An assessment of the feasibility of establishing a restoration network in South Africa

Report to the

WATER RESEARCH COMMISSION

by

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CSIR

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EXECUTIVE SUMMARY

BACKGROUND

Everyone in the world depends completely on the earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment and aesthetic enjoyment (Millennium Ecosystem Assessment (MA) 2005). The reduction in the ability of ecosystems to provide these services, brought about by widespread environmental degradation, thus poses a threat to human wellbeing. Restoration is the acknowledgement by humans of the damage we have caused and that, for our own good, it is now time to 'give back' to nature and to nature's functions on which we depend (Aronson *et al.* 2006). The success of restoration efforts in halting, and even reversing, the trend of pervasive degradation depends largely on the implementation of effective methods. It has been stated that globally, the effectiveness of restoration efforts is often limited by the lack of, or limited transfer of information from science to practice (Cabin *et al.* 2010), a phenomenon known as the science-practice gap (Young *et al.* 2005; McDonald and Williams 2009; Aronson *et al.* 2010). This results in practitioners continuing to base their restoration decisions on intuition and experience instead of scientific evidence (Bernhardt *et al.* 2007). The formation of communities of practice that bring together stakeholders and encourage the mutual exchange of information and lessons learnt has proven to be effective in bridging the gap in the field of conservation (Shackleton *et al.* 2009).

RATIONALE

South Africa faces a considerable problem of ecosystem degradation, affecting both terrestrial and aquatic ecosystems (Nel *et al.* 2011). While fully acknowledging that there is no substitute for healthy, self-sustaining ecosystems, there is widespread recognition that traditional land and water management efforts are not sufficient to combat degradation. Ecological restoration has become accepted as an appropriate response to the degradation problem and is now practiced widely in South Africa. Lack of coordination and information exchange between the various stakeholders involved in this cross-cutting field, however, undermines the potential to achieve widespread impact. The compartmentalization of efforts, with little cross-pollination across different sectors and disciplines, conceivably results in the duplication of effort and the inefficient use of limited financial resources. In an attempt to bridge this science-practice gap in restoration in South Africa the Water Research Commission commissioned a study to "*Investigate the feasibility of establishing a society, network or similar entity focused on the ecological restoration of degraded ecosystems in South Africa*".

OBJECTIVES AND AIMS

The primary objective of this project, as set out in the terms of reference, was to investigate the feasibility of establishing a society, network or similar entity focused on the ecological restoration of degraded ecosystems in South Africa. In meeting this objective the following activities were proposed:

1. Conduct a situation analysis of the present status of ecological restoration in South Africa.
2. Identify gaps in the science of ecological restoration.
3. Identify groups of people involved in restoration, assess their status and the level of coordination between them.
4. Publicize the need for collaboration and organize a national conference.
5. Establish a network of restoration stakeholders to grow the science and practice of restoration in South Africa.

METHODOLOGY

The aims of the project were grouped into 3 distinct tasks:

Task 1 (activity 1 and 3 listed above): Situation analysis of the practice of ecological restoration

A lot of restoration work is currently underway in South Africa, a review of which was done by Ntshotsho *et al.* (2011). This task built on this review and expanded it to aquatic restoration, an aspect that was missing from the review by Ntshotsho *et al.* (2011). We used standard information search methods such as internet search engines and websites of organizations involved in restoration. Information sources considered include published and grey literature.

Task 2 (activity 2 and 3 listed above): Situation analysis of the science of restoration

Restoration practice is founded in restoration science (Cairns & Heckman 1996; Palmer et al. 2006). In performing this task we thus focused on the main question “What are the research outputs of South African restoration scientists?” In addition to the traditional forms of research output (e.g. scientific literature), an important aspect to consider when looking at research output is skills transfer. We assessed the involvement of academic institutions in the training of future ecological restoration practitioners. A standard bibliometric analysis, covering the period 1994-2013 was carried out to answer both the question of information production and that of skills transfer.

Task 3 (activity 4 and 5 listed above): Establishment and promotion of a national network of restoration stakeholders

The primary goal of establishing a restoration network is to facilitate dialogue and sharing of information between stakeholders, for the advancement and improvement of the field of restoration. Under this task we collated information on who is involved in the science, practice and policy of restoration in South Africa. These stakeholders were then invited to a workshop to discuss whether the establishment of a new society was feasible, and if not, what options are available to foster collaboration and exchange of information in order to grow and coordinate the field of restoration.

An additional aspect of this task was to formulate a communication strategy for the proposed network. To this end, we evaluated the current strategies used by the Land Rehabilitation Society of Southern Africa (LaRSSA) and the Society for Ecological Restoration (SER).

RESULTS AND DISCUSSION

The practice of restoration

Billions of Rands are spent annually on the restoration of degraded ecosystems in South Africa, with the government financing a substantial chunk of this work mainly through its natural resources management programme. A significant amount of restoration work is also carried out by the private sector, particularly in the mining sector. This is primarily due to the stringent legislation applicable in the mining industry requiring restoration for the granting of mine closure certificates. Other stakeholders involved in the implementation of restoration initiatives include communities; farmers and nongovernmental organizations.

Terrestrial restoration is more widespread than aquatic restoration. This is potentially attributable to the lack of guidelines and protocols, which, in turn, is a symptom of limited expertise and associated research in this field. Indeed, the results of the scientific output assessment highlighted this as a gap. Considering the dire situation of the country's aquatic ecosystems, which are in a worse state than the terrestrial environment, there is an urgent need to address the skills and information shortages.

The science of restoration

Research in the field of restoration has grown noticeably in the past two decades in South Africa, as evidenced by the increase in the number of publications, authorship and inter-institutional collaboration. This growth has been spear-headed by a handful of highly prolific scientists affiliated to only a few academic institutions. Additionally, the future of the science of restoration looks promising, based on the output of graduate students, especially in the

scientific disciplines traditionally associated with the field of restoration. It is concerning, though, that focus on student training seems to be primarily in the natural sciences. Considering the transdisciplinary nature of restoration, there is a need to extend training to other disciplines that are emerging as highly relevant to the science and practice or restoration, such as social and economic sciences. The growing incidence of collaboration among South African peers, accompanied by the emergence of international collaboration in recent years, is a positive indication of the opening up of avenues for information sharing and co-learning, which could further drive growth of the field. Of concern, though, is the narrow and skewed focus on terrestrial ecosystems, in the face of the critical condition of the country's aquatic ecosystems. This discrepancy underscores the need for a network that will bring together academics, policy makers and practitioners in an ongoing discussion of priorities for research that will be relevant and timeous to address the nationwide, and indeed global, problem of degradation.

The policy environment

The fundamental constitutional provision for the right to an environment that is not harmful to the health or well-being of the citizens of this country, and to have the environment protected through legislative and other measures is an important foundation for an enabling policy environment to govern restoration. The abundance of legislation, as well as regional and international treaties which make specific reference to restoration are an indication of policy makers' willingness to uphold this fundamental right. Policy formulation, however, needs to be based on credible information, the accessibility of which may be a challenge in a setting where there is no central repository or go-to coordinating organization. Limited absorptive capacity within government departments poses an additional obstacle to the assimilation of scientific findings into policy. Hence the suggestion that restoration scientists need to be embedded in institutions where they can help interpret and use science to inform policy. Such arrangements, in addition to promoting the formulation of sound policy, could provide much-needed employment opportunities for restoration graduates.

Bringing the stakeholders together in an organised network

The restoration community in South Africa is relatively small, and comprises people from diverse backgrounds such as academia, government, civil organisations, private companies, etc. Thirty two of these people convened in Stellenbosch in February 2014 to discuss the future of restoration science, practice and policy in South Africa. Their group deliberations centred around the needs of practice and policy from research. The development of best practice guidelines and protocols was identified by all four groups as an important need. Other factors that were mentioned were the need to adopt a transdisciplinary approach to

restoration research; capacity building through student training and partnering with non-academic institutions involved in restoration to enhance the science absorptive capacity of those institutions (especially government departments); and the promotion of a culture of monitoring of restoration progress and long-term impacts.

In terms of resolving whether the establishment of a new society focussed on restoration was necessary or whether it would constitute duplication, it transpired that the delegates present are already subscribed to regional or biome-specific initiatives that do have a focus on restoration. Many delegates however expressed frustration with the compartmentalization of efforts and lack of cross-learning between these initiatives. The need for a coordinating body was thus emphasized. The formation of a SER chapter, however, did not attract much enthusiasm mainly as a result of the presence of a recently-formed society, the Land Rehabilitation Society of Southern Africa (LaRSSA), whose mandate and activities were seen to overlap with those of the proposed chapter.

