**SPATIAL ANALYSIS TO PROMOTE RENEWABLES:**

**Abstract**

South Africa has significant potential for the generation of renewable energy. In August 2011, the Government launched the Renewable Energy Programme under which bids were invited from independent power producers to acquire the first 3 725 MW of renewable energy. Being in possession of an Environmental Authorisation (EA) was a pre-bid requirement. This requirement doubled the number of EA applications received by the Department of Environmental Affairs over the first five years of the programme, refer to Table 2. Despite the increase in workload only 34% of approved projects were bid and less than 10% were awarded preferred bidder status. In order to improve on efficiency, the Department of Environmental Affairs (DEA) initiated a Strategic Environmental Assessments (SEAs) to identify Renewable Energy Development Zones (REDZs) in which the authorisation requirements could be streamlined. The SEA is complete and the outputs including geographical areas in which environmental sensitivities have been pre-determined, are to be implemented through a spatially enabled pre-screening tool. By using the SEA methodology, the ability of spatial analysis to practically implement an impact avoidance hierarchy and to pre-determine fatal flaws has been identified. This in turn can reduce the environmental risk and allow for post bid environmental authorizations for renewable energy projects which will reduce the the number of EAs required to the number of preferred bidders, i.e. 10% of the current number approved.

**Introduction**

In order to reduce South Africa’s dependence on coal in a carbon constrained global economy, government identified the need to diversify the country’s energy choices as a priority (National Planning Commission, 2011). The energy mix anticipated a 17.8 GW contribution from renewable energy over the 2010-2030 period (Department of Energy, 2011). This contribution was to be procured through the Renewable Energy Independent Power Producers programme (REI4P). Being in possession of a positive EA was a pre-bid requirement. An examination of the environmental authorisation application statistics for renewable energy projects received by the DEA, identified that this requirement doubled the volume of applications received during the first four years of the programme. Further, an evaluation of four wind environmental impact assessments (EIAs), indicated that the EIAs submitted lack detail which in turn compromises the objectives of the EIA process and reduces its ability to identify environmental risk and fatally flawed projects. These two issues are unintended consequences of this otherwise very successful programme. In order to reduce these inefficiencies, the DEA initiated a Strategic Assessment processes to identify geographical areas in which environmental sensitivities related to renewable energy technologies can be pre-assess through a spatial analysis of information.

This paper will firstly identify if the pre-assessment and streamlined process achieved by the use of a Strategic Environmental Assessment process could reduce the possible environmental fatal flaws and the review timeframes to a point which would allow for post-bid EAs. In so doing this approach and its implementation could address both unintended consequences of the REI4P identified above.

**METHODOLOGY**

**Environmental Impact Assessment review**

A literature review was undertaken to identify generally accepted environmental impacts related to wind energy. Considering the outcomes of this review, four pre-bid wind energy EIAs were assessed to determine if the EIAs met the requirement as identified in the EIA regulations (D, Fischer, 2016) and considered the generally accepted issues. Table 1 provides a summary of the performance of the impact assessment phase of the review on the effectiveness of an EIA for wind energy facilities corresponding to the criteria adopted for the assessment.

**SEA approach and the screening tool**

To develop the Strategic Environmental Assessment (SEA) the renewable energy applications received and approved from the initiation of the REI4P were mapped. A positive and negative mapping process was then undertaken. The positive mapping identified the significant wind and solar resources, and the negative mapping identified areas of significant environmental sensitivities. Through this process, focus areas were identified for consultation with provincial and local municipalities to identify their development priorities which were converted to “pull factors”. Certain “push factors” were also identified and weighted, for example distance from transmission lines and sub-stations. The results of this process were provided to the renewable energy industry and they were requested to identify areas in which they saw renewable energy development in the next 5, 10 and 15 years. The results of this analysis identified focus areas. Specialist studies, based on desk top analysis and in some cases field work, were then undertaken in these areas to identify more specific environmental sensitivities. The result was a four tier sensitivity map which further refined the focus areas and resulted in the Renewable Energy Development Zones. An environmental impact assessment protocol which identified the further environmental assessment required in each of the sensitivity areas was then developed (Department of Environmental Affairs, 2015). The four tier environmental sensitivity map was loaded onto the spatially enable on line screening tool which was being developed by the DEA to support all environmental impacts assessment applications.

