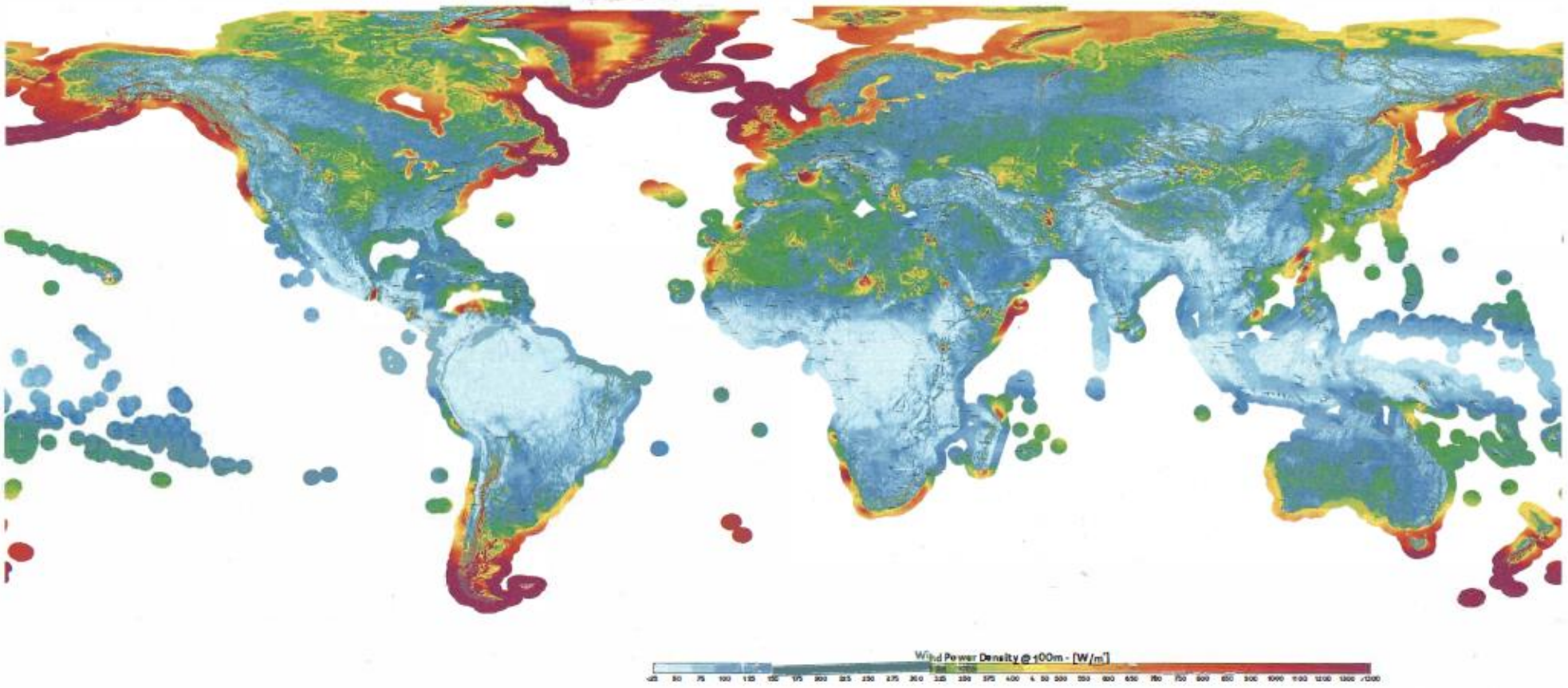
Challenges of Indonesia's RE Expansion and Asia Zero Emission Community

Ministry of Economy, Trade and Economy (METI)

March 2023

WIND RESOURCE MAP

WIND POWER DENSITY POTENTIAL



DESCRIPTION

This wind resource map provides an estimate of mean wind power density at 100 m above surface level. Power density indicates wind power potential, part of which can be extracted by wind turbines. The map is derived from high-resolution wind speed distributions based on a chain of models, which downscale winds from global models (~30 km), to mesoscale (3 km) to microscale (250 m). The Weather Research & Forecasting (WRF) mesoscale model uses ECMWF ERA-5 reanalysis data for atmospheric forcing, sampling from the period 1998-2017. The WRF output at 3 km resolution is generalized and downscaled further using the WAsP software, plus terrain elevation data at 150 m resolution, and roughness data at 300 m resolution. The microscale wind climate is sampled on calculation nodes every 250 m. For the microscale modeling, the terrain data is derived from the digital elevation models from Viewfinder Panoramas. The WAsP microscale modeling uses a linear flow model. For steep terrain, this modeling becomes more uncertain, most likely leading to an overestimation of mean wind speeds on ridges and hilltops. Users are recommended to inspect the terrain complexity of their region of interest.

