

# Wind Atlas for South Africa (WASA)

## Western Cape and areas of Northern and Eastern Cape

### Project brief – November 2011

#### Acknowledgements

The Wind Atlas for South Africa project is an initiative of the South African Government, Department of Minerals and Energy (now DoE), and the project is co-funded by

- the UNDP-GEF through the South African Wind Energy Programme (SAWEP), and
- the Royal Danish Embassy

South African National Energy Research Institute (SANERI) is the Executing Partner, coordinating and contracting contributions from the implementing partners: CSIR, UCT, SAWS, and Risø DTU.

#### Immediate objectives

To improve knowledge and quality of wind resource assessment methods and tools, as well as to ensure availability of tools and data for planning and application for wind farm developments, off-grid electrification and extreme wind studies.

#### Main outputs

The project will provide an updated overview of the wind climate based on reliable wind data using contemporary models and the following main results:

Measurement stations, data acquisition systems and data for verification for a total of 3-years

First wind atlas according to standard proven and tested method after 1 year of measurements

Researched wind atlas after 3 years of measurements

All results in public domain

#### Roles

SANERI – coordination and dissemination

UCT – mesoscale modelling

CSIR – measurements and microscale modelling

SAWS – extreme wind assessment

Risø DTU – partner in all activities



# Project plan and selected initial highlights

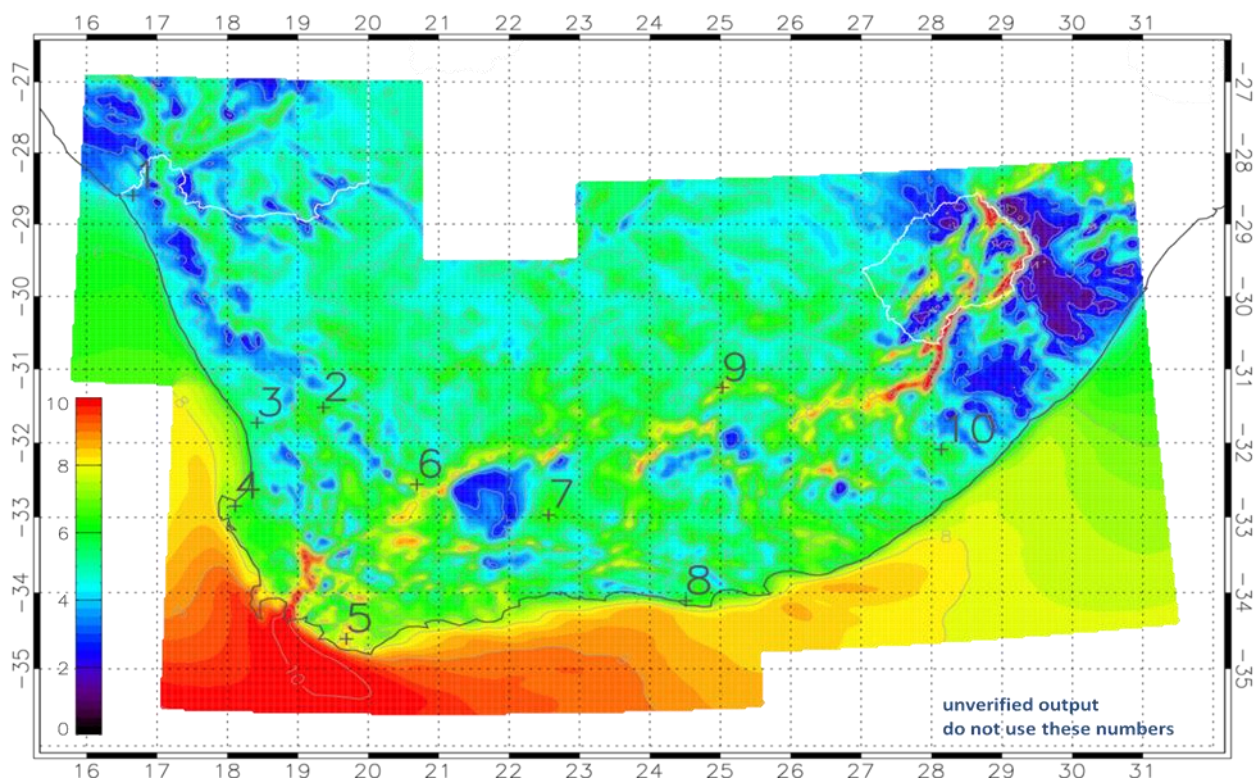
## Milestones according to work plan

30 June 2009	Project Commencement at contract signature
March 2010	First public project workshop presenting <ul style="list-style-type: none"><li>• Project plans, methods and tools</li><li>• First unverified wind atlas</li></ul>
July/August 2010	10 WASA measurement stations in operation
September 2010	Wind data publishing monthly on web-site activated
September 2011	1 year of data QA'ed. Site and station description reports for microscale modelling at the 10 WASA measurement stations.
