Wind and Solar PV Energy Strategic Environmental Assessment

Unpublished Draft REDZs Database

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DATASET DESCRIPTION

Dataset Title:
Wind and Solar PV Energy Strategic Environmental Assessment- REDZs Database

Dataset Reference Date:
26 March 2015

Data quality:
Only existing and published datasets were used with limited desk top verification. Reasonable accuracy of data layers used. During the identification of the Focus Areas (which are the boundaries of the proposed REDZs) no existing datasets were refined and/or modified and no new desktop expert mapping of features was undertaken. The list of attributes selected for the negative mapping exercise, i.e. the environmental constraint mask, is not representative of the attributes selected during the scoping level pre-assessments undertaken by specialists during Phase 2 of the SEA. The negative mapping exercise was focused on the identification of areas with the least environmental sensitivities in terms of wind and solar PV energy developments. The environmental constraint mask should not be used in isolation as exclusion layer as it does not represent a comprehensive or refined compilation of features to be excluded from wind and solar PV energy developments. The refinement of the study areas into focus areas was based on consultation with the industry as well as authorities and key stakeholders. The boundaries of the focus areas were based on existing roads; however the DRDLR 50k Topo, 2006 dataset was used for delineating the boundaries of the focus areas and therefore might not be representative of the current road network.

***Dataset Responsible Party:**
Department of Environmental Affairs - Director Enterprise Geospatial Information Management

***Geographic Location of the Dataset:**
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West 16.452278
East 38.011607
North -22.329087
South -46.980340

Keywords:
Wind and Solar PV Energy, Strategic Environmental Assessment, REDZs

Dataset Language:
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***Spatial Resolution of the Dataset:**
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Data Release classification:
SR (Special Release): Any Project specific release.

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Other Citation Details: *The Wind and Solar PV Energy Strategic Environmental Assessment- REDZs Database is provided for download as a zip file containing shape file for the renewable Energy Development Zones (REDZs) boundaries.*

Online Linkage: *https://www.environment.gov.za/mapsgraphics#renewable*

Abstract:

The Wind and Solar PV Energy Strategic Environmental Assessment- REDZs Database contains spatial data for the Renewable Energy Development Zones (REDZs) boundaries.

Purpose:

To produce and maintain a comprehensive spatial database on the Renewable Energy Development Zones (REDZs) boundaries in SA. The database is suitable for a wide range of planning, assessment, analysis and display purposes. This database should not be used for legal or other specific government actions. Read the Data Disclaimer for more information.

Supplemental Information:

The eight proposed Renewable Energy Development Zones (REDZs) boundaries were defined through a two phases process:

-Phase 1: Positive and negative mapping to identify preliminary Study Areas; and

-Phase 2: Prioritisation Exercise with the Industry, Consultation with National, Provincial and Local Authorities and Key Stakeholders to refine the Study Areas into Focus Areas.

1. Methodology for Phase 1:

Phase 1 of the SEA process consisted of the identification of 15 wind and 8 solar PV study areas that are considered strategically best suited for large scale wind and solar PV development based on a high level integrated spatial analysis of the best available environmental, technical and social data. The identification of the study areas consisted of two spatial analyses. Firstly, a positive mapping exercise was undertaken during which the development potential was determined based on wind and solar resources, as well as other pull factors such as electrical grid evacuation capacity, need for socio-economic investment, network losses, and priority areas for renewable energy industries [e.g. Special Economic Zones (SEZs)]. Secondly, a negative mapping exercise was undertaken to identify environmental (e.g. protected areas, known bird and bat sensitivity, agricultural sensitivity, etc.) and technical (e.g. slope) constraints. Through a combination of the positive and negative mapping results it was possible to delineate study areas. The positive and negative mapping exercises were undertaken for the specific purpose of identifying study areas that could be further assessed during the SEA process and the results are not suited for decision making outside the SEA context.

1.1. Positive mapping exercise

1.1.1.Resource

Resource potential is considered to be the most important criterion for the determination of development potential due to the fact that it is one of the key factors influencing the cost of renewable energy, and hence the macro-economic benefits to the country. Resource data formed the basis of the positive mapping exercise with data being converted to percentile basis before being adjusted spatially by adding or subtracting percentile values based on the distance from developmental pull factors.

