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University of Science and Technology of Hanoi
Department of Energy

Electricity in Vietnam: where does it come from, how to make it greener ?

Dr. Minh Ha-Duong , CleanED/USTH, CIRED/CNRS

Officience, HCMC, July 2017

Clean Energy and Sustainable Development Lab

Founded in 2014, building a world-class interdisciplinary research team with the mission to contribute to the green growth of the energy sector in Vietnam and other South East Asian countries.

http://cleaned-usth.com

The University of Science and Technology of Hanoi

USTH created in 2010 with France

Vietnamese public New Model University

603/608/610 USTH building, VAST campus
18 Hoang Quoc Viet, Cau Giay, Ha Noi, Viet Nam

Outline

1. Electricity in the energy system
2. Electricity and Sustainability
3. Renewable energies

1. Electricity in the energy system

Energy is the ability of a system to cause external action

- Energy can be converted to/from many forms

Mechanical energy - potential

Mechanical energy - kinetic

Thermal energy

Chemical energy

Nuclear energy

Solar energy

→ Electric energy

Energy carriers

An energy carrier is a substance that could be used to produce useful energy, either directly or by one or several conversion processes.

Examples ?

Primary and secondary energy carriers

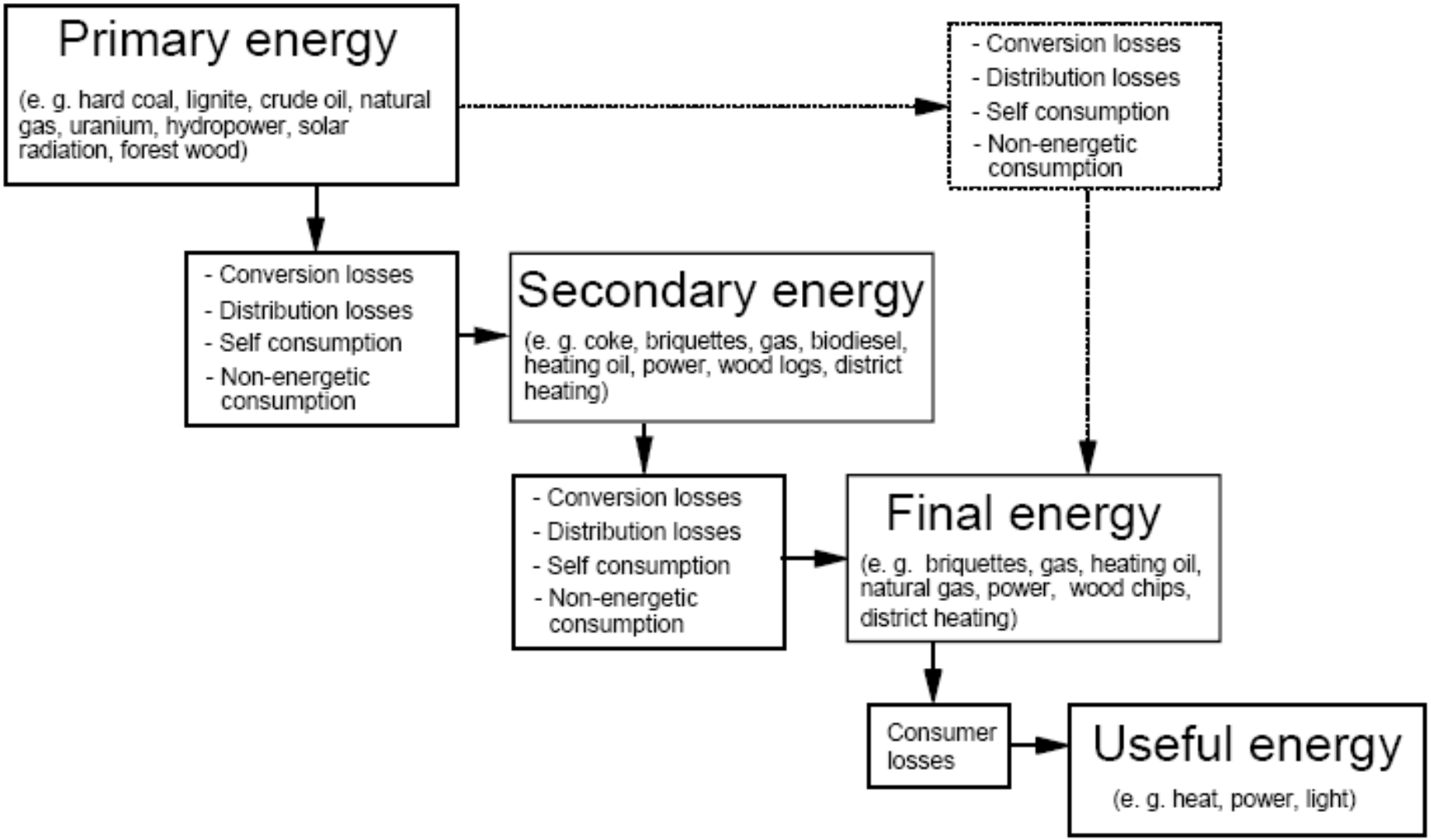
Primary energy carriers: substances which have not yet undergone any technical conversion.

Example: Crude oil. Wind. Incoming solar radiation.