ABOUT

The World Bank Group has published this wind resource map using data from the Global Wind Atlas version 3, to support the scale-up of wind power in our client countries. This work is funded by the Energy Sector Management Assistance Program (ESMAP), a multi-donor trust fund administered by The World Bank and supported by 18 donor partners. It is part of a global ESMAP initiative on Renewable Energy Resource Mapping that covers biomass, hydropower, solar and wind. This map has been prepared by the Technical University of Denmark (DTU Wind Energy) and Vortex FdC S.L. (VORTEX), under contract to The World Bank.

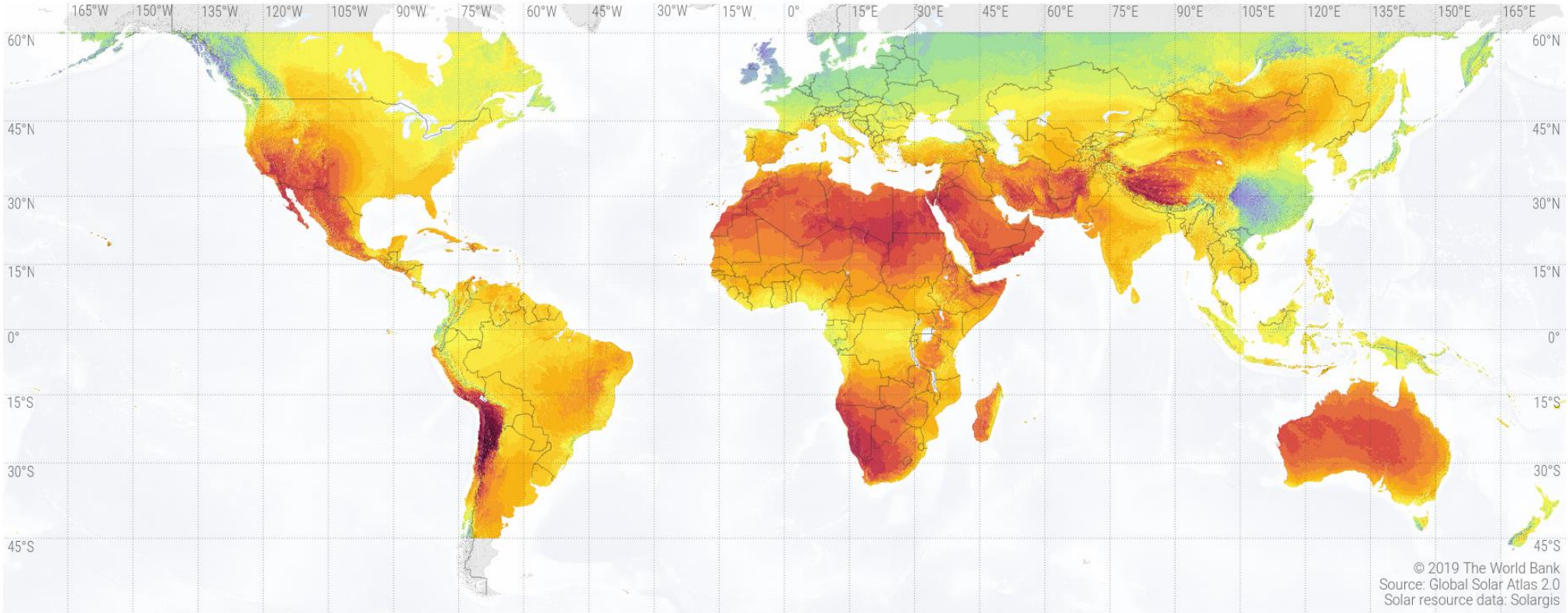
To obtain additional maps and information, please visit:

https://globalwindatlas.info

TERMS

SOLAR RESOURCE MAP

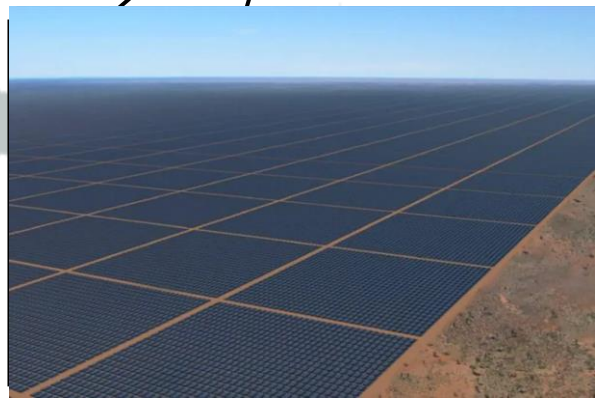
PHOTOVOLTAIC POWER POTENTIAL



Long-term average of photovoltaic power potential (PVOUT)