For the wind analysis the power density in watts per square metre (W/m2) at 100 m hub height as modelled by the Wind Atlas for South Africa (WASA) project at a 250 m raster resolution was used as the raw resource potential data. The version of the dataset used for this study was released in early 2013 and modelled using the

Wind Atlas Analysis and Application Programme (WAsP). Being a modelled dataset which has been verified with measurements from 11 wind measuring masts, the data inherently have uncertainties and some degree of inaccuracy. The data are, however, sufficient for providing regional and relative indications of resource potential as required for the purpose of this study. To limit the impacts of potential data inaccuracies the industry was also afforded the opportunity to provide inputs with regard to which areas should be prioritised for development. It is assumed that accurate resource data as measured by the industry would have been taken into consideration when preparing these inputs. This process is further discussed.

In 2014 an updated WASA dataset which is based on the integration of the WAsP and Weather and Research Forecasting (WRF) models was released. This updated dataset predicts wind resource potentials significantly higher than those contained in the previous dataset and is believed to be more accurate. A high level comparison of the two datasets indicated that even though the absolute resource potentials were estimated to be higher across the entire WASA domain, the relatively higher wind resource areas that are of interest to this study remained similar across the two datasets. Due to the fact that the industry also guided the identification of FAs based on their measured data, and the fact that the SEA was already advanced in the process of assessing the FAs at the time when the new dataset was released, the new data were not used to amend the FAs under investigation.

For the solar PV analysis the Global Horizontal Irradiation (GHI) in kilowatt hours per square metre per annum (kWh/m2/a) as modelled by GeoModel Solar at a 250 m raster resolution was used as the raw resource potential data. In total, four solar resource datasets were purchased by the Department of Environmental Affairs (DEA) as part of the SEA process. These datasets include the: 1) Global Horizontal Irradiation (GHI), 2) PV electricity potential for fixed-mounted modules, 3) optimal angle for maximising PV energy yield from fixed modules, and 4) PV electricity potential for single axis North-South tracking modules datasets. These data have been made publicly available by DEA and have since been used widely for national research and planning purposes.

In terms of this study only the GHI dataset was used as it provides the raw resource potential for PV development, while the other datasets are PV technology specific. Generally, GHI data would be used to identify areas of interest for development, and the selection of the PV technology to be installed on an identified site will depend on other factors such as site properties and pricing implications. The GHI dataset was thus considered best suited for the identification of study areas.

1.1.2.Transmission Network Losses

The majority of South Africa's base load electricity generation is derived from coal fired power stations located near the coal fields in Mpumalanga and Limpopo provinces in the northern and eastern parts of the country. Much of the electricity generated from these power stations is transmitted to the rest of the country which currently has limited generation capacity. There is thus a net north to south transmission of electricity which results in significant transmission losses. Any new generation capacity connecting in the south of the country would off-set this north to south flow of electricity and hence reduce the national transmission losses, while additional generation in the north of the country near the existing power stations would increase such losses.

The net north to south transmission of electricity could be reversed when ageing coal power stations are decommissioned and replaced by either new coal stations in different locations near new coal mining areas, or the growing generation capacity of the Cape provinces which include renewable and potential gas or nuclear generators. With Gauteng still being the largest load centre, and abundant transmission infrastructure becoming available when existing coal power stations are decommissioned, it would make sense for new renewable energy generators at that time to be placed in the northern parts of the country. This scenario will,

however, only result from significant growth in generation capacities in the south of the country and the decommissioning of existing coal power stations, which is not anticipated before 2030. Until such time it is safe to assume that connection toward the southern part of the country would reduce national transmission losses.

Average loss factors for transmission-connected generators as used for this study were determined by Eskom based on voltage and geographic location considerations. Six geographical zones differentiated in terms of transmission loss factors were identified and include the Cape, Karoo, KwaZulu-Natal, Vaal, Mpumalanga, and Waterberg zones. These zones with their associated transmission loss factors (see Table 1) were used to adjust the resource potential datasets by accordingly increasing the values in the Cape and Karoo zones and decreasing it in the other four zones.

Table 1: Zonal transmission network losses for transmission-connected generators

Transmission Network Loss Zones (Wind & Solar)	Percentile Adjustment Factor	Data Source	Extent
Cape	+2.9%	Eskom 2013/14 Tariffs and Charges	National
Karoo	+0.5%		
KwaZulu-Natal	-0.4%		
Vaal	-2%		
Mpumalanga	-2.1%		
Waterberg	-2.3%		

1.1.3.Priority Industrial Areas

Certain areas in South Africa have been identified through national and provincial planning initiatives as either being of priority for the development of renewable energy projects or for renewable energy related manufacturing industries. Such areas include the solar and wind corridors identified in the Northern Cape Province, the proposed Special Economic Zones (SEZs) for renewable energy manufacturing in Atlantis and Upington, as well as the existing Industrial Development Zones (IDZs) in ports such as Saldanha, Port Elizabeth, Ngqura, Durban and Richards Bay at which components can be imported or manufactured.