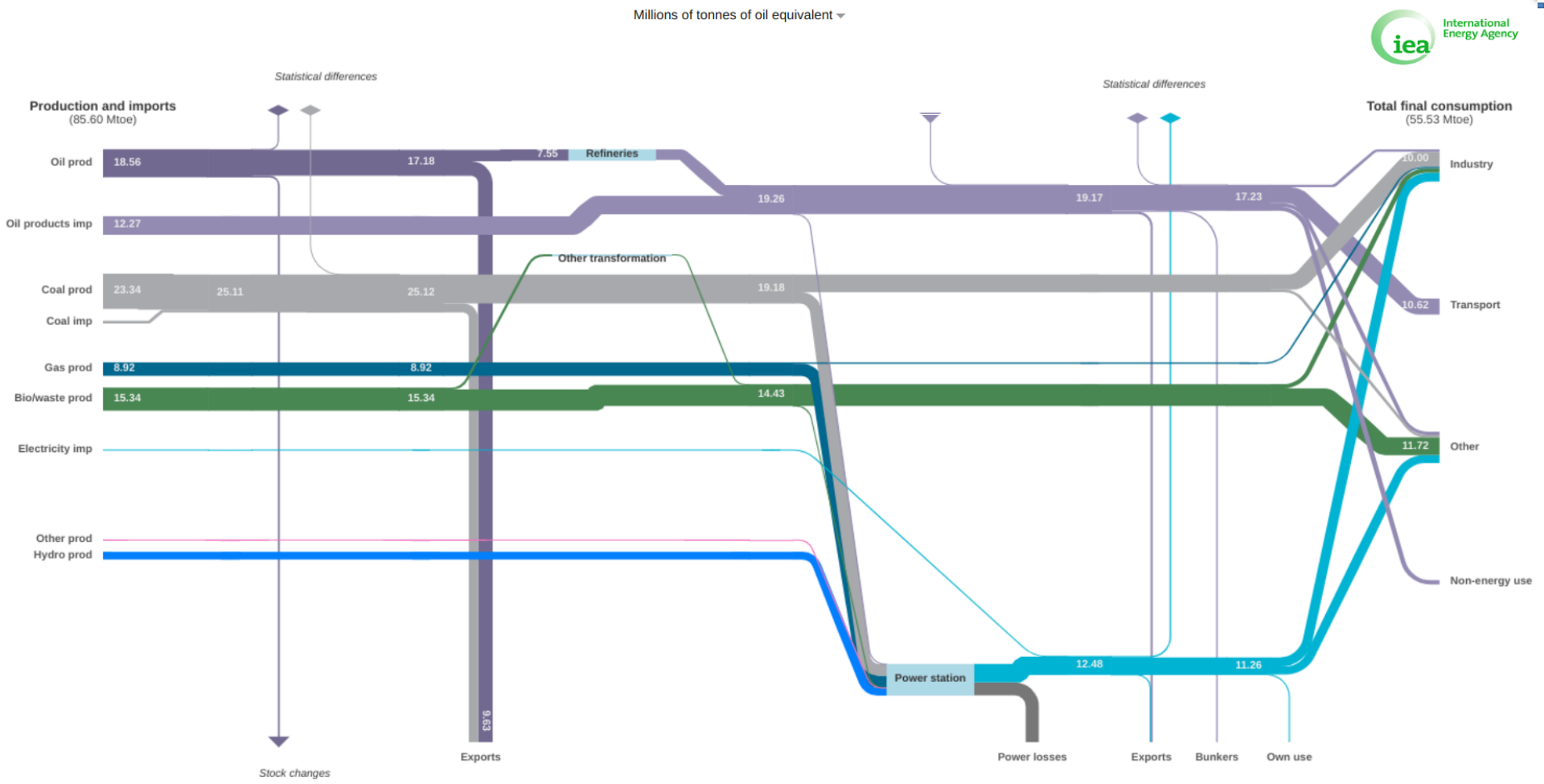
Secondary energy carriers: produced from primary or other secondary energy carriers, either directly or by one or several technical conversion processes

Example: Gas, Electricity

Energy conversion chain



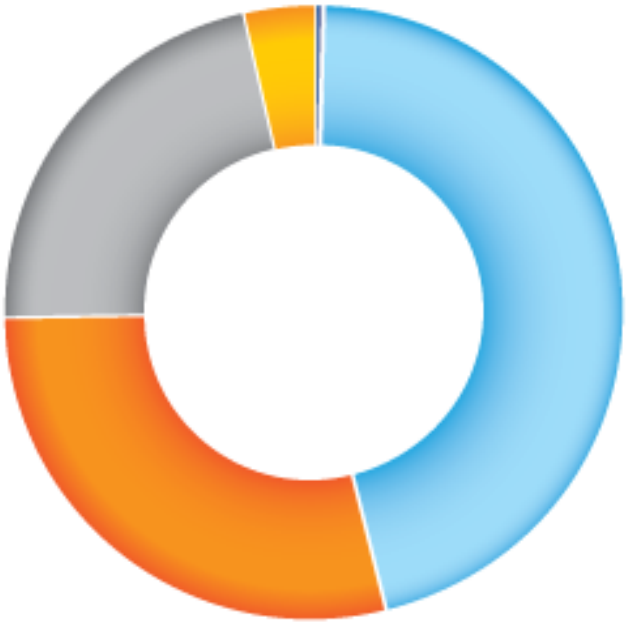
Energy conversion in Vietnam (2014)



Power generation capacity of Vietnam by 2014

Power generation by Installed Capacity

Power source	Capacity (MW)	Rate (%)
Hydropower	15,702.1	46.07
Coal fired power	9,759	28.64
Gas fired power	7,354.15	21.58
Oil fired power	1,154.5	3.39
Wind power and others	109	0.32
Total	***34,080***	***100***



2. Electricity and Sustainability

Development is sustainable when:

It meets the needs of the present generation without compromising the ability of future generations to meet their own needs

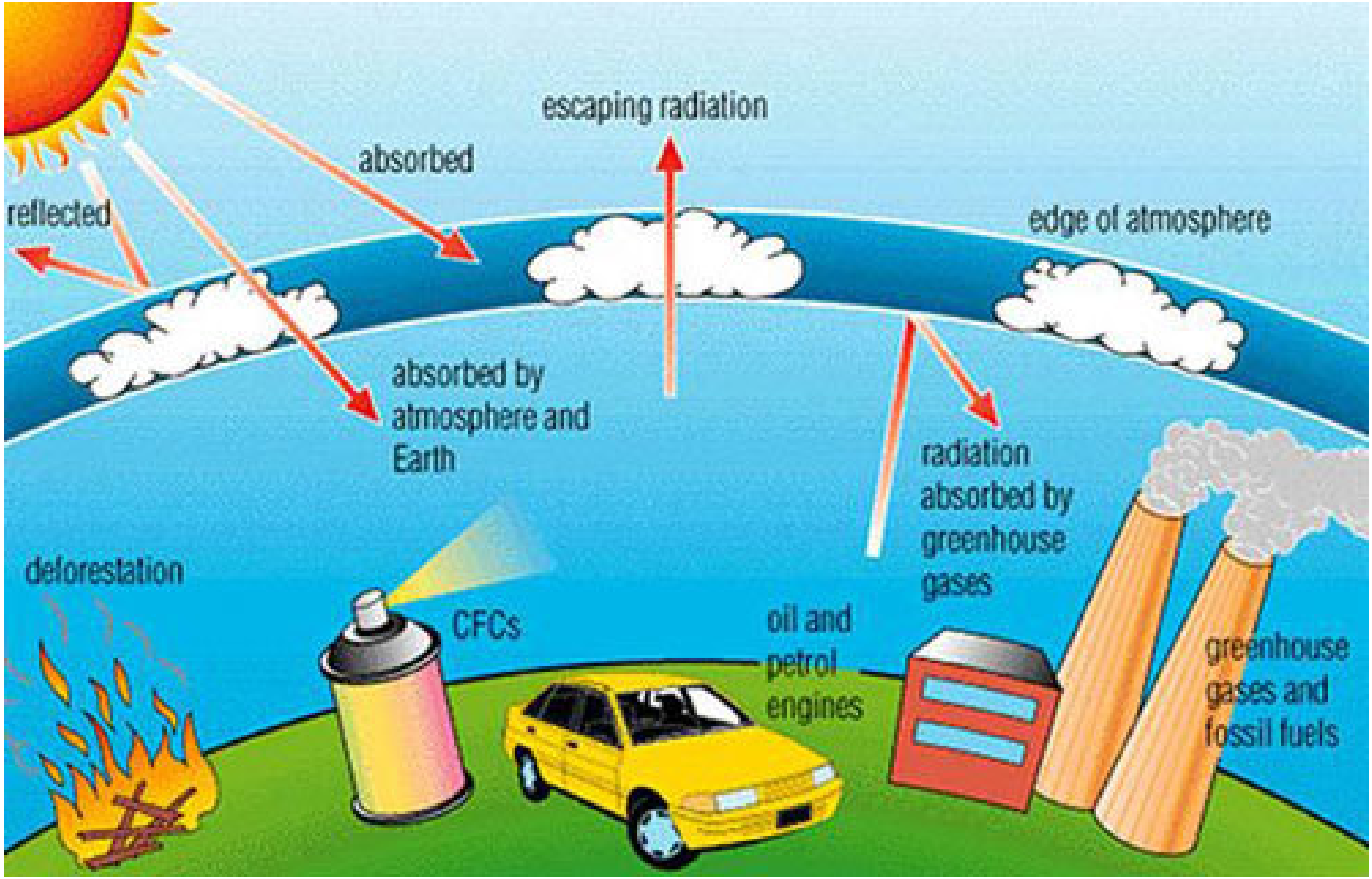
The three pillars: economy, environment, society

