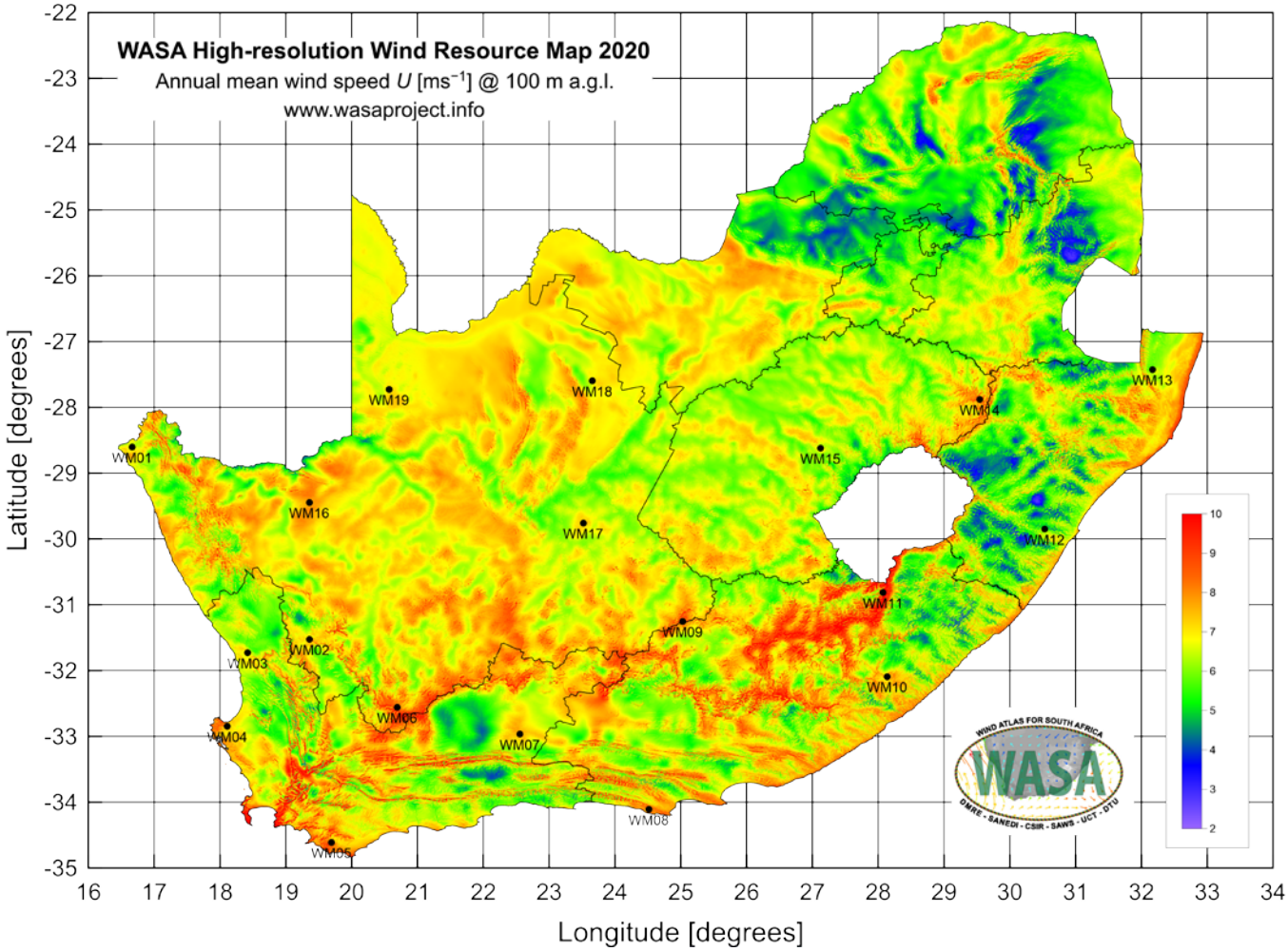


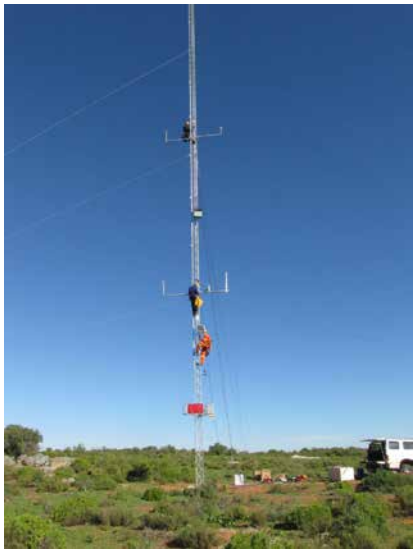
WASA 3 winds up

A webinar marked the end of Phase 3 of the Wind Atlas for South Africa (WASA) project

The preferred bidders announced in October by energy minister Gwede Mantashe for Bid Window 5 of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) included 12 wind power projects, representing some 1 600 MW of new generation capacity. If agreements are reached and all goes according to plan, these would add to the 34 wind farms procured under the first four bid windows, 27 of which were operational by December 2021 and providing 3 024 MW to the national grid. Another 1 600 MW of wind power will be procured under Bid Window 6 in 2022.

