Assessing the Role of Wind Resource Data in South Africa's Just Energy Transition

6 October 2026

Khothatso Mpheqeke

SANEDI



Policy Power People



SOUTH AFRICA'S JUST ENERGY TRANSITION CONTEXT

Why the Energy Transition Matters?

- Coal-dependent electricity system
- Decarbonisation commitments
- Socio-economic implications for coal regions
- Need for energy security, affordability and job creation
- Importance of evidence-based planning

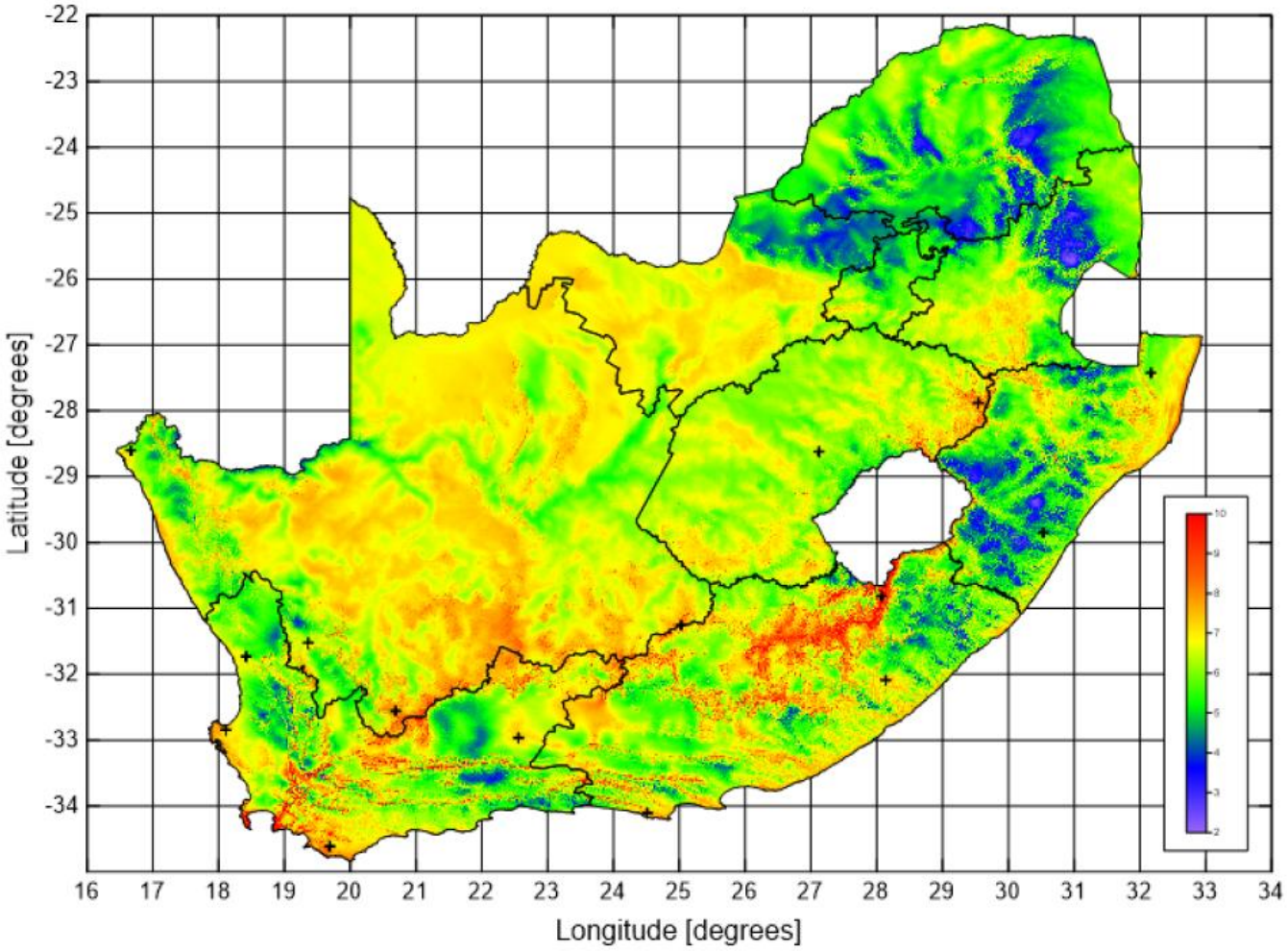
Key message: The energy transition is both a technical and socio-economic transformation.

THE WIND ATLAS FOR SOUTH AFRICA (WASA)

Building South Africa's Wind Knowledge Infrastructure

- Established in 2008/09
- Multi-institutional partnership: CSIR SANEDI SAWS UCT-CSAG DTU Wind Energy DEE DEA
- Evolution through WASA Phases 1-4
- National wind resource database

Key message: WASA has become South Africa's premier wind resource assessment platform. https://wasaproject.org/



WASA EVOLUTION AND ACHEIVEMENTS

WASA 1

2001-2014, 9 measurement stations Western, Eastern & Northern Cape coverage

WASA 2

2013 - 2018, 5 measurement stations Expanded to Free State & KwaZulu-Natal

WASA 3

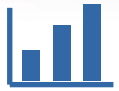
2018 - 2019, National coverage completed

WASA 4

2023 – current, 3 measurement stations. Focus on Just Transition regions; Mpumalanga, North West & Limpopo

- 30 years of modelled data (1990-2019)
- ~3.3 km mesoscale resolution
- ~100 m microscale modelling

WASA Framework



WASA Data

High-resolution WASA datasets provide the evidence base for renewable energy planning, with WASA Phase 4 focusing on poorer regions and areas affected by the declining coal economy



Information Access & Planning

Open-access wind-resource data, modelling tools improve access to reliable evidence for identifying suitable project areas, assessing wind and hybrid renewable energy opportunities.



