

Strategic Environmental Assessment for Renewable Energy in South Africa - Renewable Energy Development Zones (REDZs)

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Introduction

South Africa's power system is currently under severe pressure. The country faced several load shedding in 2014 and it is expected that the energy shortage will induce repetitive load shedding for a number of years. The shortage of electricity supply is the result of insufficient investments in electricity infrastructure development and maintenance over the past two decades. The grid constraint and the increasing demand for electricity create a need for new generation capacity from alternative sources.

The 2010 Integrated Resource Plan (IRP2010) outlines the government's strategy for electricity generation in the country until 2030 and makes provision for diverse energy mix. The plan provides generation allocation targets from diverse technologies, including renewable energy technologies. Since 2011, Independent Power Producers procure renewable energy in South Africa through a competitive bidding process called the Renewable Energy Independent Power Producer Procurement Programme (REI4P). The REI4P's total procurement targets are set in line with the IRP2010. The success of the REI4P is evident from a recent study undertaken by the CSIR Energy centre (2015) which found that the first 600 MW of wind and 1000 MW of solar photovoltaic (PV) generation capacity that gradually connected to the electricity grid in 2014 contributed benefits of R5.3 billion in total (or R2.42 per kWh of renewable energy), while the tariff payments to IPPs of the first wind and solar PV projects were only R4.5 billion (or R2.07 per kWh of renewable energy), thus resulting in a net benefit of R0.8 billion to the country.

The South African Government's strong commitment to the roll-out of renewable energy, in combination with the overriding success of the REI4P, raises questions as to how the growing spatial extent of renewable energy development in South Africa can be managed sustainably. The IRP2010 and REI4P do not spatially define the generation capacity allocations, which makes strategic and proactive spatial planning challenging. By December 2013, approximately 550 renewable energy projects were proposed across the country without a consolidated strategic spatial plan. The need to optimise strategic investment, particularly in the electricity grid, creates the national priority to adopt a proactive approach to infrastructure development to ensure the sustainable and continued success of renewable energy development in South Africa.

The recently completed strategic environmental assessment (SEA) commissioned by the national Department of Environmental Affairs (DEA) constitutes the much needed proactive spatial planning for wind and solar PV energy developments in South Africa. The SEA takes a strategic and integrated approach to identifying geographical areas in which large scale wind and solar PV development would be most appropriate, taking into consideration environmental, social and economic factors. Those strategic geographical areas are called Renewable Energy Development Zones (REDZs).

Methodology

Positive mapping exercise

Starting from wind and solar raw resource data, a development potential layer was created in order to identify those areas with highest economic potential and highest social need. Key pull factors including transmission loss, local municipalities with high social need and high potential for development, priority areas for renewable energy manufacturing and import activities, and existing transmission infrastructure were considered for the adjustment of the resource dataset (see Figure 1).

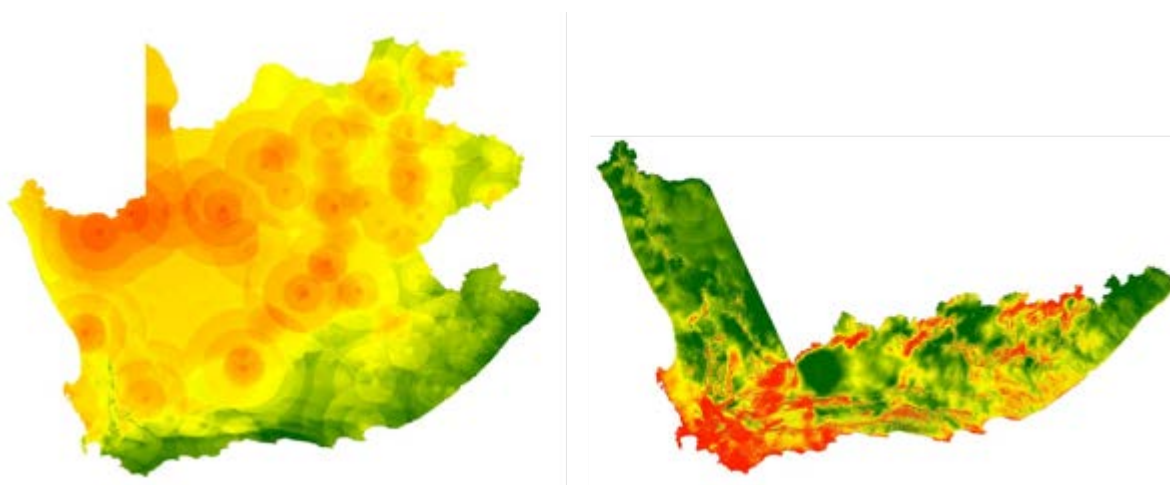


Figure 1: Development potential for solar PV energy (left) across five South African provinces and wind (right) energy across the extent of the Wind Atlas for South Africa (WASA) data. The red areas represent hot spots for development, the yellow and orange areas represent areas with medium development potential and the green areas represent areas with low development potential.

