Aiming for Carbon Neutrality in Asia

Izuru Kobayashi,

METI

The importance of decarbonizing Asian region

- Asian region has more than tripled its greenhouse gas emissions from 1990 to 2021 due to its economic growth and increasing energy demand.
- In 1990, emissions from the developed countries accounted for two-thirds of global emissions. **Asian region is now accounting for more than half of the emissions.**
- Decarbonizing Asian region is key to aim for Carbon Neutrality at global level.

GDP and Population Growth Forecasts

	GDP Growth 2020→2050	Population Growth 2020→2050
S.E Asia	**3.8%**	**0.6%**
World	3.0%	0.8%
North America	2.1%	0.5%
EU	1.5%	▲0.2%

Source : IEA World Energy Outlook2021,

NDCs and CN Commitments of SE Asian Countries

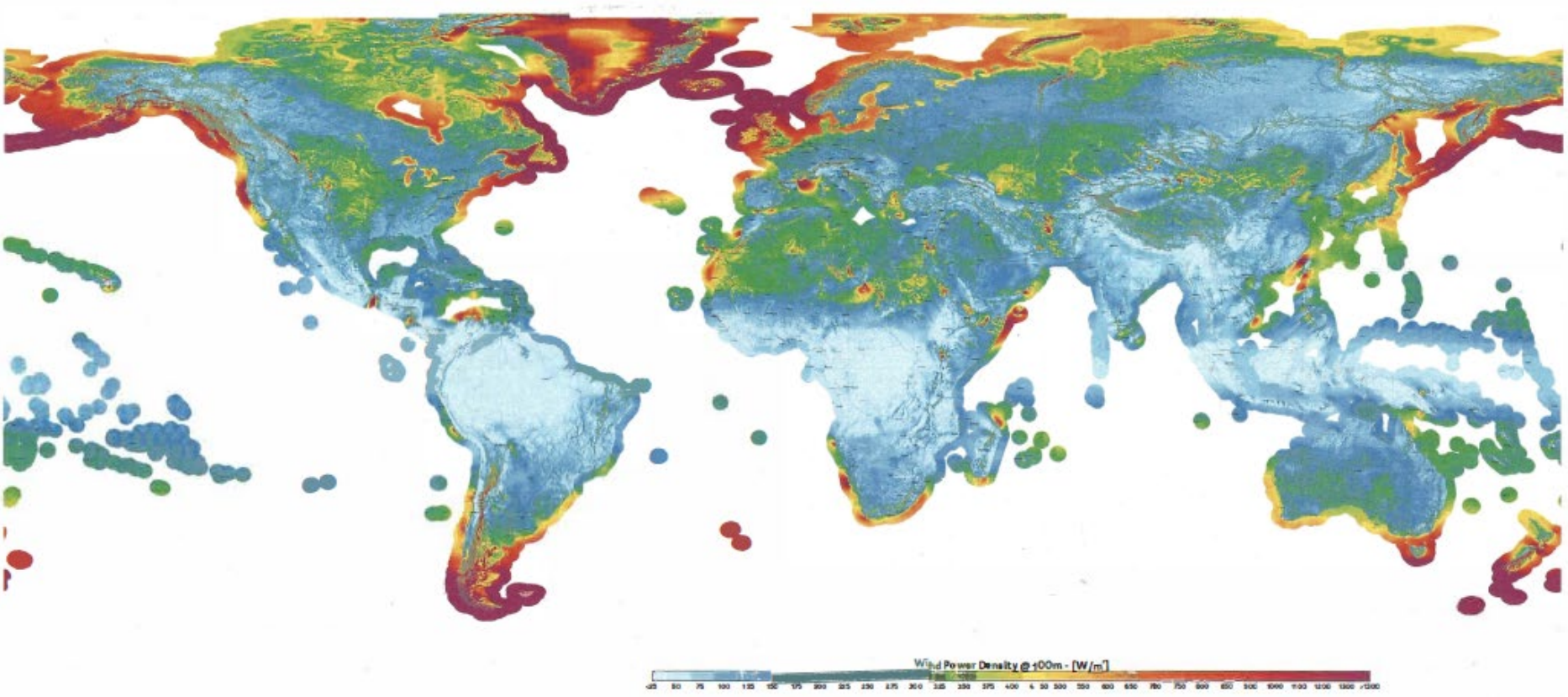
Country	NDC Submission	Emission Reduction Target	CN	Energy originated CO2(2018)
Thailand	April, 2021	20% reduction compared to BAU by 2030 *25% reduction with international support	2065 2050 for CO2	240 Mt (0.7%)
Indonesia	July, 2021	29% reduction compared to BAU by 2030 *41% reduction with international support	2060	540Mt (1.6%)
Malaysia	November, 2016	45% reduction of GHG economic intensity in 2030 compared to 2005 level	2050	230Mt (0.7%)
Brunei	December, 2020	20% reduction compared to BAU by 2030	-	7Mt (0.02%)
Singapore	March, 2020	Peaking out GHG emission by 2030 with less than 65 million tons of CO2e emission 36% reduction of GHG economic intensity in 2030 compared to 2005 level	Later in this century	50Mt (0.1%)
Lao PDR	May, 2021	60% reduction compared to BAU or reducing 62 million tons of CO2 equivalent by 2030	2050	20Mt (0.05%)
Cambodia	December, 2020	41.7% reduction compared to BAU by 2030	2050	10Mt (0.03%)
Vietnam	September, 2020	9% reduction compared to BAU by 2030 *27% reduction with international support	2050	230Mt (0.7%)
The Philippines	April, 2021	Peaking out GHG emission by 2030 75% reduction compared to BAU	-	130Mt (0.4%)
Myanmar	September, 2017	No nation wide target (specific actions are listed)	2050	30Mt (0.1%)