In this study, renewable energy development in and around these priority areas is promoted to support the proposed manufacturing industries. Development in the vicinity of these areas would also reduce the requirement for road transportation of large components from these importation or manufacturing hubs to project sites. These priority areas with applicable buffer distances (see Table 2) were used to further adjust the development potential datasets.

Table 2: Priority industrial areas including IDZs, proposed renewable energy related SEZs, and other areas identified for the pritoritisation of renewable energy development

Priority Industrial Areas	Distance	Percentile Adjustment Factor	Data Source	Extent
DTI Proposed RE SEZ (Wind & Solar): Atlantis	< 20 km	+ 5 %	**SEZs**: Special Economic Zones Planning presented to the Portfolio Committee	National
	20 – 50 km	+ 3 %		

NC Solar Corridor (Solar only): Upington, Kakamas, Keimoes, Groblershoop, Prieska and De Aar **NC Wind Corridor (Wind only)**: Port Nolloth and Keinzee **Industrial Ports (Wind & Solar):** Saldanha, Port Elizabeth, East London, Durban and Richards Bay	50 – 100 km	+ 1 %	on Trade and Industry on 26 April 2013. **Solar and Wind Corridor:** Northern Cape Provincial Spatial Development Framework 2012.	
	> 100 km	+ 0%		

1.1.4.Areas with Highest Need for Social Investment

Renewable energy development in South Africa is seen as a vehicle for achieving substantive positive socio-economic outcomes. Moreover, it has a rare potential for stimulating socio-economic investment and growth in rural areas that would otherwise struggle to attract investment. Through the economic development requirements stipulated by the Renewable Energy Independent Power Producer Procurement Programme (REI4P), renewable energy projects could result in significant direct benefits for the local communities in which they are sited.

Even though most communities in South Africa require additional socio-economic investment, some are particularly needy and lacking economic growth drivers. For renewable energy development to be feasible in such areas the local community and economy also need to be able to provide the required services and absorb the development. A certain degree of development potential is thus required. The National Spatial Development Perspective (NSDP) of 2006 considered the economic development potential in combination with the social need of the area when assessing the potential distribution of economic activity. It is on this principle that this study identified local communities which stand to benefit the most from renewable energy development

Based on official documentation, and in close consultation with provincial governments, local municipalities with the highest need for the socio-economic investment associated with renewable energy development were identified as part of this study. To ensure that those areas were also able to provide the required services for renewable energy development the municipal seats, which generally represent the largest towns serving as regional service delivery hubs, were selected as anchor points in these needy municipalities.

For the purpose of adjusting the development potential in the vicinity of the anchor points, and in line with the REI4P, a 50 km radius was used to define the local communities (see Table 3).

Table 3: Seats of local municipalities with the highest need for social investment

Seats of local municipalities with high need for social investment (Wind & Solar):		Distance	Percentile Adjustment Factor	Data Source	Extent
Local Municipality	**Municipal Seats**				
Eastern Cape:		0 – 20 km	+ 5 %	**FS:** Draft Free State Rural Development Plan 2013 **EC:** Regional Global Insights Data 2013 **NC:** Northern Cape Provincial Spatial Development Framework 2012 **WC:** Growth Potential Study of Towns in the Western Cape (Van der Merwe et al. 2004) and revision thereof in 2010 **NW:** North West Provincial Spatial Development Framework 2008.	WC, NC, FS, EC and NW
EC121 Mbhashe	Idutywa				
EC133 Ikwanca	Molteno				
EC137 Engcobo	Engcobo				
EC153 Ngquza Hill	Flagstaff				
EC154 Port St Johns	Port St Johns	20 – 30 km	+ 4 %		
EC155 Nyandeni	Libode				
EC442 Umzimvubu	Mount Frere				
EC443 Mbizana	Bizana				
Free State:		30 – 40 km	+ 3 %		
FS161 Letsemeng	Koffiefontein				
FS163 Mohokare	Zastron				
FS164 Naledi	Dewetsdorp				
FS181 Masilonyana	Theunissen				
FS182 Tokologo	Boshof				
FS184 Matjhabeng	Welkom				
FS185 Nala	Bothaville	40 – 50 km	+ 2 %		
FS194 Maluti a Phofung	Phuthaditjhaba				
FS195 Phumelela	Vrede				
FS203 Ngwathe	Parys				
Northern Cape		> 50 km	+ 0 %		
NC071 Ubuntu	Victoria West				
NC072 Umsobomvu	Colesberg				
NC075 Renosterberg	Petrusville				
NC081 Mier	Mier				
NC091 Sol Plaatje	Kimberley				
NC092 Dikgatlong	Barkley West				
NC093 Magareng	Warrenton				
NC094 Phokwane	Hartswater				
NC451 Moshaweng	Mothibistad				
NC452 Ga-	Kuruman				
	Brits				
	Rustenburg				
	Mogwase				