- **Economy.** Preservation of productive capacity for the foreseeable future.

- **Environment.** Biophysical sustainability means maintaining or improving the integrity of the life support system of earth

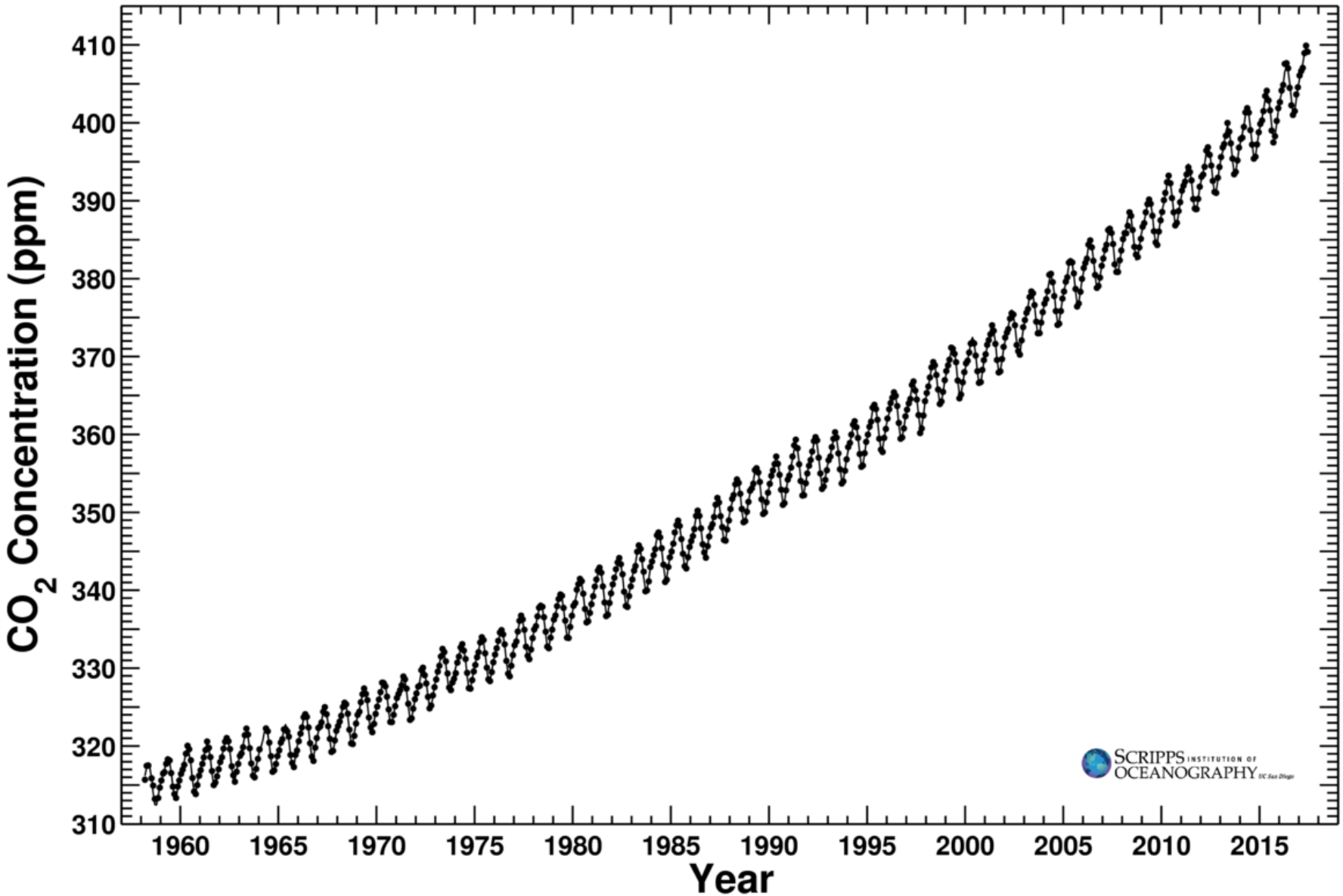
- **Society.** A dynamic harmony between the equitable availability of energy-intensive goods and services to all people and the preservation of the earth for future generations

