

SUSTAINABILITY ASSESSMENT: DRESSING UP SEA? — EXPERIENCES FROM SOUTH AFRICA

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Sustainability Assessment is a recent addition to the environmental assessment toolbox that is not currently applied in South Africa in any formal way. However, there appear to be remarkable similarities between what is commonly proposed as Sustainability Assessment and how Strategic Environmental Assessment (SEA) has been conceptualised and promoted in South Africa. This paper therefore investigates the following questions:

- Could the South African concept and application of SEA be what is required for Sustainability Assessment?
- If Sustainability Assessment is “dressing up” SEA, is there really a need to introduce a new tool?
- If there is a need for a new tool, are there lessons learnt from the application of SEA in South Africa, which can be used to inform the further development and indeed practice of Sustainability Assessment?

This paper identifies from the literature some key criteria that should underpin Sustainability Assessment that are then used to identify some of the shortcomings of SEA, both as promoted and as practised in South Africa. Two sets of criteria form the basis of the analysis: one relating to sustainability assessment processes and the other to the concept of sustainability itself. As a result of this analysis, the paper makes recommendations as to how the practice of SEA in South Africa may be improved to better align with the principles of Sustainability Assessment. These recommendations are also likely to be relevant to other countries seeking

to develop Sustainability Assessment processes based upon SEA. Finally, the potential for the emerging field of sustainability science as an underpinning body of knowledge is introduced.

Keywords: Sustainability; Strategic Environmental Assessment; Sustainability Assessment; Sustainability Science; principles.

Introduction

The concept and the application of Strategic Environmental Assessment (SEA) as an environmental assessment tool has emerged rapidly since the 1990s. Several approaches and definitions for SEA have been developed in different parts of the world. These definitions reflect different understandings of its purpose. Earlier SEA definitions focussed the tool on the assessment of environmental impacts, for example:

The formalised, systematic and comprehensive process of evaluating the environmental effects of a policy, plan or programme and its alternatives (Therivel and Partidario, 1996, p. 4); and

SEA is the systematic process for evaluating the environmental consequences of a proposed policy, plan or programme initiative in order to ensure that they are fully included and appropriately addressed at the earliest appropriate stage of decision-making on par with economic and social considerations (Sadler and Verheem, 1996, p. 27).

More recently, the range of interpretations of SEA has become wider, and many definitions now emphasise the integration of sustainability considerations into decision-making for policies, plans and programmes, for example:

SEA is a process directed at a holistic understanding of the environmental and social implications of the policy proposal. The intention of SEA is moving the policy, plan and programme towards sustainable outcomes (Brown and Therivel, 2002, p. 185); and

SEA is a process that aims to integrate environmental and sustainability considerations in strategic decision-making (Thérivel, 2004, p. 3).

Emerging in parallel with SEA is a "new" addition to the environmental assessment toolbox. *Sustainability Assessment* appears to be the new *in vogue* tool on the international Integrated Environmental Management agenda. Sustainability Assessment

as described by Gibson *et al.* (2005), Dalal-Clayton and Sadler (2004), Pope *et al.* (2004), Gibson (2001) and Devuyt (2000) reflects a common purpose — to integrate the biophysical environmental, social and economic pillars of sustainability into decision-making in a way that acknowledges their inter-relatedness.

Sustainability Assessment has the potential to enhance the sustainable decision-making processes of local, regional, national or international authorities or private organisations (Dalal-Clayton and Sadler, 2004; CSIR, 2001). Despite this, sustainability assessment, as a formalised process, is not currently practiced in South Africa and may not even be adopted or promoted. However, through this initial conceptualisation of Sustainability Assessment, there appear to be remarkable similarities between what is proposed in the tool and how SEA has been conceptualised and promoted in South Africa. This paper therefore investigates the following questions:

- Could the South African concept and application of SEA be what is required for Sustainability Assessment?
- If Sustainability Assessment is “dressing up” SEA, is there really a need to introduce a new tool?
- If there is a need for a new tool, are there lessons learnt from the application of SEA in South Africa that can be used to inform the further development and indeed practice of Sustainability Assessment?

In responding to these questions, the principles of SEA as defined in South Africa are firstly assessed against a set of process principles for sustainability assessment to determine whether SEA as defined conceptually could indeed be a tool for sustainable development.

Then, four case studies are analysed against a set of sustainability criteria to determine the extent to which SEA processes in South Africa embody the principles of sustainability assessment in practice.