Segonyana **North West** NW372 Madibeng NW373 Rustenburg NW375 Moses Kotane NW382 Tswaing NW383 Mafikeng NW384 Ditsobotla NW385 Ramotshere Moiloa NW403 Matlosana **Western Cape:** WC011 Matzikama WC041 Kannaland WC044 George WC053 Beaufort West	Delareyville Mafikeng, Lichtenburg Zeerust Klerksdorp Vredendal Ladismith George Beaufort West				

1.1.5.Transmission Evacuation Capacity

The availability of evacuation capacity on the electricity grid is a growing constraint for renewable energy development in South Africa. Although this study aims to facilitate the development of additional grid infrastructure and the unlocking of new high development potential areas through proactive and strategic investment, the use of existing infrastructure must be given precedence where appropriate. In other words, the substantial investment and time required to develop new grid infrastructure and unlocking new areas only make sense if the areas being unlocked present a higher development potential than those with existing infrastructure.

In consultation with Eskom and using the Generation Connection Capacity Assessment of the 2016 Transmission Network (GCCA-2016) study, transmission substations with sufficient evacuation capacity, that either already exists or can be unlocked with limited investment, were identified. The identified substations were used to adjust development potential values spatially. Only transmission level substations were considered for this purpose since these are the central evacuation points which require major investment and long timeframes to develop, whilst distribution level collection infrastructure requires less investment and can be developed faster.

The following assumptions were made in order to identify transmission substations with sufficient evacuation capacity that either exists or can be unlocked with limited investment:

1. ***Substations with a Transformer N-1 Limit indicated in the GCCA-2016 as "N/A" were assigned the Busbar N-1 Limit;***
2. ***Substations with only one transformer were assigned that transformer's capacity to overcome the N-1 constraint;***

3. ***Only substations with an area stability limit (i.e. network capacity) of greater than 1 000 MW and a transformer limit greater than 100 MW, as determined according to the above assumptions, were identified as anchor points for the adjustment of development potentials; and***
4. ***It was assumed that grid connection costs for large scale wind and solar PV developments become prohibitive with connection distances greater than 100 km from transmission substations.***

The identified transmission substations with applicable buffer distances (see Table 4) were used to adjust and determine the final development potentials.

Table 4: Transmission substations with sufficient evacuation capacity that either exists or can be unlocked with limited investment

Transmission Substations with sufficient evacuation capacity that exists or can be unlocked with limited investment (Wind & Solar)				Distance	Percentile Adjustment	Data Source	Extent
Acornhoek	Fordsburg	Marang	Proteus	< 10 km	+ 5 %	Eskom Generation Connection Capacity Assessment of the 2016 Transmission Network release in 2013 (GCCA-2016)	National
Aggeneis	Foskor	Marathon	Quattro				
Alpha	Garona	Marathon B	Rabbit				
Apollo	Georgedale Glockner	Merapi	Rigi	10 - 50 km	+2.5 %		
Ararat	Grassridge	Mercury	Rockdale				
Ariadne	Gromis	Merensky	Rockdale_1				
Aries	Gumeni	Mersey	Rockdale_2	50 - 100 km	+ 0 %		
Athene	Harvard	Midas	Roodekuil				
Aurora	Hector	Minerva	Ruigtevallei				
Avon	Helios	Mookodi	Scafell				
Bacchus	Hera	Muldersvlei	Senakangwedi				
Benburg	Hermes	Nama	Simmerpan	100 – 150 km	- 2.5 %		
Bighorn	Hydra	Neptune	Simplon				
Bloedrivier	Hydra2	Nevis	Snowdon				
Bloukrans	Illovo	Ngwedi	Sol				
Borutho	Impala	Njala	Spencer				
Boundary	Incandu	Normandie	Spitskop	> 150 km	- 5 %		
Brenner	Ingagane	Northrand	Spitskop2				
Carmel_A	Invubu	Olien	Stikland				
Carmel_B	Juno	Olympus	Tabor				
Chivelston	Jupiter	Olympus_A	Taunus				
Chivelston	Kappa	Omega	Theseus				
Craighall	Klaarwater	Oranjemond	Trident				
Croydon	Komatipoort	Paulputs	Tugela				