Global warming

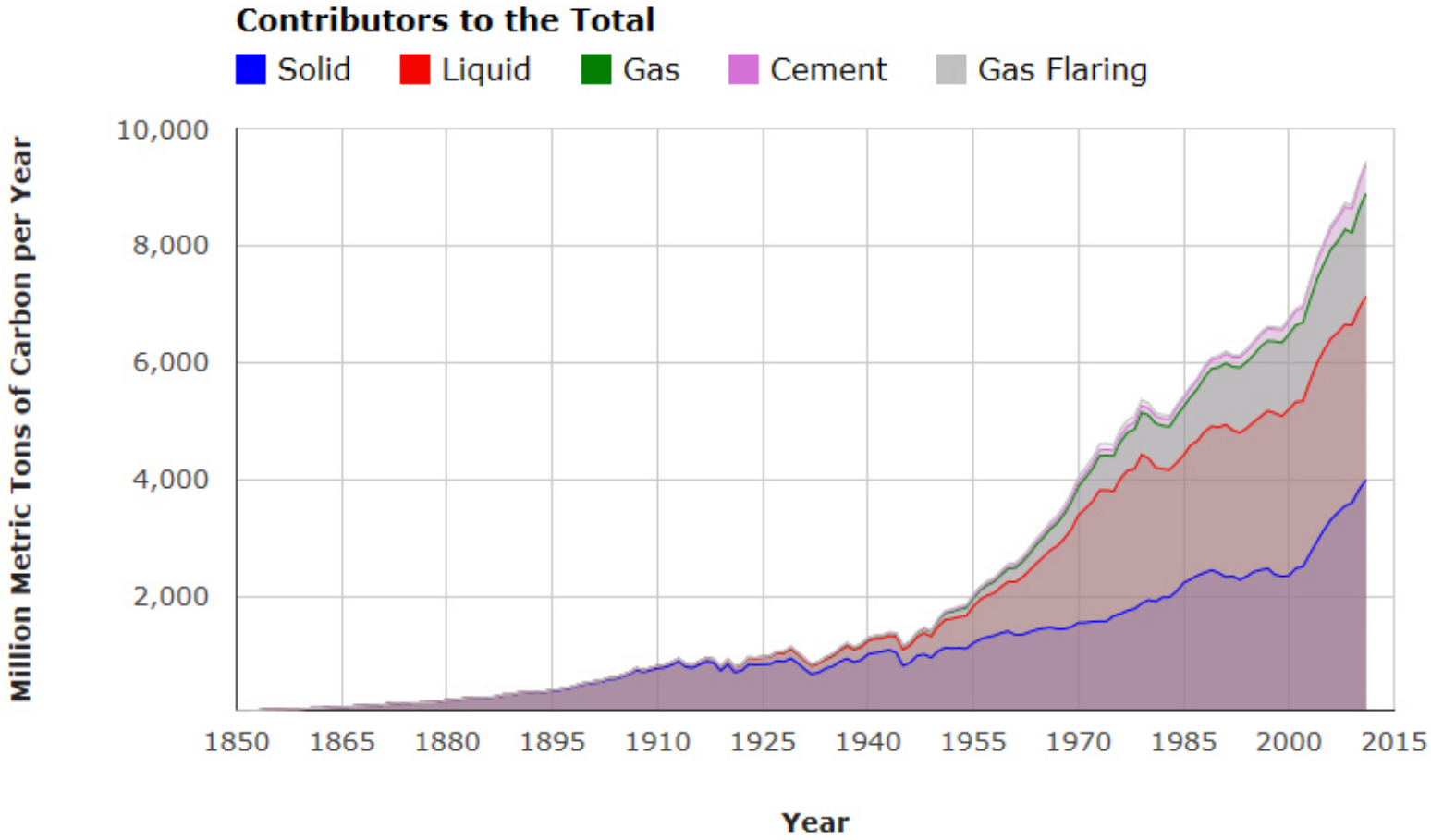


Mauna Loa Observatory, Hawaii
Monthly Average Carbon Dioxide Concentration

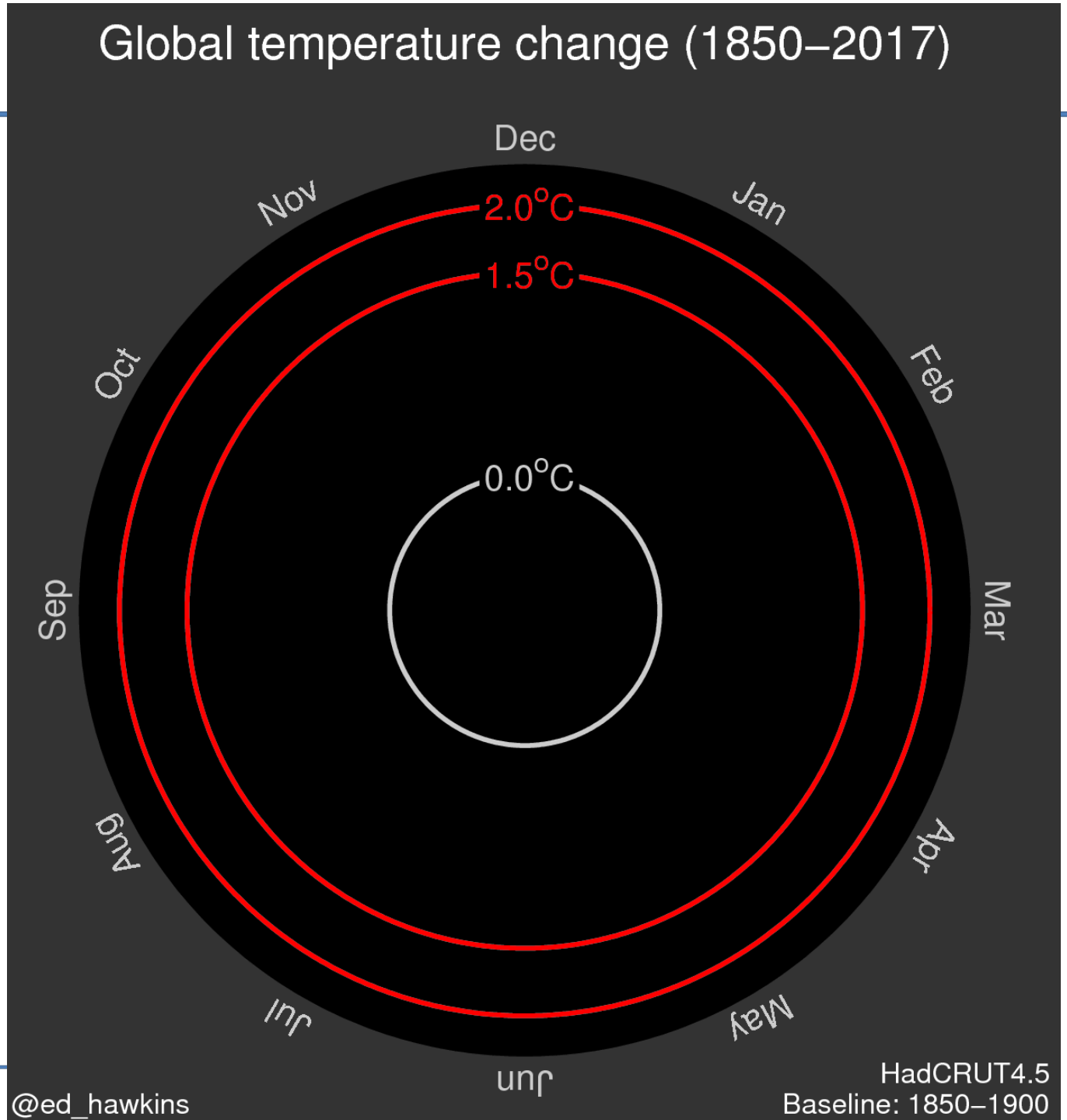
Data from Scripps CO_2 Program Last updated July 2017