Global Distribution of Wind Power Potential

WIND RESOURCE MAP

WORLD BANK GROUP ESMAP DTU Wind Energy Department of Wind Energy VORTEX

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

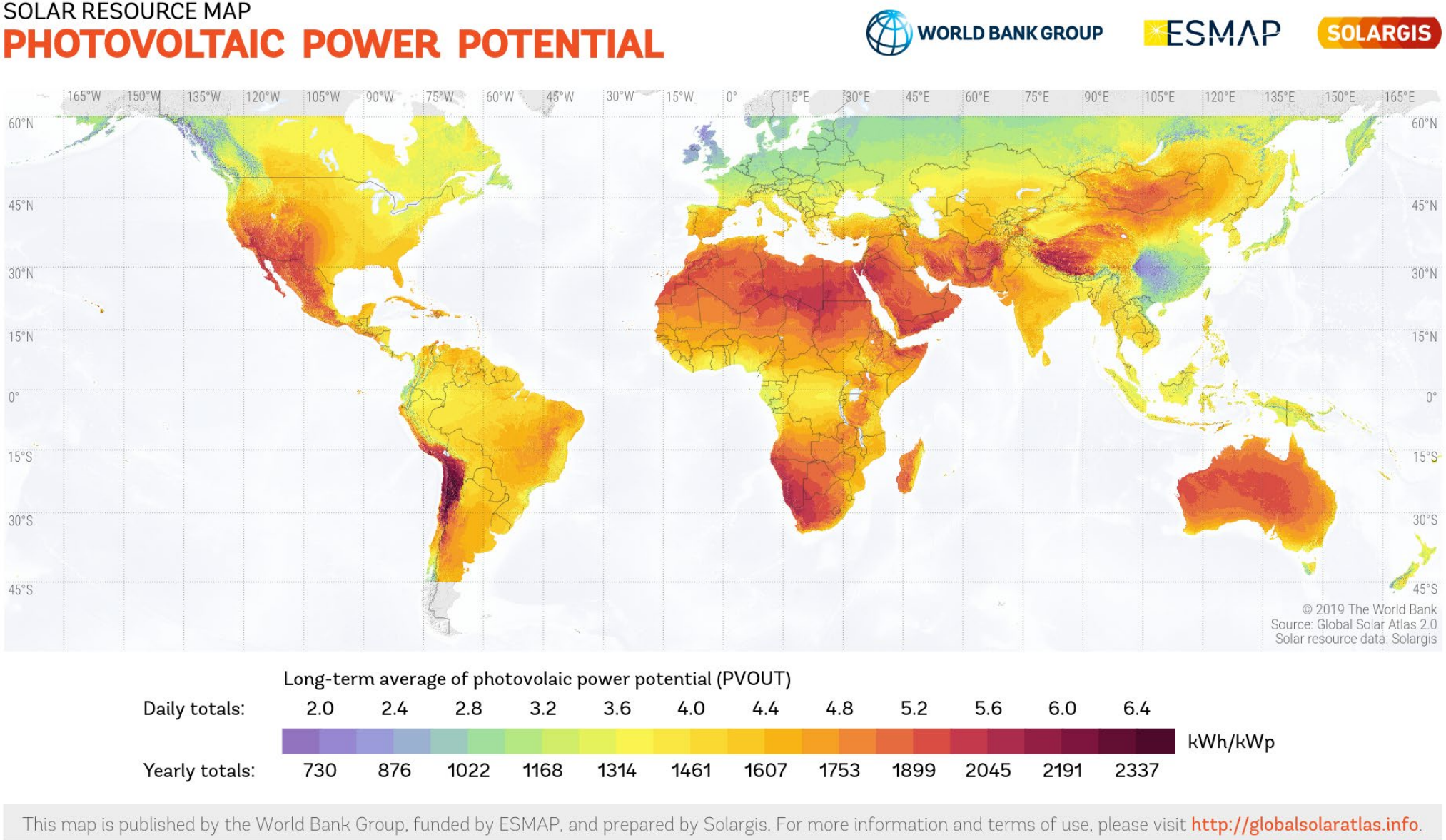
The World Bank Group has published this wind resource map using data from the Global Wind Atlas version 3, to support the scale-up of wind power in our client countries. This work is funded by the Energy Sector Management Assistance Program (ESMAP), a multi-donor trust fund administered by The World 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

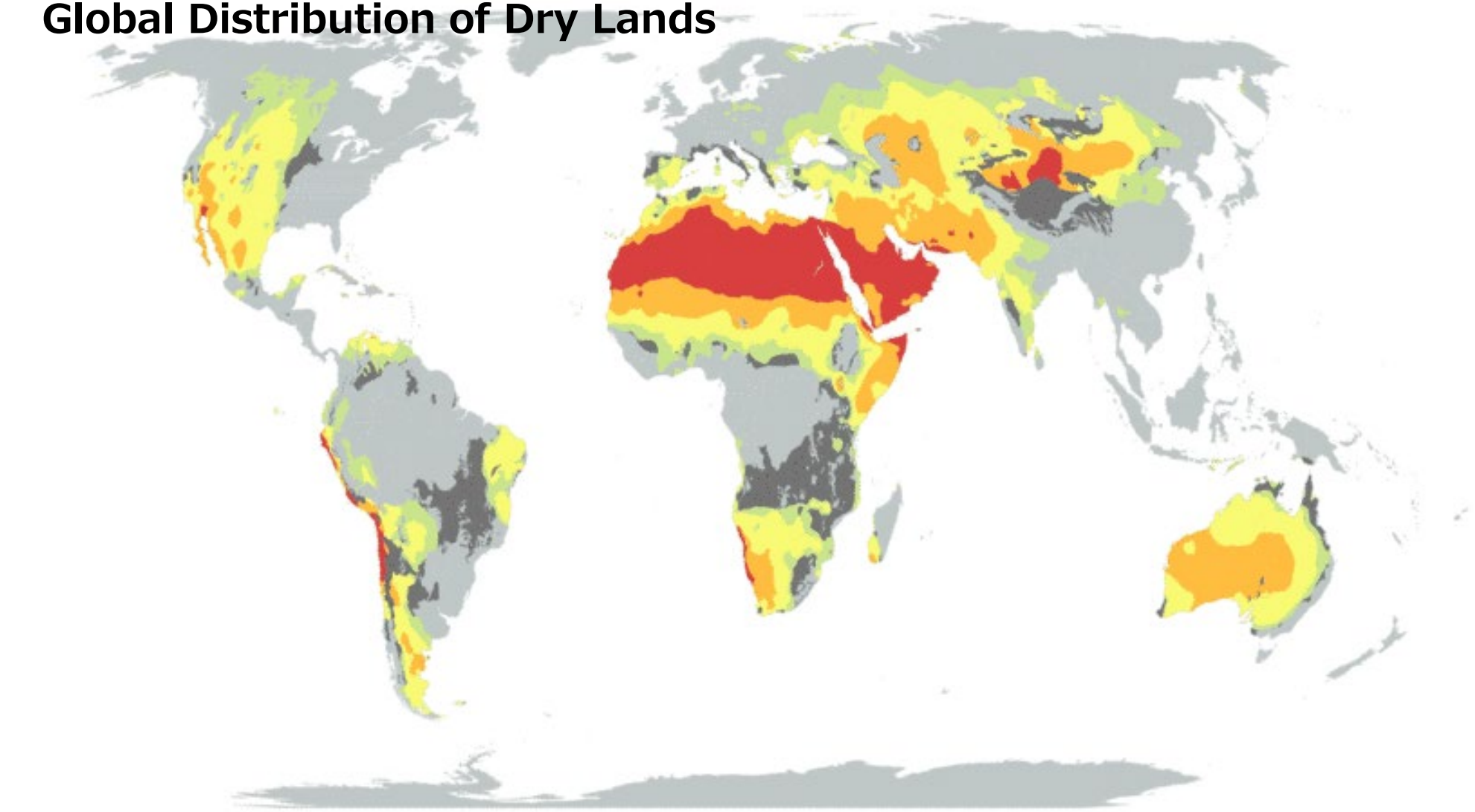
TERMS

Global Distribution of Solar Power Potential



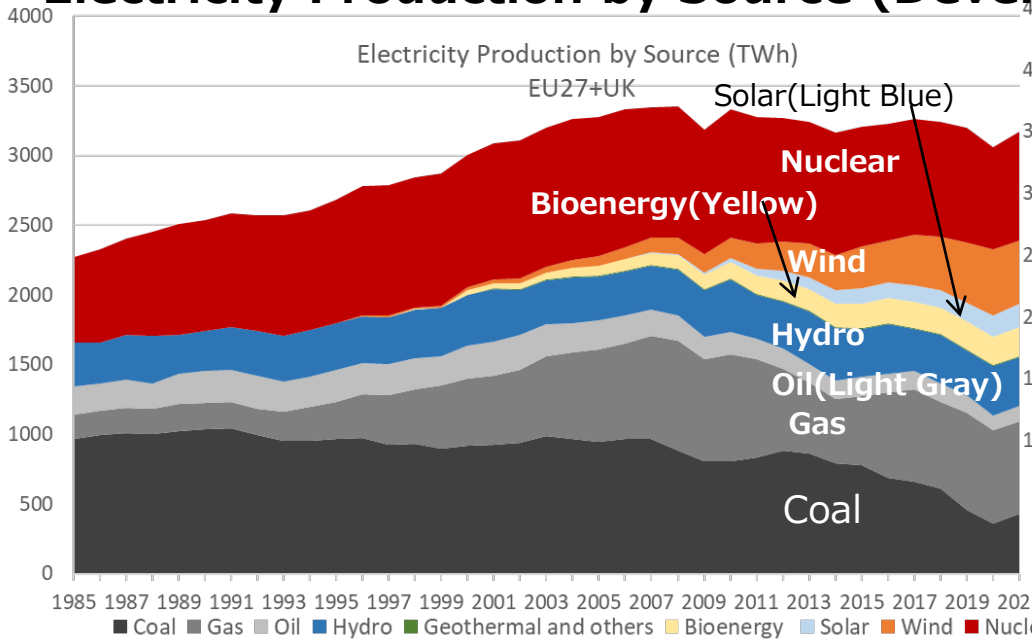
This map is published by the World Bank Group, funded by ESMAP, and prepared by Solargis. For more information and terms of use, please visit http://globalsolaratlas.info.