Danskraal Dedisa Delphi Delta_A Delta_B Dinaledi Droerivier Eiger Eros Esselen Etna Everest Ferrum	Kookfontein A Kookfontein B Kookfontein C Kruispunt Kwagga Leander Lepini Leseding Lomond Lulamisa Makalu Malelane	Pelly Pembroke Perseus Phillipi Pieterboth Pluto Poseidon1_1 Poseidon1_2 Poseidon2_1 Poseidon2_2 Prairie Princess	Umfolozi Venus Verdun_A Verdun_B Verwoerdburg Vulcan Vuyani Warmbad Watershed Westgate Witkop Zeus				

1.1.6.Identification of Top Development Potential per Province

Due to technical (e.g. impacts of the weather on grid stability), socio-political (e.g. provincial commitments to renewable energy development) and environmental considerations, large scale wind and solar PV development must be spread across the country. In order to achieve the required spread across all provinces under investigation, the areas of highest development potential per province were identified. The total high development potential area identified per province needs to be relative to the overall potential of the province. In other words, the higher the resource potential of a province, the larger share of renewable energy development should be located in that province and the larger the area that should be identified in that province.

The high development potential area per province was determined according to the percentage of the province that has a resource above what was considered to be the economically exploitable threshold. The economically exploitable resource threshold values were derived from bids submitted during the REI4P bid window 1 and determined as a GHI of greater than 1850 kWh/m2/annum for solar PV and a wind power density of greater than 400 W/m2 at 100 m hub height. Based on the fact that there are less social and environmental constraints applicable to solar PV development than to wind, the relative areas identified for solar PV development (i.e. the top 5 to 10% area) (see Table 5) were smaller than those identified for wind development (i.e. the top 15 to 35% area) (see Table 6). The top development potential areas per province represent the final outputs of the positive mapping exercise.

Table 5: Criteria for identifying top solar PV development potential per province

Factor	Province	Percentage of province with an economically exploitable solar resource (GHI>1850 kWh/m^2)	Development potential area identified	Extent
Identification of top development potential per province **(Solar)**	Northern Cape	100%	Top 10%	Provincial
	North West	100%	Top 10%	
	Free State	100%	Top 10%	
	Western Cape	78%	Top 8%	
	Eastern Cape	50%	Top 5%	

Table 6: Criteria for identifying top wind development potential per province

Factor	Province	Percentage of province with an economically exploitable wind resource (PD>400 W/m^2)	Development potential area identified	Extent
Identification of top development potential per province **(Wind)**	Western Cape	24%	Top 35%	Provincial within WASA Domain
	Eastern Cape in WASA Domain	8%	Top 25%	
	Northern Cape in WASA Domain	2%	Top 15%	

1.2. Negative mapping exercise

The negative mapping exercise consisted of identifying high level environmental and technical constraints for large scale wind and solar PV development based on the best available data at a national scale. Datasets and applicable buffers were selected in consultation with the relevant authorities and key stakeholders. In instances where data were not available (e.g. for birds and bats) indicative sensitive areas were provided by relevant key stakeholders (e.g. Birdlife South Africa and the Endangered Wildlife Trust) in consultation with the specialist fraternities. Further environmental and technical constraints considered during the analysis include various environmental features such as protected areas and other sensitive ecological features. Also included were existing and future planned land uses such as agriculture, existing infrastructure and the Square Kilometre Array (SKA). Technical constraints such as slopes with a gradient greater than 10 degrees were also considered (see Table 7).

The primary assumption for the selection of environmental and technical constraints was that clusters of large scale wind and solar PV development were under consideration. The environmental and technical constraints masks resulting from this exercise thus only served to inform the identification of study areas which would be further assessed through the SEA process. The environmental and technical constraints masks resulting from the negative mapping exercise are thus not suited for the evaluation of individual projects within or outside of REDZs, but rather serve as sensitivity indicators that can be used to inform the requirements for further assessments.