CONCLUSIONS

South Africa has a well-established track record in the research and practice of restoration. The policy environment is also developing, with environmental considerations now being incorporated into national priorities. The need to bring together stakeholders from these divergent backgrounds cannot be overemphasized. However, starting a chapter or society is associated with substantial transaction costs and constraints in terms of finances, human resources and institutional arrangements. The added consideration of the voluntary nature of the coordination of such a network poses the threat of management fatigue and organisational collapse. Moreover, the presence of local societies and fora that have overlapping objectives as the proposed network, specifically the recently-formed LaRSSA, raises the issue of duplication of effort, in addition to membership or subscriber fatigue. It is thus concluded that forming a new network, such as a SER chapter, is not a viable option.

RECOMMENDATIONS

It was unanimously recommended at the meeting of stakeholders that the option of affiliating to LaRSSA be investigated further. Stakeholders presented a suite of requirements and expectations from a network focussed on restoration. Their request is that the WRC engages in discussions with LaRRSA to ascertain whether LaRSSA is ideally placed to grow this community of ecological restoration practice.

ACKNOWLEDGEMENTS

The authors would like to thank the research manager of the WRC Project K8/1020 for the assistance and the constructive comments during the duration of the project. Our sincere thanks also go to the restoration scientists, practitioners and policy-makers who contributed to the success of the workshop held in Stellenbosch in February 2014. Guidance and support were received from Karen Esler of the University of Stellenbosch, as well as certain members of the Natural Resources and the Environment unit of the CSIR.

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LIST OF ABBREVIATIONS

CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DMR	Department of Mineral Resources
LaRSSA	Land Rehabilitation Society of Southern Africa
SANBI	South African National Biodiversity Institute
SER	Society for Ecological Restoration
WESSA	Wildlife and Environment Society of South Africa
WRC	Water Research Commission

1 INTRODUCTION AND OBJECTIVES

1.1 Introduction

Everyone in the world depends completely on the earth's ecosystems and the services they provide, such as food, water, disease management, climate regulation, spiritual fulfillment and aesthetic enjoyment (Millennium Ecosystem Assessment (MA) 2005). The reduction in the ability of the environment to provide these services is known as environmental degradation. Globally, humans have changed ecosystems more rapidly and extensively in the past 50 years than in any comparable period of time in human history, largely to meet rapidly growing demands for food, fresh water, timber, fiber and fuel (MA 2005). This has led to the degradation of 60% of the (16 of the 25) ecosystems evaluated in the assessment. Degradation, as described in the United Nations Convention to Combat Desertification, may take many forms, e.g. soil degradation, veld degradation and the loss of biodiversity.

Restoration is the acknowledgement by humans of the damage we have caused and that – for our own good – it is now time to 'give back' to nature and to nature's functions on which we depend (Aronson *et al.* 2006). Restoration, which is officially defined as the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed (SER 2004), has been globally adopted as a supporting tool to conservation efforts. Some have gone as far as hailing restoration as essential to ensure the future survival of human society (Cairns 1998; Hobbs & Harris 2001). Considering the significant problem of degradation in South Africa, it is encouraging to know that restoration is now widely practiced in the country at scales ranging from local to landscape. The cumulative associated annual expenditure ranges in billions of South African Rands (Kotze & Ellery 2008, C. Marais, *pers. comm.*[1], U. Bahadur, *pers. comm.*[2]).

Scientific literature suggests that overall, restoration decisions are largely based on experience and intuition, instead of scientific evidence. This is a symptom of inadequate information transfer between the research (knowledge producer) and practice (would-be implementer of knowledge) of restoration (Ntshotsho 2012), a phenomenon that has been termed the "science-practice gap" or the "research-implementation gap" (Pullin *et al.* 2004, Roux *et al.* 2006, Knight *et al.* 2008, Sunderland *et al.* 2009, Esler *et al.* 2010, Aronson *et al.* 2010). The science-practice gap is not only a problem in restoration, but also in the related field of conservation and has been cited as a major limitation to the advancement of the field of restoration (Cabin *et al.* 2010). Attempts at bridging this gap that have been implemented

[1] Dr C. Marais is the Chief Director in the Working for Water and Working on Fire Chief Directorate of DEA.
[2] Mr U. Bahadur is the Director of the Working for Wetlands sub-programme.

in conservation science include the packaging of research findings as user-friendly products, making them easily accessible to practitioners (Pierce *et al.* 2005, Knight *et al.* 2006, Reyers *et al.* 2007). This approach, however, is based on the traditional view of a one-way transfer of information from science to practice. Another approach, which actually emphasizes the need for co-learning between research and practice, proposes the formation of information sharing networks, where all stakeholders are viewed as worthy participants in knowledge production and information sharing. These networks have been termed “communities of practice” (Roux *et al.* 2006).

At a global scale, an attempt to establish something akin to communities of practice has been undertaken by the Society for Ecological Restoration (SER) through its establishment of regional chapters and the Global Restoration Network (GRN) (SER 2010). In addition to the Society and the GRN fulfilling the role of a central portal for global information on restoration-related activities, periodic meetings such as conferences serve as fertile ground for the interaction of, and exchange of information between, parties involved in restoration. Partnerships fostered through the SER continue to bear fruit in the form of invaluable information resources (see www.ser.org). Similarly, a South African restoration network could facilitate the building of a substantial and useful body of knowledge that is of direct relevance to South Africa, through active and ongoing engagements between restoration scientists and practitioners.

The regional chapters of SER are particularly important in that whereas they are part of the bigger, global organization, their focus is on issues and activities that are relevant to the specific regions (e.g. Australasia; Europe; North America). As such, they serve the function of coordinating regional activities while also being the common gateway to the parent organization, SER. Currently, the African continent is not represented in the regional chapters of SER. This limits the visibility of the region’s restoration work to the international community, which, in turn undermines the potential for more widespread active engagement with the international community. The establishment of a South African restoration network could potentially provide the impetus for the establishment of an African chapter of SER.

The Water Research Commission commissioned a research project to investigate the feasibility of establishing such a network. In order to achieve this, it was critical to first conduct a situation analysis of the science, practice (and policy) of restoration, so as to establish who the role-players are. In this report we describe the process followed and the outcome thereof.

1.2 Objectives

The primary objective of the project, as set out in the terms of reference, was to investigate the feasibility of establishing a society, network or similar focused on the ecological restoration of degraded ecosystems in South Africa. This objective was disaggregated into the following aims:

- Conduct a situation analysis of the present status of ecological restoration in South Africa, including ecological success and social impacts of existing restoration efforts, as well as weaknesses, threats and opportunities for the practice of ecological restoration.
- Identify gaps in the science of ecological restoration.
- Identify groups of people involved in restoration, assess their status and level of coordination between them.
- Publicize the need for collaboration and organize a national meeting.
- Establish a network of restoration stakeholders to grow the science and practice of restoration in South Africa.

2 METHODS

2.1 Restoration practice in South Africa

A review of practical restoration was done by Ntshotsho (2012), but it only focussed on terrestrial projects and programmes. To supplement this work, we conducted a simple web search using the search terms “river/stream/aquatic rehabilitation/restoration South Africa”. We also searched the WRC webpage, specifically because this organisation has been at the forefront of research and implementation initiatives in aquatic ecosystems. We focused on grey literature as information sources, specifically excluding academic publications because these were dealt with in detail in the assessment of scientific output.

2.2 Restoration science

Bibliometric analysis

Bibliometrics is an approach commonly used to “shed light on the nature and course of development of a discipline by means of counting and analysing the various facets of written communication” (Pritchard 1969, Rehn & Kronman 2008). To assess the nature of written communication in the academic field of restoration we consulted two electronic databases, *viz.:* (i) Thompson Reuters’ Web of Science© and (ii) Sabinet’s SA Theses (including Navtech and UCTD)©.

(i) Web of Science

Rehn and Kronman (2008) have named the Science Citation Index Expanded (SCIE), which is one of the databases available in the Web of Science as the most important citation index for medicine, life science and the natural sciences. In addition to the SCIE database we used the Social Sciences Citation Index (SSCI) and Conference Proceedings Citation Index-Science (CPCI-S), also available within Web of Science. The search was conducted on the 15th of May 2013 using the following criteria:

- timespan: 1994-2013
- search phrases: restor* AND South Africa OR rehabilitat* AND South Africa
- search field: title and topic (these two fields were not searched simultaneously, the topic search was only done after the title search had been completed)

The search was further refined according countries/territories (South Africa); document types (article or review or proceedings paper or correction); and Web of Science categories that were judged to be relevant (e.g. ecology or environmental sciences or marine freshwater biology etc.). The resulting records were imported into the reference manager Refworks for further analysis.

(ii) Sabinet SA Theses

The Sabinet SA Theses database was chosen over the National Research Foundation's (NRF) National Electronic Theses and Databases (ETD) portal because the latter is not able to export records to a reference manager like Refworks for further analysis. A search was conducted on Sabinet's SA Theses database on the seventh of June 2013 using the same time span (1994-2013) as in the Web of Science search. The search terms used were restorat* AND South Africa or rehabilitat* AND South Africa in the "Subject phrase" field. Resulting records were scanned for relevance and records that contained irrelevant terms such as "art"; "dental"; "justice"; "buildings"; and their derivatives in the title were excluded. The remaining records were imported into Refworks.