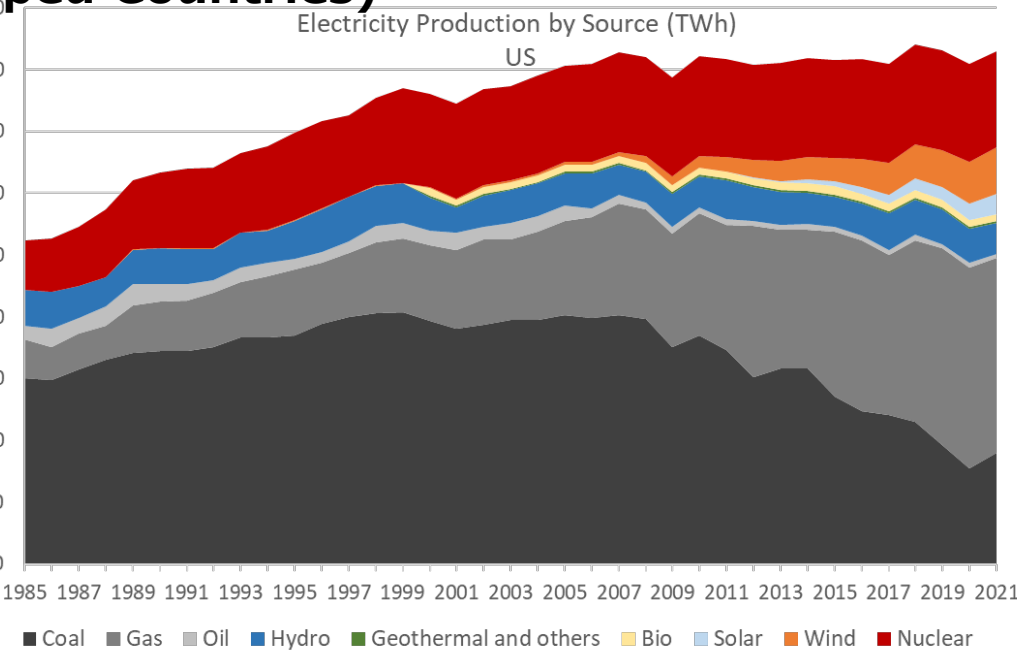
Global Distribution of Dry Lands

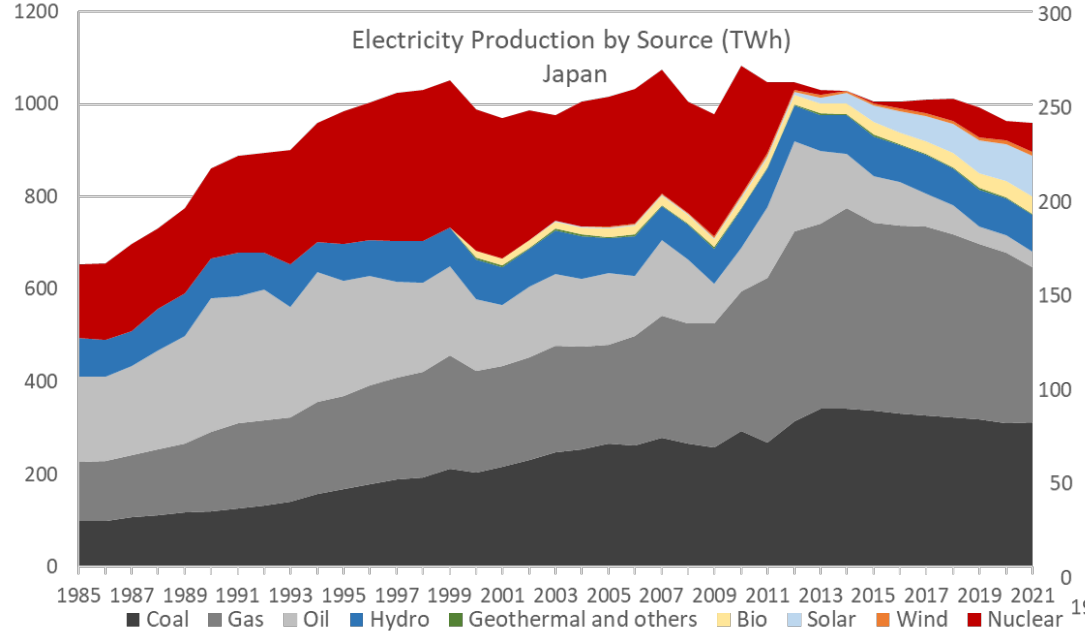


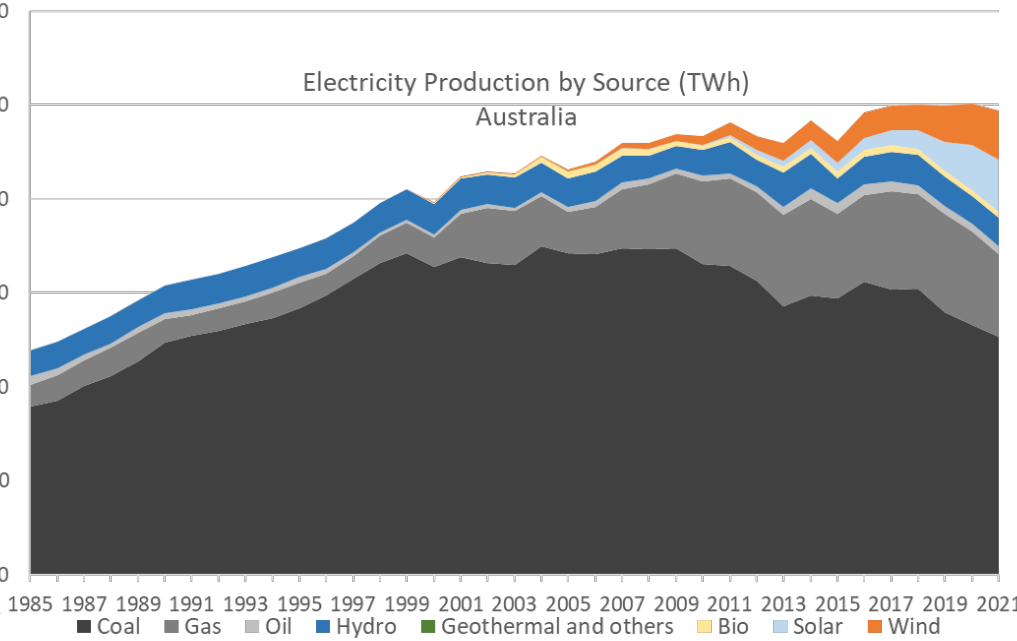
** UNEP-WCMC, 2007, according to UNCCD and CBD definition*

Electricity Production by Source (Developed Countries)