Table 7: Data used to prepare high level environmental and technical constraints masks

Feature		Attributes	Wind Buffer	Solar PV Buffer	Data info	Extent
Natural	South African National Biodiversity Institute (SANBI) Protected Areas	Forest Act Protected Areas	500 m	500 m	SANBI, 2012 updated 2013	National
		Island Reserves	500 m	500 m		
		Local Nature Reserves	500 m	500 m		
		Marine Protected Areas	500 m	500 m		
		Mountain Catchment Areas	500 m	500 m		
		National Botanical Gardens	500 m	500 m		
		Protected Environment	500 m	500 m		
		Provincial Nature Reserves	500 m	500 m		
		Special Nature Reserves	500 m	500 m		
		World Heritage Sites	500 m	500 m		
		National Parks	500 m	500 m		
	Ramsar sites	All	500 m	500 m	Ramsar, 2013	National
	Critical Biodiversity Areas (CBAs)	Irreplaceable	No buffer	No buffer	SANBI, 2013 updated	National
	Remaining Threatened Ecosystems	Critically Endangered Ecosystems	No buffer	No buffer	SANBI, 2013 updated	National
		Endangered and Poorly Protected Ecosystems	No buffer	No buffer		

	Threatened Forests	All	No buffer	No buffer	Department of Agriculture, Forestry and Fisheries (DAFF), 2013	National
	Coast (including estuaries)	Coastline and Estuaries	1 km	1 km	Coastline: Department of Rural Development and Land Reform (DRDLR) 50k Topo, 2006 Estuaries: CSIR, SANBI 2009	National
	Strategic Water Source Areas	>220 mm/annum rainfall (30 % of county's rainfall)	Not considered	No buffer	SANBI/ Council for Scientific and Industrial Research (CSIR) 2013	National
	Rivers	River Freshwater Ecosystem Priority Areas (FEPA)s	100 m	100 m	SANBI/CSIR, 2011	National
		National Freshwater Ecosystem Priority Areas (NFEPA) Rivers Order 3-7	100 m	100 m		
	Wetlands	Wetland FEPAs	100 m	100 m		
		Wetland clusters	No buffer	No buffer		
Natural	Birds	Specific Important Bird Areas (IBAs) in whole	No buffer	Not considered	Bird Areas provided by BirdlifeSA, 2013	National
		Amur Falcon colonies	10 km	1 km		
		Bearded Vulture nests	20 km	2 km		
		Lesser Kestrel colonies	10 km	1 km		
		Priority Vulture colonies	20 km	2 km		
		Largest Vulture colonies	40 km	4 km		
		Potberg Vulture colonies	40 km	4 km		
		Transkei Vulture IBA	No buffer	Not considered		
		Saldanha flyway	No buffer	Not considered		
		Verlorenvlei flyway	No buffer	Not considered		
		Lower Breede River	20 km	Not considered		
	Bats	Major Bat Roosts (> 500 bats)	20 km	2 km	Bat Areas provided by Endangered Wildlife Trust (EWT), 2013	National

Land Use	Land Capability	Class 1 to 3	No buffer	No buffer	DAFF, 2002	National
	Field Crop Boundaries	Horticulture & Viticulture	No buffer	No buffer	DAFF, 2013	
		Pivots	No buffer	No buffer		
		Shadenet	No buffer	No buffer		
		Tea Plantations	No buffer	No buffer		
		Annual Crop Cultivation / Planted Pastures Rotation	Not considered	No buffer		
	Square Kilometer Array (SKA)	Telescope Sites	20 km	10 km	SKA, 2013	National
	South African Astronomical Observatory	All	5 km	5 km	Department of Sciences and Technology (DST), 2013	National
	Buildings	All	300 m	300 m	SPOT Building Count, 2009	WC, EC, NC, NW, FS
	Roads	Major Roads (national, arterial, main)	500 m	500 m	DRDLR 50k Topo, 2006	National
		Secondary Roads (secondary)	500 m	500 m		National
		Tourist Routes (Western Cape only)	2 km	2 km		WC
	Railway	All	300 m	300 m	DRDLR 50k Topo, 2006	National
	Power lines and substations	Existing Transmission and Distribution with 2022 Planned Transmission	300 m	300 m	Eskom, 2013	National
	Airports	Major Airports	35 km	Not considered	DRDLR 50k Topo, 2006	National
		Landing Strips	1 km	Not considered		
		Military Air Force Bases	27 km	Not considered	Centre for Renewable and Sustainable Energy Studies (CRSES)/ South African Defence Force (SADF), 2013	National
	Telecommunication towers	Towers >20 m	500 m	500 m	Civil Aviation Authority (CAA)/CRSES, 2012	National

