

# THE NAMIBIAN RENEWABLE ENERGY AND GREEN HYDROGEN LANDSCAPE

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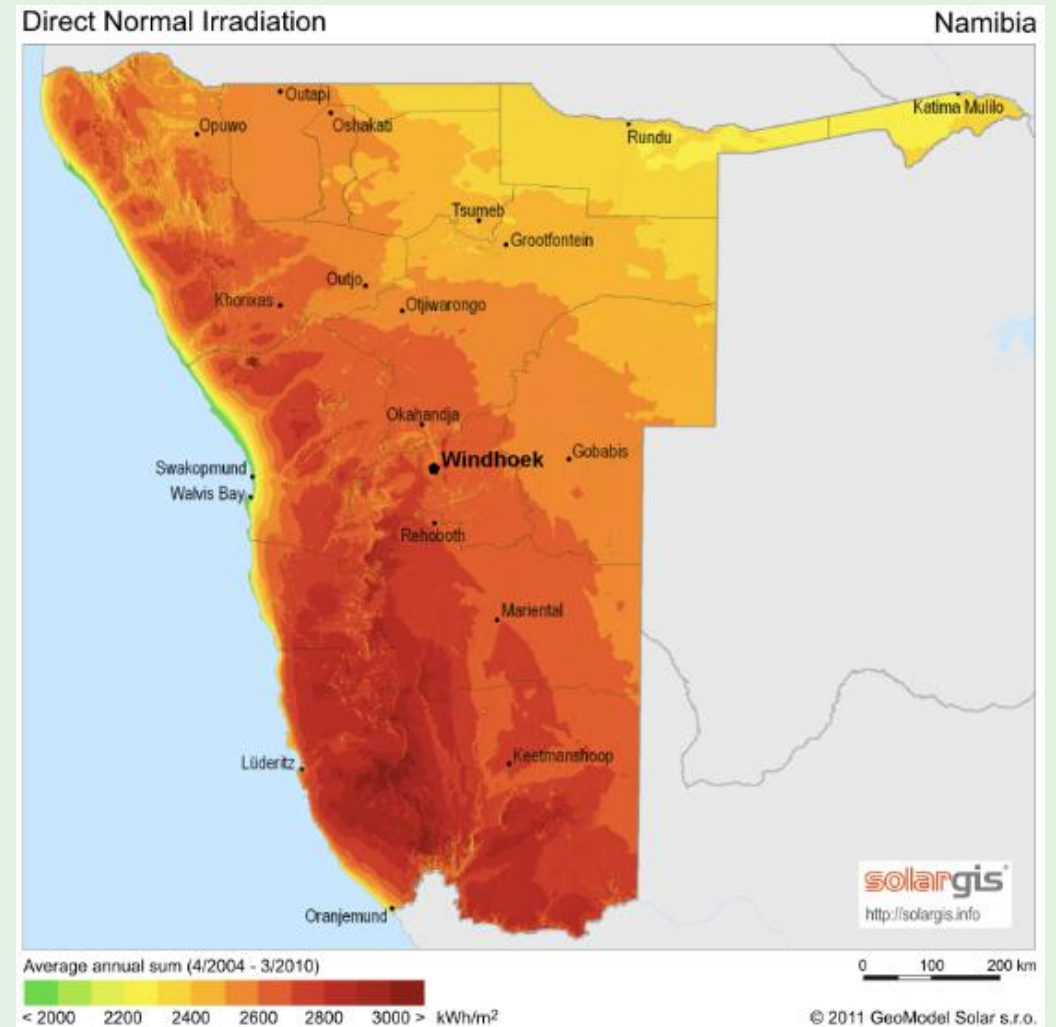
# Namibia

Namibia's energy policy is to generate 70% of its electricity from renewable energy sources.