Principles of the South African Approach to SEA

The early conceptualisation and application of SEA in South Africa had a uniquely different focus to the international situation as described above, since its focus has always been on the opportunities and constraints which the environment places on policies, plans and programmes, rather than the impact (consequences) of policies, plans and programmes on the environment (CSIR, 1996).

The initial concepts related to SEA in South Africa were articulated in an *SEA Primer and Protocol* produced by the CSIR in 1996 and 1997, respectively (DEAT, 2004). In 2000, the National Department of Environmental Affairs and Tourism (DEAT) published guidelines for SEA that promoted this “sustainability” approach

to SEA by stating that

“SEA is driven by the concept of sustainability” and more specifically “the focus of SEA is on integrating the concept of sustainability into strategic decision-making” (DEAT, 2000, p. 9).

While Chapter 5 of South Africa’s National Environmental Management Act (NEMA) provides for the development of procedures for the assessment of the impact of policies, plans and programmes (RSA, 1998a), SEA-specific legislation does not exist. However, DEAT prepared these guidelines in the absence of formal legal requirements in response to the need for informed planning and decision-making. Not only did the limitations of project EIA become widely recognised but planning legislation — e.g. The Development Facilitation Act (RSA, 1995) and Local Government Transition Act (RSA, 1993) — identified principles of community empowerment and concern for the environment, however, did not prescribe methods by which environmental issues can be accounted for early in the planning process (Wiseman, 2000). During this time, a number of SEAs were initiated. Therefore, DEAT published the guideline document to provide a basis on which context specific, integrated and sustainability-led processes for SEA could be formulated in South Africa.

The guidelines apply to environmental assessment at the planning and programme level, and describe the main benefits of SEA; the contribution that SEA can make to guide development within sustainable limits; the essential elements of SEA; and how these can be combined in the SEA process. At present, DEAT is updating this guideline document to provide practical guidance to undertake SEAs. With further experience, SEA may in the future be legislated for application within specific contexts. Notwithstanding the limited legislative backing, a survey conducted by Retief *et al.* (2004) identified 50 SEA’s that were conducted in South Africa between 1996 and 2003.

The DEAT guidelines do not propose a “step-by-step” process for SEA but rather focus on key principles. The principles were developed within the overall context of NEMA where the definition of the term “environment” is holistic and includes social, ecological and economic systems. The concept of a “principle-based” approach is that while there is broad agreement on principles, interpretations of these principles may differ and this can lead to confusion. Nonetheless, it emphasises the flexible nature of SEA in that it allows SEA to be applied in varying contexts for a variety of purposes. With a lack of firm step-by-step guidance, the principles remain the consistent linkage between the SEAs that have been conducted despite the context within which an SEA is applied or the approach undertaken. The DEAT (2000) SEA principles are reflected in Box 1.

Box 1. SEA principles in South Africa (DEAT, 2000).

- SEA is driven by the concept of sustainability;
- SEA identifies the opportunities and constraints that the environment places on the development of plans and programmes;
- SEA sets the levels of environmental quality or limits of acceptable change;
- SEA is a flexible process, which is adaptable to the planning and sectoral development cycle;
- SEA is a strategic process, which begins with the conceptualisation of the plan or programme;
- SEA is part of a tiered approach to environmental assessment and management;
- The scope of an SEA is defined within the wider context of environmental processes;
- SEA is a participative process;
- SEA is set within the context of alternative scenarios; and
- SEA includes the concepts of precaution and continuous improvement.

Sustainability Assessment Criteria

Sustainability Assessment has been defined as:

A formal process of identifying, predicting and evaluating the potential impacts of an initiative (such as a legislation, regulation, policy, plan, programme or project) and its alternatives on the sustainable development of society. The process includes writing a report on the findings of the sustainability assessment in such a way that it improves the publicly accountable decision-making process (Devuyt, 2000, p. 68).

Sustainability Assessment is increasingly being viewed as an important tool to aid the shift towards sustainable development (Pope *et al.*, 2004). The understanding of sustainable development has led to different approaches towards environmental assessment and management. Despite having a wide spectrum of environmental assessment processes of which most are sustainability-based, a truly integrative sustainability-based assessment framework is yet to be established out of these experiences (Buselich, 2002).

Gibson (2004) outlined the basic features for sustainability assessment. A comparative examination of the DEAT principles and those of Gibson reveals a high

degree of overlap (Table 1). At a superficial level, in theory, SEA as practiced in South Africa meets the requirements of what should constitute sustainability assessment. It is relevant to note that the key “definers” reflected in Table 1 are mostly in terms of process rather than content.

