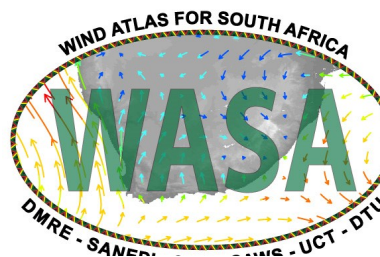




Wind Atlas for South Africa (WASA)

South African Wind Atlas (WASA) Guide

Jody Julies
Council for Scientific and Industrial Research (CSIR)



January 2021

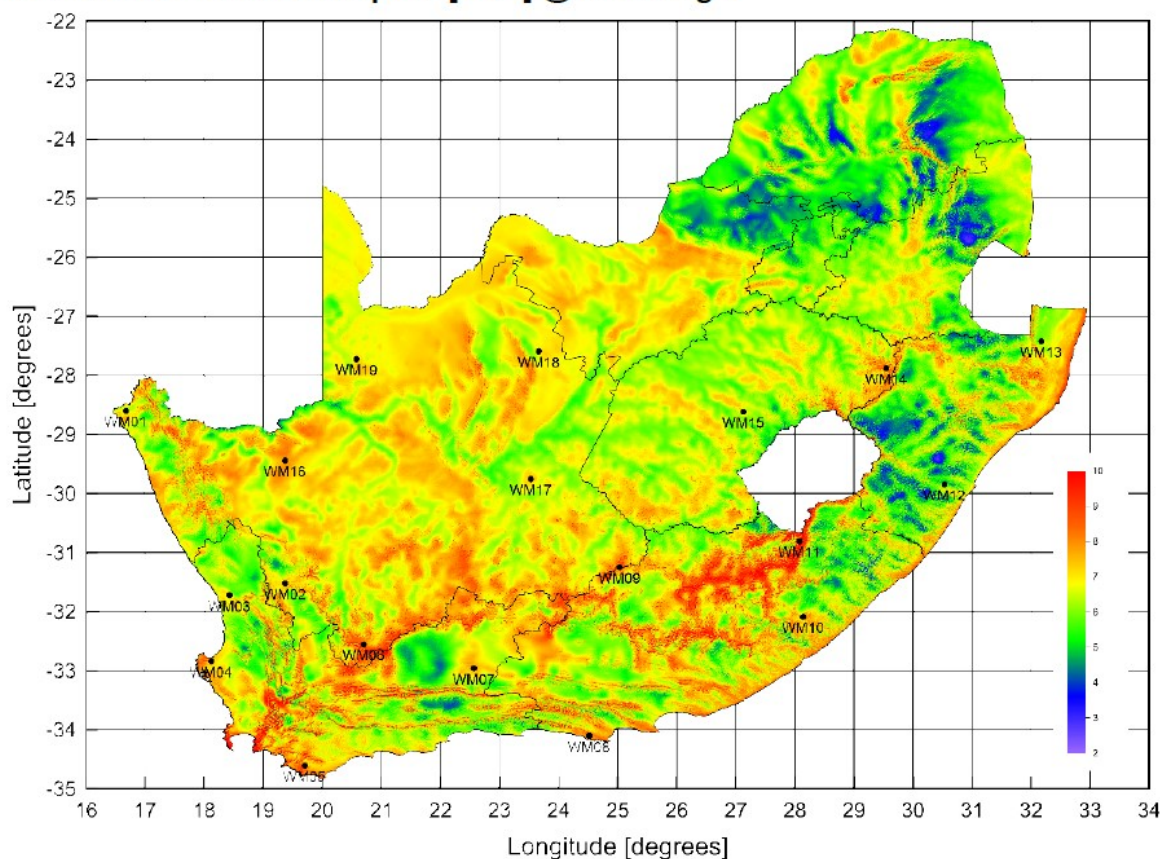
SOUTH AFRICAN WIND ATLAS (WASA) GUIDE

WASA (2009 to 2021) is an initiative of the South African Government, Department of Mineral Resources and Energy, and the project is co-funded by the UNDP-GEF¹ through the South African Wind Energy Programme (SAWEP), the Royal Danish Embassy¹ and the Danish Government². South African National Energy Development Institute (SANEDI) is the Executing Partner, coordinating and contracting contributions from the implementing partners: CSIR, UCT, SAWS, and DTU Wind Energy.