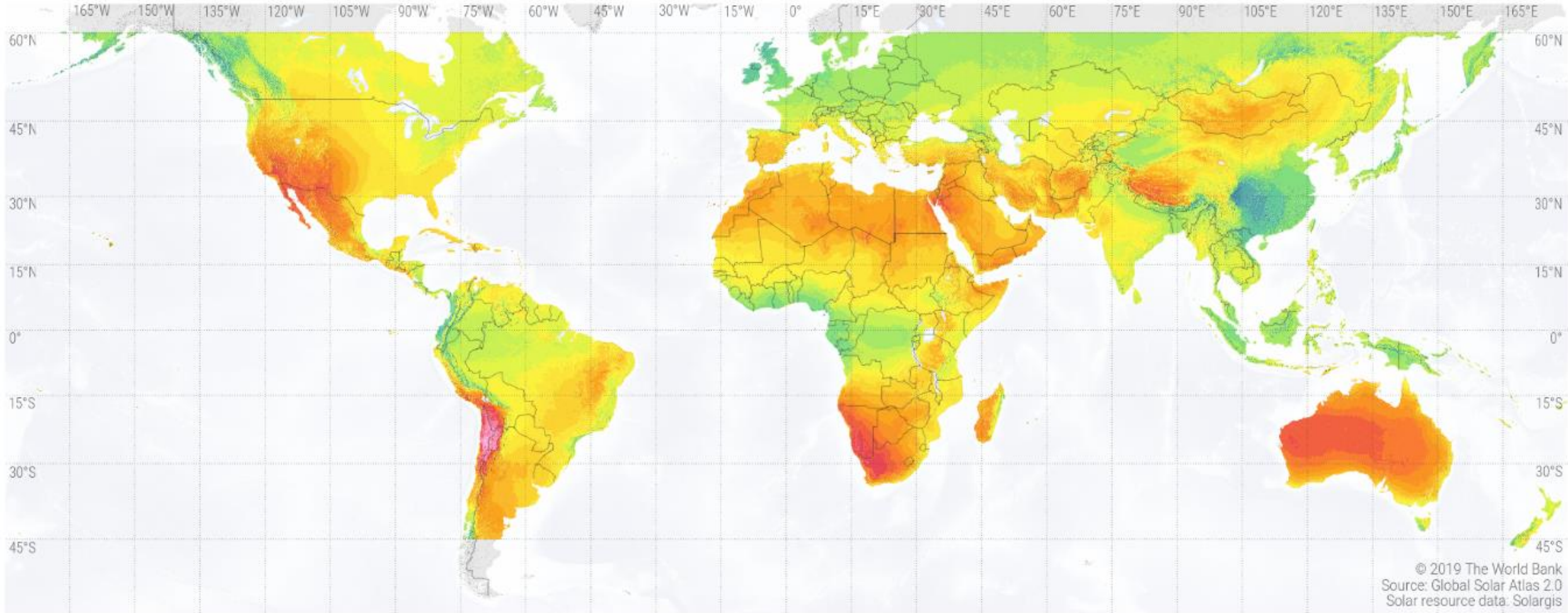
With an installed capacity of 680 MW, Namibia produces 70% of its electricity from renewable sources, including solar, hydro and wind. But the country imports 60% of its electricity from South Africa, through the Southern African Power Pool (SAPP) according to Power Africa. However, more than 80% of South Africa's state-owned Eskom's electricity network is powered by coal-fired power stations.

# RENEWABLE ENERGY RESOURCES: SOLAR POWER

- Direct Normal Irradiation (DNI) is the amount of solar radiation received per unit area by a surface that is always held perpendicular to the rays that come in a straight line from the direction of the sun at its current position in the sky.
- The average annual solar radiation on the Earth's atmosphere is 1361 W/m<sup>2</sup>. Namibia has ~10 hours of strong sunlight per day for close to 300 days per year.
- Due to the constantly high irradiation Namibia has some of the highest solar irradiation potentials of any country in Africa and PV systems in Namibia generate twice as much electricity as comparable systems in Germany on an annual average.



# DIRECT NORMAL IRRADIATION



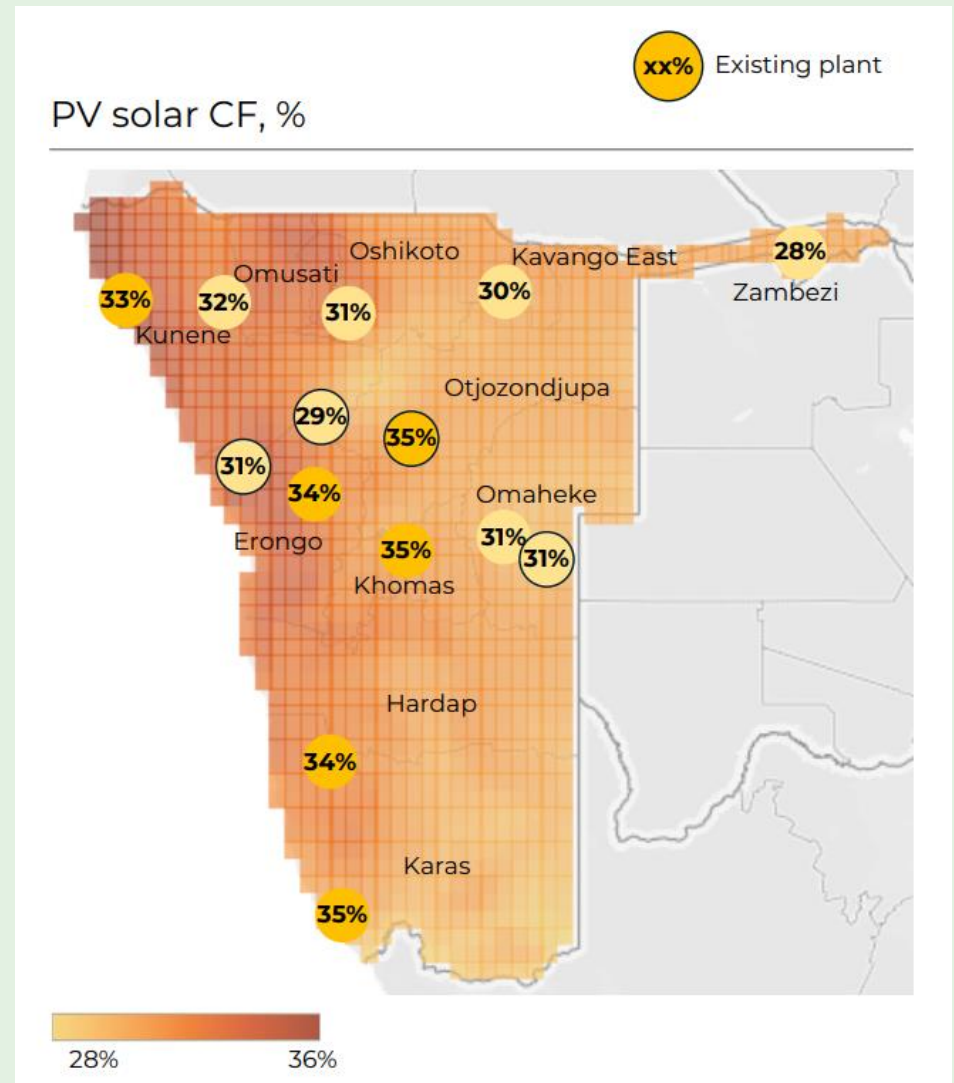
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Source: Global Solar Atlas 2.0  
Solar resource data: Solargis