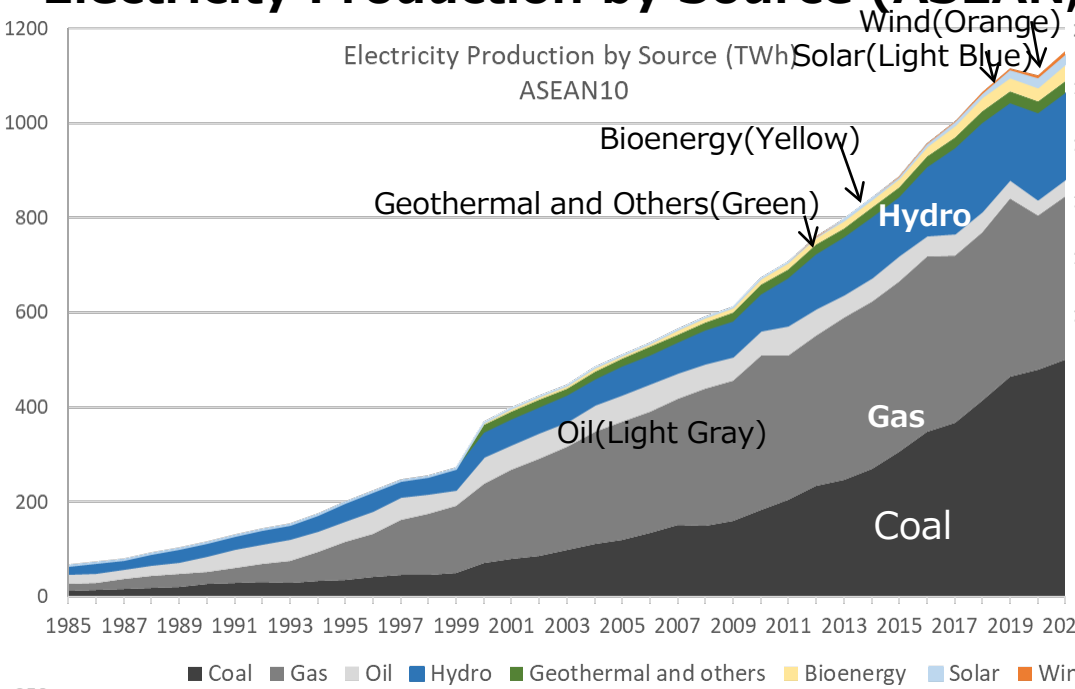


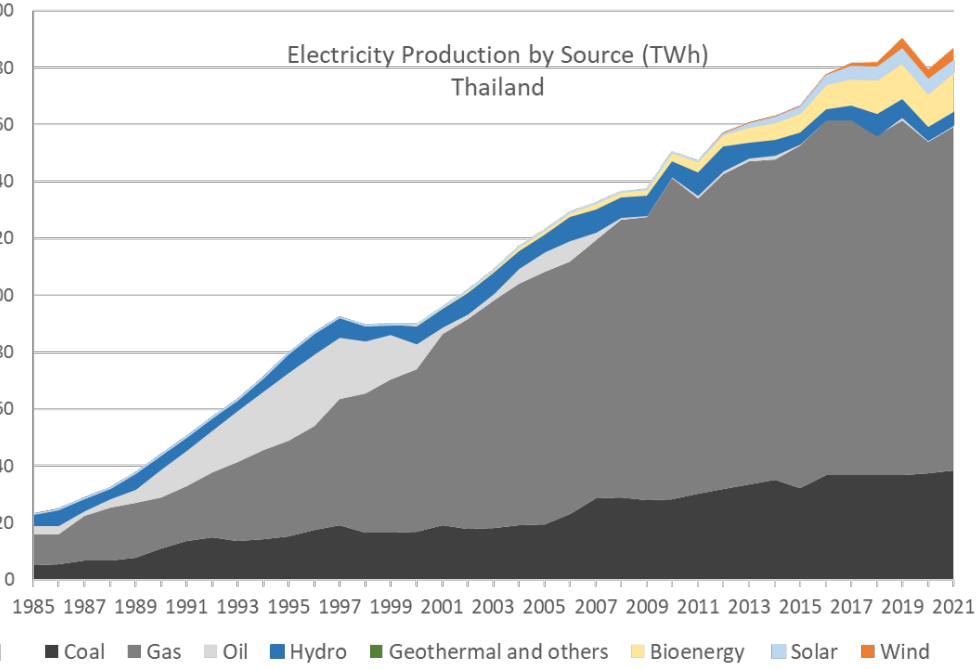


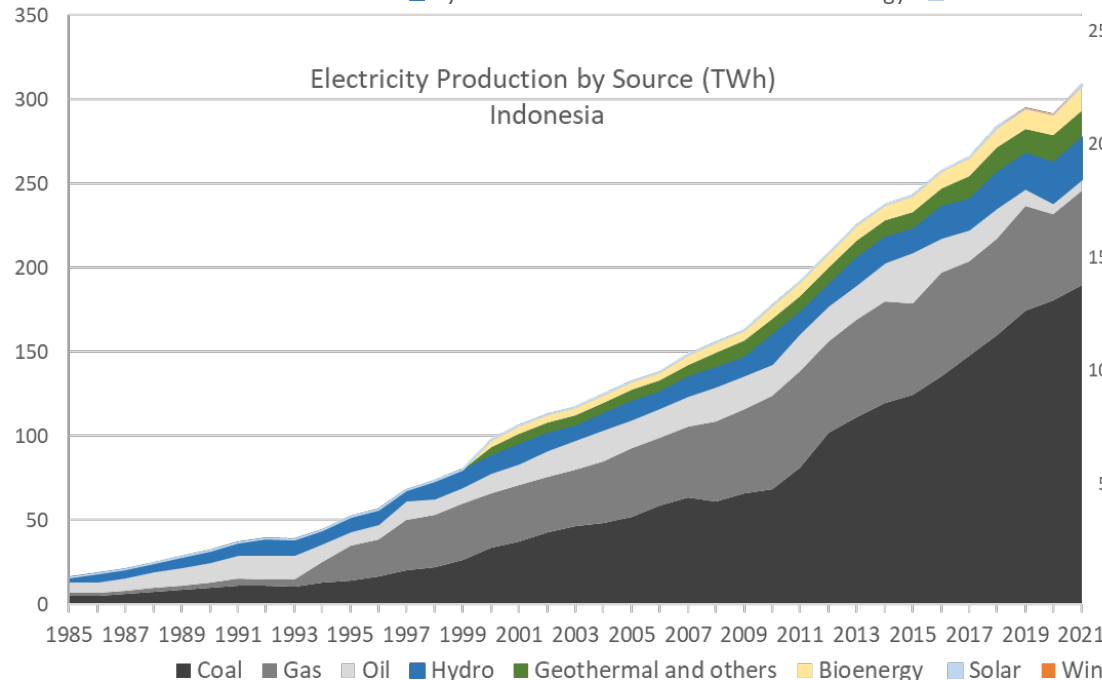


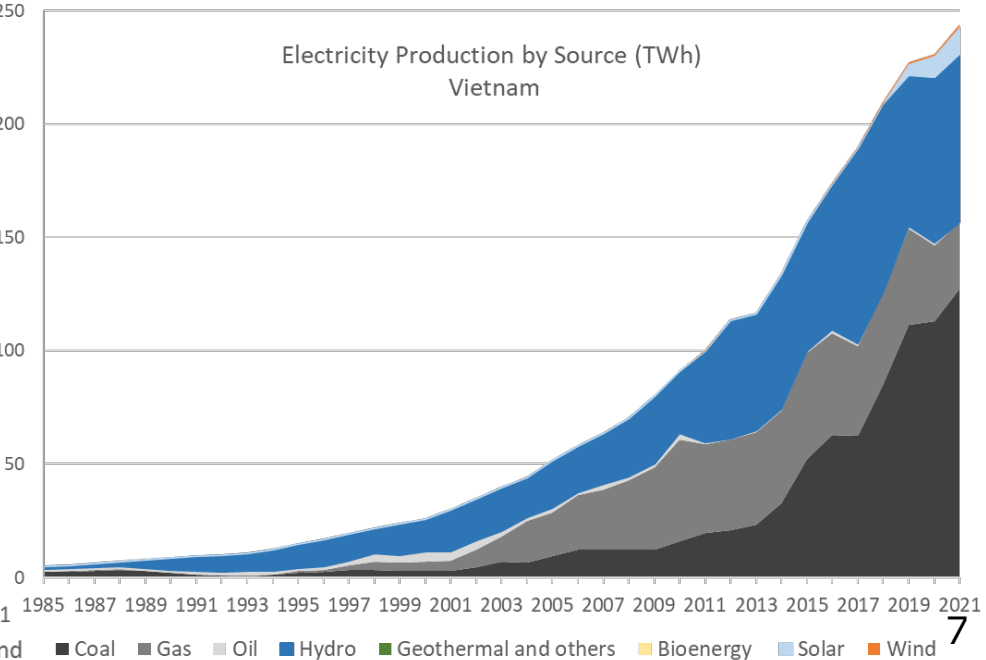
Source: Our World in Data based on BP Statistical Review of World Energy (2022); Ember's Global and European Electricity Reviews (2022)
Note: 'Other renewables' includes waste, geothermal, wave and tidal.

Electricity Production by Source (ASEAN, Indonesia, Thailand, Vietnam)