Table 1. Comparison of SEA principles and Sustainability Assessment “definers”.

Features for Sustainability Assessment (Gibson, 2004)	SEA Principles (DEAT, 2000)
Begins with explicit commitment to sustainability objectives and to the application of sustainability-based criteria	SEA is driven by the concept of sustainability
Covers all potentially significant initiatives, at the strategic as well as project level, in a way that connects work at the two levels	SEA is part of a tiered approach to environmental assessment and management
Focuses attention on the most significant undertakings (at the strategic and project levels) and on the work that will have the greatest beneficial influence	SEA is a flexible process, which is adaptable to the planning and sectoral development cycle
Is transparent and ensures open and effective involvement intended beneficiaries, local residents, potentially affected communities and other parties with important knowledge and concerns to consider and an interest in ensuring properly rigorous assessment	SEA is a participative process
Takes special steps to ensure representation of important interests and considerations not otherwise effectively included (e.g. disadvantaged populations, future generations and broader socio-ecological relations)	
Gives integrated attention to social, economic, cultural, political and environmental factors, with guidance from a set of essential sustainability considerations that respect the inter-relations among these factors	The principles of SEA were developed within the overall context of NEMA where the definition of the term “environment” is holistic and includes social, ecological and economic systems
Incorporates means of specifying and integrating sustainability considerations particular to the local and broader context of individual assessments	SEA is part of a tiered approach to environmental assessment and management
Addresses indirect and cumulative as well as direct and immediate effects	
Emphasizes enhancement of positive effects as well as avoidance or mitigation of negative ones	SEA identifies the opportunities and constraints which the environment places on the development of plans and programmes

Table 1. (Continued)

Features for Sustainability Assessment (Gibson, 2004)	SEA Principles (DEAT, 2004)
Is initiated at the outset of policy, programme and project deliberations when problems and/or opportunities are identified	SEA is a strategic process, which begins with the conceptualisation of the plan or programme
Requires critical examination of purposes and alternatives	SEA is set within the context of alternative scenarios
Favours options incorporating adaptive design and requires preparation for adaptive implementation of approved undertakings	
Seeks to identify alternatives that offer the greatest overall benefits and avoid undesirable trade-offs (rather than merely enhance/mitigate the effects of already chosen options)	SEA is set within the context of alternative scenarios
Specifies and applies explicit rules and/or requires explicit rationales for trade-off decisions	SEA sets the levels of environmental quality or limits of acceptable change
Includes effective means of monitoring implementation and effects, and of ensuring appropriate response to identified problems and opportunities	SEA includes the concept of precaution and continuous improvement
Recognises uncertainties, favours caution, designs for continuous learning and follows initial decisions for adaptive adjustment through the full lifecycle of assessed undertakings	SEA includes the concepts of precaution and continuous improvement
Ensures that proponents of undertakings and responsible authorities are aware of their assessment obligations before they begin planning and that they have effective motivations (legal requirements or the equivalent) to meet these obligations	

Source: Gibson (2004) and DEAT (2004).

At the level of process and principles, SEA in South Africa and Sustainability Assessment therefore appear (in theory) to merge quite well. However, to determine whether SEA is indeed a tool for sustainability assessment in practice in South Africa, the content of the assessment must also be examined. For this purpose a set of criteria were formulated that describe the elements of sustainability that should be addressed in sustainability assessment processes (CSIR, 2001). Sustainability

criteria are value-based and open to significant interpretation; therefore, the following principles were based on recognised and respected principles, including the Natural Step (The Natural Step, 2003) and the Bellagio Principles (Hardi and Zdan, 1997). To promote sustainable development, assessment processes should:

- Consider the whole system (linkages);
- Consider the well-being of social, ecological and economic sub-systems;
- Consider the fair distribution of costs and benefits for human and ecological systems (taking into account unique circumstances and different value systems);
- Consider intergenerational equity;
- Consider effects of economic development on human well-being and their ability to meet basic needs through *inter alia* equitable access to resources;
- Consider the limits of life supporting systems;
- Have adequate scope (both in terms of time and space — taking account of global implications);
- Allow for broad and meaningful participation in policies, plans and programmes; and
- Allow for the policy, project, plan or programme to sustain itself through its lifecycle.

In the following section, these criteria are used to evaluate the extent to which the practice of SEA in South Africa has embodied sustainability considerations.