Introduction

The Numerical Wind Atlas (NWA) shows the generalised³ climatological annual mean wind speed [m/s] 100 m above ground level, for South Africa.

South Africa mean wind speed [ms^{-1}] @ 100 m a.g.l.



The Numerical Wind Atlas Database contains the generalised³ wind climate data sets (LIB files) for the entire modelling domain. The WRF based data set for South Africa (December 2018) which has a generalised wind climate for every $3.3 \text{ km} \times 3.3 \text{ km}$, corresponding to approximately 170 707 data points (“virtual masts”)

The generalised wind climates can be viewed directly with WAsP, however, to employ the LIB files (calculations) for wind farm planning and wind resource assessment a licensed version is required.

How to access the Numerical Wind Atlas Database

1. Download the latest version of WAsP from the WAsP website <https://www.wasp.dk/Download/WAsP12-Suite-Installer>. Install the WAsP software on the hard disc drive (HDD). The unlicensed WAsP will allow you view the Generalized Wind Climate LIB files **but will not allow any calculations to be done.**



PRODUCTS WIND ATLAS COURSES SUPPORT

Previous WAsP Suite Installers

Home > Download > [WAsP Suite Installer](#)



WAsP Suite Installer

The WAsP Suite installer ensures that all the programs included are compatible with each other and it allows you to install any subset of the software.

Release date	License	Product	Release notes	Download installer file (By downloading this software, I agree to the terms of the license agreement, as available at www.wasp.dk)	File size
06.01.2021	WAsP Bundle	WAsP 12 (Version 12.6.24)	Get it	WAsPSuite-2021-A-4.exe	244MB
		WAsP Engineering 4 (Version 4.0.198) Scripts for WEng 4	Get it		
		WAT 4 (Version 4.6.168)	Get it		
		WAsP 11 (Version 11.6.0034)	Get it		
	WAsP CFD Result Viewer (Version 1.3.0.54)	Get it			
	Freeware	WAsP Map Editor 12 (Version 12.3.1.54)	Get it		
		WAsP Climate Analyst 3 (Version 3.1.49)	Get it		

SEE ALSO

- > [System requirements](#)
- > [What's new in WAsP 12](#)
- > [What's new in WEng 4](#)
- > [WAsP software installation guide](#)
- > [Consulting Services](#)
- > [WAsP Bundle license agreement](#)
- > [Publications](#)

DOWNLOAD

- > [Present versions](#)
- > [Previous versions](#)

2. Register for data downloads on the WASA website

<http://wasadata.csir.co.za/wasa1/WASAData>

i. Go to the downloads page



ii. Complete all the required fields



Welcome to the WASA download site

If you are **already registered**, and want to download data, OR if you want to **check whether you are registered**, please complete the log in form below, and press the 'Log in' button. If you have **forgotten your password**, please fill in your e-mail address, and press the 'Send Password' button. It will be sent to you by e-mail.

E-mail:

Password:

If you have **not yet registered**, and want to download data, please complete the registration form below.

First name: *

Surname: *

Company name / Affiliation / Personal user: *

Affiliation type: *

If 'Other' above, please enter:

Intended usage: *

If 'Other' above, please enter:

Address: *

Country: *

Telephone: *

E-mail: *

Password: *

Confirm Password: *

CSIR - Copyright 2010 @ All Rights Reserved - Updated: June 2010

ii. Click on the <Register> button

3. **Log in to the data download website using your e-mail address and password provided.**

Welcome to the WASA download site

If you are **already registered**, and want to download data, OR if you want to **check whether you are registered**, **Password** button. It will be sent to you by e-mail.