Data analysis

(i) Web of science

The titles and abstracts of the 359 records resulting from the topic and title searches were read to determine their relevance. Relevant records were those whose title or abstract contained the terms "restoration" or "rehabilitation" or their derivatives. Additionally, relevant articles had to be about habitat or ecosystem restoration or rehabilitation (and not animal relocation or rehabilitation of injured animals). Duplicated and irrelevant records were removed, resulting in a final list of 190 journal articles. Content analysis of the remaining records was then done to ascertain number of authors per publication; author affiliation; and

ecosystem type and/or land use. With regards to ecosystem type, we distinguished between terrestrial and aquatic ecosystems, but also included the categories “catchment” and “riparian” because they typically include/straddle the terrestrial and aquatic. We further

(ii) Sabinet SA Theses

The 70 records of theses imported into Refworks were categorized according to institution and degree type. More detailed content analysis was not possible because abstracts and full text were not available.

2.3 Restoration policy

Wassenaar and Ntshotsho (2006) conducted a comprehensive evaluation of the legislation governing restoration in South Africa. That work was used as the basis for this task, supplemented with any new legislation and/or policy deemed to be relevant.

2.4 Bringing stakeholders together to form a network

In light of the fact that potential SER affiliation was a major consideration in this project, we approached the communications officer of SER (Ms Leah Bregman) for guidance on the requirements of forming a chapter. Additionally, at the last SER international conference held in Madison, USA in October 2013 a few delegates from South Africa, including the lead researcher and the WRC research manager of this project, expressed these intentions at the annual general meeting.

Locally, a database of restoration stakeholders was compiled from the results of the searches conducted under sections 2.1 and 2.2 above as well as from the researcher’s own professional networks. A total of 83 contactable people were on the database. An invitation to a stakeholder workshop was sent to these people. Conservation societies that have a focus on restoration (e.g. AZEF, CapeNature, GSSA, Fynbos Forum and WESSA) were also sent the invitation to distribute to their members. A one-day workshop themed “*Charting the future of restoration science and practice in South Africa*” was held at the STIAS (Stellenbosch Institute for Advanced Study) Wallenberg Research Centre on the 26th of February 2014. The specific objectives of the workshop were three-fold:

1 To bring together stakeholders from academia, government departments and other organizations and fora involved in the science and practice of restoration to discuss topical issues in the field of restoration
2 To set out priorities for research, to promote alignment with the needs of practice
3 To assess buy-in and chart a way forward for the proposed restoration network

32 people attended the workshop, with 14 apologies received from other would-be participants. Lively discussions were had (see plate 1), culminating with a recommendation on how to keep this initiative going.

Plate 1. Delegates at the stakeholder workshop discussing the needs of practice and policy from science during a break-away session.

3 RESULTS AND DISCUSSION

3.1 Restoration practice

Several restoration projects and programmes were identified, spanning a range of ecosystems, from terrestrial, through riparian to aquatic. Implementers and funders of these projects are equally diverse, as are the reasons for undertaking restoration (Appendix 1). Overall, billions of Rands are spent on these restoration projects annually, with government departments funding a significant portion of this expenditure. These government departments include the department of Environmental Affairs (with an annual budget of over two billion Rands across the sub-programmes of its Natural Resource Management programme) (C. Marais, *pers. comm.*, U. Bahadur, *pers. comm.*). The department of Mineral Resources also spends a considerable amount of money on the rehabilitation of derelict and ownerless mines, having committed a budget of R30 billion for the entire programme. The

latest figures for the LandCare programme of the department of Agriculture, Forestry and Fishes could not be obtained, but figures from the period 1998-2001 indicate that between R15 and R39 million were spent, with approximately 60% of these costs being for rehabilitation. Though we could not ascertain expenditure by private mining companies on post-mining rehabilitation, we are of the opinion that it is substantial, plausibly in the range of millions of Rands annually.

Our findings indicate a difference in terms of implementation scales between terrestrial and aquatic restoration initiatives. With the exception of the Working for Wetlands sub-programme, all the aquatic and riparian restoration projects happen at local scales. While this may arguably be attributable to funding constraints, the question of achieving significant impact becomes important. Taking into account the landscape-, and sometimes regional-, scale nature of drivers of river degradation, we emphasize the need to scale up efforts beyond the local scale. As far back as 2004, Uys made a call for the establishment of "*a central programme or hub for river (or aquatic ecosystem) rehabilitation, […] the creation of structures to enable practical linkage of relevant programmes and processes, the sharing of information and expertise, and the initiation of trial rehabilitation projects at a catchment or sub-catchment scale (addressing all ecosystems)*" (Uys 2004). The implementation of catchment-scale projects is still largely lacking, but there is hope that this may change in the future, particularly in light of the catchment focus of the new National Water Resource Strategy of the department of Water Affairs (DWA 2012). Commendable efforts, largely spearheaded by the WRC, have been made to grow the practice of aquatic restoration. For example, a suite of wetland restoration guides have been produced. An initiative to do the same for river rehabilitation is currently underway. We recommend that the publication of these products be coupled with a concerted marketing and dissemination drive in order to promote extensive uptake and use.

The effectiveness of restoration initiatives, especially in the long term, is largely unknown due to a lack of monitoring (see Ntshotsho *et al*. 2011). What we can surmise is that a limited availability of monitoring guidelines and protocols could be a contributing factor. This underscores the need for the proposed restoration network, where practitioners can come together with researchers to identify information needs and promote relevant and user-driven research. Moreover, because scientists come from a culture that sees monitoring as an integral part of project design and implementation, the cross-fertilization of cultures that could happen within this network could potentially stimulate the adoption of this habit in practical restoration.

3.2 Restoration science

Research output by South African restoration scientists

The number of journal articles published per year has generally increased in the time period covered in this evaluation, reaching a peak of 26 records per year in 2011 (Figure 1). The low number of articles for the current year (2013) is probably an under-representation, due to the fact that the literature search was conducted in May. As such, it is most likely that the number will have increased by the end of the year.

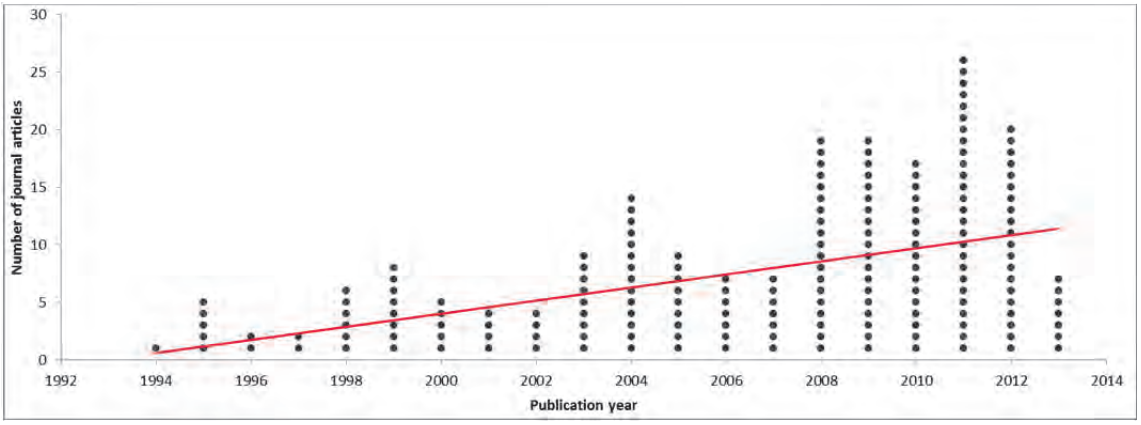
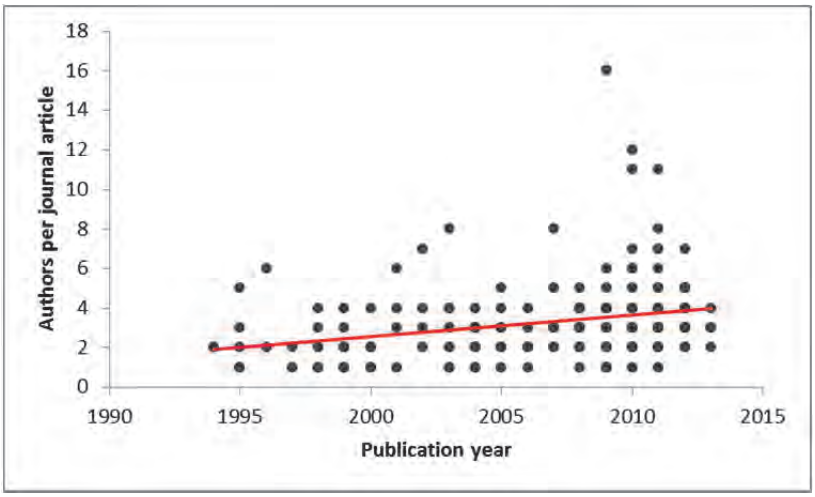
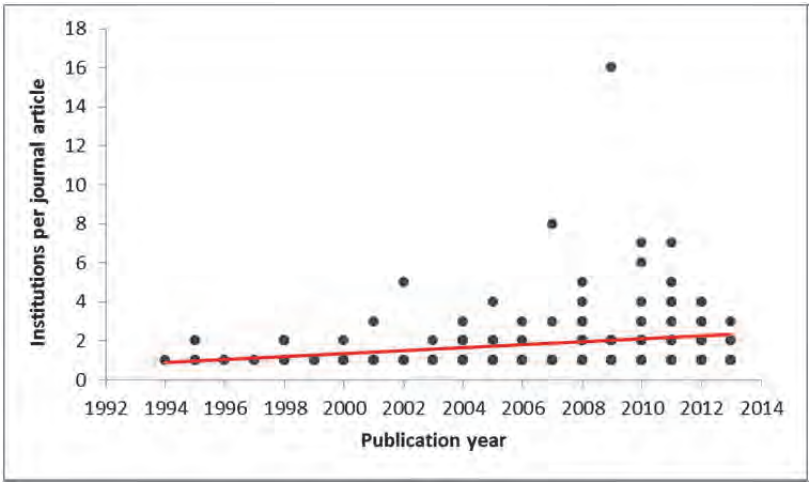