Long-term average of direct normal irradiation (DNI)



## SOLAR POWER CONT.

- Namibia has solar capacity factors that reach up to 35%.
- The capacity factor is the ratio between what a generation unit is capable of generating at maximum output versus the unit's actual generation output over a period of time.



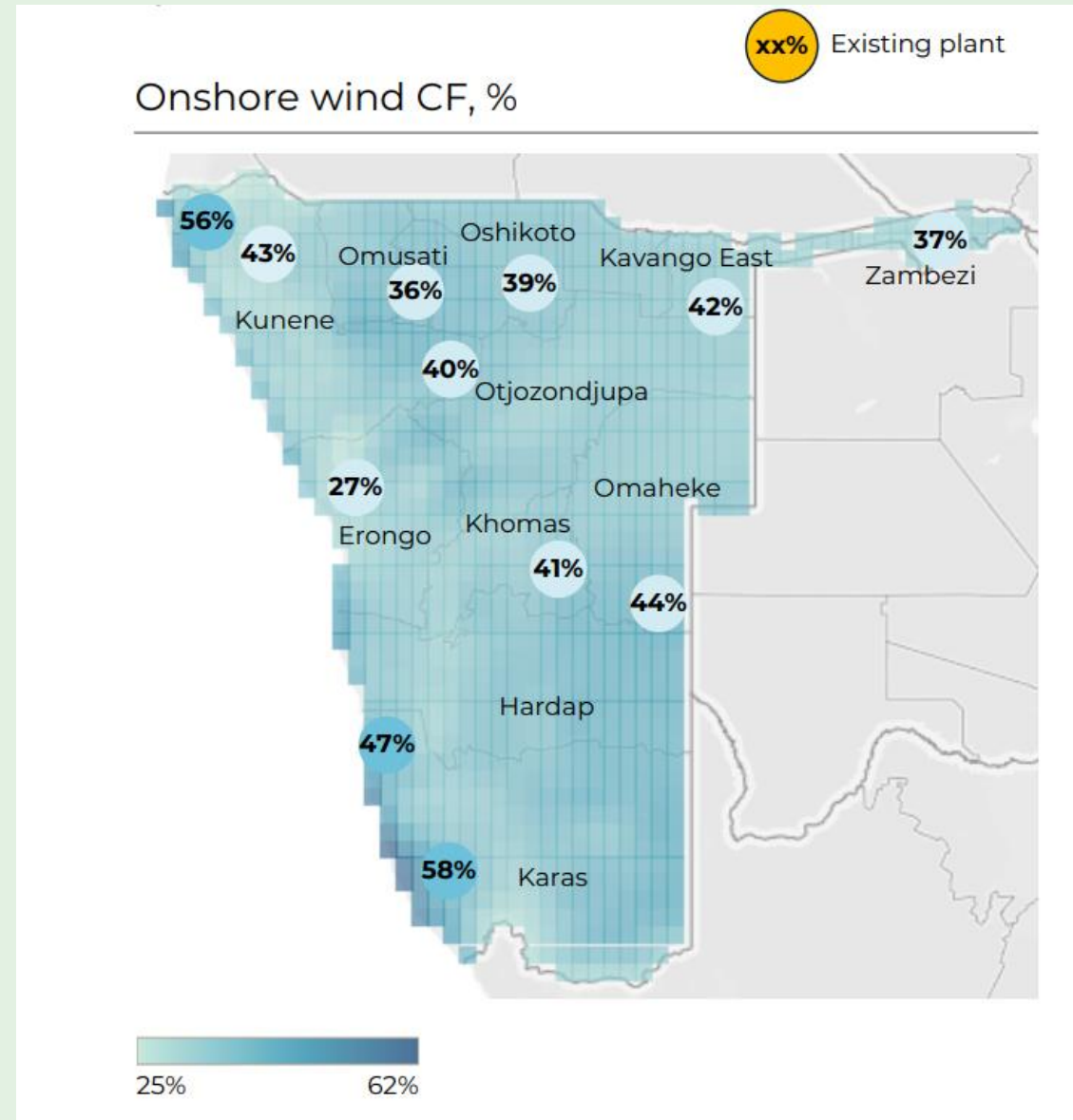


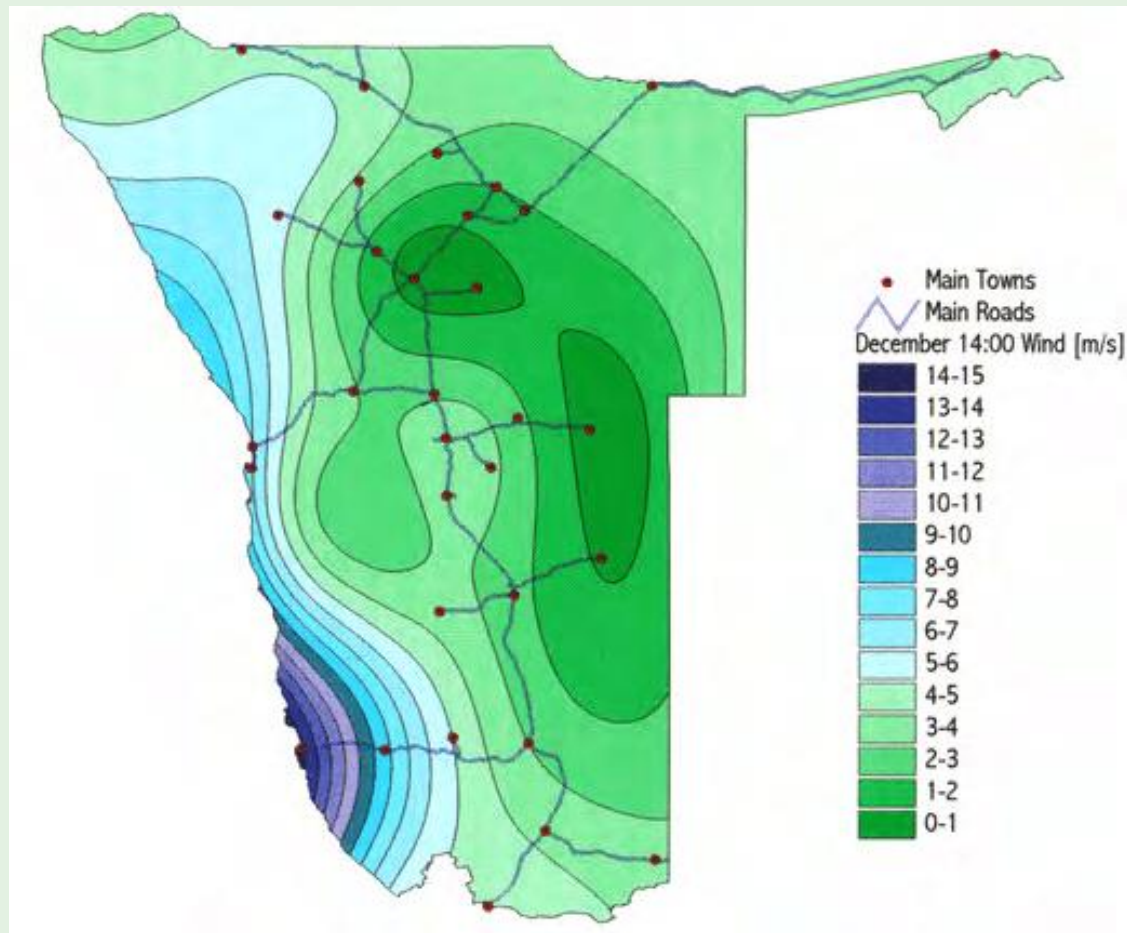
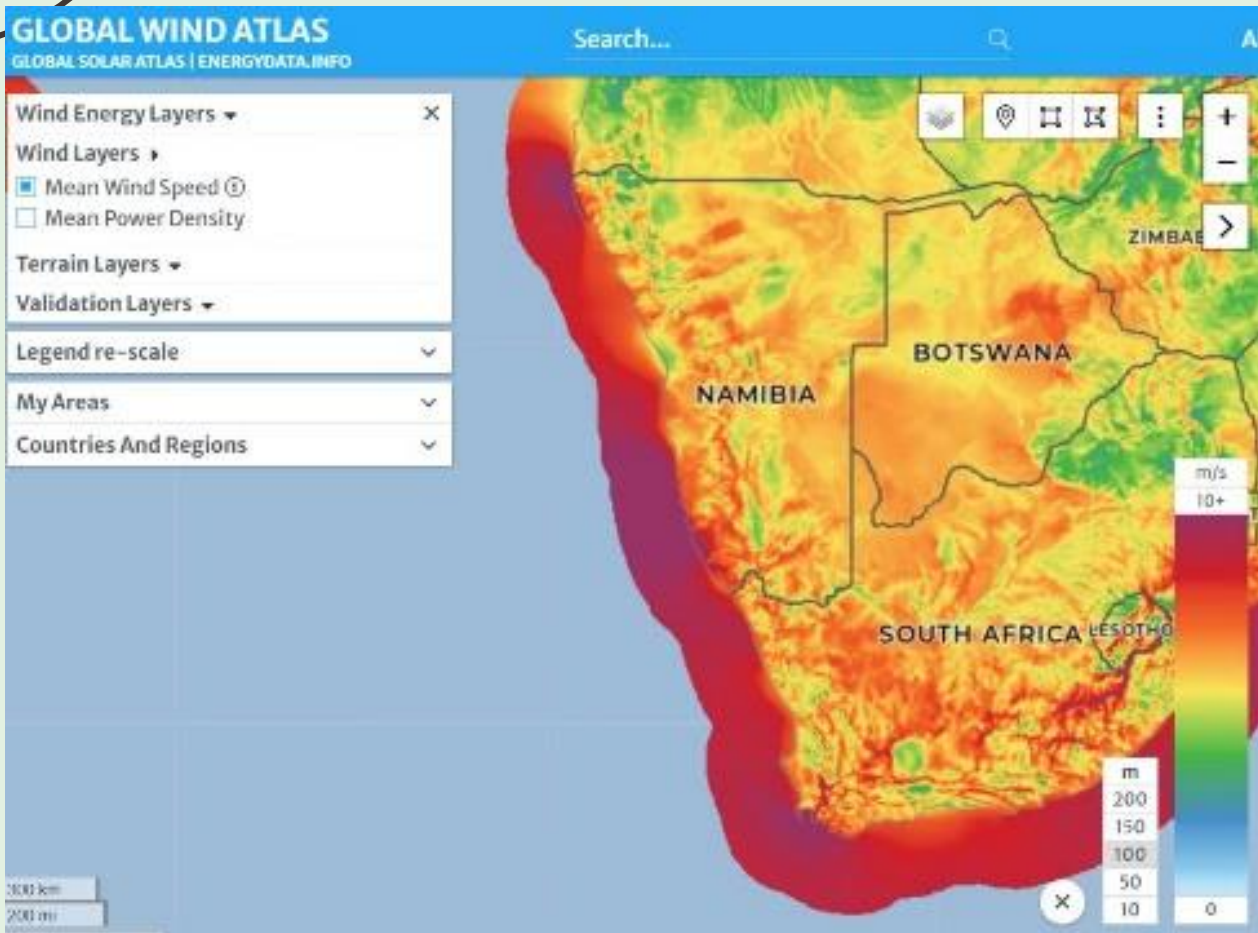
## LOCAL SOLAR FARMS