E-mail:

Password:

4. **There are a number of download options on this page. To access the generalized wind climate LIB files click on 'WASA Wind Atlas downloads'**



Other links: [WASA Online Graphs](#) [WASA FAQ](#)

WASA1: [Arrangement Drawing](#) [Instrumentation Summary](#) [Mast Site Information](#) [Station and Site Description Report \(April 2014\).pdf](#)

WASA2: [Arrangement Drawing](#) [Instrumentation Summary](#) [Mast Site Information](#) [Station and Site Description Report \(April 2017\).pdf](#)

WASA3: [Arrangement Drawing](#) [Instrumentation Summary](#) [Mast Site Information](#) [Station and Site Description Report \(Dec2019\) v1.pdf](#)

The WASA download site

[WASA1 Final Reports April 2014](#)

[WASA2 Final Reports December 2018](#) **UPDATED (2019/07/04)**

[WASA1 Wind time series downloads](#)

[WASA1 Extreme wind atlas downloads](#)

[WASA2 Extreme wind atlas downloads](#) **UPDATED (2019/06/22)**

[WASA High-Resolution Wind Resource Map \(December 2018\)](#) **UPDATED (2019/07/04)**

[WASA1&2 Interim High-Resolution Wind Resource Map \(October 2017\)](#)

[WASA1 High-Resolution Wind Resource Map \(October 2017\)](#)

[WASA1 Large Scale Wind Resource Map \(April 2014\)](#)

[WASA1 Large Scale Wind Resource Map \(May 2013\)](#)

[WASA Wind Atlas downloads](#) **UPDATED (2019/06/15)**

WASA Meteorological data downloads

Please choose the sites from which you wish to download data.

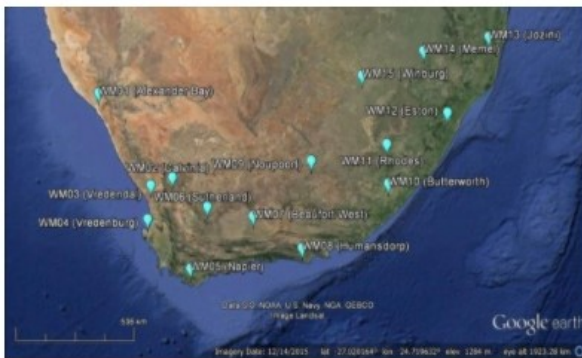
- WM01 (28°36'06.7"S, 16°39'51.9"E - since 2010-06-23)
- WM02 (31°31'29.7"S, 19°21'38.7"E - since 2010-06-30)
- WM03 (31°43'49.4"S, 18°25'10.1"E - since 2010-06-24)
- WM04 (32°50'41.2"S, 18°06'34.5"E - since 2010-05-18)
- WM05 (34°36'41.6"S, 19°41'30.3"E - since 2010-05-20)
- WM06 (32°33'24.4"S, 20°41'28.7"E - since 2010-09-17)
- WM07 (32°58'00.2"S, 22°33'23.8"E - since 2010-05-28)
- WM08 (34°06'32.0"S, 24°30'49.0"E - since 2010-08-04)
- WM09 (31°15'05.8"S, 25°01'50.2"E - since 2010-09-01)
- WM10 (32°05'26.5"S, 28°08'09.0"E - since 2010-08-05)
- WM11 (30°48'51.6"S, 28°04'25.3"E - since 2015-10-27)
- WM12 (29°51'00.4"S, 30°31'42.8"E - since 2015-10-16)
- WM13 (27°25'34.2"S, 32°09'58.1"E - since 2015-10-15)
- WM14 (27°52'54.1"S, 29°32'36.4"E - since 2015-10-02)
- WM15 (28°37'11.9"S, 27°07'23.4"E - since 2015-09-30)
- WM16 (29°26'39.2"S, 19°21'25.1"E - since 2018-10-25)



5. Scroll down to the Numerical Wind Atlas - Data access and system requirements. There are three options for download, 3km resolution for the WASA1 domain (part of the Northern Cape, whole of the Western Cape and part of the Eastern Cape), 5km resolution for the whole of South Africa and a 3.3 km resolution for the whole of South Africa. Select the dataset that best suits your requirements. Select the *Complete set of wind atlas data sets* to download the full set of LIB files. A complete list of LIB file coordinates is also available for download.