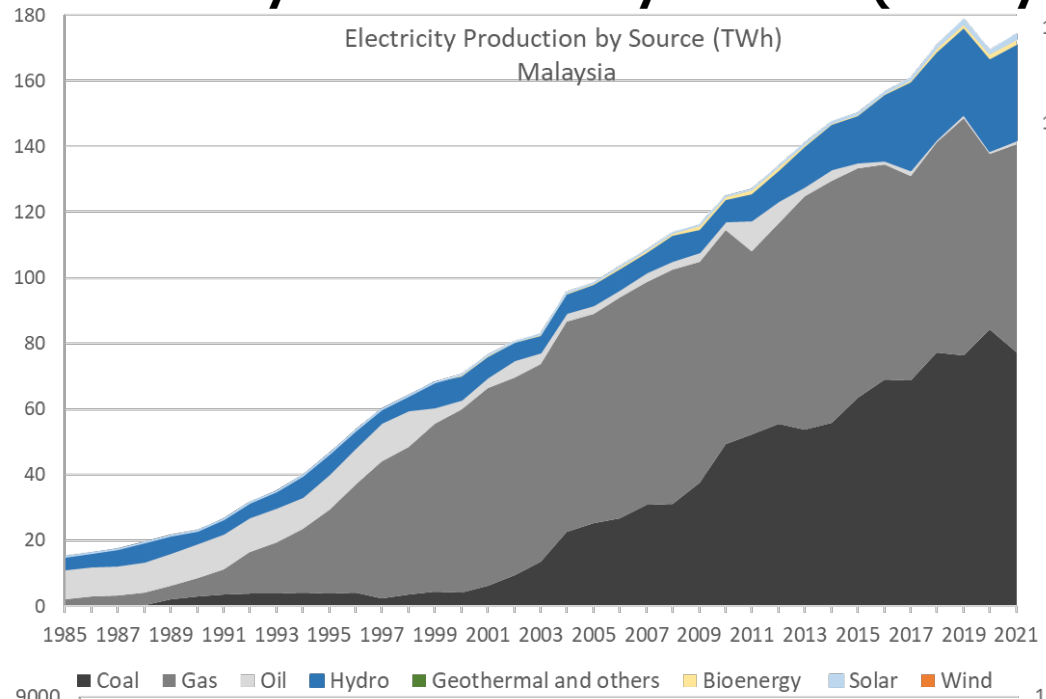


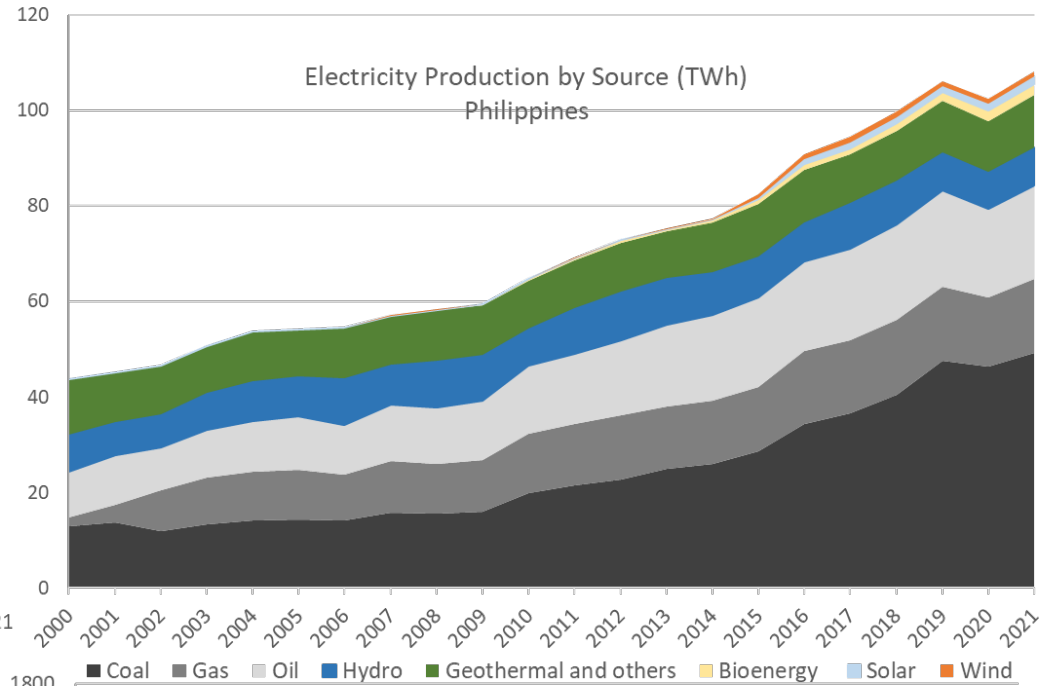


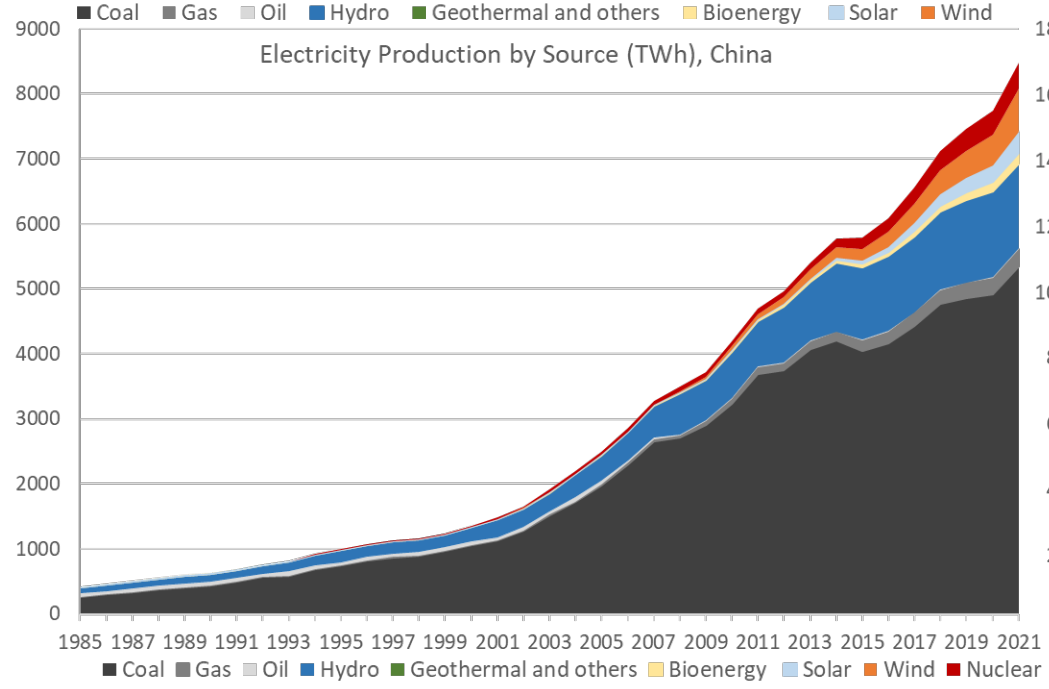


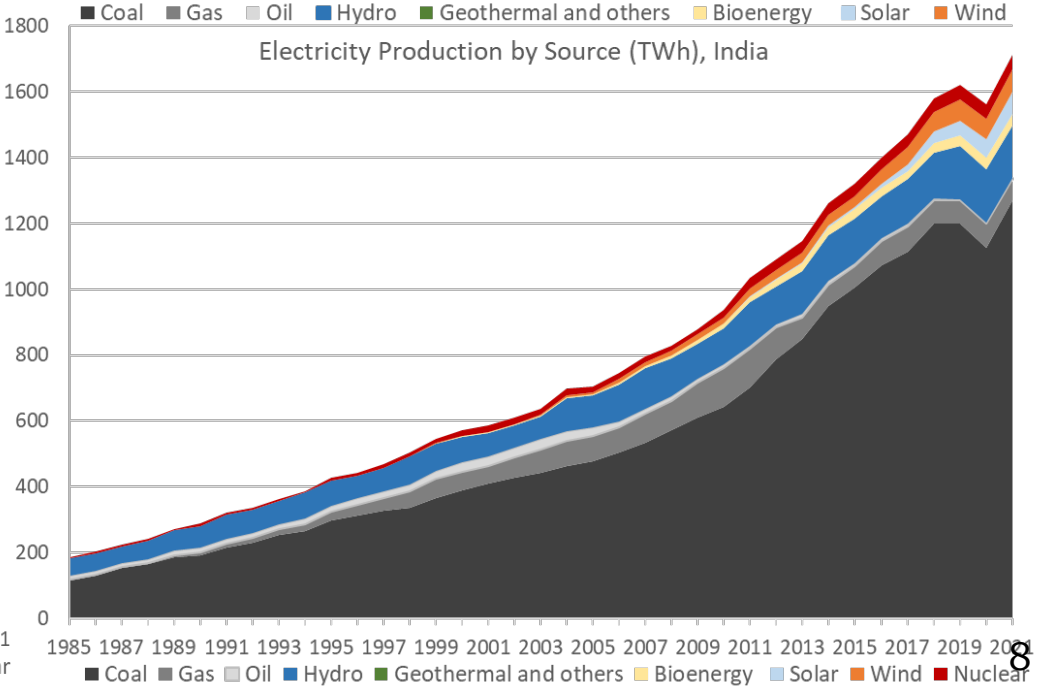


Electricity Production by Source (Malaysia, Philippines, China, India)