Case Study Analysis

The application of SEA in South Africa is voluntary. Despite not having the legislative support for SEA, South Africa's extensive voluntary SEA practice is expanding. Retief (2005) conducted a survey to determine the effectiveness of SEA in South Africa. For the purposes of this research, four of his case studies, where the lead agents were generally satisfied with the outcomes of the SEA, were selected for comparison against the criteria outlined in the previous section. The outcome of Retief's study, as well as an analysis of the SEA process and reports produced in each of these case studies against the sustainability criteria, informed the conclusion and recommendations in this paper. While this may not be a sufficiently detailed assessment, the aim of presenting this information is to raise the key issues and stimulate debate. A brief overview of each study and the analysis against the sustainability criteria defined above is represented in Table 2.

Several conclusions can be drawn from the case study analysis. First, while the "ideal" SEA (Table 1) considers social, economic and ecological issues and their inter-relations, in practice, these are generally considered as separate entities and the linkages and relationships between these are not fully explored.

Table 2. Comparison of case studies against the sustainability criteria.

Coega IDZ	uMhlatuze Municipality	Port of Richards Bay	South Durban
	Purpose of the SEA		
A number of developments were proposed for the Coega area, 20 km north of Port Elizabeth, South Africa. An SEA was conducted to ensure that environmental issues were addressed early in the planning and decision-making process	The uMhlatuze Municipality in KwaZulu-Natal, South Africa embarked on an SEA linked to their planning process to ensure that SEA integrates the concept of sustainability into their planning process	To develop a framework to facilitate sustainable port development by identifying economic, social and ecological issues that need to be assessed, and monitored on an ongoing basis as to facilitate informed decision-making at the port planning level	The objective of this SEA was to provide strategic direction for sustainable development of the South Durban Industrial Basin, KwaZulu-Natal and South Africa
Considers the whole system	<p>The SEA identified opportunities and constraints that the ecological, social and economic environment placed on the proposed development. The interaction between these components was not adequately addressed</p> <p style="text-align: center;">Sustainability Criteria</p> <p>The aim was to ensure that ecological considerations were considered on par with social and economic issues. The SEA was successful in highlighting the issues, however, linkages were not considered effectively</p>	The entire system was considered, however, the underlying consideration was the effect of the social and economic systems on the natural environment	The first phase of the SEA reviewed the existing natural, social and economic elements of the environment

Table 2. (Continued)

	Coega IDZ	uMhlathuze Municipality	Port of Richards Bay	South Durban
Considers the well-being of social, ecological and economic sub-systems	The study considered the well-being of the ecological and social systems within the context of economic development	The study considered the well-being of the ecological system	The study considered the well-being of the social and the ecological systems within the context of economic development	The study considered the well-being of the ecological and social systems within the context of economic development
Considers the fair distribution of costs and benefits for human and ecological systems	An assessment of the financial and ecological costs and benefits were considered within the SEA	The study focused on the costs and benefits of the ecological systems	Unique circumstances and value systems of surrounding communities were not considered effectively	The distribution of costs and benefits was not considered
Considers intergenerational equity	Consideration was given to the future generations through issues such as waste management, maintenance of conservation, etc.	The SEA considered issues such as waste minimisation and management and maintenance of ecological resources	The study focused on future port development and the impact of this on future generations and included issues such as maintenance and enhancement of ecosystem functioning	Future development opportunities were considered, however, these were in light of current generations

Table 2. (Continued)

	Coega IDZ	uMhlathuze Municipality	Port of Richards Bay	South Durban
Considers the effects of economic development on human well-being and their ability to meet basic needs	The SEA considered opportunities for job creation and economic growth	This was largely undertaken through the planning process and to avoid duplication the SEA did not address this aspect	The study focused on opportunities that could be created for small-scale harvesting and farming	This was a core component of the study
Considers the limits of life supporting systems	The SEA focused on the protection and conservation of ecologically important areas in particular the coastal dunes, areas of Valley bushveld, etc.	Where possible, ecological limits and thresholds were considered and indicators for monitoring were recommended	Indicators were recommended for long-term monitoring and potential limits were suggested. A number of baselines studies were recommended to determine the current state of healthy environments so that these are not compromised by future port development	Limits of acceptable change were thought through but not agreed with the community

Table 2. (Continued)