Numerical Wind Atlas

The WASA numerical wind atlas contains generalized wind atlas data sets for tens of thousands of model grid points covering all of South Africa. WASA programme has three phases. WASA1 for the domain of WC and areas of NC and EC was completed in 2014. WASA2 focus is KZ FS, while WASA3 is modelling all of South Africa. WASA2 and WASA3 are ongoing with completion in 2018 and 2020 respectively. WA measurements have been continued through all phases since 2010. WASA2 measurements were added since 2015 and WASA3 measurements on line from mid-2018. The location of the 10 WASA1 met. stations as well as the 5 WASA2 met. stations are shown here:



The wind atlas data sets for each grid point are stored in a database; the grid point locations can be viewed in Google Earth:

[Download](#)

Data access and system requirements (WASA 2)

The complete set of wind atlas data sets consists of 3-km LIB files for the WASA 1 domain, 5-km LIB files and 3.3-km LIB files (Dec 201 entire South Africa). The LIB files are stored in ZIP archives and the names and positions are given in three different format files: CSV (MS), DAT (simple ASCII text) and KMZ (Google Earth).

Please choose the file(s) you wish to download.

Data for 3-km LIB files in WASA 1 domain::

- Complete set of wind atlas data sets (37,847 LIB files in archive)
- List of files and their coordinates in CSV format for MS Excel
- List of files and their coordinates in DAT format for ASCII text editor
- List of files and their coordinates in KMZ format for Google Earth

Data for 5-km LIB files in all of South Africa:

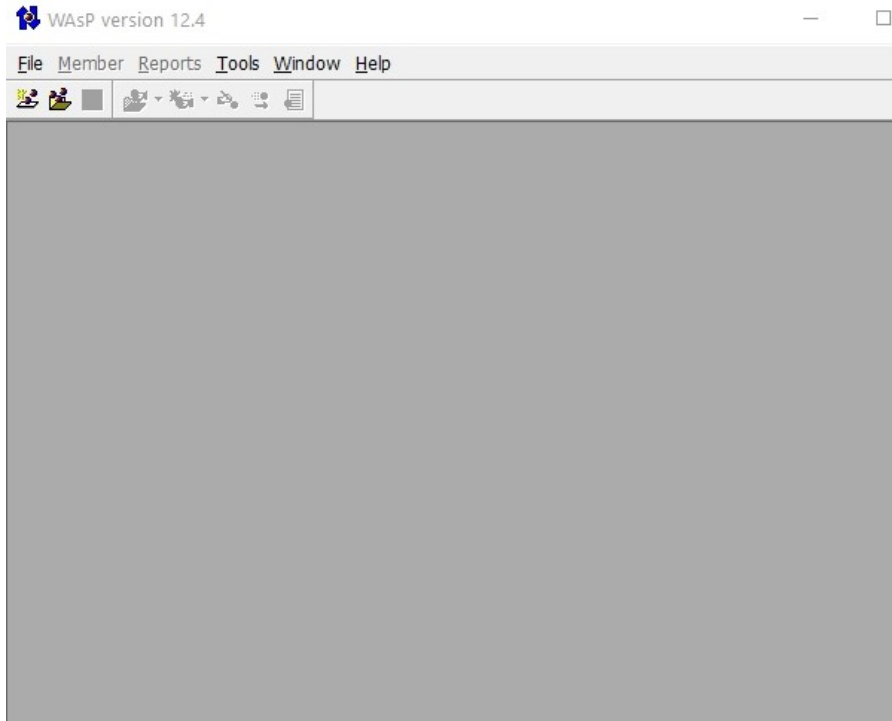
- Complete set of wind atlas data sets (44,326 LIB files in archive)
- List of files and their coordinates in CSV format for MS Excel
- List of files and their coordinates in DAT format for ASCII text editor
- List of files and their coordinates in KMZ format for Google Earth
- Map of South Africa mean wind speed at 100 m in KMZ format

Data for 3.3-km LIB files in all of South Africa (December 2018):

- Complete set of WASA 3 (2018-2017) data sets (170,707 LIB files in 75 archives)