February 2012	Midterm Workshop presenting <ul style="list-style-type: none"><li>• First wind atlas according to standard proven and tested method after 1 year of measurements</li></ul>
February 2014	Final Workshop and Wind Seminar presenting <ul style="list-style-type: none"><li>• Researched wind resource atlas</li><li>• Extreme wind atlas</li></ul>

## Work Package 1: Mesoscale modelling

Initial model set up and preliminary calculations have been made both at Risø DTU (KAMM) and at UCT (WRF). WRF wind forecasts are available on: <http://veaonline.risoe.dk/wasa>. Work to refine model set up, terrain descriptions and parameterisation is ongoing. 1 year of data available for verification. KAMM modelling and verification initiated.

### Mesoscale Modelling (5 km grid spacing; 100 m level) 30-year mean mesoscale wind speed (m/s)



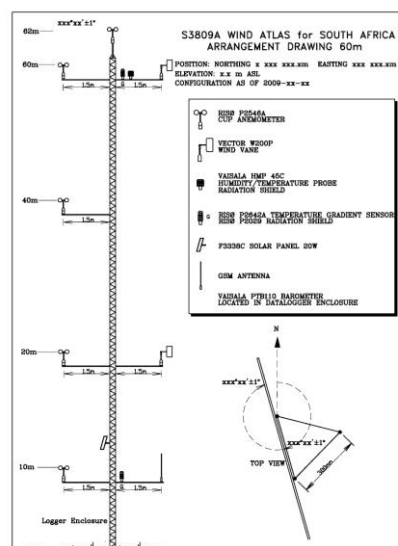
## Work Package 2: Wind measurements

Ten lattice-type, 60-m wind masts installed at sites selected primarily for their use for verification of mesoscale modelling in the project areas of Western, Northern and Eastern Cape. Mast locations and numbering is shown in the map. 10 minutes statistics data are collected at CSIR, and graphs are made available automatically for viewing online on the project web site <http://www.wasa.csir.co.za>.



WASA	Data recovery (%)	$U_{\text{mean}}$ @ 61.5m (m/s)
WM01	100.0	5.83
WM02	100.0	6.19
WM03	100.0	7.13
WM04	100.0	6.68
WM05	95.8	8.58
WM06	100.0	7.00
WM07	100.0	6.95
WM08	100.0	7.36
WM09	89.6	7.55
WM10	92.4	6.52

Some photos from the installation work and a sketch of the instrumentation on the 10 measurement masts are shown below. Further details are also available on the project web site <http://www.wasa.csir.co.za>.



Monthly data files are made available for download for anyone entering their registration information. Registration includes your coordinates, affiliation and the intended type of use. About a week after the turn of the month, the wind data from each month (after some QA by the project team) will be made available from <http://wasadata.csir.co.za/wasa1/WASAData>.

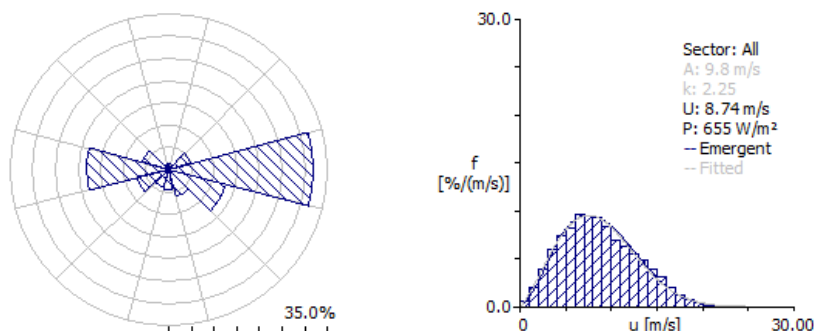
Please always make sure to get the latest version of any dataset reflecting findings of the ongoing QA process.