Figure 1. Number of journal articles published on the topic of ecological restoration in South Africa from 1994 to 2013.

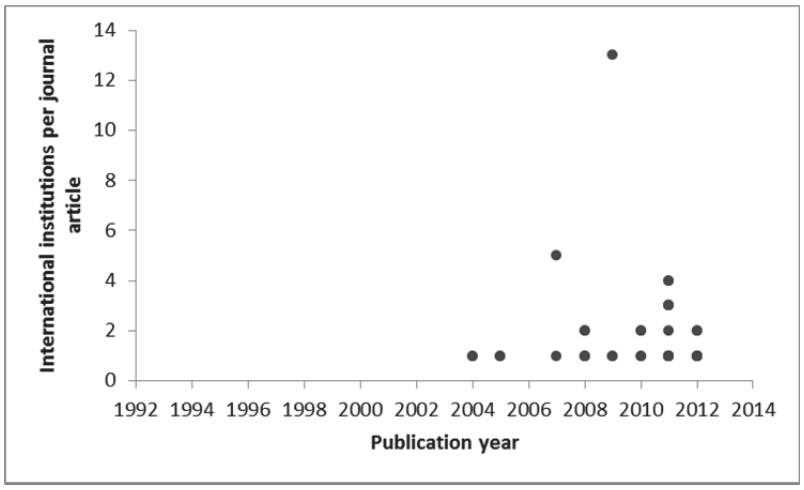
Similarly, there has been a steady increase in collaboration through the years, as reflected in the increasing numbers of authors, as well as institutions per publication (Figure 2a & 2b). This positive trend is not unique to restoration, and has been observed in other fields of science in South Africa (Sooryamoorthy 2009). Collaboration bodes well for the field of restoration as it has been shown that it increases research productivity (Landry *et al.* 1996). Moreover, collaborative partnerships can serve as nuclei for the formation of networks, which are known to be important for the flow of information. The old adage “what you know is who you know” (Crona and Bodin 2006) remains relevant in the science and practice of restoration, especially when we take into account the value of undocumented, experiential knowledge (Fazey *et al.* 2006, Ntshotsho 2012).



(a)



(b)

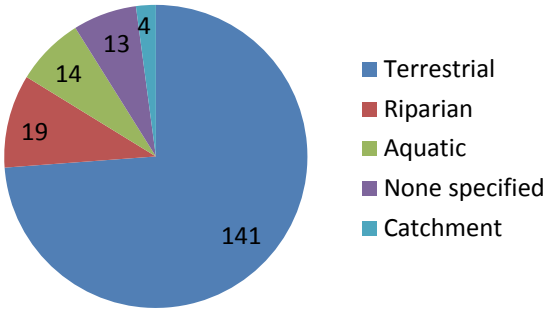


(c)

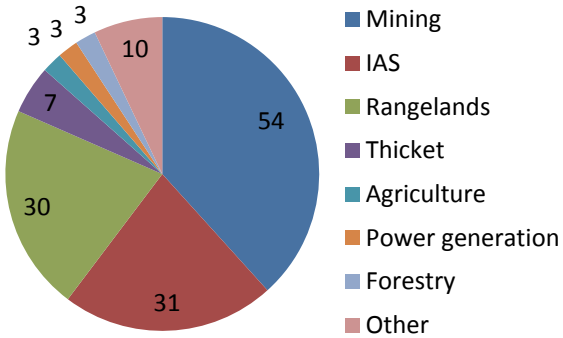
Figure 2. Number of authors (a), total number of institutions (b), and number of international institutions (c) per publication produced between 1994 and 2013.

Collaboration with authors from international institutions, however, has lagged behind, only beginning a decade into the study period (Figure 2c). Because of the few data points it was not possible to assess a trend. Nevertheless, we can speculate that international collaboration is likely to enhance local scientific excellence through fostering access to complementary expertise, knowledge and skills of the international collaborators. This has been cited as the strongest motivation for international collaboration (Georghiou 1998). An additional benefit is the prospect of improved individual researcher reputation, which, in turn, can influence the successful securing of research funds.

A look at the ecosystem types covered in the research showed that an overwhelming majority of the 191 journal articles focused on terrestrial ecosystems, with only 19 and 14 articles reporting on riparian and aquatic studies respectively (Figure 3a). A further four studies were conducted on a catchment scale, while 13 did not specify either the ecosystem or the scale of the study. The disproportionate research focus on terrestrial ecosystems is cause for concern, especially considering that aquatic ecosystems are also under immense pressure. For example, it was stated in the National Spatial Biodiversity Assessment of 2005 that 44% of river ecosystems, 23% of estuarine ecosystems, 12% of marine ecosystems, and 5% of terrestrial ecosystems in South Africa are critically endangered (Driver *et al.* 2005). A subsequent report six years later indicated that over half of South Africa's river, wetland and estuary ecosystems are threatened (Nel et al. 2011). In fact, the same report highlighted that wetlands are the most threatened of all South Africa's ecosystems. As such, it would seem that there is an urgent need for more research effort on non-terrestrial ecosystems, to inform and guide implementation of practical interventions. The four studies conducted at catchment scale rather than at the scale of specific ecosystems are good examples of research that spans different ecosystem types and signify an awareness of a need for a landscape approach to studying and practicing restoration. There is growing recognition that for restoration to be successful, it needs to be considered within a landscape and social context (Hallett 2013.



(a)



(b)

Figure 3. Categorization of journal articles according to (a) ecosystem type and (b) subject matter within terrestrial ecosystems.

Within the terrestrial studies, almost a third focused on mining (Figure 3b). This is probably linked to the relatively large ecological footprint of the mining sector, a fact which has led to mining and its related activities being explicitly named as potentially detrimental to the environment under the Environment Conservation Act 73 of 1989. Recognition of mining's potential detrimental impacts has, in turn, led to the formulation of stringent legislation which, among other things, requires the implementation of remedial actions, including restoration (Wassenaar & Ntshotsho 2006). The legal requirement for demonstrable effectiveness of these remedial actions has supposedly necessitated that mining houses partner with researchers in a search for effective and efficient interventions. Indeed, a preliminary scan of the 54 mining studies reveals that a majority of them fall into the category of applied research, highlighting existing links between research and practice.

The second-largest number of terrestrial studies (31) dealt with the subject of invasive alien species (IAS), followed by rangelands at 30 articles. It has been noted that next to habitat

fragmentation, invasion by alien species poses a major threat to the country's biodiversity. The strong focus on this problem and how to tackle it is thus reassuring. Similarly, studies that pay attention to the problem of degradation of rangelands, and potential solutions thereto, are necessary as livestock production is an important component of the South African economy. Other subject areas covered included the thicket biome (seven articles), agriculture, power generation and forestry (3 articles each), adding some diversity to the range of research subjects.

The average number of publications by a single author during the 20 year period under review was six. Nationally, 12 researchers achieved this average of six publications, with the majority of these prolific researchers publishing more than six, and the most prolific having published 16 articles in this period (Figure4). This number includes first authorship as well as co-authorship.