Daily totals:	2.0	2.4	2.8	3.2	3.6	4.0	4.4	4.8	5.2	5.6	6.0	6.4
	kWh/kWp											
Yearly totals:	730	876	1022	1168	1314	1461	1607	1753	1899	2045	2191	2337

Arid lands Distribution

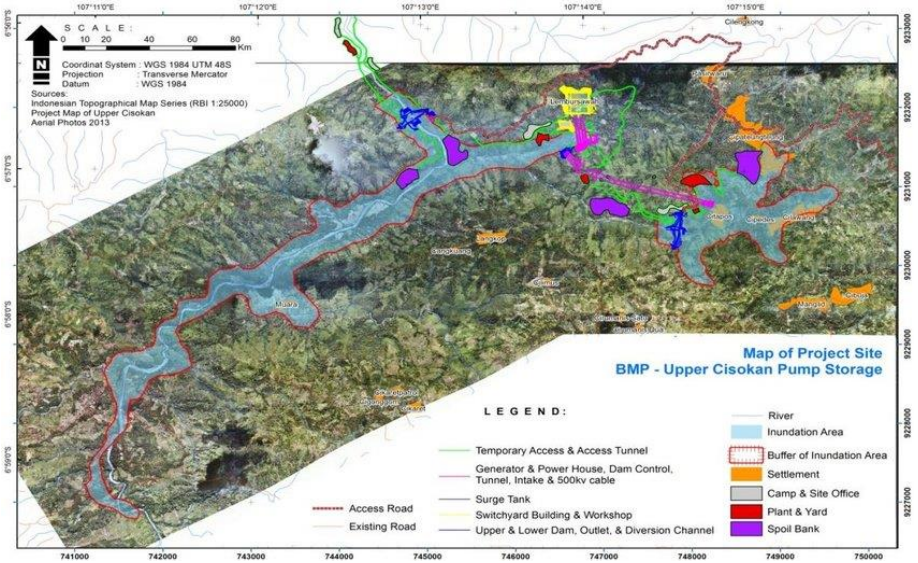


Aridity zones *

Hyperarid	(P/PET < 0.05)
Arid	(P/PET = 0.05 - 0.20)
Semiarid	(P/PET = 0.20 - 0.50)
Dry subhumid	(P/PET = 0.5 - 0.65)
Excluded presumed drylands	

** UNEP-WCMC, 2007, according to UNCCD and CBD definition*

Geothermal, Hydro, Biomass Can Also Play Significant Roles in Energy Transition



Asia Zero Emissions Community

AZEC countries will exchange information, and discuss and take necessary actions (project support, policy coordination, standard setting, etc.) such as:

- **Development and demonstration of decarbonization technologies**
  Renewables, Energy Efficiency, Ammonia, Biomass, CCUS, Clean use for fossil fuels, etc.
- **Financial support to build decarbonization infrastructures**
  Renewables, Energy Efficiency, Hydrogen, Ammonia, Biomass, CCUS, metal mining etc.
- **Development of technical and business standards and guidelines**
  Energy efficiency, energy management, etc.
- **Human resource development**
  Energy efficiency, smart city, energy management, etc.

The Japanese Government is ready to provide necessary financial and technical support to AZEC partneres including through JBIC, JICA, NEXI, JOGMEC, NEDO, JETRO, etc.

Reference: Japan's existing projects to be included into AZEC (renewables and energy efficiency projects)

- Japan implements studies, public-private joint missions, demonstration projects, and financial supports in Asian countries to promote renewable energy, energy efficiency and energy management related projects.

1. Renewables based distributed electricity generation system

Combining solar, wind, biomass, BESS and energy management, etc. to optimize control of distributed power generations in remote islands and industrial parks through storage batteries and energy management technologies, etc.

2. Enhancing grid capacity to accept intermittency

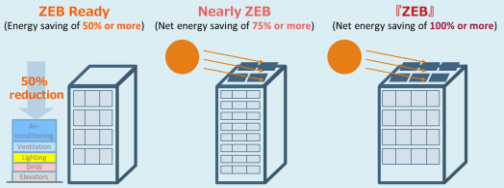
Construction of a next-generation power transmission and distribution network that enables flexible energy management based on forecasts of supply/demand fluctuations in response to the increase in intermittent renewable energy

3. Power and heat management

Participating in the early stage of urban development project to design efficient supply and management of energy for the entire area utilizing cogeneration, boilers, heat pumps and energy management technologies.

4. ZEB

Combining energy-saving and energy-creating technologies to significantly reduce energy consumption of buildings.



5. Geothermal

Utilizing cutting-edge flash and binary turbines to develop efficient projects.