It should be noted that any use of the data is at own risk according to disclaimer on the web site.

## Work Package 3: Microscale modelling

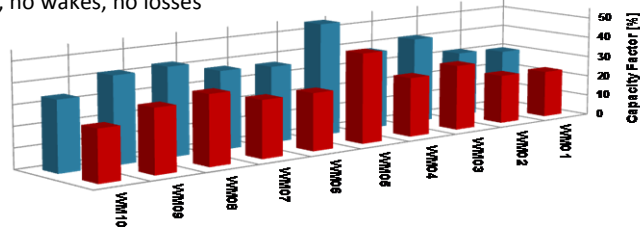
A microscale workshop for all project partners was held in November 2009, introducing and discussing tools and methods. WASP and the Wind Atlas Method is being used for wind data analysis and wind resource mapping.

Land-use data have been extracted from and further detailing of stations and surroundings at the 10 WASA masts have been made. Databases of statistical distributions and observational wind atlases after 1 year of measurements are now available. See all 10 mean wind speeds and power densities as well as WM05 wind rose and wind speed distribution for 1 year below:

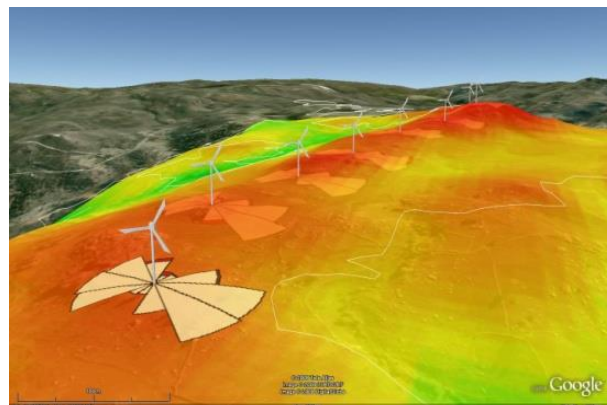


### Capacity Factors - WASP predictions based on 1 year of WASA data.

Theoretical values for a 2-MW and a 3-MW turbine assuming 100% availability, no wakes, no losses



	WM01	WM02	WM03	WM04	WM05	WM06	WM07	WM08	WM09	WM10
2-MW Ø90m	30	32	42	38	55	37	38	43	42	34
3-MW Ø90m	23	24	32	29	44	28	28	34	31	25



## Work Package 4: Application

Wind Atlas for South Africa database will be available through links from <http://www.wasa.csir.co.za> and presented at Mid-term and Final Workshops. Preliminary calculations for one 2-MW wind turbine (80 m hub height, 90 m rotor diameter) at each mast position using 1 year WASA data are shown in table above. SAWEP Workshop on the Wind Atlas for South Africa (WASA) with Presentation and Demonstration of WASA methods, tools and products was held in Cape Town, 4 March 2010. You will find the presentations on [http://www.saneri.org.za/wind\\_atlas.htm](http://www.saneri.org.za/wind_atlas.htm)

## Work Package 5: Extreme winds

PhD work initiated by SAWS and supported by this project since June 2009 was completed - "Wind Climatology of South Africa relevant to the Design of the Built Environment" in 2010. The PhD research contains a.o. study of prevailing macroclimate, extreme value theory, statistical analysis of strong wind data with different approaches and methodologies, development of new 1:50 year maps. The WASA project will further develop and apply methods related to exploitation of the results of WP1, WP2 and WP3.

## Work Package 6: Documentation and dissemination

The WASA project is presented at conferences and seminars, e.g.

- Wind Energy Seminar, Pretoria, 23 January 2009,
- Wind Power Africa 2010 conference, Cape Town, 13 May 2010,
- WinDaba 2011, Cape Town, 27-29 September 2011.

Presentations and links to information are available at the SANERI web site

<http://www.saneri.org.za> and <http://www.wasaproject.info/>.