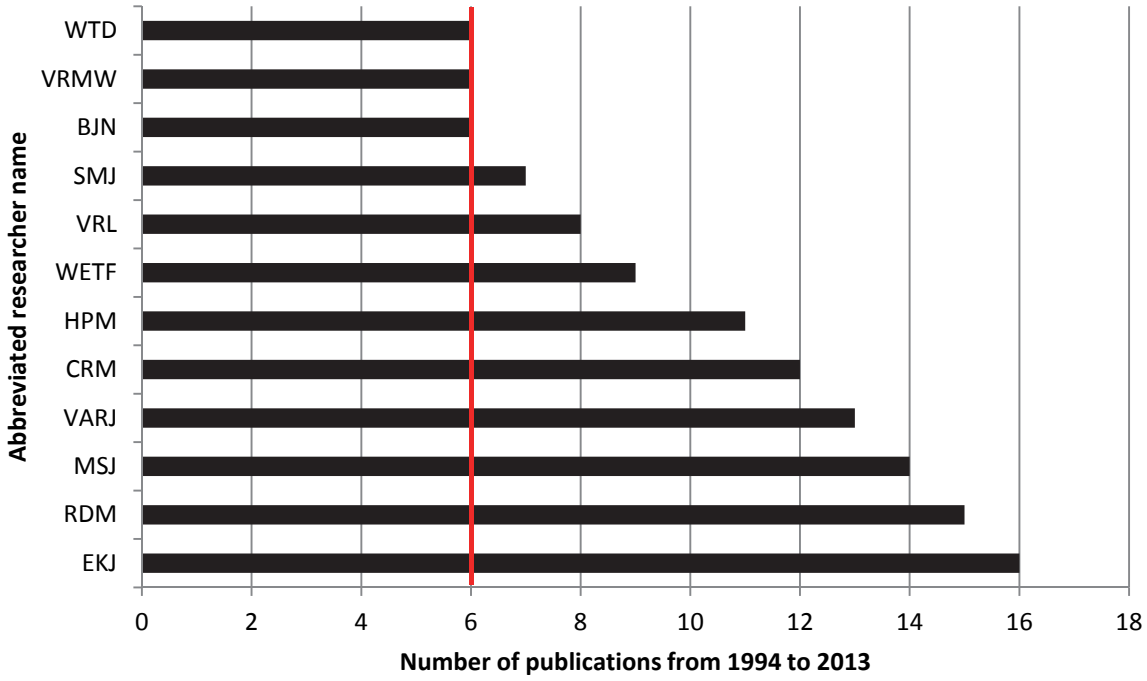


Figure 4. Journal articles authored by each of the 12 most prolific researchers in the field of ecological restoration between 1994 and 2013. The red line denotes the mean for the period. The initial letters of the surname precede the first name initials.

The 12 most prolific researchers were affiliated to six universities, with Stellenbosch University and the University of Pretoria being home to two thirds of these top researchers (Figure 5). This result was not unexpected, because these two institutions are among the five most research-intensive universities locally (McGregor 2010). While this assessment did not include a look at the location of the study sites used by these academics, the

underrepresentation of institutions located in the provinces with severe land degradation is interesting to say the least. Soil and vegetation degradation (collectively referred to as land degradation) are most severe in the historically communal lands of South Africa, which are now part of the Eastern Cape, KwaZulu-Natal and Limpopo provinces (Meadows & Hoffman 2002). It would thus make sense to have academics in these institutions at the forefront of finding solutions to this problem. This, in turn, could potentially enhance the respective institutions' relevance to the surrounding communities as the universities would be perceived as conducting locally-relevant work that could be of direct benefit to their immediate stakeholders. This, however, is not to say researchers geographically removed from sites of severe degradation cannot carry out socially-relevant research at those sites. Thus, an interesting extension of this work would be an analysis of congruence between high-intensity research sites and sites of severe degradation.

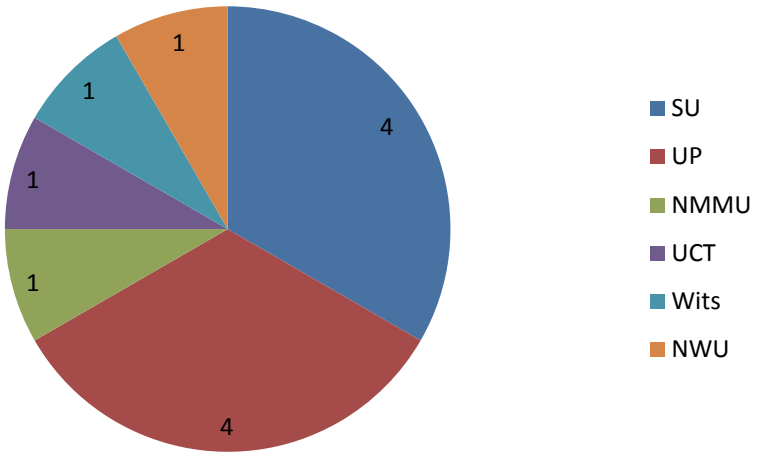


Figure 5. Categorization by home institution of the 12 most prolific researchers. SU = Stellenbosch University; UP = University of Pretoria; NMMU = Nelson Mandela Metropolitan University (previously University of Port Elizabeth); UCT = University of Cape Town; Wits = University of the Witwatersrand; NWU = North West University (previously Potchefstroom University for Christian Higher Education)

Skills transfer as reflected by graduate training

Postgraduate theses written on the subject of restoration between 1994 and 2013 came from ten of South Africa's 23 universities. More than a quarter (20 of 70) of these was by students from North West University (Figure 6). This was followed by 13 theses from Stellenbosch University, nine each from the Universities of Pretoria and Cape Town, eight from the University of Johannesburg and five or less from five other universities, as listed in in the

figure. The outstanding performance of North West University in terms of graduate training was surprising, considering that institutional journal article output did not predict this outcome. In other words, one would expect that the universities with the highest number of prolific researchers (and hence the most research-intensive) would also have the highest number of graduate students.

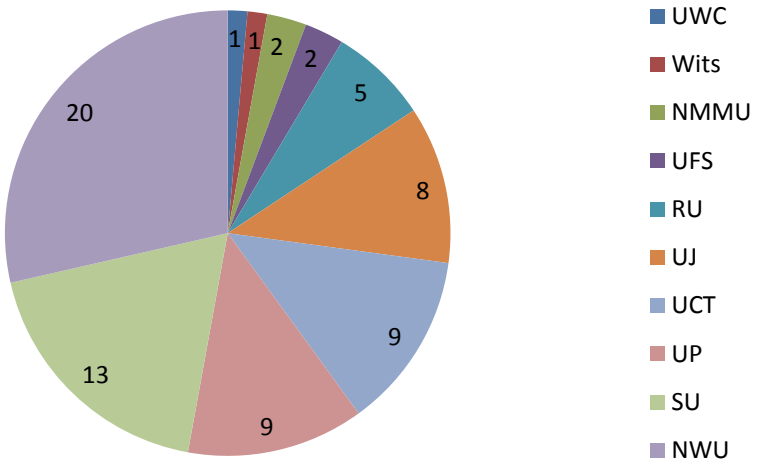


Figure 6. Output of postgraduate theses addressing the topic of ecological restoration from South African academic institutions between 1994 and 2013 (N = 70). UWC = University of the Western Cape; Wits = University of the Witwatersrand; NMMU = Nelson Mandela Metropolitan University (previously University of Port Elizabeth); UFS = University of the Free State; RU = Rhodes University; UJ = University of Johannesburg; UCT = University of Cape Town; UP = University of Pretoria; SU = Stellenbosch University; NWU = North West University (previously Potchefstroom University for Christian Higher Education)

Fifty-five of the theses were produced for the Master of Science (MSc.) degree, while seven more were produced for other types of masters' degrees, including engineering, arts, law, commerce and business administration (Figure 7). Seven theses were produced at doctoral level, six of them being for the degree of doctor of philosophy while the last one was for a doctorate in commerce.

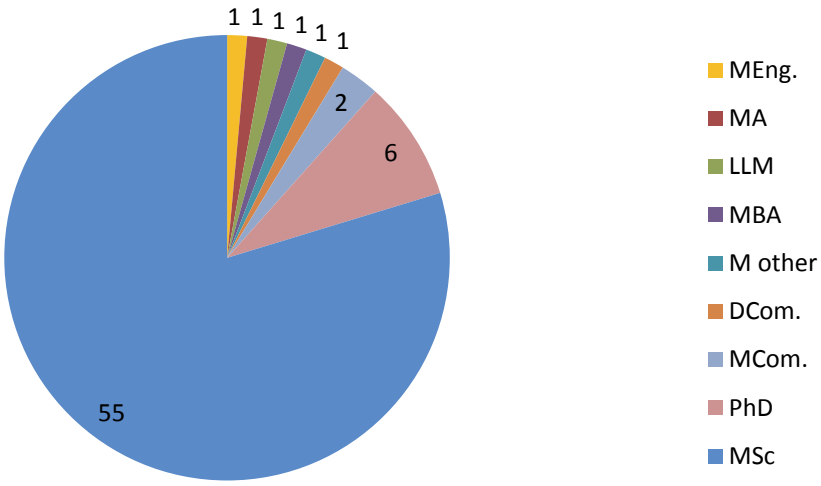


Figure 7. Types of postgraduate degrees represented in the pool of theses written in South African universities on the subject of restoration between 1994 and 2013.