**Outcomes of the EIA review**

The Environmental Assessment Practitioner authoring the four EIAs reviewed, indicated that the information on which the EIA was based was inadequate and the project scope would change. This resulted in aspects of the same project being reviewed by DEA on seven separate occasions, excluding the first review. The lack of detailed information similarly impacts on the ability of the EIA to identify and mitigate environmental fatal flaws. The following factors contribute refer to Table 1:

* Specialists conduct studies that are on occasion inadequate to provide credible assessments. Specialists rationalise these inadequacies by including disclaimers in their work. This practice can result in fatal flaws emerging at construction.
* Although the key impacts are identified they are not well assessed and the specialists and practitioners on average do not provide concluding statements on the acceptability of impacts to assist decision making.
* The identification of adequate mitigation measures is not well executed nor is the transferring of the mitigation measures into EMPRs
* Due to to the lack of detailed information the level to which site specific EIAs could provide more detailed assessments that that produced through a geographical assessment based on a SEA approach was not convincingly demonstrated. Although site specific information was generated on noise, bird and bat activity and visual impacts, these assessments were undertaken on preliminary turbine layouts that changed significantly through the development of the projects. Therefore, although the level of site-specific information generated was high, at 57%, the ultimate value of that information was very low.

Table 1: Outcome of the impact assessment phase of the effectiveness review for wind energy facilities in SA

Source: D Fischer, 2016 I

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| --- | --- | --- | --- | --- | --- |
|  | **Case study 1** | **Case study 2** | **Case study 3** | **Case study 4** | **Average** |
| Timing of specialist studies | 50% | 25% | 50% | 25% | 38% |
| Identification of key impacts associated with wind energy technologies identified through the literature review; | 81% | 81% | 81% | 71% | 78.5% |
| Assessment of impacts; | 72% | 55% | 63% | 72% | 65.5% |
| Environmental statement provided; | 63% | 46% | 46% | 63% | 54.5% |
| Identify and propose generally acceptable mitigation measures; | 63% | 27% | 27% | 55% | 43% |
| Site specific mitigation measures are transferred to the EMPR; | 46% | 55% | 46% | 36% | 46% |
| Provide a level of site-specific assessment that exceeds that which could be achieved through a geographical assessment. | 46% | 81% | 55% | 46% | 57% |
| **Overall average** | | | | | **55%** |

**Outcome of the SEA process to identify Renewable Development Zones**

To reduce the number of applications received and to instil confidence in the siting of renewable energy projects, the DEA decided to use a SEA process to identify areas suitable for the roll out of wind and solar PV energy in South Africa. These areas were to be approved by Cabinet and would allow for wind and solar PV projects and their associated grid infrastructure to be exempted from requiring an environmental authorisation in terms of the EIA regulations (Department of Environmental Affairs, 2012).

This objective was communicated to the renewable energy industry during the first consultation meeting. The industry was not supportive of the proposal and did not want to draw attention to their industry by being the first activity to be delisted though an SEA process. Although the identification of REDZs was later accepted and welcomed by the industry the delisting or exemption of the activity was not supported and the objective and level of expectation from the SEA had to be revised.

What was achieved through the SEA, was the identification of eight REDZs which will be nationally recognised through gazetting. Due to the pre-assessment which was undertaken within the REDZs, the authorisation requirement to undertake a Scoping and Environmental Impact Assessment Report (S&EIR) was lowered to a Basic Assessment (BA) with a corresponding reduction in timeframes from 300 to 147 days. The level of further site specific assessment was identified through the environmental protocols which were associated with the four tier sensitivity maps generated for various anticipated environmental impacts. The environmental sensitivities maps and the protocols were captured within the on-line spatially enabled pre-screening tool.

**Discussion and conclusion**

The linking of the competitive bid model used by the REI4P and site-specific environmental authorisations has posed a challenge to the traditional method of undertaking and reviewing EIAs. Due to the number of studies required and the extent of consultation required, applying for EA is one of the first process that developers embark on. The EIA review identified that applications were submitted on average 3 years prior to construction. The extended period between undertaking the EIA studies to the construction of the project, together with the uncertainty of success in the bid process, reduces the level of effort and expense the developer is willing to expend on the project pre-bid. As a result, EIAs are submitted without detail on critical factors such as turbine layout and technology, the size of the facility, grid connectivity and substation locations, among others. This leads to the issuing of conditional EAs and on average, 5.25 amendments and/or additional applications per project being submitted for approval prior to construction. This increases the workload of the Department, the regulatory burden on the applicant and may also compromise the principles of informed, transparent and fair decision-making as the update information is not always subjected to consultation. The possibility of fatal flaws occurring after authorisation still remains and it is questionable, if, with the low level of detail provided in developing the EIA, whether a site-specific assessment provides substantially more environmental protection that a geographical assessment approach based on a SEA.