In order to achieve a spread of development, as is technically and socio-politically required, the development potential layer was further refined by selecting the highest development potential of each of the five provinces included in the extent of the study.

Negative mapping exercise

An environmental and technical constraints mask was then developed to eliminate areas with highly sensitive features in terms of wind and solar PV developments. The constraints mask consisted of environmental features (e.g. protected areas and areas of known bird and bat sensitivity), existing and future planned land uses (e.g. agriculture), existing infrastructure (e.g. electricity grid), existing national plans (e.g. Square Kilometre Array electro-magnetic telescope project) and technical constraints (see Figure 2).

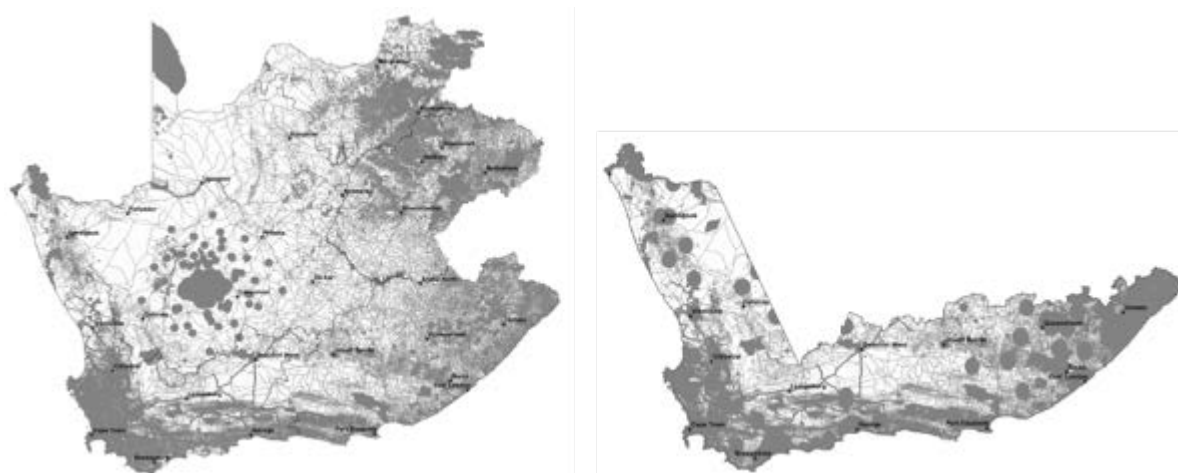


Figure 2: Environmental and technical constraints mask for solar PV energy (left) across five South African provinces and wind (right) energy across the extent of the Wind Atlas for South Africa (WASA) data. The grey areas represent highly sensitive features in terms of wind and solar PV development.

Prioritisation exercise (short term scenario)

In order to identify large clusters of land with the lowest environmental sensitivity, the mask was overlaid with the highest development potential areas per province. The remaining areas were then interrogated in consultation with South African solar PV and wind developers to identify priority development areas on a 0 to 5 year scenario (see Figure 3).

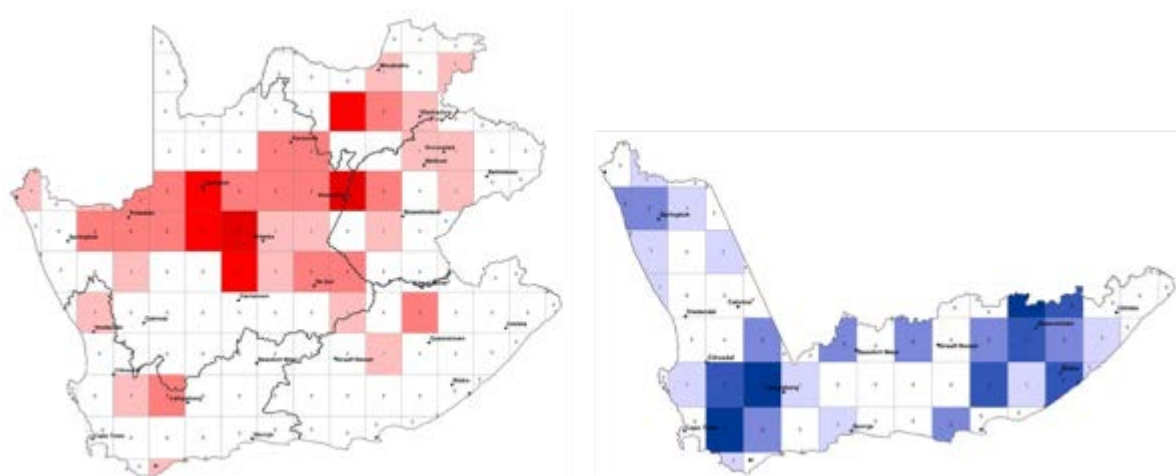


Figure 3: Combined results of the prioritisation exercise with the industry on a 0 to 5 year scenario for solar PV energy (left) across five South African provinces and wind (right) energy across the extent of the Wind Atlas for South Africa (WASA) data. The darker grid cells were selected by the most developers in terms of where future development, from the industry's perspective, should be prioritised.