Technical	Slope	Slope >10%	No buffer	No buffer	RSA Shuttle Radar Topography Mission (STRM) 20m Digital Elevation Model (DEM), 2002	National

1.3. Identification of the Study Areas

The integration of environmental, social and economic considerations was achieved by applying the large scale wind and solar PV environmental and technical constraints masks (resulting from the negative mapping exercise) to the top development potential areas (resulting from the positive mapping exercise) in order to identify the highest development potential areas that are available for development (i.e. unconstrained). The largest clusters of unconstrained top development potential areas were subsequently identified through a point density analysis. The areas that were statistically delineated from this process were selected as study areas. The 15 wind and 8 solar PV Study Areas were the final outputs of Phase 1 of the SEA process.

2. Methodology for Phase 2:

After having identified the unconstrained top development potential areas (i.e. Study Areas), a verification and prioritisation process was undertaken. This included an extensive consultation process with the industry, provincial governments, local governments, other key stakeholders, and the wider public. The consultation process was primarily aimed at identifying the areas that best serve both the strategic objectives of the country (which include economic, environmental and socio-political considerations) and the needs of the industry. The outcome of the process was the identification of eight Focus Areas (FAs) that would be further assessed during Phase 3 of the SEA process.

2.1. Industry Consultation

Much data and knowledge exist in the private sector that cannot be made available for public studies such as this SEA due to the competitive nature of the renewable energy industry. Measured resource data which are collected by developers across the country and more accurate than the modelled resource data used for this study is an example of such confidential data. In order to afford the industry an opportunity to provide inputs based on the confidential data and knowledge at their disposal, without having to actually disclose such information, an appropriate consultation process was designed.

The consultation process consisted of a survey including a map of the area covered by the SEA divided into 100 km × 100 km grid cells. This survey was distributed to the members of the South African Wind Energy Association (SAWEA), the South African Photovoltaic Industry Association (SAPVIA), and any other developers registered as stakeholders in the SEA process. A commitment was made that all individual submissions by developers would be treated as confidential while the aggregated results would be used for the study. Developers were requested to select up to 5 different grid cells where wind or solar PV development should be prioritised in 0-5, 5-10, or 10-15 year timeframes. In total, 18 developers from the wind industry and 21 developers from the solar PV industry submitted inputs which were used to inform the SEA refinement of the study areas.

Developers make use of different selection criteria when identifying priority sites for development, and a wide range of grid cells were consequently identified through the consultation process. The objective of this consultation process was to identify the cells that have been selected by several developers, and thus demonstrate some agreement among developers. As the certainty on infrastructure availability decreases with the

longer timeframes, the level of agreement in the developers' submissions decreased. For the purpose of this study the grid cells selected by most developers (i.e. representing the highest level of agreement from the industry) in the 0-5 year timeframe and overlapping with the study areas were used to delineate eight FAs. For practical reasons the delineation of FAs needed to be according to well defined geographical features. Existing roads were, therefore, used to delineate the FAs.

2.2. Provincial Government Consultation

Following the delineation of the eight FAs, a dedicated consultation process with provincial authorities was undertaken to discuss the proposed FAs and their alignment with provincial and regional planning. The opportunity was also used to identify additional information and potential concerns from provincial departments that needed to be taken into consideration going forward. Five workshops hosted at the relevant departments' provincial offices were undertaken during November and December 2013. While the outcomes of these workshops are discussed in more detail in the SEA report, outcomes of particular interest include the Eastern Cape Government's request to keep the former Transkei homeland area as part of the Stormberg wind FA, despite the known vulture sensitivities in this area. The Eastern Cape Government committed to commission vulture tracking studies in this area to further inform and find potential mitigation measures. The Western Cape Government requested that all eight FAs be assessed for both wind and solar PV development to allow for the optimal utilisation of any strategic investment made into these areas.