POWER PLANT	COMMUNITY	CAPACITY (MW)	YEAR COMPLETED
HopSol Hardap	Mariental	47	2018
HopSol Otjiwarongo	Otjiwarongo	5	2015
InnoSun Omburu	Omaruru	4.5	2015
HopSol Otjozondjupa	Grootfontein	5	2016
Ejuva I	Gobabis	5	2016
Ejuva II	Gobabis	5	2016
Rosh Pinah Power Plant	Rosh Pinah	5	2017
Karibib Power Plant	Karibib	5	2017
TeraSun Energy Solar Power Stations	Arandis	81	2023 expected
Omburu Power Plant	Omburu	20	2022
Khan Power Plant	Usakos	20	Under Construction

## RENEWABLE ENERGY RESOURCES: WIND POWER

- Wind is a form of solar energy. The uneven heating of the atmosphere by the sun, the irregularities of the earth's surface, and the rotation of the earth causes winds.
- Wind flow patterns are altered by the earth's terrain, bodies of water, and vegetation.
- Onshore wind speeds in Namibia reach up to 10 m/s with capacity factors of about 56-58%.
- High, constant wind speeds, which offer ideal conditions for the construction of wind power plants, are found above all on the south coast in the region around Lüderitz, in the coastal region on the border to Angola, and the coastal areas in the central-north areas of Namibia.