Although the streamlined process achieved through the SEA, improves on efficiency it still does not decrease in the number of applications submitted for EA, which was its objective. Noting that the renewable energy industry did not support the exclusion or delisting of their activity, an obvious change that can be made to the REI4P process to improve efficiency, is to allow for a post-bid EA. This would have reduced the number of EAs in the four-year period from 899 to 90. A post-bid scenario is presently applied to securing a Water Use licence from the Department of Water and Sanitation (DWS). At bid submission, the bidder is merely required to submit an acknowledgement from the DWS of the notice of their intention to submit an application for a Water Use license.

From a time perspective, the streamlined process facilitated by the pre-screening undertaken through the SEA process allows for a post-bid EA to be feasible. Table 2 indicates that the time between the bid submission and the financial closure has been 12.3 months on average over the three finalised bid windows. Noting that the agreed timeframe for reviewing an application for a renewable energy project within a REDZ is 147 days (5 months), it would be possible for the BA to be undertaken between preferred bidder announcement and financial closure. Not only would this assist in reducing the numbers of applications received, but it would also bring the time between the initiation of the EIA process and the construction of the project closer thereby improving on the technical detail available for consideration and reducing the need for conditional authorisations.

A concern was raised that a post-bid EA would increase the risk of a fatal flaw occurring after the successful bidder is announced. However, this possibility is mitigated by the improved screening process identified through the SEA process and housed within the pre-screening tool. The EIA review identified that a geographical study followed by a site walkthrough of the final turbine and road location prior to construction could, in most instances, yield the same level of environmental protection as the site specific EIA prepared on limited information.

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| Table 2: EIA applications received for renewable energy projects per REI4P bid window  Source: (Fourie & Essop, 2015) |
| |  |  |  |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | | **Bid window** | **Reporting period** | | **Number of new applications** | | | | **Total number of new applications per bid window** | | **Number of amendments** | | **S&EIR[[1]](#footnote-1)** | | **BAR[[2]](#footnote-2)** | | | **Prior to REFIT & REI4P** | Prior to 2009 | | 2 | | 0 | | N/A | | Not recorded | | **1** | 2009 to 04-11-2011 | | 250 | | 91 | | 341 | | 20 | | **2** | 04-11-2011 to 05-03-2012 | | 54 | | 59 | | 113 | | 23 | | **3** | 05-03-2012 to 18-08-2013 | | 232 | | 72 | | 304 | | 130 | | **4** | 18-08-2013 to 19-08-2014 | | 96 | | 33 | | 129 | | 114 | | **Sub-total to bid window 4:** | | | **634** | | **255** | | **889** | | **287** | | **Post 4** | 19-08-2014 to 07-07-2015 | | 44 | | 3 | | 47 | | 77 | |  | **Total:** | | **678** | | **258** | | **936[[3]](#footnote-3)** | | **364** | | **Bid information** | **Bid Window 1** | **Bid Window 2** | | **Bid Window 3** | | **Bid Window 4** | | **Bid Window 4 additional bidders** | | | **Date of procurement documents release** | 17-11-2011 | 03-02-2012 | | 03-05-2013 | | 20-05-2014 | |  | | | **Bid closure** | 04-11-2011 | 05-03-2012 | | 18-08-2013 | | 19-08-2014 | |  | | | **Date of preferred bidders announced** | 07-12-2011 | 10-05-2012 | | 29-10-2013 | | 16-04-2015 | | 08-06-2015 | | | **Date of financial closure and signing of NERSA Agreements** | 05-11-2012 | 09-05-2013 | | 11-12-2014 | | Expected Q4 2015 | | Expected Q4 2015 | | | **Months from bid to financial closure** | 15 | 15 | | 19 | | - | | - | | | **Months from preferred bidder announcement to financial closure** | 11 | 12 | | 14 | |  | |  | | |

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1. Scoping and Environmental Impact Report [↑](#footnote-ref-1)
2. Basic Assessment Report [↑](#footnote-ref-2)
3. This value does not include applications related to renewable energy generation, which is the erection of the power lines. The case study revealed that in three of the four projects power lines were applied for separately. [↑](#footnote-ref-3)