Considering that ecological restoration is essentially a pragmatic interdiscipline, and needs to be informed by various underlying empirical disciplines (e.g. biology, ecology, economics, hydrology, social science, etc.), while at the same time directing these disciplines in their data and knowledge generation (Ntshotsho 2012), it is encouraging to see the representation of other fields of study other than biological sciences, albeit to a limited degree. The underrepresentation of the social sciences, however is still cause for concern. If we concur that restoration is about reversing degradation, which has multiple drivers, including those of a biophysical and socio-economic nature, we then need to agree that there is a need for a transdisciplinary approach to restoration. Transdisciplinarity is an approach to knowledge production and implementation that not only spans various research disciplines, but also includes non-research knowledge spheres, communities and governments, for the management of complex societal problems (Luks & Siebenhuner 2007, Apgar et al. 2009). As such, greater participation of academics from the social sciences in the discourse on restoration is called for.

3.3 Restoration policy

Section 24 of the Constitution of South Africa (Act 108 of 1996) enshrines the right of every individual to have the environment protected, for the benefit of present and future generations. Implicit in this is the need for the minimization or elimination of factors that may have a detrimental impact on the environment. In line with this provision, there is environmental legislation that specifically addresses restoration. The most stringent and

enforceable of these laws are aimed at the mining sector, probably because of its ecological footprint which is larger than that of other land uses. Companies are legally bound to demonstrate that they have restored to a certain, pre-determined state, as provided for in Environmental Management Plans. Legislation and policies governing the rehabilitation of land after mineral extraction only came into being with the enactment of the Minerals Act 50 of 1991. They therefore do not apply to mines that were operational prior to their coming into effect, thus leaving the state with a burden of around 6 000 derelict and ownerless mines in need of rehabilitation that were abandoned before the promulgation of this legislation (DMR 2009).

Other legislation that addresses restoration includes CARA (Act No. 43 of 1983), the Mineral and Petroleum Resources Development Act (MPRDA) Act No 28 of 2002, the National Environmental Management Act (NEMA) Act No. 107 of 1998, and NEMBA (Act No. 10 of 2004). In addition to national laws and program-specific policies, South Africa is signatory to several international conventions that address degradation and restoration (e.g. Convention on Wetlands of International Importance (RAMSAR); Convention to Combat Desertification; Convention on Biological Diversity; and Framework Convention on Climate Change).

Additionally, the recent Presidential Outcome 10 (see Box 1.) sets out clear targets for the valuing, protection and enhancement of the natural environment, as well as actions and indicators required to meet the targets. Outputs one and three make explicit reference to restoration and rehabilitation. Of particular significance about the Presidential Outcomes are the performance agreements signed with cabinet ministers of responsible departments and the great potential they present for the monitoring of progress at national and sub-national levels. This creates an opportunity for academics and practitioners to have an influence at policy level through, for example, the development of indicators needed for monitoring.

The second edition of the National Water Resource Strategy (NWRS 2) published by the Department of Water Affairs (DWA 2012) also makes explicit reference to restoration and rehabilitation. A noteworthy aspect of the NWRS 2 is the new catchment level approach to the management of water resources, which recognizes that water resources are entrenched in wider ecosystems and that they cannot be managed in isolation. This advance was made possible by the involvement of scientists from various institutions such as the CSIR, SANBI, WRC and WWF.

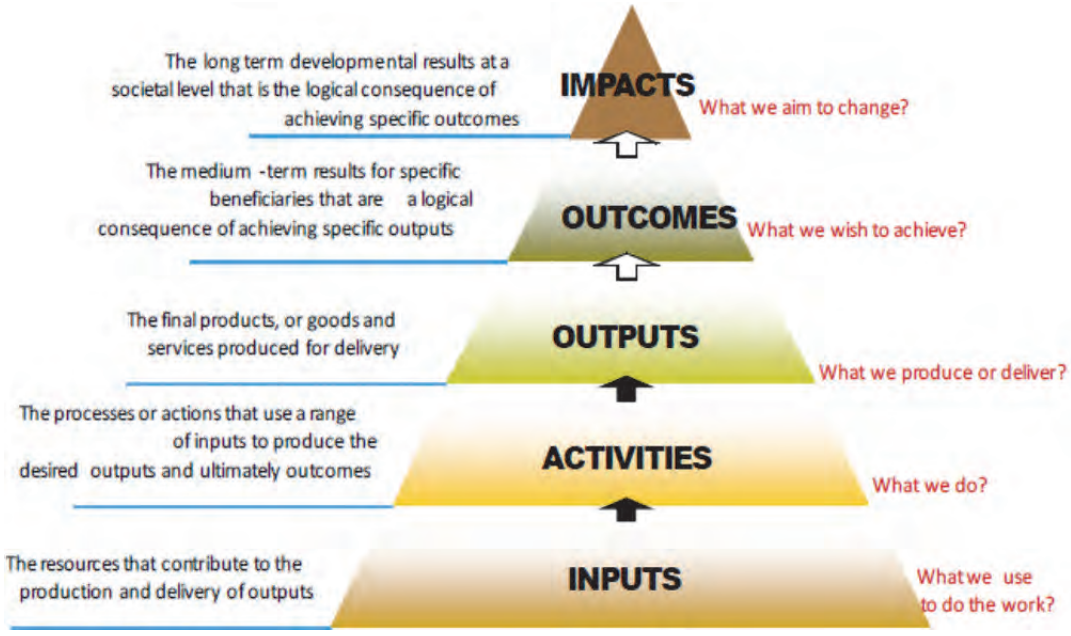
Development of policy and legislation needs to be well-informed, taking cognizance of advances in research and development. As such, the input of people who can access and

interpret the latest scientific outputs is crucial in policy development, as illustrated in the NWRS 2 example. This can be achieved through embedding scientists in state organs or through the formation of partnerships that facilitate free-flow of information. A shortage of such arrangements has been identified as a gap in the policy arena.

Box 1. (Text and figure courtesy of the South African Presidency, see www.thepresidency.gov.za/dpme/docs/outcome10.pdf)

The Presidential Outcomes

The presidential outcomes are an expression of the South African government's need to go beyond the work it does and interrogate the impacts thereof. The approach involves management using a logic model which links inputs, activities, outputs, outcomes and impacts, as demonstrated in the figure below. A set of twelve outcomes was developed, together with performance agreements signed with responsible government ministers to improve accountability for the outcomes.



Outcome 10: Protected and enhanced environmental assets and natural resources, specifically refers to the natural environment, with outputs 1 and 3 explicitly listing restoration and rehabilitation of degraded ecosystems as sub-outputs and indicators.

List of outputs under Presidential Outcome 10, that specifically address restoration and ecosystem services.

Output	Sub-outputs	Associated indicator
1. Enhanced quality and quantity of water resources	• Water resource protection	• Number of wetlands rehabilitated per year
3. Sustainable environment	• Restoration and rehabilitation of degraded ecosystems	• Number of hectares of degraded ecosystems rehabilitated • Number of derelict mines rehabilitated

3.4 Forming a network of restoration stakeholders

At the inception of this study eventual affiliation to SER was a strong consideration. This idea was well-received by members of the board of SER at the Madison conference and there was a lot of enthusiasm around providing the necessary support and guidance. Realisation of this notion however depended heavily on buy-in from the local restoration community. One of the direct questions posed to the 32 people who attended the workshop in Stellenbosch therefore was their willingness to become members of SER (the international society), a fundamental requirement of being a chapter member. A minimum membership of at least 10 individuals is one of the requirements for the formation of a SER chapter. Only five delegates indicated that they were already members of SER, but no one else indicated a willingness to sign up for membership. The cost of membership was cited as a major limiting factor and LaRSSA was acknowledged as a more attractive alternative. During the meeting no one knew exactly what SER membership actually costs, and figures ranging between R600 and R1000 were thrown around. However, from the comparison below (Table 1) it seems SER membership is actually cheaper than that of LaRSSA.

Table 1. Comparison of the Land Rehabilitation Society of Southern Africa (LaRSSA) and the Society for Ecological Restoration (SER).