	Coega IDZ	uMhlatuze Municipality	Port of Richards Bay	South Durban
Adequate scope (both in terms of time and space — taking account of global implications)	The focus was localised and insufficient attention was given to alternative sites for the IDZ or alternative land uses	The SEA study area was localised and transboundary issues or global impacts were not considered	While the study considered timeframes up to 50 years global implications such as the issue of climate change of the activity of ports were not addressed within the study	The SEA study area was localised and transboundary issues or global impacts were not considered
Broad and meaningful participation in policies, plans and programmes	Very little time was available for rigorous public participation	A public participation process was designed for the planning process and the SEA was presented and discussed at these meetings, however, it was not a rigorous process	Stakeholder participation was divided into key stakeholders and general stakeholders with rigorous participation with key stakeholders	Stakeholder participation was wide-spread, but stakeholders were not afforded the opportunity to be part of a future scenario development exercise
Ability of a policy, project, plan and programme to sustain itself through its lifecycle	The SEA recommended the preparation of a Strategic Environmental Management Plan for the management of the IDZ, but this was not undertaken within the study itself	A Strategic Environmental Management Plan was prepared, which provided guidelines and recommendations for environmental management	A Sustainability Framework was prepared, which provided recommendations, guidelines and monitoring procedures for port operations, management and future port development	The SEA has not been operationalised in totality and only small components have been taken forward

Practical application may reflect an uncertainty as to whether SEA should act as a development instrument for decision-making for sustainable development, or whether it should remain as an advocate assessment instrument for the natural environment (Govender, 2005; Kornov and Thissen, 2000). On one hand, if SEA is to ensure that trade-offs in decision-making processes are exposed; it needs to provide an objective assessment that considers social, economic and ecological issues equally. However, such assessments must be adequately scoped. In Retief's (2005) study, that included these four case studies, he found that the scopes of the SEAs were far too extensive, with a large number of unmanageable issues, objectives and indicators. There were clear statements of frustration expressed by those who conducted the SEA, which seem to reveal that they did not know where to stop and what to exclude.

The counter argument is that SEA would be more effective if the scope was narrowed and the focus placed on the ecological environment. For example, in the uMhlatuze case study, the social and economic factors were dealt with within the planning process and the SEA, therefore, needed to champion the ecological aspects. However, this perspective clearly does not reflect the sustainability criteria we have identified. We argue that sustainability assessment processes that do embody these criteria have the potential to drive significant change. While there are various ways in which SEA can be applied, the sustainability-led model is the most proactive model that can be used to inform various decisions, as well as act as an assessment tool. This model does not assess a single policy, plan or programme but rather provides a framework against which a variety of policies, plans and programmes can be assessed or developed. It is for this reason that this type of SEA was promoted by the DEAT (2000) guideline document (Audouin *et al.*, 2003).

Secondly, the case study analysis revealed that the SEAs conducted were localised and did not consider global implications, for example, the impact of climate change on future port development or even transboundary issues. Furthermore, a key principle of SEA as defined by the SEA guideline document (DEAT, 2000) is that SEA considers alternative scenarios against the sustainability framework developed in the SEA. In practice, this has generally not been undertaken.

Thirdly, the participation of stakeholders is a critical component of the SEA process. Although "hard science" can provide valuable inputs, the SEA still needs to incorporate local values and priorities. The DEAT (2000) guideline suggests that stakeholders in the SEA process can be divided into two groups: key stakeholders (who receive all documentation and attend all workshops to provide constructive and valuable input into the process), and general stakeholders (who receive all the documentation so that they could be kept informed of the SEA process and provide information if and when they feel it is necessary). The analysis, however, indicated that although stakeholder engagement occurred within the SEA process, it

focussed more on information sharing rather than active engagement. Stakeholder engagement within SEA can become difficult in cases where stakeholders have differing perspectives and values (CSIR, 2003). Furthermore, the issues considered in the SEA are often "too strategic" and seem "divorced" from everyday lives of stakeholders (Retief, 2005; CSIR, 2003; DEAT, 2000). Creative methods are required to actively and adequately engage with stakeholders.

Fourthly, a key output of the SEA process is the development of a sustainability framework or a management plan. The purpose of this sustainability framework is to present a practical means for the adoption and implementation of the objectives, targets, indicators and sustainability parameters developed within the SEA process. The framework can be used in two ways, either to guide the formulation of new plans and programmes or to provide a measure against which existing plans and programmes can be assessed (DEAT, 2000). While sustainability frameworks were developed for the case studies analysed, there is not yet sufficient evidence to indicate clear operationalisation or implementation of the framework by the lead agency.

Fifthly, for SEA to be aligned with sustainability criteria, intergenerational equity should be considered. In each of these studies, consideration was given to intergenerational equity, through issues such as waste minimisation, maintenance of conservation and enhancement of ecosystem functioning. Future opportunities were considered, however, these were considered in the light of the current generation's needs. It is necessary to devise appropriate ways to consider these issues in a more comprehensive manner.