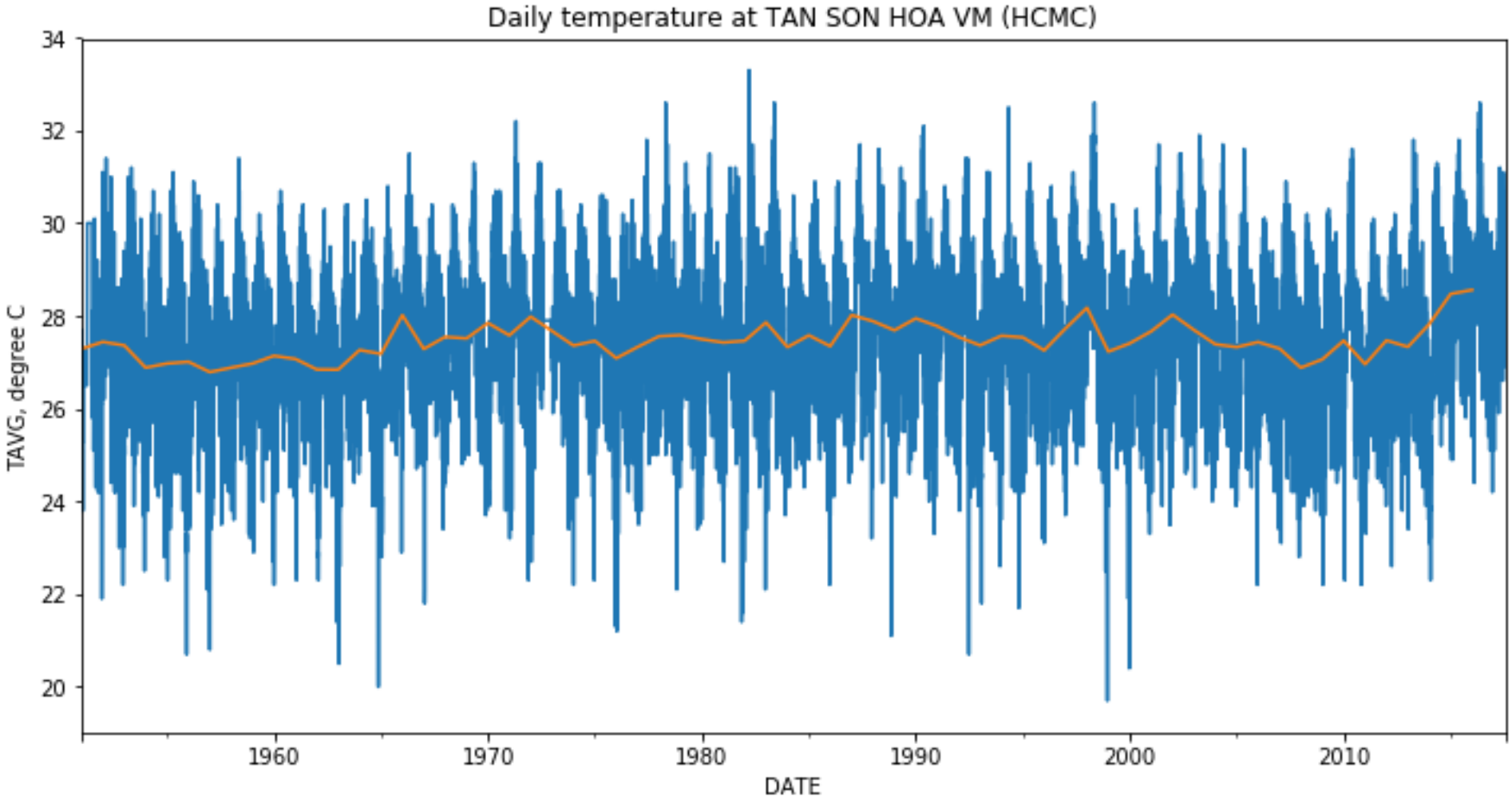
Global carbon emissions



Source: Boden, T.A., G. Marland, and R. J. Andres. 2015. Global, Regional, and National Fossil-Fuel CO_2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi: 10.3334/CDIAC/00001_V2015.


Global temperature change (1850–2017)
Dec
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
2.0°C
1.5°C
0.0°C
@ed_hawkins
HadCRUT4.5
Baseline: 1850–1900

Global warming at your place



How does energy use impact sustainability?