6. View the LIB file by:

i. Double clicking on the saved LIB file or



ii. Run the WAsP program. Open the LIB file by using the

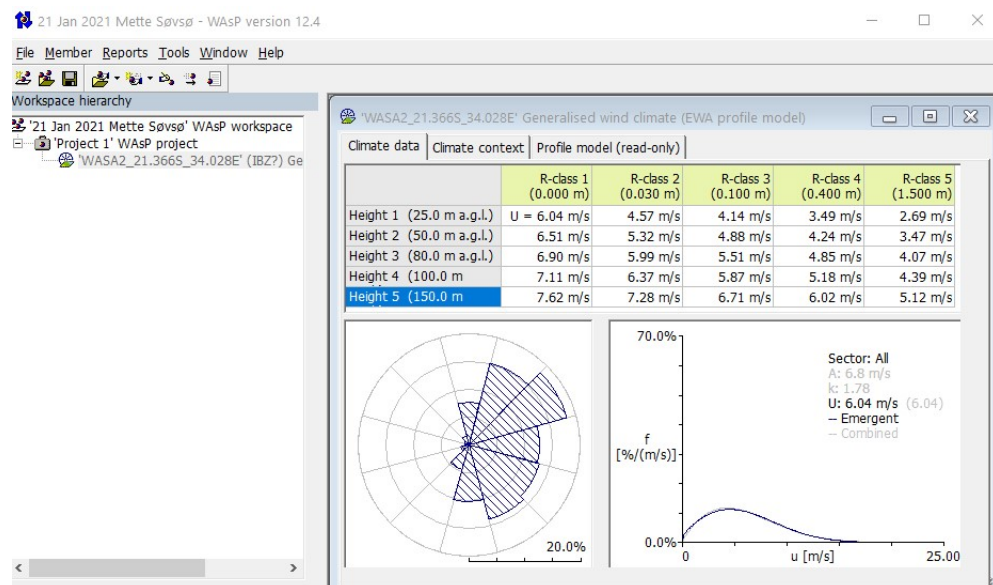
File|New Workspace

Right click on Project 1

Insert from File

Select Wind Atlas, locate the file you downloaded and Open.

iii. Generalized wind climate at the selected point. Left click on the wind rose sectors to display the sectorized wind speed distribution curve.



7. The LIB file is the Generalised³ or Geostrophic wind climate for the selected grid point. The LIB file contains the wind direction distribution as well as the sectorized and all wind speed distribution for the selected grid point. The table contains the mean wind speed and power density at five standard heights above ground level (25m, 50m, 80m, 100m, 150m) and five roughness classes. The roughness classes correspond to ground cover types:
R class 0 (0.000m) water areas, R class 1 (0.030m) farmland with open appearances, very few buildings, trees, airport area with some buildings and trees, R class 2 (0.100m) farmland with closed appearance, R class 3 (0.400m) low forest, suburbs, shelter belts, many trees and/or bushes and R class 4 (1.500m) tall forest.

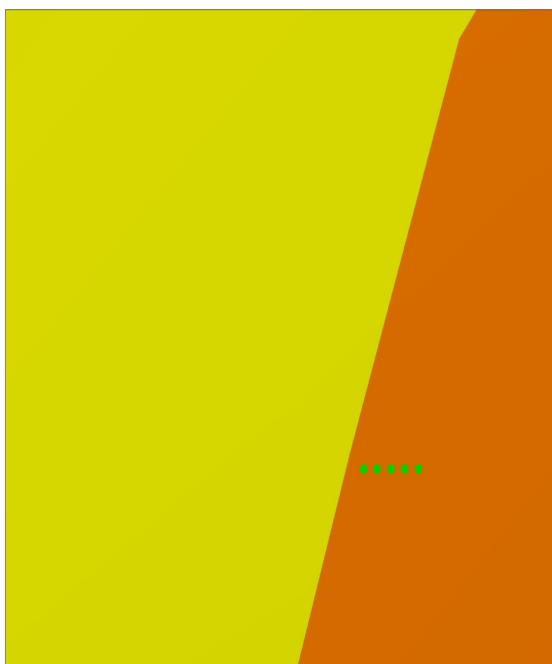
It also shows the Weibull graph and parameters A and k (lower right corner) which is a mathematical fit to the generalized wind data. The Weibull parameters A and k are used in combination with the wind turbine power curve, to calculate e.g. the estimated Annual Energy Production (AEP) etc. of a wind turbine(s) at the site.