Further consultation and scoping level pre-assessments

Additional consultation with provincial governments, the private sector and the public informed the refinement of the strategic geographical areas called Renewable Energy Development Zones (REDZs). Specialist scoping level pre-assessments were then undertaken in the eight proposed REDZs for agriculture, landscape, heritage, terrestrial and aquatic biodiversity, birds, bats, and socio-economic sensitivities. Further aspects of sensitivity in terms of aviation, defence,

telecommunication, weather services, SKA, mining, noise and flicker effects were determined in consultation with the relevant authorities.

Results

The findings of the SEA and sensitivity maps, informed by the specialist scoping level pre-assessments, were used to establish wind and solar PV energy development protocols. Those development protocols will guide project level environmental assessments and authorisation processes in the REDZs. Without compromising environmental protection, the integrated approach followed to identify the REDZs as well as the alignment of policies and plans to create an enabling environment in those areas ultimately allow for the streamlining of the environmental authorisation process in these areas.

Discussion

By facilitating the development of large infrastructure projects while protecting the country's natural and social resources, the SEA participates to the national social, economic and political goals as described in the South African National Development Plan (NDP), New Growth Path (NGP) for South Africa and National Infrastructure Plan (NIP). Under the NIP, 18 Strategic Integrated Projects (SIPs) have been developed to promote fast-tracked development and growth of social and economic infrastructure across all nine provinces. Among the 18 SIPs, SIP 8 targets the development of green energy in support of the South African economy and SIP 10 targets the provision of electricity transmission and distribution for all. Further streamlining in terms of local and national planning will result from the official adoption of REDZs as areas of strategic importance in terms of SIP 8, which gives the PICC and local government the mandate to ensure that wind and solar PV development in these areas is given priority in planning, approval and implementation. Furthermore, the electricity grid infrastructure expansion (EGI) SEA undertaken in support of SIP 10, aims at identifying suitable routing corridors that will enable the efficient and effective expansion of key strategic transmission infrastructure designed to satisfy national transmission requirements up to 2040. The alignment of the REDZs and the EGI planning provides an integrated spatial planning for SIP 8 and SIP 10 by ensuring the sustainable development of renewable energy projects in areas with available evacuation capacity and supporting infrastructure (see Figure 4).

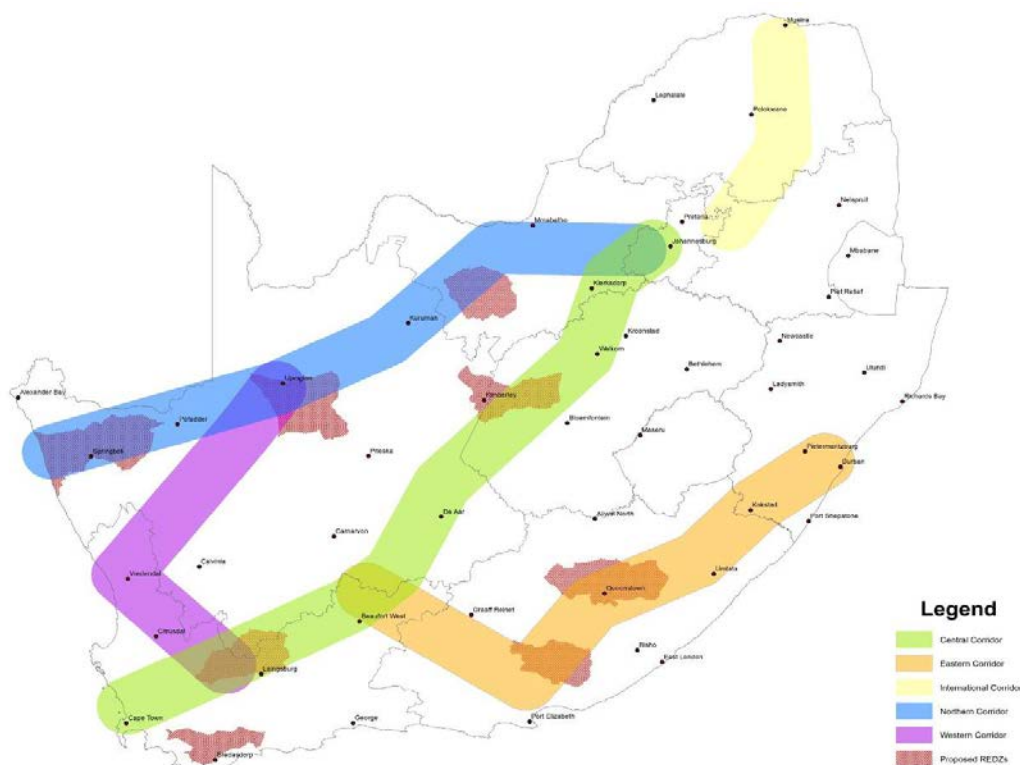


Figure 4: Proposed REDZs and preliminary EGI corridors

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