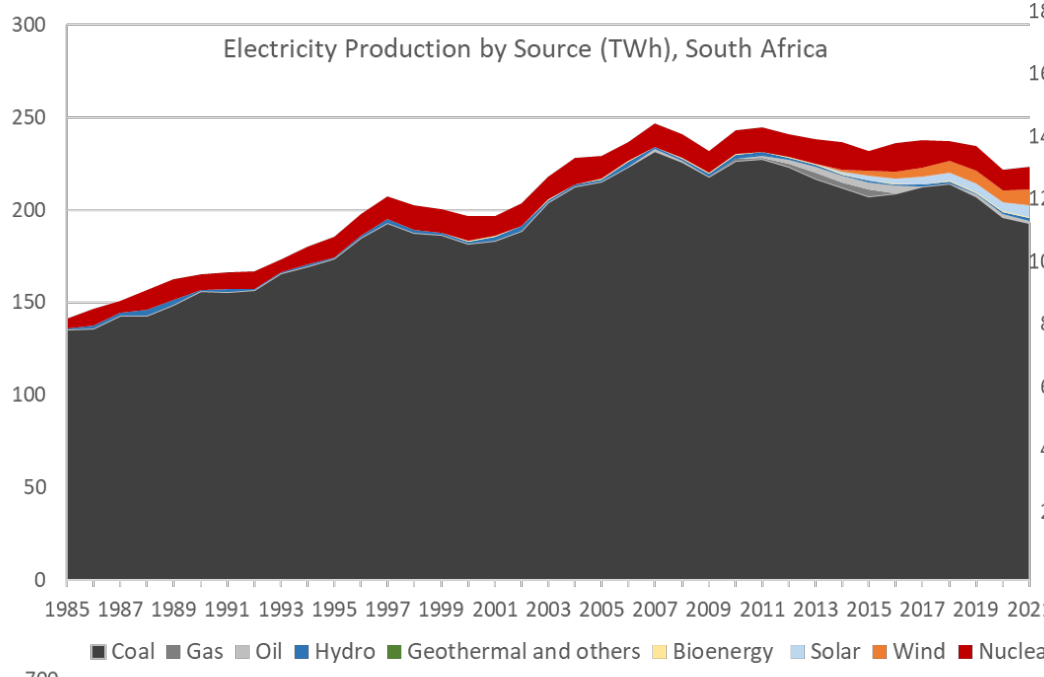


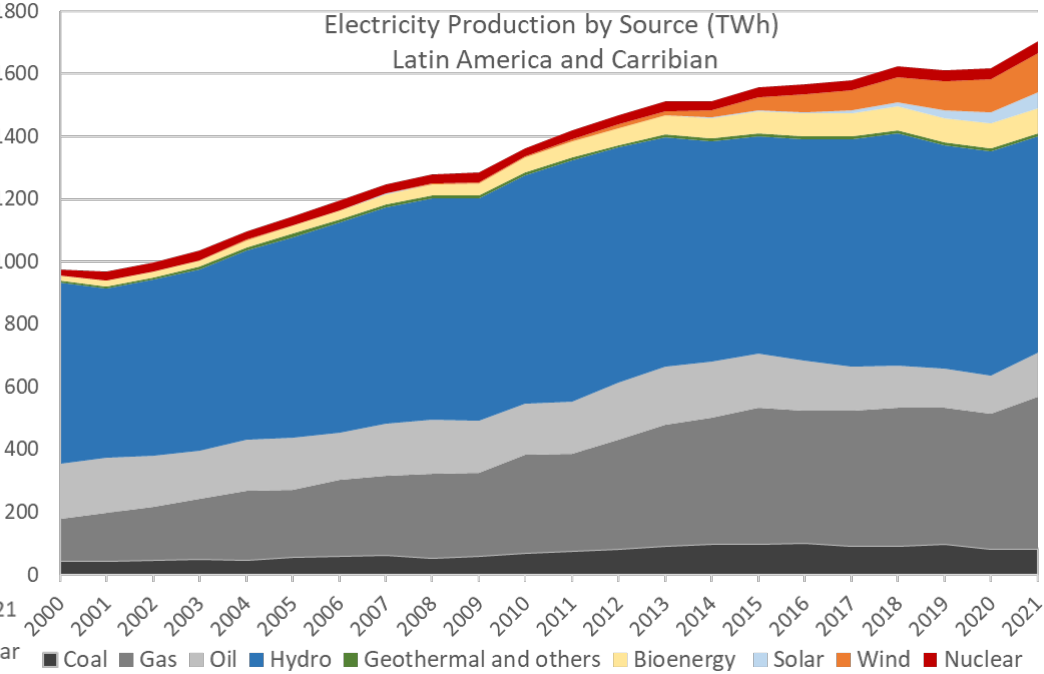


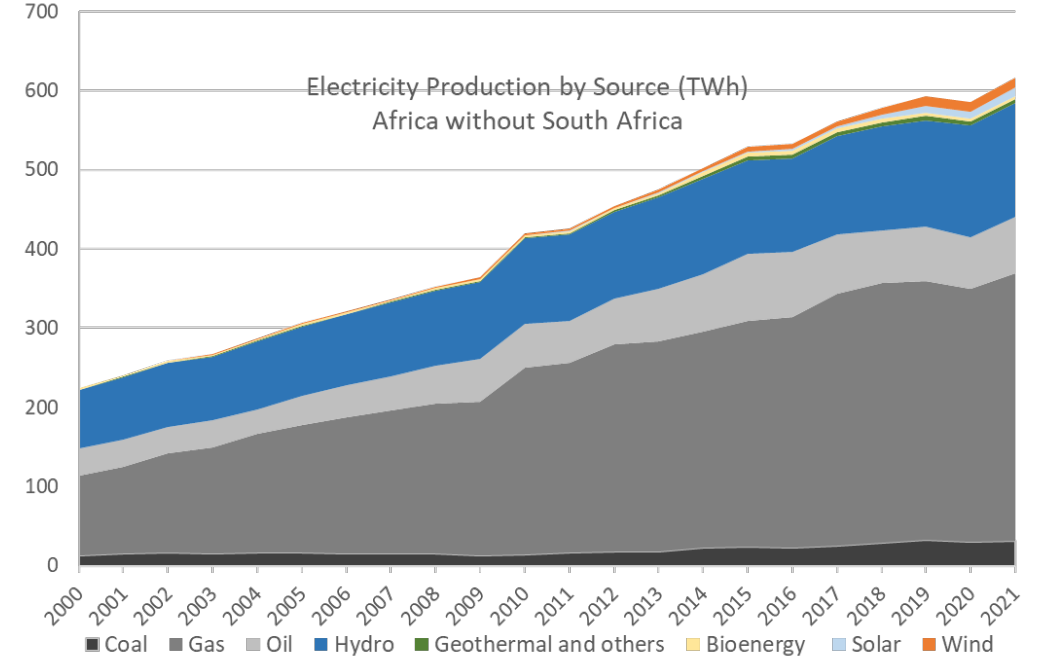


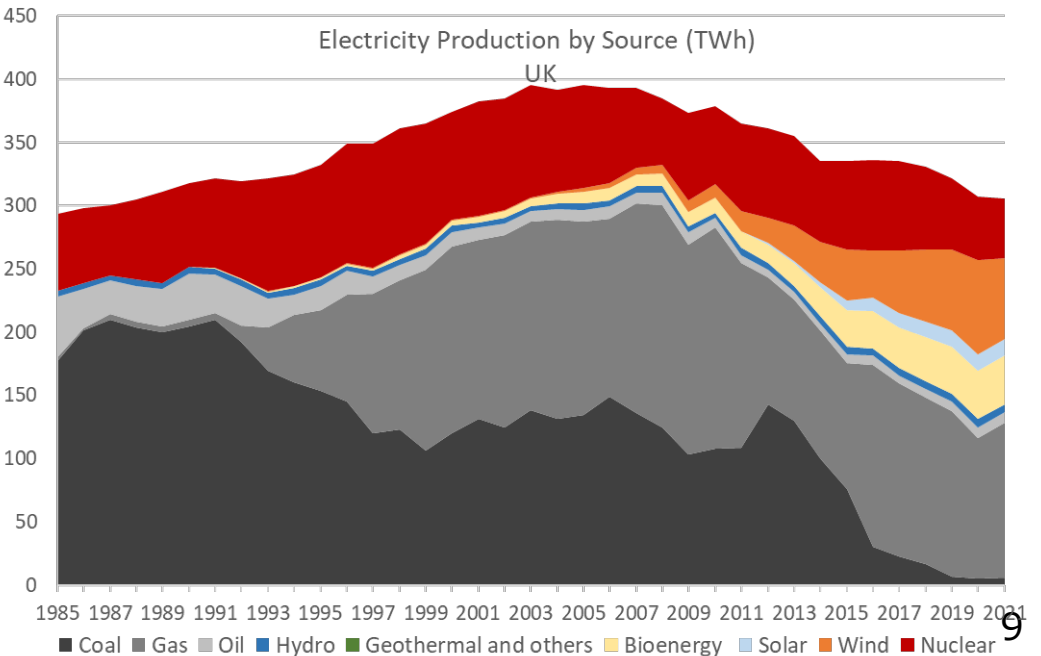


Electricity Production by Source (Developing Countries other Than Asia, UK)









Importance of approaching energy transition reflecting the actual situation of each country

- While the goal of CN is the same, **the pathways should be various and realistic in accordance with the different situation of each country**.
- Given the difference in various conditions, **Asia should have different approaches from Europe**. An approach to pursue a **balance among the 3Es (environment, economy, and energy security), may well fit into the Asian context**.
- It is important to **aim for carbon neutrality while ensuring economic growth and energy security**.

Situation in Europe

・**Stable/declining energy demand**
・**Rich in renewables (especially wind)**
・**Wide and well-connected grid networks** covering the continent
・**Pipeline supplied gas** has been sufficiently available
⇒**Promoting energy transition focusing on renewables such as wind/solar.**

Situation in Asia

・**Rapidly growing energy demand**
・**Uneven distribution of renewable potential** (Wind potential is generally weak, flat areas are mostly populated.)
・**Small grid size. Weak in inter grid connections.**
・Limited availability in pipeline gas and **shifting to LNG**
⇒ Because **no single source can secure 3Es**, various approaches should be considered.

Asian countries should form “one team” to aim for carbon neutrality.

Asia Zero Emission Community (AZEC)