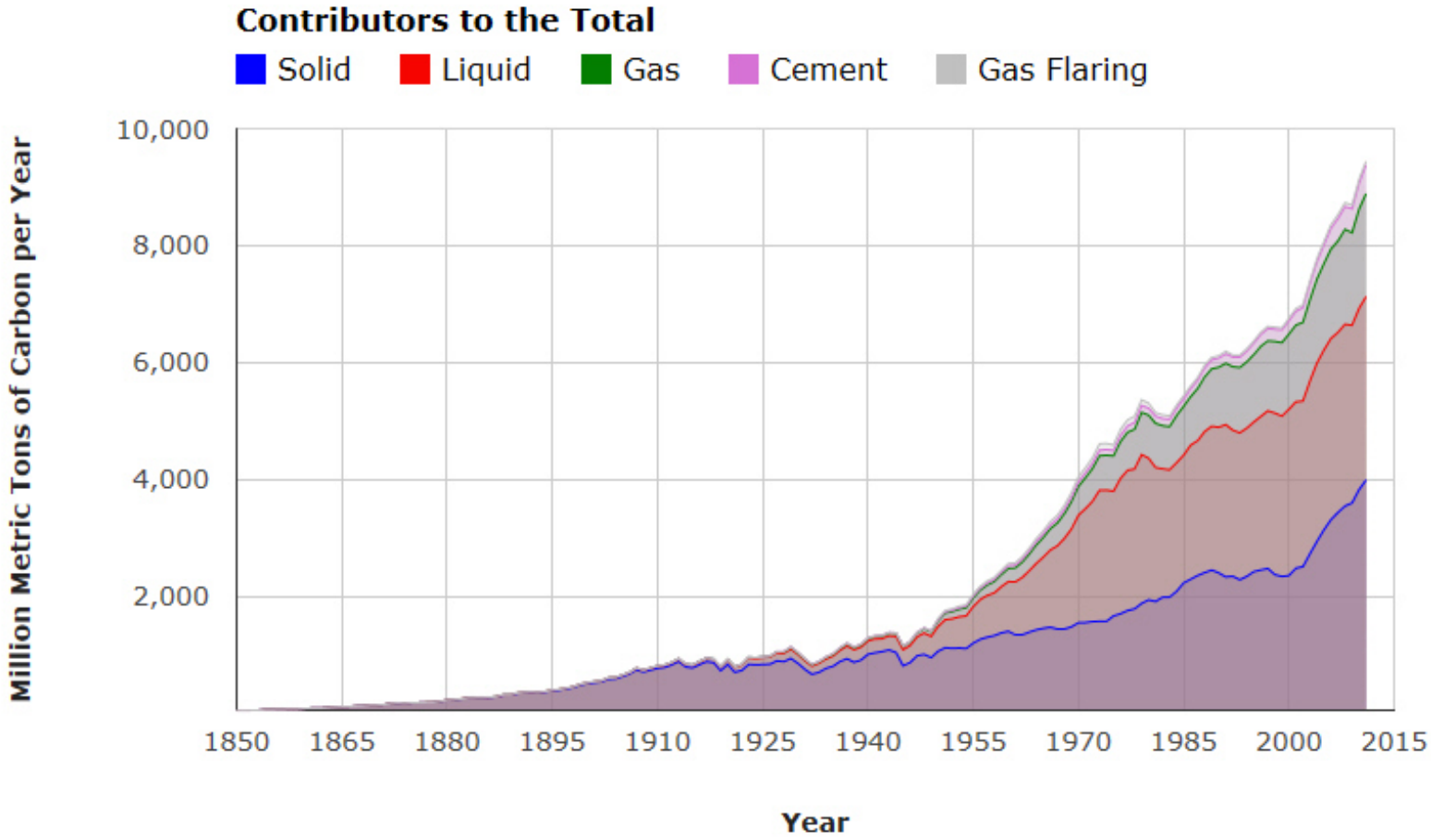
Some Benefits

- Energy is critical to human survival and development
- Fossil fuels are plentiful and convenient to use
- Energy is key to industrialization and transportation
- Energy facilitates economic growth and globalization

Some Problems

- Rapid growth in fossil fuel use raises concerns about:
- Security of supply (over-dependence?)
- Environmental impacts
- Societal conflicts over inequitable distribution of resources
- Depletion of critical resources

Global carbon emissions



Source: Boden, T.A., G. Marland, and R. J. Andres. 2015. Global, Regional, and National Fossil-Fuel CO_2 Emissions. Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, Tenn., U.S.A. doi: 10.3334/CDIAC/00001_V2015.

Without more mitigation, global mean surface temperature might increase by 3.7° to 4.8°C over the 21st century.