2.3. Local Government Consultation

During March and April 2014, another round of consultation was undertaken in collaboration with provincial governments and with all district and local municipalities with jurisdictions in the FAs. The purpose of these workshops was to inform local government of the SEA process, discuss any additional relevant information available at local and regional levels, verify the obstacles and benefits that would be associated with wind and solar PV development, and finally discuss the inclusion of REDZs, once adopted, into Spatial Development Frameworks (SDFs) and Integrated Development Plans (IDPs). Details of the outcomes of these workshops are provided in the SEA report.

2.4. Public Consultation

In addition to consulting key stakeholder groups through the Expert Reference Group (ERG), extensive wider public consultation was conducted through the exchange of information and data via a dedicated online platform (project website) as well as public meetings hosted at appropriate locations in each of the eight FAs during March and April 2014. The public meetings were widely advertised in newspapers as well as electronic and telephonic invitations that were extended to all registered stakeholders and additional key stakeholders identified in each FA. The purpose of the public meetings was to inform local communities and other stakeholders of the SEA process, present the findings to date, discuss additional issues and collect additional relevant information that should be considered during the further assessment of the FAs. Details on the organisation and outcomes of these meetings are provided in the SEA report.

2.5. Identification of the Focus Areas

Taking into consideration all information and data gathered during the consultation process, the final boundaries of the eight FAs were determined with the existing roads. The DRDLR 50k Topo, 2006 dataset was used for delineating the boundaries of the focus areas.

***Lineage Statement:**

This Geodatabase was informed by the methodology and datasets indicated in the Supplemental Information section of this document. The methodology followed is replicable

and described in the Wind and Solar PV Energy Strategic Environmental Assessment report to allow for update of the database when updated and improved information becomes available.

ATTRIBUTE INFORMATION

Attribute Description:

Field name	Alias Name	Data Type	Description	Example
Shape*	Shape	String	Shape of the feature	Polygon
Area in km 2	Area in km 2	Integer	Area of the polygon type feature i.e. area of the of the Renewable Energy Development Zone in km 2	12041 km^2
Name of REDZ	Name of REDZ	String	Name of the Renewable Energy Development Zone	Stormberg-REDZ4
Perimeter in km	Perimeter in km	Integer	Perimeter of the Renewable Energy Development Zone in km	12041 km^2
Province	Province	String	Province in South Africa where the Renewable Energy Development Zone is located	North West

SUPPLEMENTARY INFORMATION

The Supplementary information is available from www.egis.environment.gov.za.

DATA MAINTENANCE

Dataset last updated:

2015-01-01

Time Period of Content: 2013

Progress:

Completed. This version database is currently being reviewed by DEA: EGIM Unit. New information will be systematically verified and added to the database in subsequent releases.

Maintenance and update frequency:

The database will be updated as new information becomes available.

DISTRIBUTION AND CONSTRAINTS

On-line Resource:

www.egis.environment.gov.za

***Distribution Format:**

ArcGIS 10.1 Shapefile (shp) file format

Access constraints:

The data can be obtained from The Department of Environmental Affairs. The department must be acknowledged in the use of the data.

Distribution constraints:

Use limitations:

Please refer to the License Agreement. The user shall not sell or license the digital maps. The Department of Environmental Affairs cannot give any warranty on the accuracy of the map. The

Department of Environmental Affairs shall in no way be liable for results related to the use of these maps. Users of these digital maps must acknowledge the copyright for the digital map. Source: Department of Environmental Affairs.

METADATA INFORMATION

Metadata Point of Contact:

Director: Enterprise Geospatial Information Management

Metadata Email Contact:

Reapplicationmap@environment.gov.za

Postal Address:

Department of Environmental Affairs
Directorate: Enterprise Geospatial Information Management
Private Bag X447
Pretoria
Gauteng
South Africa
0001

Physical Address:

Environment House
473 Steve Biko
Arcadia
0083
Pretoria
Gauteng

Telephone:

+ 27 (12) 399-8916

Additional Extent information for the Dataset (Vertical & Temporal):

N/A

***Spatial Representation Type:**

Vector –Polygon

***Reference System:**

Geographic Coordinate System: GCS_WGS_1984
Datum: D_WGS_1984
Prime Meridian: Greenwich
Angular Unit: Degree

***Metadata File Identifier:**

SEA_Agriculture.meta

Metadata Standard Name:

SANS 1878

Metadata Standard Version:

SANS 1878-1:2005

***Metadata Language:**

English

***Metadata Character Set:**

US-Ascii