Investment Decision

Wind-resource information supports better spatial planning for wind and hybrid projects, helping identify development opportunities and inform infrastructure and investment priorities



Infrastructure Development

Planning insights can inform energy and supporting infrastructure, while enabling localisation, developer engagement and green-economy opportunities linked to renewable deployment.



Regional Economic Development

Renewable-energy deployment can support equitable participation, local enterprise, skills development and broader regional development in communities affected by coal-sector transition



Just Energy Transition Outcomes

WASA outputs can strengthen environmental stewardship, transparent decision-making and technical readiness through tailored capacity-building for communities and stakeholders in coal-transition regions, supporting sustainable, inclusive and lower-carbon regional development..

Policy Alignment

WASA supports five national frameworks.

POLICY + PLANNING

WIND-ENERGY DEVELOPMENT

Resource potential → planning → investment → delivery

TRANSITION & INVESTMENT

JET Investment Plan (JET-IP)

Strategic framework for mobilising investment towards a low-carbon, climate-resilient economy, while addressing socio-economic impacts on workers, communities and high-carbon regions.

ELECTRICITY PLANNING

Integrated Resource Plan 2025

Primary national electricity planning framework. The 2025 plan envisages at least 34 GW of wind to be installed by 2039.

IMPLEMENTATION

JET Implementation Plan

Envisages substantial investment in renewable energy, transmission infrastructure, distribution networks, storage and other enabling infrastructure.

GRID ENABLEMENT

NTCSA Transmission Development Plan 2025–2034

Framework for major expansion and strengthening of the transmission network, closely linked to the geographic distribution of future generation resources.

INDUSTRIALISATION

SAREM

Shifts the policy discussion from renewable-energy deployment towards industrialisation and localisation, with a focus on solar, wind and battery storage.

DE-RISKING RE INVESTMENT

Benefits of wind resource data:

1. Site screening and prioritisation
2. Energy yield estimation
3. Feasibility studies
4. Reduced development cost
5. Improved investor confidence

Outcome: Lower project risk and more efficient renewable energy deployment.

SUPPORTING ELECTRICITY REFORM

Information accessibility strengthens a competitive market. Open-access wind data enables:

1. Enhanced forecasting

   Improves renewable generation forecasting accuracy significantly.

2. Improved grid operations

   Supports efficient grid management and security.

3. Better planning decisions

   Enables proactive transmission and infrastructure planning.

4. Increased market transparency

   Strengthens transparency across electricity market decisions.

5. Lower barriers to entry

   Reduces information barriers for smaller participants.

INFRASTRUCTURE AND GRID PLANNING

WASA data supports:

1. Transmission expansion planning
   Guides transmission expansion toward wind-rich areas.
2. Substation development
   Identifies locations requiring additional substations.
3. Grid congestion management
   Anticipates congestion before renewable development expands.
4. Renewable energy corridors
   Identifies suitable corridors for renewable development.
5. Infrastructure investment prioritisation
   Supports prioritisation of strategic infrastructure investments.

Major challenge: Best wind resources are often distant from demand centres.

SUPPORTING INCLUSIVE DECISION-MAKING

Special focus on MP with key areas:

1. Open-access information

   Open wind data supports informed decisions.

2. Stakeholder participation

   Accessible data enables broader stakeholder participation.

3. Reduced information asymmetry

   Shared evidence reduces information gaps.

4. Community engagement

   Accessible information strengthens meaningful engagement.

5. Evidence-based planning

   Wind data supports evidence-based regional planning.



MUNICIPAL INCLUSION AND REGIONAL DEVELOPMENT

Empowering local government through capacity development and support for:

1. Spatial Development Frameworks (SDFs)

   Supports evidence-based spatial planning decisions.

2. Integrated Development Plans (IDPs)

   Integrates renewable energy into municipal planning.

3. Local Economic Development (LED) strategies

   Supports local economic opportunities and investment.

4. Energy planning

   Strengthens municipal renewable energy planning capacity.

5. Investment promotion

   Helps municipalities identify renewable investment opportunities.

CAPACITY BUILDING AND KNOWLEDGE TRANSFER

Key initiatives:

1. Technical workshops
2. University and TVET partnerships
3. Student research support
4. Industry engagement
5. Municipal training



CHALLENGES AND FUTURE OPPORTUNITIES

CHALLENGES

- Data usability and interpretation
- Municipal capacity constraints
- Dataset integration
- Climate uncertainty
- Evolving electricity markets

OPPORTUNITIES

- Renewable resource intelligence platform
- Green hydrogen planning
- Enhanced decision support tools
- Stakeholder-specific knowledge transfer

ACKNOWLEDGEMENTS

WINDAC AFRICA

The Knowledge Behind WATT Matters
POLICY. POWER. PEOPLE.

electricity & energy
Department:
Electricity and Energy
REPUBLIC OF SOUTH AFRICA

CSIR
Touching lives through innovation

University of Cape Town • iYunivesithi yaseKapa • Universiteit van Kaapstad

WIND ATLAS FOR SOUTH AFRICA
WASA
DMRE - SANEDI - CSIR - SAWS - UCT - DTU

DTU

sanedi
South African National Energy Development Institute

Danish Energy Agency

South African Weather Service

SAWEA
South African Wind Energy Association

EW SETA

THANK YOU

CONTACT DETAILS

Ms Khothatso Mpheqeke
Senior Project Officer