Finally, a criterion for sustainability is for the study to consider the limits of life supporting systems. For each of the case studies, indicators and targets/limits of acceptable change were suggested. In South Africa, for certain ecological components such as water quality, national guidelines and standards are available (RSA, 1998b). The main difficulty is determining and/or applying limits acceptable in the absence of guidelines and standards. An approach based on best practice/scientific deduction was used to determine limits in the absence of guidelines and standards in the above studies. These may have been inappropriate and should rather have been established through a process that reflects both public views as well as scientific information.

The case study analysis has demonstrated that although the principles and theory underpinning SEA processes in South Africa are basically sound, SEA in practice does not adequately address the sustainability criteria that we have identified as being important. Sustainability assessment requires an approach that encompasses a wide range of human activities and environmental factors linked to an economic system. In contrast, the SEA case studies, even when nominally applying a sustainability approach, were found to focus more strongly on the ecological environment. This is probably because SEA based upon a sustainability approach addresses

complex problems, has diverse and sometimes conflicting objectives, affects multiple stakeholder groups and is developed under conditions of uncertainty. Under these conditions, it is difficult to decide what the best options are and how best to make trade-offs, especially between the overall economic, social and ecological sphere. Gibson (2006) views trade-offs as the last resort and not the assumed task in Sustainability Assessment. However, trade-offs are often necessary, he therefore suggests six rules (maximum net gains; burden of argument on trade-off proponent; avoidance of significant adverse effects; protection of the future; explicit justification and open process) that provide a useful beginning at the level of general principles for handling trade-offs (Gibson *et al.*, 2005; Gibson, 2006). These have yet to be tested in South Africa. To date, practitioners have focussed on the ecological environment where it may have been easier to use scientific judgement and reasoning to make decisions.

While some of the impediments to the effective implementation of sustainability assessment may be contextual, others relate to the complexities of the concept of sustainability itself. As highlighted in the study conducted by Retief (2005), if the underlying concepts of SEA are not fully understood then the process and the outcomes become flawed. If Sustainability Assessment is believed to be important and necessary, the focus on Sustainability Assessment research should therefore not be constrained to defining a process but rather understanding and defining the concept of sustainability that should underpin Sustainability Assessment practice, and how to apply this concept within decision-making. To support this aim, we introduce the concept of Sustainability Science.

Sustainability Science and Sustainability Assessment

Sustainability Science (Folke *et al.*, 2002), with its transdisciplinary roots (Max-Neef, 2005) and recognition of the value of complexity theory, provides a promising vehicle for the further development of Sustainability Assessment which are able to effectively deal with and guide social-ecological systems along sustainable trajectories. Complexity theory looks for patterns rather than parts, probabilities rather than predictions, processes rather than structures and non-linear dynamics instead of deterministic causalities. It makes possible an epistemology that treasures uncertainty and therefore reinforces a sense of humility (Swilling, 2002).

The focus in applying Sustainability Science within Sustainability Assessment would be on clearly identifying complex nature-society risks and uncertainties and managing them rather than trying to eliminate them. Other common principles emerging from research in this field include the recognition of the interdependencies in nature-society systems, the importance of system resilience and its determinants and the use of adaptive management and governance approaches.

Sustainability Assessment should be augmented with practical and tried and tested management tools such as scenario and foresighting exercises. These tools have the potential to provide society with the scientific certainties and uncertainties and the probable outcomes of different plausible futures for better planning and management (Kerkhof and Leroy, 2000). Scenario or foresighting exercises have been used in many contexts such as the work of the Global Scenario Group (UNEP, 2002) and the Intergovernmental Panel on Climate Change (Nakicenovic and Swart, 2000). These exercises were useful in bridging the gaps between science and policy by engaging a wide range of experts and stakeholders in a systematic exploration of diverse global futures (Swart *et al.*, 2002). The methodology employed in creating scenarios can be infused throughout the Sustainability Assessment process or be used to inform the Sustainability Assessment process. Sustainability Science and its associated tools should inform the development or enhancement of Sustainability Assessment as it promises to address the limitations of traditional scientific inquiry and deals rather with the complex reality of social institutions and their interaction with natural phenomena (Earth Ethics, 2006).

Conclusion

This paper has attempted to address the following three questions:

- Could the South African concept and application of SEA be what is required for Sustainability Assessment?
- If Sustainability Assessment is “dressing up” SEA (as conceptualised and applied in South Africa), is there really a need to introduce a new tool?
- If there is a need for a new tool, are there lessons learnt from the application of SEA in South Africa that can be used to inform the further development and indeed practice of Sustainability Assessment?