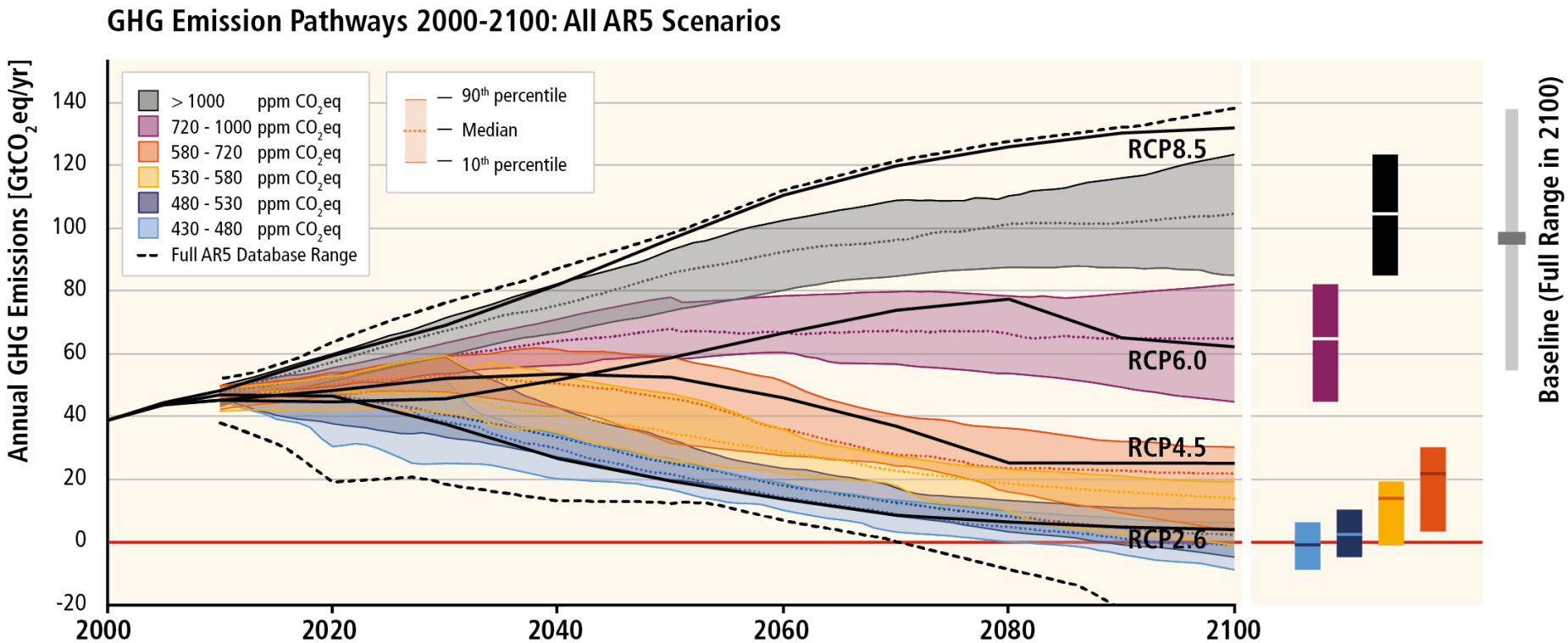
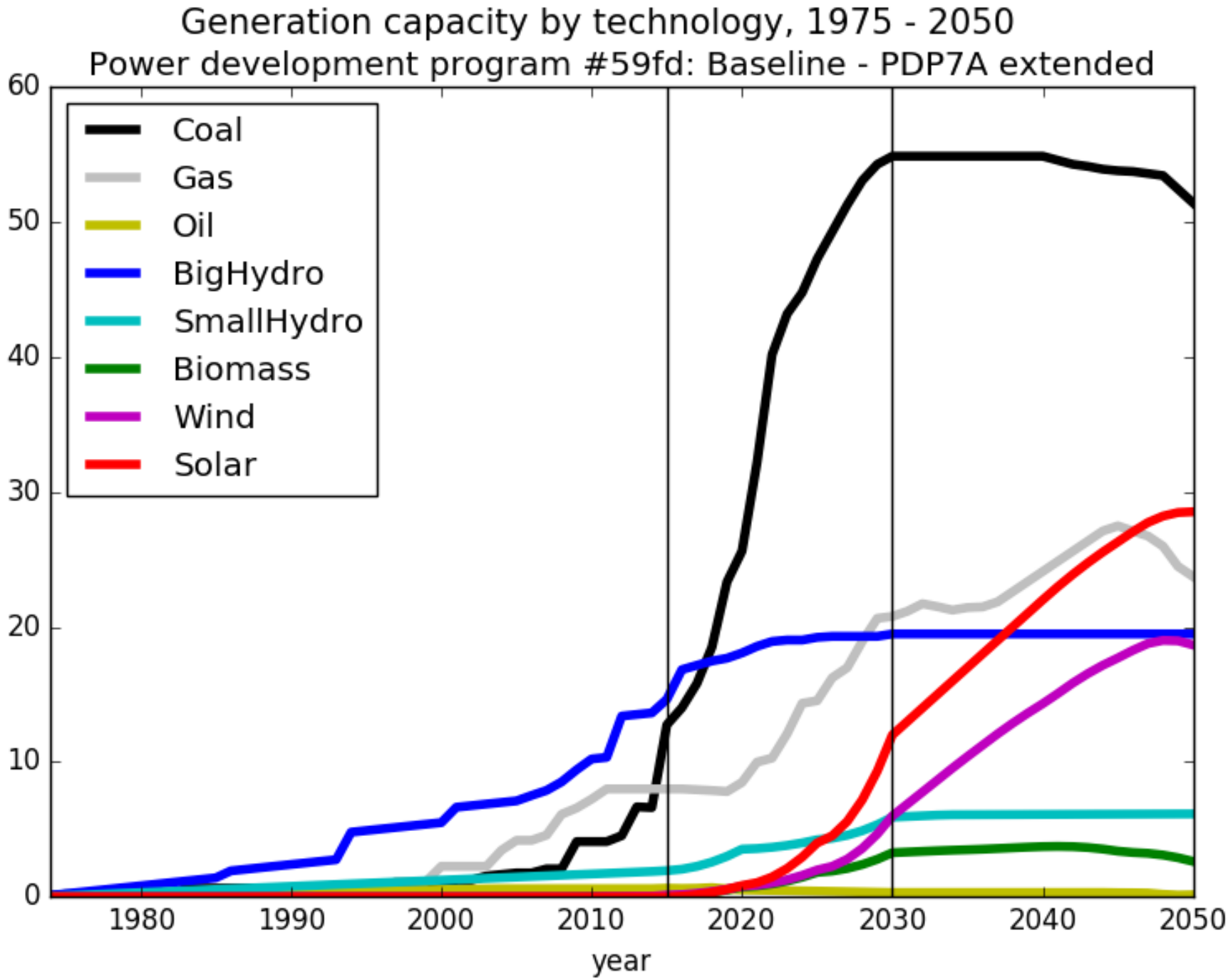
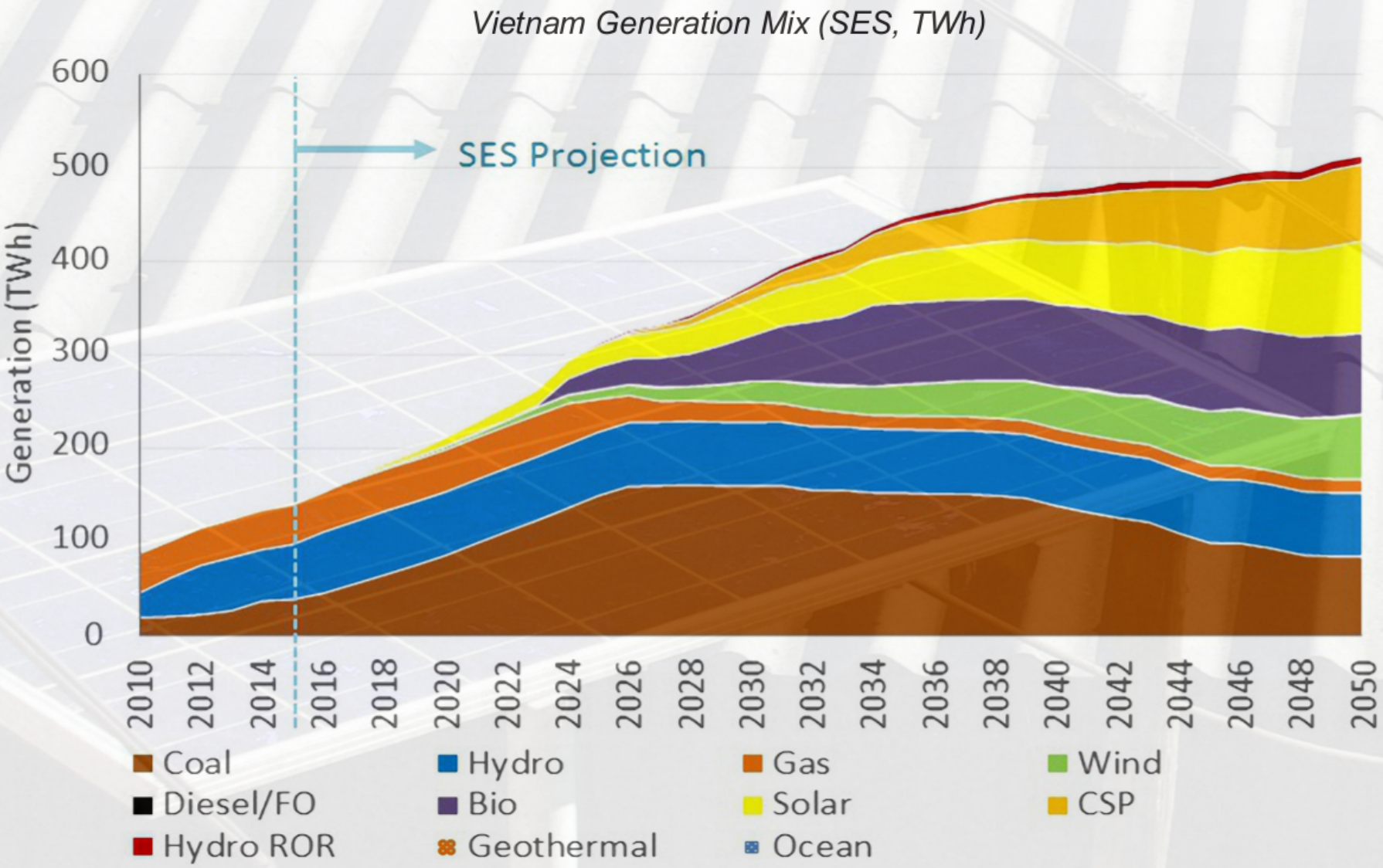