8. Any further analysis to estimate the actual wind climate, wind farm planning, layout and wind resource assessment at the area/point of interest (e.g. microscale modeling) will require a licensed version of WAsP, see 15. If you are unfamiliar with WAsP or microscale modelling you are urged to contact a reputable wind energy specialist or consultant to help in assessing your needs.
9. Note, that although the WAsP software has been used in this guideline it should be possible to use any similar software (WindPro, GH WindFarmer etc.) to view the LIB file.
-

10. Microscale Modeling

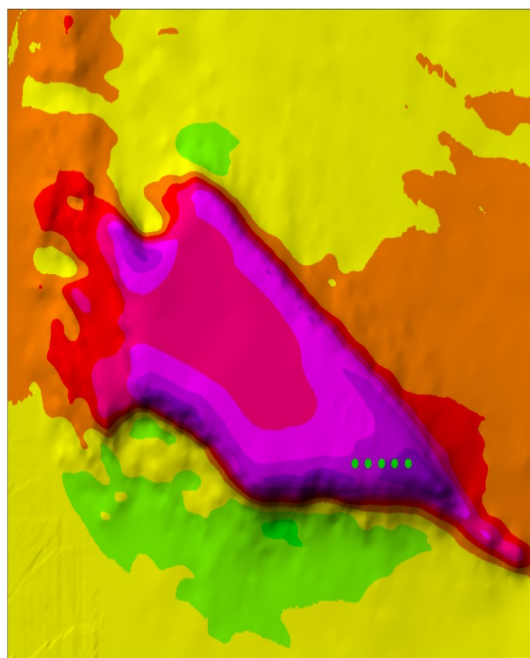
The Numerical Wind Atlas and database assume a flat, uniform terrain, with no obstacles and with 3 cm roughness (e.g. farmland with open appearances) everywhere. i.e. it ignores surface effects such as elevation (e.g. hill that can speed up the wind), roughness (e.g. forest that can slow down the wind), obstacles etc. It is then very likely that the Numerical Wind Atlas will over- or under-predict the mean local wind speed and power density.

Numerical Wind Atlas



Grid cell size 5120 m
Wind farm of five 2 MW turbines
Estimated AEP = 39 GWh

Microscale Modeling



Grid cell size 20 m
Wind farm of five 2 MW turbines
Estimated AEP = 55 GWh

Microscale modeling of the surface effects such as elevation, roughness, obstacles etc. that results in a more accurate prediction of the local wind climate and therefore wind farm planning, layout and wind resource assessment is called downscaling and requires a fully licensed version of WAsP or similar software and professional assistance to set up and run the software. See also: Planning and Development of Wind Farms (Risø-I-3272)(ed.2) for more information.

https://backend.orbit.dtu.dk/ws/portalfiles/portal/7901631/Ris_I_3272_ed.2_EN_.pdf

11 Please complete the questionnaire and provide feedback on your experience.



Other links: [WASA Online Graphs](#) [WASA FAQ](#)

WASA1: [Arrangement Drawing](#) [Instrumentation Summary](#) [Mast Site Information](#) [Station and Site Description Report \(April\)](#)

WASA2: [Arrangement Drawing](#) [Instrumentation Summary](#) [Mast Site Information](#) [Station and Site Description Report \(April\)](#)

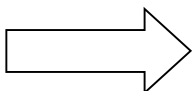
WASA3: [Arrangement Drawing](#) [Instrumentation Summary](#) [Mast Site Information](#) [Station and Site Description Report \(Dec20\)](#)

[Home / Download Data](#) [Log out](#)

The WASA download site

This is the download site for the Numerical atlas for South Africa

- [Numerical Wind Atlas UPDATED \(Jun 2019\)](#)
- [WASA Observational Wind Atlas UPDATED \(Dec 2018\)](#)
- [Case studies UPDATED \(Dec 2018\)](#)
- [Reports and Guidelines UPDATED \(Dec 2018\)](#)
- [Map data and tools UPDATED \(Dec 2018\)](#)
- [Software UPDATED \(Dec 2018\)](#)



PLEASE NOTE. While the application of the Numerical Wind Atlas NWA assists anyone, for free, to explore the generalized wind climate, it does not substitute the need for proper wind measurements which is a usual requirement for funding.

DISCLAIMER

By using this Guide, you agree that the exclusions and limitations of liability set out in this disclaimer are reasonable. If you do not think that they are reasonable, you must not use this Guide.

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