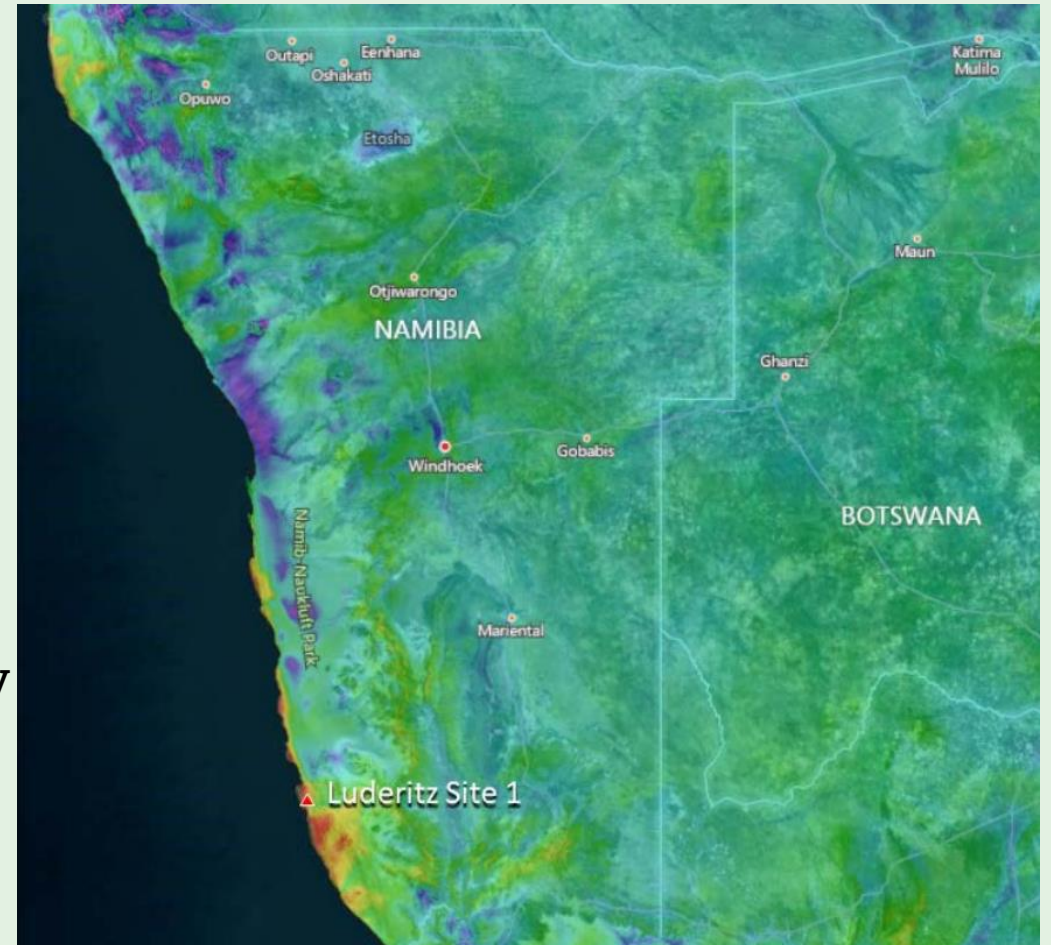
## PROPOSED NAMPOWER WIND FARM PROJECT:

### LUDERITZ

40 MW wind farm to be developed in Luderitz where wind speeds reach up to 9.21 m/s at 100m height above ground level with capacity factors of 50%.

The objectives of the wind farms are to:

- Reduce the overall NamPower tariff to the end customer by introducing the most affordable “newbuild” renewable energy to the Namibian grid;
- Support renewable commitments prescribed in the Renewable Energy Policy and National Energy Policy as well as Pillar 4 of the HPP II.
- Provide complementary renewable energy outside of the typical solar PV dispatch profile.



# HYDROPOWER IN NAMIBIA

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- Namibia houses 1 hydropower station, the Ruacana Power Station.
- The Ruacana Power Station has a capacity of 330 MW.