A comparison of the South African SEA principles against principles for Sustainability Assessment revealed that at the level of process and principles, SEA in South Africa and Sustainability Assessment appear, in theory to merge well. Four case studies were then evaluated against a set of Sustainability criteria that were formulated using recognised and respected principles such as the Natural Step and the Bellagio Principles. The case study analysis revealed that SEA, while attempting to focus on the holistic (ecological, social and economic spheres) environment, focussed much of its attention on the ecological environment. Even in cases where the “holistic environment” was considered, the SEA still fell short of addressing the interrelationships and linkages between these spheres. Further shortcomings

included a lack of consideration of global issues, inadequate stakeholder engagement and appropriate methodology consider how best to address intergenerational equity and limits of life supporting systems.

Despite the shortcomings of SEA practice in South Africa when compared with criteria for Sustainability Assessment, the introduction of sustainability concepts within the SEA process has commenced, and practice will only improve with further experimentation and experience. As Sustainability Assessment practitioners across the world begin to apply Sustainability Assessment, it is likely that similar problems will be faced. Therefore, our experiences and our challenges may provide valuable information to aid the development of Sustainability Assessment processes and tools in the international arena. Similarly, the development of Sustainability Assessment processes in other jurisdictions will provide opportunities for learning that may enhance the sustainability-based approach to SEA in South Africa. Therefore, as the international arena considers the development of Sustainability Assessment processes, there is an opportunity for mutual learning.

A key concern is that claims of an assessment tool strengthening sustainability considerations in strategic decision-making may be founded on theoretical definitions and process principles (as in the case of South Africa), without engaging adequately with the concept of sustainability itself. Most importantly, then, the development of Sustainability Assessment processes must take into account not simply the process but also the supporting technologies that will provide substantive information. This new scientific approach needs to understand the irreducibility of risks and uncertainties, accept assumptions about unpredictability, incomplete control and multiple perspectives. Furthermore, Sustainability Assessment may not entail the application of a single tool but rather require an approach drawing from a suite of tools that enable the assessment of sustainability either through their individual application or through their integration. This new "Sustainability Science" will need to occur in the margins of existing disciplines through a transdisciplinary approach. Without this evolution, our dabbling in process nuances will come to nought.

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References

- Audouin, M, K Govender and V Ramasar (2003). Guidelines for Strategic Environmental Assessment for the countries of Eastern Africa and the Western Indian Ocean Island

- States. Published by the Secretariat for Eastern African Coastal Area Management (SEACAM).
- Brown, AL and R Therivel (2002). Principles to guide the development of Strategic Environmental Assessment Methodology. In *Strategic Environmental Assessment in Australasia*, S Marsden and S Dovers (eds.) Sydney, Australia: The Federation Press.
- Buselich, K (2002). An outline of Current thinking on Sustainability. Background paper prepared for the Western Australian State Sustainability Strategy. Institute for Sustainability and Technology Policy, Murdoch University, Western Australia. Available at: <http://www.sustainability.dpc.wa.gov.au/BGPapers/KathrynBuselichSustainabilityAssessment.pdf> [12 February 2006].
- CSIR (1996). Strategic Environmental Assessment (SEA): A Primer. CSIR Report ENV-S-RR96001, Environmentek, Stellenbosch, South Africa.
- CSIR. (2001). *An Introduction to Sustainability Assessment and Management*. Durban: CSIR.
- CSIR (2003). Strategic Environmental Assessment (SEA) Resource Document: Introduction to the Process, Principles and Application of SEA. CSIR Report ENV-S-C 2002-073, Environmentek, Stellenbosch, South Africa.
- Dalal-Clayton, B and B Sadler (2004). Sustainability Appraisal: A Review of International Experience and Practice. International Institute for Sustainable Development. Draft document — work in progress.
- DEAT (2000). Guideline Document: Strategic Environmental Assessment in South Africa, Department of Environmental Affairs and Tourism.
- DEAT (2004). Strategic Environmental Assessment. Integrated Environmental Management, Information Series 10, Department of Environmental Affairs and Tourism (DEAT), Pretoria.
- Devuyt, D (2000). Linking impacts assessment and sustainable development at the local level: The introduction of sustainability assessment systems. *Sustainable Development*, 8, 67–78.
- Earth Ethics (2006). Sustainability Science. Available at: <http://www.earthethics.com/Sustainability%20Science.htm> [12 February 2006].
- Folke, C, *et al.* (2002). Resilience and Sustainable Development: Building Adaptive Capacity in a World of Transformation. Scientific Background Paper for the World Summit on Sustainable Development, on behalf of the Environmental Advisory Council to the Swedish Government.
- Gibson, RB (2001). Specification of sustainability-based environmental assessment decision criteria and implications for determining 'significance' in environmental assessment. Available at: <http://www.sustreport.org/downloads/Sustainability,EA.doc> [12 February 2006].
- Gibson, RB (2004). Sustainability assessment: basic components of a practical approach. Paper presented at annual conference of the International Association for Impact Assessment, 24–30 April 2004, Vancouver.
- Gibson, RB, S Hassan, S Holt, J Tansey and G Whitelaw (2005). *Sustainability Assessment: Criteria and Processes*. UK: Earthscan.