- "Asia Zero Emission Community (AZEC)" concept aims for **energy transitions tailored to each country's circumstances**, together with Asian countries that are actively trying toward carbon neutrality while having similar challenges to Japan in decarbonization.
- AZEC is a **platform consisting of Asian countries that are promoting decarbonization**. Japan intends to contribute its resources and experience to AZEC, by **providing support on technology, finance, and human resources** through AETI, JCM, etc., and by **policy coordination** with partner countries. AZEC aims to support new technologies and reduce costs through market expansion.

Examples of supports

- **Financial support by JBIC, NEXI, JICA,** etc.
- **Assistance in developing roadmap** and long-term strategy for CN
- Establishment and dissemination of **Asia Transition Finance**
- **Development, demonstration, and deployment of decarbonization technologies** such as renewable energy, energy saving, hydrogen, ammonia, biomass, and CCUS

Examples of policy coordination

- Share information on **maximizing deployment renewable energies**
- **Establish standards** for energy conservation, energy management, and other decarbonization technologies
- **Share the direction** of utilization of bio-energy, hydrogen, ammonia, etc. in the field of thermal power generation.
- Consider of **effective utilization of power grids**

AZEC Ministerial Meeting

- On 4 March 2023, METI hosted **Asia Zero Emissions Community (AZEC) Ministerial Meeting**.
- Minister Nishimura, Minister of Economy, Trade and Industry of Japan, who chaired the meeting, made remarks on **the importance of decarbonization in Asia, AZEC concept, and Japan's specific efforts**.

