategy that invites conversation and critical questions. These and the rear view mirror artifacts can be used with the video materials and alongside the WEHAB and waste articles to continue creative innovation with heritage in mind and whilst working together for the common good. All of the strands in heritage, experience and the knowledge of the day are interwoven throughout the materials that have been assembled in the thematic chapters, in search of a positive and hopeful view of RCE partners taking simple steps towards a sustainable future in Africa and beyond.

Although heritage provides us with a rearview mirror that can give critical traction on the issues of the day, there is no going back as we live in and with the social-ecological challenges of the present. In learning to change, we can only look back and around with a critical eye and work at social innovations that will enhance quality of life whilst producing a more sustainable future for future generations.

In simple terms what we are learning together in this book on heritage knowledge and learning to change in Africa is to **look around** us and to **look back** in questioning ways. This can help us to bring out heritage practices that have commonly been diminished and forgotten in Africa. More useful learning can happen when we **bring in** what is now known; but the real challenge in heritage and social innovation is to **bring together** this knowledge in ways that help us to reimagine a sustainable future. Knowing and imagining better things together is not enough unless we can **bring about** change like Nelson Mandela and the will of a divided people did in South Africa and has similarly been achieved in many sites of injustice, conflict and suffering in Africa and elsewhere.

An image of the inspiring company all global citizens share is the recent 21 Icons (2013) image of Nelson Mandela. The caption used with a photograph of Mandela looking into a mirror (www.21icons.com) is a fitting way to conclude this exploration of African heritage knowledge in RCE contexts of social innovation:

> *"What counts in life is not the mere fact that we have lived. It is the difference we have made to the lives of others that will determine the significance of the life we lead".*
>
> (21 Icons South Africa, Sunday times supplement, 28 July, 2013.)

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Photo of igoqo courtesy of Michelle Cocks and Tony Dold

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Soul Shava holds a doctorate in Environmental Education from Rhodes University. He has been researching knowledge/power relations across colonial/modern institutions and their effects on indigenous knowledge practices for more than a decade. Much of his work is currently on the appropriation and recovery of indigenous knowledge practices for restoring quality of life, social-ecological justice and sustainability in southern Africa.

Dr. Cryton Zazu – ELRC, Rhodes University
Cryton Zazu recently completed a doctorate degree on Heritage Education at Rhodes University, South Africa. He is currently the Communication Expert for the SADC Integrated Water Resources Management Pilot Projects. Born into a family of eight, Zazu was brought up in a typical African traditional family context, a background that influenced his work on indigenous knowledge systems and an interest in inter-epistemological dialogue towards the resolution of social-ecological risk in a modern world.

This publication is a most welcome and timely addition to the ESD lexicon as it serves not only to validate but also to disseminate many traditional practices that are threatened by neglect in the face of the aggressive modernization of African societies… It provides scientific explanations for why many traditional practices work, the absence of which had previously caused so many of these practices to become marginalized or even expunged in the colonial period. The focus is not just environmental but also socio-economic in assessing how learning takes place and the wider impacts of adopting more holistically sustainable practices. Although the book is organized into discrete chapters on water, energy, agriculture, health etc the book's integrity lies not just in its focus on African heritage, but also in discussing how each of these sectors can both cause and remediate climate change.

Tony Shallcross, University of Hull

The book bridges the gap between rhetorical representations of cultural heritage practices by scholars, educators, planner, policy makers, and the reality of practical experiences on ground…. It thus provides basic knowledge and practical skills across the African-indigenous heritage systems and creates space for comparing, sharing, understanding, evaluating, analysing, and assessing indigenous or cultural heritage practices, knowledge, and skills against emerging socio-economic, ecological, cultural, and environmental challenges.

Daniel Sabai, Dar-es-Salaam University College of Education

We have been the lucky readers of this book. We have written 'lucky' because we read the texts as wise advice for establishing a sound understanding of an educational way to raise the worth of knowledge on the crossroad between the heritage of ancestors and the practical application of modern science…. It is thoroughly thought through in a complex web of relations that hopefully can contribute to restoring African heritage as an important part of the identity for the upcoming African generation. The way this book makes suggestions for how to integrate important local heritage with the global models of universal science ought to be recognized and applied in European education as well.

Halvor Hoveid and Dag Atle Lysne,
Norwegian University of Science and Technology