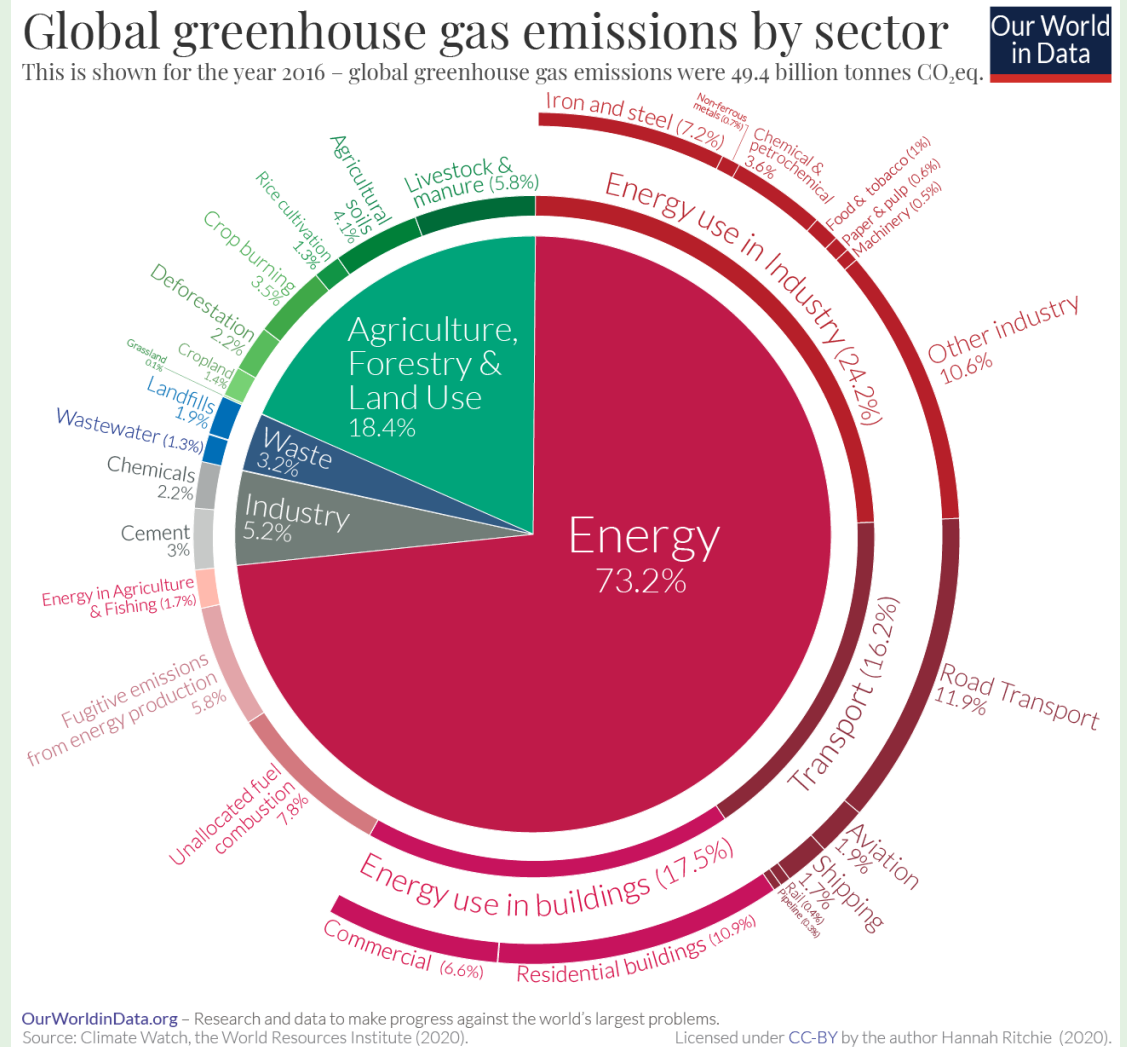
## RENEWABLE ENERGY CAPACITIES IN NAMIBIA

	PHOTOVOLTAICS	WIND POWER	BIOMASS	CONCENTRATED SOLAR POWER
<b>TOTAL PLANNED CAPACITY</b>	229.5 MW	149 MW	80 MW	250 MW
<b>BUILT SO FAR</b>	150 MW	49 MW		
<b>COMMENT</b>	REMAINING CAPACITY TO BE PUT OUT TO TENDER IN SEVERAL LOTS BY 2032	GRID CONNECTION PLANNED BY 2028	REALIZATION IN 3 LOTS BETWEEN 20 AND 40 MW BY 2025	CONSTRUCTION OCCURRING DEPENDENT ON BATTERY STORAGE COST TRENDS. REALLOCATION TO PV/WIND POWER POSSIBLE.

By 2030, a total of 510 MW of grid-connected renewable energy capacity is expected to be installed.

# WHY GREEN HYDROGEN?

- The Paris Agreement's objective is to substantially reduce global greenhouse gas emissions to limit the global temperature increase in this century to 2 degrees Celsius while pursuing efforts to limit the increase even further to 1.5 degrees.
- Green hydrogen can meet the necessary needs required for the decarbonization of the transportation field, concrete and steel manufacturing which requires high energy density fuel or intense heat.





## NAMIBIA'S POTENTIAL IN THE GLOBAL HYDROGEN MARKET

- Namibia ranks 141 as a contributor to global greenhouse emissions. (2020)
- Namibia has set a goal to reduce its greenhouse gas emissions by 91% by 2030 and has also aspired to use its natural resources to support the global transition to net zero and deliver socio-economic benefits to its people.
- Namibia's unique mix of wind and solar resources could provide a stable supply of very low-cost, clean power for hydrogen production. Combined, these resources could enable Namibia to achieve a levelized cost of hydrogen (LCOH) of just US\$1.2-1.3/kg for production by 2030.
- Most of its renewable resources are coastal, ensuring a sustainable and low-cost water supply through desalination for electrolysis. They are close to ports, in particular in the Kharas and Erongo regions. The Government owns and can lease large amounts of land that is readily available thanks to the low population density.