Participating countries (in alphabetical order)
Australia, Brunei, Cambodia, Indonesia, Japan, Laos, Malaysia, Philippines, Singapore, Thailand, Viet Nam

Participating international organizations (in alphabetical order)
Economic Research Institute for ASEAN and East Asia (ERIA)
International Energy Agency (IEA)

AZEC Ministerial Meeting (Joint Statement and Chair's Summary)

- The participants launched **AZEC as a platform** and agreed to **AZEC joint statement** including the three following common views:
  1) **Advancing cooperation towards carbon neutrality/net-zero emissions while ensuring energy security**
  2) **Promoting energy transition while achieving economic growth**
  3) **Recognizing there are various and practical pathways toward carbon neutrality/net-zero emissions depending on the circumstances of each country**

- After the ministerial meeting, Minister Nishimura issued **"Chair's Summary"** that reflects the comments and opinions expressed in the ministerial meeting under his responsibility, as for following areas.
  1) **Energy efficiency and demand-side energy conversion**
  2) **Renewable Energy/Energy Management**
  3) **Natural gas and LNG**
  4) **CCUS/Carbon Recycling**
  5) **Hydrogen and Ammonia**
  6) **Critical Minerals**

AZEC Public-Private Investment Forum

- On 3 March 2023, the **Asian Zero Emissions Community (AZEC) Public-Private Investment Forum** was co-hosted with KEIDANREN(Japan Business Federation). Approximately 700 participants, both local and online, attended.
- Ministers and CEOs of SOEs in Asia explained their **efforts toward decarbonization** and **expectations for cooperation with Japan** were made by.
- **Japanese companies** introduced **their decarbonization technologies**, including renewable energy, biomass, hydrogen, ammonia, and CCS, and **their initiatives to accelerate energy transitions in Asia**.
- Japanese government related organizations explained that **they are ready to provide all kinds of support measures**, including financial support and knowledge sharing, for realistic energy transitions.

Philippines, Secretary, Department of Energy, H.E. Lotilla

Pertamina, President Director and CEO, Ms. Nicke Widyawati

Australia, Assistant Minister for Climate Change and Energy, Hon. Jenny McAllister

MOU between NEXI and PLN on cooperation to decarbonize the power sector
(From left: Minister of Economy, Trade and Industry Nishimura, NEXI President Kuroda, PLN President Daruwaman and Minister of Energy and Mines Arifin)

Key Elements of G7 Sapporo Climate, Energy and Environment Ministers' Communiqué

- **Energy security and clean energy transitions (Para 49)** https://www.meti.go.jp/press/2023/04/20230417004/20230417004-1.pdf

- highlight **various pathways according to each country's energy situation, industrial and social structures, and geographical conditions** should lead to **our common goal of net zero**

- reaffirm the importance of **realizing simultaneously safety, energy security, economic efficiency, and environment (S+3E)**

- commit to **holistically address energy security, the climate crisis and geopolitical risks**.

- **Collective action (Para 58)**

- take note of initiatives carried out both individually and in partnership with others, such as **Asia Zero Emission Community (AZEC) initiative**

- **Energy Efficiency (Para 63)**

- highlight the role of energy efficiency as **the "first fuel" as a key pillar in the global energy transition towards net-zero GHG emissions in 2050**

- **Renewable Energy (Para 64)**

- contribute to **expanding renewable energy globally and bringing down costs** by **strengthening capacity including through a collective increase**

- **Low-carbon and renewable hydrogen and its derivatives such as ammonia (Para 67)**

- note that some countries are **exploring the use of low-carbon and renewable hydrogen** and its derivatives in the **power sector to work towards zero-emission thermal power generation**

- affirm the importance of **mutual recognition mechanism for carbon intensity-based** tradability, transparency, trustworthiness and sustainability.

- **Carbon Management (Para 68)**

- recognize that **CCU/carbon recycling and CCS can be an important part of a broad portfolio of decarbonization solutions to achieve net-zero emissions by 2050**, including **recycled carbon fuels and gas (RCFs) such as e-fuels and e-methane**

- **Natural gas and LNG (Para 69)**

- **investment in the gas sector can be appropriate** to help **address potential market shortfalls** provoked by the crisis, subject to clearly defined national circumstances, in the context of Russia's aggression against Ukraine impacts energy markets and inflation have had a negative impact all over the world, especially in developing counties.

Schedule

Member Countries: Australia, Brunei, Cambodia, Indonesia, Lao PDR, Malaysia, the Philippines, Singapore, Thailand and Vietnam.

March 2023@Tokyo

Ministerial Meeting

Public-Private Investment Forum

April 2023@Sapporo

G7 Energy and Climate Ministerial Meeting

May 2023

G7 Summit in Hiroshima

September 2023

ASEAN-Japan Summit in Indonesia

December 2023

ASEAN-Japan Special Summit in Japan

Thank you!

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

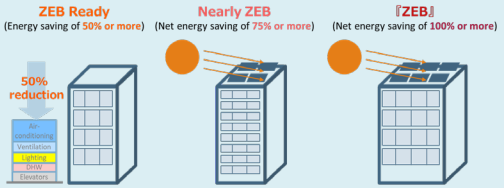
Construction of a next-generation power transmission and distribution network that enables flexible energy management based on forecasts of supply/demand fluctuations in response to the increase in intermittent renewable energy

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

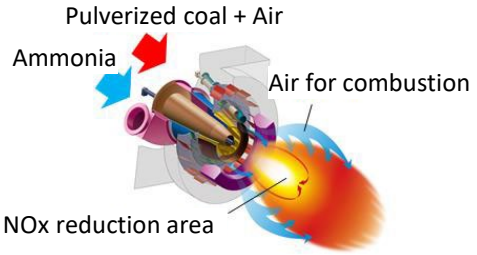
Utilizing cutting-edge flash and binary turbines to develop efficient projects.

Reference: Japan's existing projects to be included into AZEC (Zero emission thermal related projects)

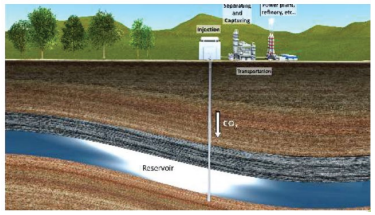
- Support **international studies and demonstration projects of thermal-power decarbonization technologies** such as ammonia, hydrogen, biomass and CCUS and other clean technologies. **(Total: 15.5 billion yen in 2022)**
- **Support deployments of such technologies in neighboring countries/regions** based on the achievements of demonstration projects.

- ✓ Studies and demonstrations of installing hydrogen/ammonia co-firing turbines, etc.
  - ➢ Indonesia, Malaysia,
- ✓ Introducing green hydrogen/ammonia production systems
  - ➢ Indonesia, Lao PDR
- ✓ Promoting biofuel/biomass utilization
  - ➢ Indonesia, Thailand, Vietnam
- ✓ Studies on the needs for zero-emission technologies in various countries
  - ➢ Indonesia, Thailand, Vietnam, Indonesia, the Philippines
- ✓ Studies on CCUS/CO2 EOR
  - ➢ Indonesia, Malaysia

etc.



CCS (Carbon Capture and Storage)



CO2 EOR (Enhanced Oil Recovery)