But long before wind farm developers submit such bids, they need to know whether their plans are viable. First and foremost, will the area they are considering have enough wind on a sustained basis to generate electricity at a financially feasible level? And once they get the go-ahead, where exactly should they install the wind turbines on their site for best performance?

Thanks to research and capacity-building efforts undertaken within the Wind Atlas for South Africa (WASA) project over more than a decade, these kinds of questions can be answered with confidence. The WASA project is a government initiative implemented by the South African National Energy Development Institute (SANEDI) with its partners – the Council for Scientific



WASA

Four more wind measurement masts (WM16–19 on map) were installed for WASA 3.

and Industrial Research (CSIR), the South African Weather Service (SAWS), the University of Cape Town (UCT) Climate System Analysis Group (CSAG), and the Technical University of Denmark (DTU) Wind Energy Department.

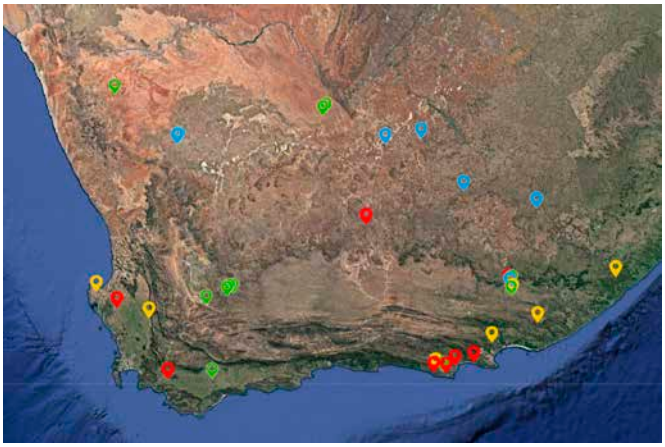
The project began in 2009 and initially focused on the Western Cape and areas of the Northern Cape and Eastern Cape provinces. This first phase, WASA 1, wrapped up with a Final Seminar for interested stakeholders in April 2014 and was followed by WASA 2, which covered KwaZulu-Natal, Free State and the remaining areas of the Eastern Cape. Based on this research, a High-resolution Wind Resource Map covering all nine provinces was released at the WASA 2 Final Seminar in April 2019. The most recent phase, WASA 3, included the remaining areas of the Northern Cape province and the rest of South Africa. The research component ended in 2020, with the Final Seminar held online in October 2021.

The research involved mesoscale wind modelling to downscale global weather data at a resolution of 200 km x 200 km to regional data at 3 km x 3 km. The final output was 30 years of wind simulations for the period 1990–2019 as a Numerical Wind Atlas, accompanied by time series of wind speed and direction at 20 m, 60 m, 100 m and 120 m above ground level (AGL), as well as temperature at 2 m AGL. This data, which was made freely accessible to all, was used for microscale modelling that took local terrain into account, with the results verified using measurements from wind stations. These are 62 m-high masts equipped with instrumentation measuring wind speed and direction, temperature, relative humidity and barometric pressure at various heights. During WASA 1, 10 such masts were erected in the area of interest, but another five were added in the eastern region for WASA 2 and then four more in the Northern Cape for WASA 3. This allowed the model to be refined for a more accurate High-resolution Wind Resource Map.

During the webinar, WASA project manager Andre Otto explained that wind power is directly proportional to wind speed cubed. Wind farm developers can therefore use wind speed and power density data to estimate their energy production, and hence their potential profit margins. The microscale data can also be used to plan a farm's layout to take account of wind hotspots or

Lekela Power

The Perdekraal East Wind Farm near Ceres in the Western Cape commenced commercial operations in October 2020.



SAWEA

Under the first four bid windows (BW) of the REIPPPP, 34 wind farms were procured (BW1 = red, BW2 = yellow, BW3 = blue, BW4 = green).

E-GIS, DFFE

Six Renewable Energy Development Zones (REDZ) have been identified for large-scale wind energy facilities through two Strategic Environmental Assessment processes that made use of the WASA data. The middle one in the Beaufort West area was added in February 2021 to the others announced in February 2018.

turbulence effects. And since developers also need to assess the threat of extreme winds, which might cause costly turbine damage, an extreme wind atlas was developed too. This would allow developers to either avoid areas prone to 1:50 year extreme wind events or choose a stronger class of turbine, rated for such conditions.

Dr Karen Surridge, Manager of SANEDI's Renewable Energy Centre of Research and Development (RECORD), noted in her presentation on WASA's status and future that climate change – with associated changes in storm events and near-surface atmospheric flow – could potentially impact energy generation by wind farms. Accurate forecasting would be required, highlighting the importance of ongoing, long-term meteorological measurements.

- WASA is implemented by SANEDI and financially supported by the Global Environment Facility (GEF) through the South African Wind Energy Project (SAWEP) with UNDP Country Office support and with the Government of Denmark, which co-funded WASA 1 and funded WASA 2.

For more information and access to wind data, see https://www.wasaproject.info/