- Gibson, RB (2006). Beyond the pillars: sustainability assessment as a framework for effective integration of social, economic and ecological considerations in significant decision-making. *Journal of Environmental Assessment Policy and Management*, 8(3), 259–280.
- Govender, K (2005). The integration of Strategic Environmental Assessment with Integrated Development Planning: A case study of the uMhlathuze Municipality. Unpublished Masters dissertation, University of KwaZulu-Natal, South Africa.
- Hardi, P and T Zdan (1997). *Assessing Sustainable Development: Principles in Practise*. Canada: International Institute for Sustainable Development.
- Kerkhof, M van de and P Leroy (2000). Recent environmental Research in the Netherlands: Towards Post-Normal Science? *Futures*, 32(9–10), 899–911.
- Kornov, L and W Thissen (2000). Rationality in decision and policymaking: Implications for Strategic Environmental Assessment. *Impact Assessment and Project Appraisal*, 18(3), 191–200.
- Max-Neef, MA (2005). Foundations of transdisciplinarity. *Ecological Economics*, 53, 5–16.
- Nakicenovic, N and R Swart (eds.) (2000). *IPCC Special Report on Emissions Scenarios*. Cambridge: Cambridge University Press.
- Pope, J, D Annandale and A Morrison-Saunders (2004). Conceptualising sustainability assessment. *Environmental Impact Assessment Review*, 24, 595–616.
- Republic of South Africa (1995). The Development Facilitation Act 67 of 1995. Government Gazette, Cape Town, South Africa.
- Republic of South Africa (1993). The Local Government Transition Act 209 of 1993. Government Gazette, Cape Town, South Africa.
- Republic of South Africa (1998a). National Environmental Management Act 107 of 1998. Government Gazette No. 19519, Cape Town, South Africa.
- Republic of South Africa (1998b). The National Water Act 36 of 1998. Government Gazette No. 19182, Cape Town, South Africa.
- Retief, FP (2005). Quality and effectiveness of Strategic Environmental Assessment (SEA) in South Africa. Unpublished doctoral dissertation, School of Environment and Development, University of Manchester, UK.
- Retief, F, N Rossouw, C Jones and S Jay (2004). Status of SEA practice in South Africa, *Impact Assessment for Industrial Development: Whose business is it?* International Association for Impact Assessment (IAIA) conference, Vancouver.
- Sadler, B and R Verheem (1996). *Strategic Environmental Assessment: Status, Challenges and Future Directions*. The Netherlands: Ministry of Housing, Spatial Planning and the Environment of The Netherlands.
- Swart, R, P Raskin and J Robinson (2002). Critical Challenges for Sustainability Science. *Sciences Compass*, 297, 1994–1995.
- Swilling, M (2002). Two cultures: the intellectual basis for greater collaboration between the sciences and humanities in the 21st Century. Opening address for the workshop on the Origins of humanity and the Diffusion of Human Populations in Africa, September 17–19, 2002, Lanzerac Estate, Stellenbosch, Convened by the Africa Human Genome Initiative.

- The Natural Step (2003). The Natural Step International Gateway. Available at: <http://www.thenaturalstep.com> [12 February 2006].
- Thérivel, R (2004). *Strategic Environmental Assessment in Action*. UK and USA: Earthscan.
- Thérivel, R and M Partidario (1996). *The Practice of Strategic Environmental Assessment*. London: Earthscan Publications Ltd.
- UNEP (2002). *Global Environmental Outlook 3*, UNEP. Nairobi, Kenya: Earthscan.
- Wiseman, K (2000). Environmental Assessment and Planning in South Africa. In *Perspectives on Strategic Environmental Assessment*, MR Partidario and R Clark (eds.) US: Lewis Publishers.