

The Art and Science of Environmental Impact Assessments

Opinion piece by Dr Alex Weaver and Dr Sibusiso Sibisi, CSIR

Forty years ago, environmental impact assessment (EIA) did not exist. Today it is recognised as one of the most successful policy innovations and a formal - if not legal - requirement in most countries world wide, including South Africa. "Sustainable development" was introduced as a concept almost 20 years ago (Brundtland Report, 1987). It is encouraging that the reality of being true to that concept is something that policy makers, scientists and the public at large are learning not to ignore.



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Recent public debate and media coverage of EIA processes surface very pertinent issues relating to sustainable development. Examples include the Pebble Bed Modular Reactor (PBMR) project, the development of the N2 Wild Coast Toll Road and the Expansion of the Cape Town Container Terminal Stacking area - the CSIR was involved in the Cape Town project as an EIA consultant. The development dilemmas and tensions related to these projects require the engagement of all sectors of society, as they shape the sustainable development process South Africa follows in a dynamic rather than a static manner. It is said that sustainable development is a journey; we are still far from the destination.

With government implementing its infrastructure programme as part of the Accelerated and Shared Growth Initiative for South Africa (ASGISA) initiative, these issues will no doubt continue to be a matter of public discourse. Indeed, one of the binding constraints identified in the ASGISA process was that "... the planning system (including EIAs) ... unnecessarily hampers the development of business" (ASGISA, 2006, www.info.gov.za/avgisa). Concerns about EIAs hampering the development process have been expressed directly and indirectly by a number of senior politicians in recent months ([Media briefing on the mid-year Cabinet Lekgotla by President Thabo Mbeki, 30 July 2006](#), [Budget vote speech by Ms Lindiwe Sisulu, Minister of Housing, 24 May 2006](#)).

As commentators with expertise in the world of science and practice of EIAs, we would like to express and confine our opinions regarding the other dimension of the discourse that tends to accompany projects undergoing EIAs. Our comments relate to the persistent critique of the EIA processes including matters pertaining to stakeholder participation, diligence and robustness of the science underpinning EIA studies.

The CSIR has been involved in the field of EIAs since the late 1980s and has a track record in both the policy development (e.g. the DEAT IEM Guideline series) and the practice of EIAs (e.g. mineral sand

mining on the eastern shores of Lake St Lucia, the Alusaf Hillside Aluminium Smelter and Saldanha Steel). We have reflected deeply on a number of these issues and would like to reinforce that EIA is one of the key support tools for ensuring sustainability of development, as envisaged by the Brundtland Commission. The fact that EIA appears to be a constraint to development, is anchored in various factors including poor institutional capacity and competence, leading to time delays in decision making and a poor understanding by applicants of the role of EIAs in the overall development life cycle.

It is our contention that EIA remains a key tool - as with all tools, it is the way in which it is used that requires improvement. An important question for those of us in the sciences is to how to improve our contribution within the EIA process and contribute to it realising its full potential in guiding sustainable development.

The EIA has its origins in the sciences. It was originally practised within an analytical, reductionist paradigm wherein separate studies were brought together, covering the various components of the (largely biophysical) environment and how each was likely to be affected (either positively or negatively) by the proposed development. These studies were then stapled together as an "integrated report". Decision makers were often presented with complex data matrices with scores in them and were left to make important, often political, decisions on the basis of objective scientific data. Some observers contend that this artificial fracturing of knowledge has, in fact, become a key contributor to our limited ability to address the environmental problems we face.

During the 1980s and 1990s, the public started losing faith in the "science" of EIAs and increased public involvement in these processes became the global norm. In South Africa, increased public involvement coincided with the introduction of our integrated environmental management process (that provided the framework for EIA) and a rapid acceptance of the importance of public involvement in decision making within our new democracy. Of particular importance was the role interested and affected parties played in determining key issues of concern, which then provided the focus for detailed assessment. The South African EIA approach soon gained worldwide recognition as being one of the more inclusive and progressive of such processes - many countries, especially in southern Africa, have based their EIA systems on South Africa's learning.

So - where did things go wrong? We think the answer lies in the loss of balance between what we would call the "art" and the "science" of EIA. The pendulum has swung too far from over-reliance on the quantitative and largely objective (science) to over-reliance on the qualitative and more subjective (art) needs in the EIA process. Science is not finding sufficient purchase within typical EIA processes and is not playing a sufficient role in improving decision making. The art aspect in EIAs is not able to provide decision makers with quantitative predictions of the consequences of their decisions. On the other hand, science as we know it is not well-equipped to deal with many of the value-laden subjective views and multiple perspectives that are often expressed in EIA processes.

To restore the balance, scientists need to be more explicit about the assumptions (be they empirical or wholly subjective) that underpin their predictive modelling. They should also continue to improve their modelling capabilities in a broad range of fields such as ground and surface-water movement and contamination, air pollution dispersal, coastal dynamics, oil-spill prediction and ecosystems functioning.

Correspondingly, scientists should be explicit about the uncertainties involved in the predictions arising from their models. Most importantly, they need to ensure that their results are communicated in a way that is clearly understood by not only the decision maker, but also the participating public.

Hence the challenge for scientists is to assist decision makers to understand the potential consequences of development choices based on uncertain predictions. This entails clear communication of the nature of uncertainty involved - if it is quantifiable then the risk of a definitive choice of policy or action may be correspondingly quantifiable. It may also be the case that so little is known about a phenomenon of interest that purely qualitative statements can be made about attendant uncertainties; for example if the appropriateness of a chosen model under different environmental conditions cannot readily be assessed in quantitative terms. In the extreme, uncertainty may amount to ignorance (where it is not known what is unknown) and indeterminacies (where outcomes are outside the scope of scientific prediction).

EIA is ultimately about making informed choices where we can ill-afford to take extreme views on what ought to be allowed to inform those choices. We must neither adopt the stance of a pristine and objective quantitative investigation nor one of purely subjective qualitative judgement. The study of social-ecological systems calls for a fusion of the two extreme stances into a "sustainability science" that will facilitate choices that can be described as both informed and balanced. It is in this way that EIA, which is neither pure "science" nor pure "art", can retain its rightful position as a key support tool for sustainable development in South Africa.

About the authors

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