	LaRSSA	**SER**
Website	www.larssa.co.za	www.ser.org
Established	2012	1988
Mission	To be a multidisciplinary society that promotes Land Rehabilitation that is: - Scientific - Technically robust - Economically viable - Socially acceptable	To promote ecological restoration as a means of sustaining the diversity of life on Earth and re-establishing an ecologically healthy relationship between nature and culture
Membership	>140	>2400
Membership fee	~R600	$20 (individual, low income country) Chapter membership at an additional cost determined by the Chapter Board
Member benefits	• Networking with specialists • Exposure to best practices • Reputational value • Recognition as Land Rehabilitation Specialist • Reduced rates for society events • Learning and development opportunities • Discussion forums • Access to reputable Land Rehabilitation Information	• SER Conferences & Event Discounts • RESTORE & SERNews (bi-weekly and quarterly newsletters, respectively) • Online Member Directory (opportunity to connect with members from across the world) • Access to Global Restoration Network (web-based portal/database of case studies) • Opportunity to use Restoration Project Showcase (online gallery of restoration

	• Certificate of membership	projects used by members to promote visibility of their projects) • Discounted journal subscriptions (*Restoration Ecology* and *Ecological Restoration*) • 25% discount on Island Press books • 35% discount on John Wiley & Sons books

Moreover, because of the largely voluntary nature of managing and driving communities of practice, there was also a feeling that the human resource costs of a new SER would be a hindrance. Indeed, when the facilitator specifically asked who would be willing to serve on the committee of volunteers to drive the initiative, there was no eagerness. Additionally, the issue of finding an institutional home for the proposed chapter could not be resolved. As such, considering that LaRSSA is already an established local body, with many areas of overlap with the proposed chapter, there was a general feeling that the option of joining LaRSSA could be a more viable option than establishing a new network that would affiliate to SER as a regional chapter.

One delegate raised a concern that LaRSSA seems to be more industry-oriented and that it may not be appealing to academics. This opinion could have arisen from the presentation given earlier which suggested a strong focus on the mining and agricultural sector, giving an impression that this society serves mainly the interests of these groups. It was clarified by the LaRSSA president that the society is not meant to cater for the needs of one group of stakeholders, to the marginalisation of others. On the contrary, it is meant to be an open space for all stakeholders to come together and share learning and experiences around restoration. He further emphasized that the Board of LaRSSA is open to the possibility of discussing a way forward. To this end, delegates were invited to submit their needs and expectations from a society focussed on restoration. These could be summarised as follows:

- the society must offer affordable membership and tangible benefits
- be represantative of a diverse range of stakeholders and their needs (academics, practitioners, policy makers)
- work hard to mitigate the silo effect currently apparent in restoration, through for example (i) engaging with other existing fora and negotiating for a defined space within these fora for restoration-focused discussions, and (ii) offering opportunities for collaboration / knowledge exchange between stakeholders through workshops, meetings and similar events
- offer opportunities for students and promote skills development (e.g. by offering and/or coordinating high quality training)
- promote the development of restoration as a science and profession in its own right

- offer practical guidance on rehabilitation techniques (best practice protocols and guidelines)
- promote exposure (opportunity to raise awareness of involvement in restoration)
- have the capacity to lobby government for the inclusion of restoration in policy, law and decisionmaking
- build the capacity of civil society to understand the need and fundamental role of restoration for sustainability
- have the capacity to enhance the profile of restoration ecology in the media and in society
- be able to raise funds to sustain itself

It is apparent from this list that the ability to serve as an information or communication hub is central to this much-needed, inclusive network. In appendix 2 we elaborate further on a communication strategy.

4 CONCLUSIONS

There is an undeniable need and scope for a network focussed on the restoration of degraded ecosystems in South Africa. The gaps identified between the science, practice and policy of restoration underscore this. Ultimately, the goal of such a community of practice would be to foster learning, exchange of experiences and dissemination of knowledge. It is critical that in-person meetings are an integral part of the activities of such a network. Annual conferences and symposia fulfil this requirement and are a standard feature on LaRSSA's annual calendar. Additionally, the attractiveness and usefulness of a network can be enhanced if it also acts as a central repository for relevant, documented information, in addition to the information exchanged in face-to-face meetings, which can often be experiential and undocumented. To this end, something akin to SER's global restoration network, where research; practical projects; and policy advances could be archived would be highly beneficial to the local restoration community. Such a database is currently not on LaRRSA's list of offerings but is something that can be included in the discussions. It is also important that such a network establishes itself as an authority in its field. One measure of how authoritative an organisation relates to the influence it can exert on policy formulation. Globally, SER is well-placed to fulfil this function, as evidenced by its recent participation in the deliberations leading up to the COP11 decision XI/16 on Ecosystem Restoration (Aronson & Alexander 2013). It remains to be established whether LaRSSA, the preferred option to establishing a restoration network, has the potential to influence local policy.

5 RECOMMENDATIONS

The principal recommendation emerging from this work is that the option of partnering with LaRSSA, instead of establishing a new network to subsequently affiliate to SER, be investigated further. To this end, participants at the stakeholder workshop held as part of this research project came up with a list of requirements and expectations from a truly representative restoration network. The unanimous resolution was that the WRC, as the driving force behind this initiative, engages in discussions with LaRSSA to establish whether this organisation has the potential to cater to these stakeholder needs. The outcome of the discussions then needs to be communicated back to the stakeholders.

A secondary recommendation is that in carrying this initiative forward, a concerted effort should be made to encourage the participation of social scientists and other stakeholders currently missing from the restoration community (e.g. universities of technology).

Additionally, pending the outcome of discussions with LaRSSA, it is recommended that the establishment of a central repository or database of restoration research and projects be facilitated, either to be hosted and managed by LaRSSA or another capable institution.

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7 APPENDICES

APPENDIX 1: EXAMPLES OF RESTORATION PROJECTS AND PROGRAMS. ADAPTED FROM NTSHOTSHO 2012

Restoration category	Ecosystem type	Rationale for restoration	Short description and reference
National LandCare Programme	Terrestrial	Ecological and socioeconomic	The National LandCare Programme started in 1998/1999 and is a sustainable resource utilization programme based in the community and driven by both the public and private sectors through partnerships and co-operation. Initiated by the National Department of Agriculture (NDA), the programme is mainly aimed at rural poverty alleviation and job creation through the launching of various natural resource rehabilitation, improvement and conservation projects. Resource conservation works, which include rehabilitation activities, account for 60% of the annual budget. This budget was in the range of R15 million to R39 million between 1998 and 2001. More recent figures were unobtainable. - http://www.daff.gov.za/daffweb3/Programmes/LandCare
Post-mining restoration	Terrestrial	Legal obligation	In South Africa mines have a legal obligation to carry out restoration and rehabilitation on areas that have been mined. The South African Chamber of Mines, in collaboration with Coaltech Research Association, loosely defines rehabilitation and restoration as activities aimed at putting the land impacted by mining activities back to a sustainable usable condition (Chamber of Mines of South Africa/Coaltech, 2007). It is up to the individual mines to refine this definition and name their specific restoration goals. The Department of Mineral Resources initiated a project aimed at the rehabilitation of derelict and ownerless mines. These are mines that were abandoned prior to the enactment of legislation in 1991 obliging mining

			operators to rehabilitate. The department initially committed to a budget of R30 billion to rehabilitate close to 6000 such mines. - Department of Mineral Resources (2009). The National Strategy for the Management of Derelict and Ownerless Mines in South Africa.
#Restoration in protected areas	Terrestrial	Legal obligation	Protected areas serve the purpose of protecting and conserving biodiversity. Invasion by alien species is currently regarded as the single biggest threat to South Africa's biodiversity. Alien plant invasion constitutes degradation, and the removal of the degrading agent constitutes restoration. It is in this vein that restoration in protected areas was included in this assessment. We used Kruger National Park and Table Mountain National Park as case studies. Both conservation areas have a long history (over six decades each) of alien plant control operations.
Restoration on commercial farming land	Terrestrial	Ecological and socioeconomic	Information on restoration activities on commercial farming land was obtained from a computerised decision support system (DSS) developed by van der Merwe (1997) and later upgraded by Barac (2003). The DSS, named EcoRestore – Grass Expert combines scientific and indigenous knowledge into a single, interactive computer program that users can access directly to support their decisions, based on results of land users' management practices. At the time of consultation, the database contained information from 171 case studies scattered throughout the country. - http://www.puk.ac.za/fakulteite/natuur/soo/EcoRestore/grassexpert.html,
*Working for Water (WfW)	Terrestrial	Ecological and socioeconomic	Working for Water (WfW) is a government programme that was initiated in 1995 to simultaneously control the alien invasive species problem to provide water benefits, while creating employment. It has been internationally acclaimed as a success. Having initially been under the management of the Department of Water Affairs and Forestry (DWAF), WfW is now the biggest

			sub-programme of the Natural Resources Management Programme of the Department of Environmental Affairs (DEA), with an annual budget of R1.13 billion in the 2013/14 financial year. - https://www.environment.gov.za/projectsprogrammes#workingfor
*Working for Wetlands	Aquatic	Ecological and socioeconomic	Working for Wetlands (WfWet) was born out of the WfW programme and commenced in 2000. Aimed at the rehabilitation, protection and sustainable use of wetlands, WfWet is a joint initiative of the departments of Environmental Affairs (DEA), Water Affairs (DWA) and Agriculture, Forestry and Fisheries (DAFF) that is managed by the South African Biodiversity Institute (SANBI). - https://www.environment.gov.za/projectsprogrammes#workingfor
*Working for Land	Terrestrial	Ecological and socioeconomic	Previously known as the Working for Woodlands programme, Working for Land is now a sub-programme of the Natural Resources Management Programme of the Department of Environmental Affairs, focusing on the need for restoration of degraded woodlands and the ecosystem services they provide. A keystone project of this sub-programme is the Subtropical Thicket Restoration Project, which has now been registered to trade in the international carbon market. - https://www.environment.gov.za/projectsprogrammes#workingfor
River rehabilitation through the removal of alien fishes	Aquatic	Ecological	The Western Cape government, in collaboration with civil society organizations, initiated a project aimed at the removal of alien invasive fishes in order to promote the security of native fishes in the Cape Floristic Region. Scoping work started in 2003 and actual eradication was initiated in a pilot project in 2012. A major funding source for the project is the Water Research Commission (WRC). - www.wrc.org.za