## 3 GREEN VALLEYS

- Based on its natural topography, domestic input factors (e.g., labour, land) and realistically achievable market share, Namibia aspires to reach green hydrogen production volumes of 10-15 Mtpa by 2050 (corresponding to 5-8% of expected international hydrogen equivalent trade volume<sup>13</sup>).
- Three hydrogen valleys in the Northern, Central, and Southern Regions will form a green fuel ecosystem.

### Vision for Namibia's three green valleys

Illustrative

#### Northern Region

Hybrid renewable production (solar PV + onshore wind) will feed electrolysis plant and ammonia production near the new port facility

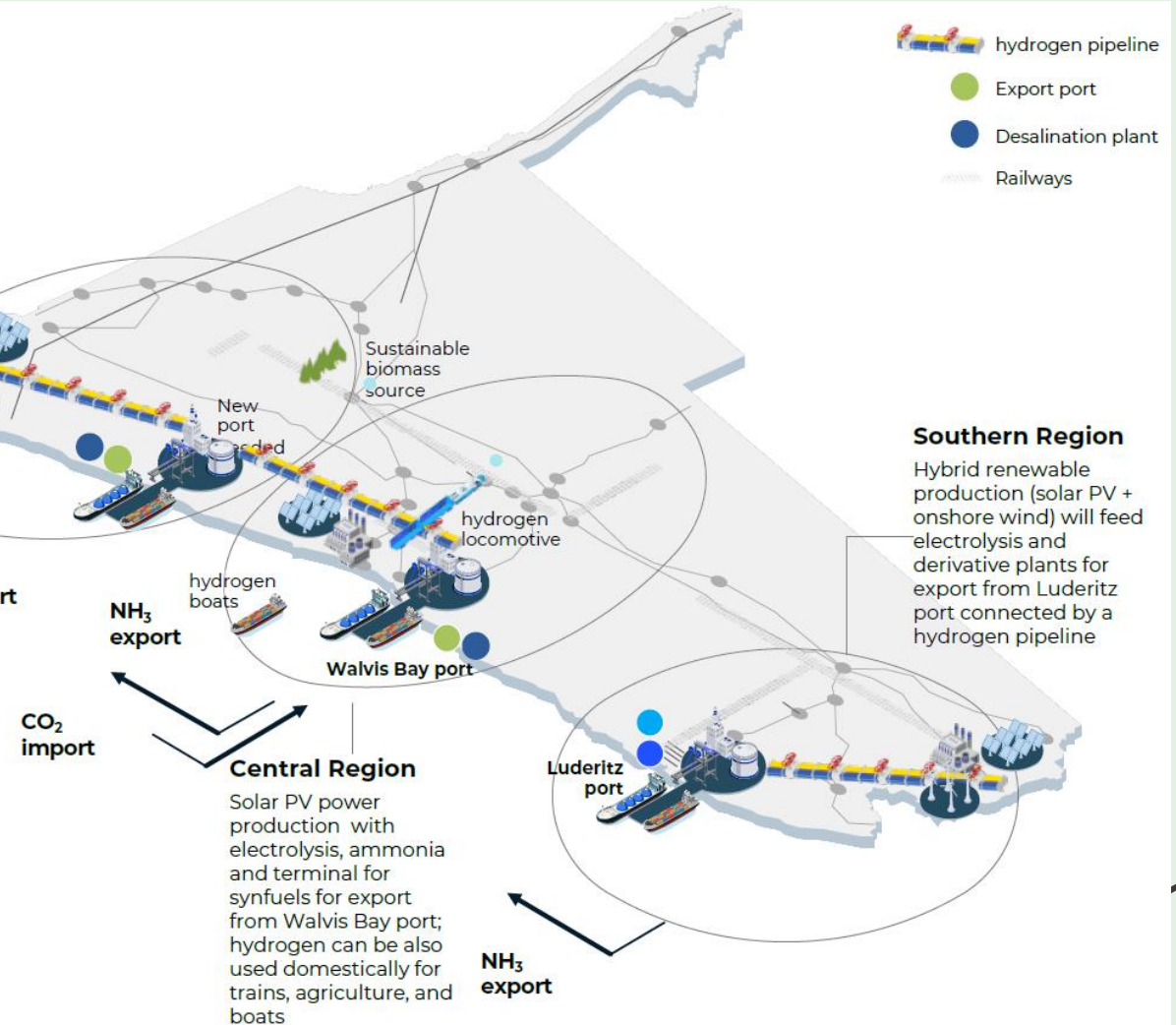
#### Confirmed pilot projects in Central Region

Project 1: Green Hydrogen Applications in the Port Environment

Project 2: Hydrogen-Diesel Dual Fuel Locomotive Pilot Project Proposal for Namibia

Project 3: Daure Green Hydrogen - agriculture

Project 4: hydrogen-Pilot Plant / Refueling Station in Walvis Bay



**THANK YOU!**