			- Woodford DJ; Weyl OLF; Cunningham M; Bellingan T; de Moor FC; Barber-James H; Day JA; Ellender BR; Richardson NK (2012). Monitoring the Impact and Recovery of the Biota of the Rondegat River after the Removal of Alien Fishes. Research Report No. KV 304/12
Rehabilitation of riparian systems	Riparian	Ecological	As part of a project aimed at developing a decision support system for the rehabilitation of riparian areas, techniques and protocols were tested at selected sites in the province of KwaZulu-Natal. Financial support was provided by the WRC. - www.wrc.org.za - Quinn (2003). A decision support system for rehabilitation and management of riparian systems. Report No. 1064/1/03
Restoration of rivers and riparian areas by the City of Cape Town	Aquatic and riparian	Ecological and socio-economic	Several restoration initiatives have been implemented by the City of Cape Town. Examples include: 1. Keyser River restoration project. Started in 2004, this project is one of very few South African case studies listed on SER's Global Restoration Network. It was a partnership between the City of Cape Town, the University of Cape Town, local private business and non-governmental organizations aimed, at restoring and maintaining the Keyser River, one the feeder rivers to Zandvlei. This project forms part of the larger Zandvlei estuary management initiative. - http://www.zandvleitrust.org.za/ 2. The Lower Silvermine River upgrade. This project was implemented in 1999, with a brief to institute appropriate measures to control the flooding of properties in Fish Hoek and Clovelly and improve the ecological functioning of the Lower Silvermine River, among other things. - Van Zyl H., Leman A. and Jansen A. (2004). The costs and benefits of urban river and wetland rehabilitation projects with specific reference to their

			implications for municipal finance: case studies in Cape Town. WRC Research Report No. KV 159/04 3. The Kuils River canalisation and rehabilitation project was implemented in 2000 to reduce flood risk. - www.capetown.gov.za
Restoration of rivers and wetlands by WWF	Aquatic, riparian	Ecological	One of WWF South Africa's freshwater programme targets is the restoration of river ecoregions. We identified two examples of restoration initiatives that have been undertaken under this programme, *viz.:* the Sand River Wetland restoration and the Kouga River restoration projects. These are based on partnerships between the WWF, local communities and relevant state departments. The primary aim is the promotion of the sustainable use of water resources: www.panda.org

The removal of invasive alien plants is now done under the auspices of the Working for Water sub-programme in protected areas managed by SANPArks.

* These initiatives are now sub-programmes of the Natural Resource Management Programme of the national Department of Environmental Affairs.

APPENDIX 2: COMMUNICATION STRATEGY FOR A RESTORATION NETWORK

Background

When project K8/1020 was commissioned, it was anticipated that it would lead to the establishment of a new local network focussed on the restoration of degraded ecosystems. The finding of the feasibility assessment, which solicited the input of expert stakeholders, has been that, due to practical considerations, it would be largely unrealistic to form a new network. It has thus been recommended that the possibility of linking to an existing local society, specifically the Land Rehabilitation Society of Southern Africa (LaRSSA), be investigated further. In light of this development, the formulation of a communication strategy for an independent network, as originally envisioned, became irrelevant. Instead, we reviewed the approach currently used by LaRSSA to communicate with its members and the wider restoration community, compared it to the approach used by the Society for Ecological Restoration (SER, the international society it was hoped the local network would eventually affiliate to), and made recommendations.

Current communication avenues

Official websites

It is standard practice for societies to have official websites as the first port of call for people seeking information on them (see for example the official websites of the Arid Zone Ecology Forum (AZEF); Grassland Society of Southern Africa (GSSA); Wildlife and Environment Society of South Africa (WESSA); etc.). Both LaRSSA and SER have established websites, whose respective home pages contain pertinent information such as the mission; vision; activities and copyright. Tabs and links to other pages connect users to more detailed material, including information resources (e.g. publications, projects and relevant databases); membership options; events; contact details; social media; etc. Dedicated pages for members contain exclusive resources that come with the benefit of membership. Typically, these member-only pages are more interactive, thus facilitating communication between members. For instance, in the case of LaRSSA, the member-only page includes a blog and a discussion forum, where members can post discussion topics and comment on topical issues surrounding the field of restoration. The SER member-only page allows members to access the member database and connect on an individual basis with other members. Additionally, member-only pages enable members to showcase their work by posting case studies.

Newsletters

Websites represent a primary information portal for both members and non-members of societies but are characterised by somewhat limited interaction between the society itself and its members. Beyond maintaining an up-to-date and interesting website, the society takes no active role in ensuring that the intended users actually do visit the website. Newsletters, on the other hand, exemplify an approach where a society takes active steps to keep its members informed on the latest news, events and developments. By using mailing list servers societies deliver newsletters to their members. It needs to be highlighted, however, that in an age where people are flooded with electronic communication, societies have to maintain a fine balance between giving members regular updates and overwhelming them with too-frequent communication. This is imaginably one of the reasons why *RESTORE*, a bi-weekly e-bulletin provided to members of SER, is now being phased out, to be replaced by a quarterly newsletter *SERNews*. LaRSSA currently sends out a newsletter to its members every two months. The option of unsubscribing from a list server is a normal feature of electronic newsletters. Tracking subscription/unsubscription rates could give an indication of the relevance and utility of these newsletters and lead to the implementation of user-desired formats.

Social networks

Social media have taken the world by storm, including the traditionally conservative world of academia (see for example the editorial in the latest issue of the Journal *Conservation Biology*[3]). The foremost attraction of social media is that their use is free. Moreover, the highly dynamic, interactive, mobile and current nature of social media makes them a convenient platform to engage with a much wider audience, including the general public, than is possible with other methods of communication and information dissemination. An example of the sheer power of social media as communication platforms is the Square Kilometre Array – Africa (SKA_Africa), a science project which now boasts a following in excess of 3000 people on Twitter, including notable media personalities. Such a following means that newsworthy developments within the project stand a chance of making it onto mainstream news, and subsequently reaching an even wider audience.

Popular social media used by LaRSSA and SER include Facebook, LinkedIn and Twitter. SER has a bigger and more active presence on these platforms, arguably because of the focussed effort of its communications manager. We feel that the potential of social media to

[3] Parsons, E.C.M., Shiffman, D.S., Darling, E.S., Spillman, N. & Wright, A.J. (2014). How Twitter literacy can benefit conservation scientists. *Conservation Biology*, 28: 299-301.

enhance the visibility and social relevance of restoration remains under-exploited in the case of LaRSSA. Lessons on how to harness this potential could be learned from initiatives that have attained and maintained high levels of member activity. Such an exploration would need to be driven by someone.

A major drawback of social media is the lack of quality control. Information sources are not necessarily authoritative and this may pose a threat to a developing field such as restoration. For example, the dissemination of incorrect information pertaining to restoration interventions (e.g. unverified guidelines and protocols) may do more harm than good. It is thus imperative that potential users of such information bear in mind that the content of social media is mainly opinions and does not carry the golden standard of peer review. Members should thus use these platforms mostly as a way of "staying-in-the-loop", but revert to authoritative sources such as publications for more credible information.

Conclusions and recommendations

A key difference between LaRSSA and SER in terms of their communication strategies is that the former has a dedicated communications manager, whereas this function falls under general administration in the case of the latter. The significance of this difference shows in the wider reach and visibility of SER (as evidenced by membership and activity on communication platforms). Admittedly, this could be an artefact of its longer history (having been established 26 years ago, in comparison to LaRSSA which was established barely two years ago). However, we feel that the marketing and promotion of LaRSSA to date has been limited primarily to the Gauteng province. This, coupled with its apparent focus on mining and agriculture, has the potential to portray LaRSSA as being "closed off" to the wider restoration community. Indeed, many of the delegates at the workshop held in February 2014 in Stellenbosch, as a component of the feasibility assessment, heard about the society for the first time during this workshop. We thus recommend that the option of establishing a dedicated communication function is explored during the discussions between WRC and LaRSSA. This will arguably promote visibility and subsequently grow the member base. Being cognisant of the likely monetary and management costs associated with such an undertaking, we suggest that soliciting the involvement of volunteers to perform this function should be strongly considered.