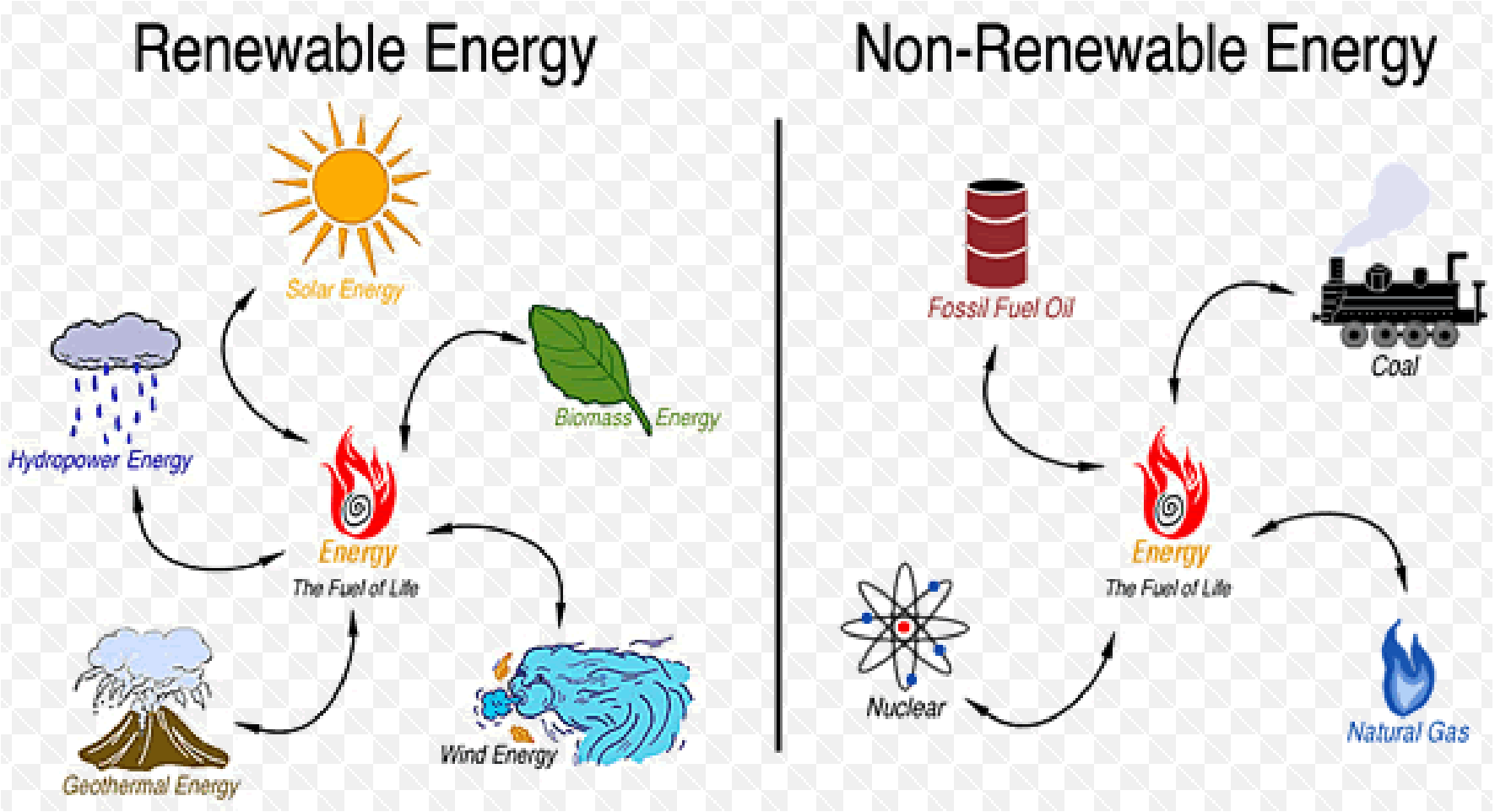
Figure SPM.4. Pathways of global GHG emissions ($GtCO_2eq/yr$) in baseline and mitigation scenarios for different long-term concentration levels (upper panel) and associated upscaling requirements of low-carbon energy (% of primary energy) for 2030, 2050 and 2100 compared to 2010 levels in mitigation scenarios (lower panel). The upper and lower panels exclude scenarios with limited technology availability and the lower panel in addition excludes scenarios that assume exogenous carbon price trajectories. [Figure 6.7, Figure 7.16] [Subject to final quality check and copy edit.]


Generation capacity by technology, 1975 - 2050
Power development program #59fd: Baseline - PDP7A extended
Coal
Gas
Oil
BigHydro
SmallHydro
Biomass
Wind
Solar
0
10
20
30
40
50
60
1980
1990
2000
2010
2020
2030
2040
2050
year

WWF vision


Vietnam Generation Mix (SES, TWh)
SES Projection
Generation (TWh)
600
500
400
300
200
100
0
2010
2012
2014
2016
2018
2020
2022
2024
2026
2028
2030
2032
2034
2036
2038
2040
2042
2044
2046
2048
2050
Coal
Hydro
Gas
Wind
Diesel/FO
Bio
Solar
CSP
Hydro ROR
Geothermal
Ocean

3. Renewable energies



Common aspects of renewable energy

- Wind, solar, geothermal and tidal energy are inexhaustible primary energy sources at the human timescale.

- The energy produced by the sun is responsible for most of other renewable energies (wind and hydropower) as well as renewable energy carriers (such as solid or liquid biofuels)

- Energy from waste is renewable only if it is of non-fossil origin (organic domestic waste, waste from the food processing industry)

Renewable energy: Advantages

- Non depletable
- Mostly everywhere
- Low CO2 and CH4 emissions
- Conserve water

Renewable energy: Disadvantages

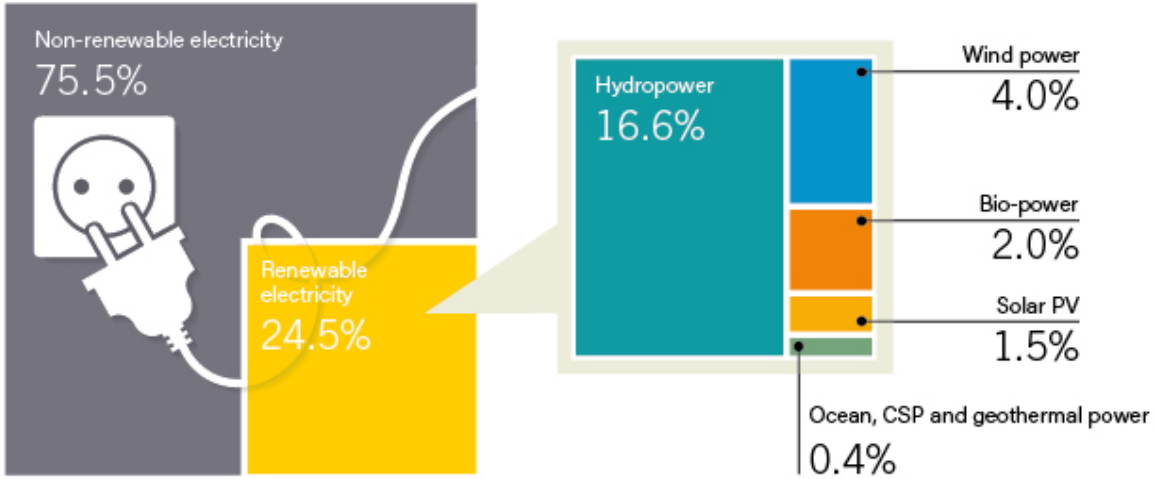
- Variability (wind, solar)
- Low density, need space
- Capital-intensive, higher initial cost
- Visual, noise, smell impact
- Kills birds and bat (wind turbines, concentrated solar)
- Brine (geothermal energy)

- Wherever a large renewable facility is to be located, there will be perceived and real problems to the local people. There is the problem of "**not in my backyard**."

Renewables in electricity production – the World

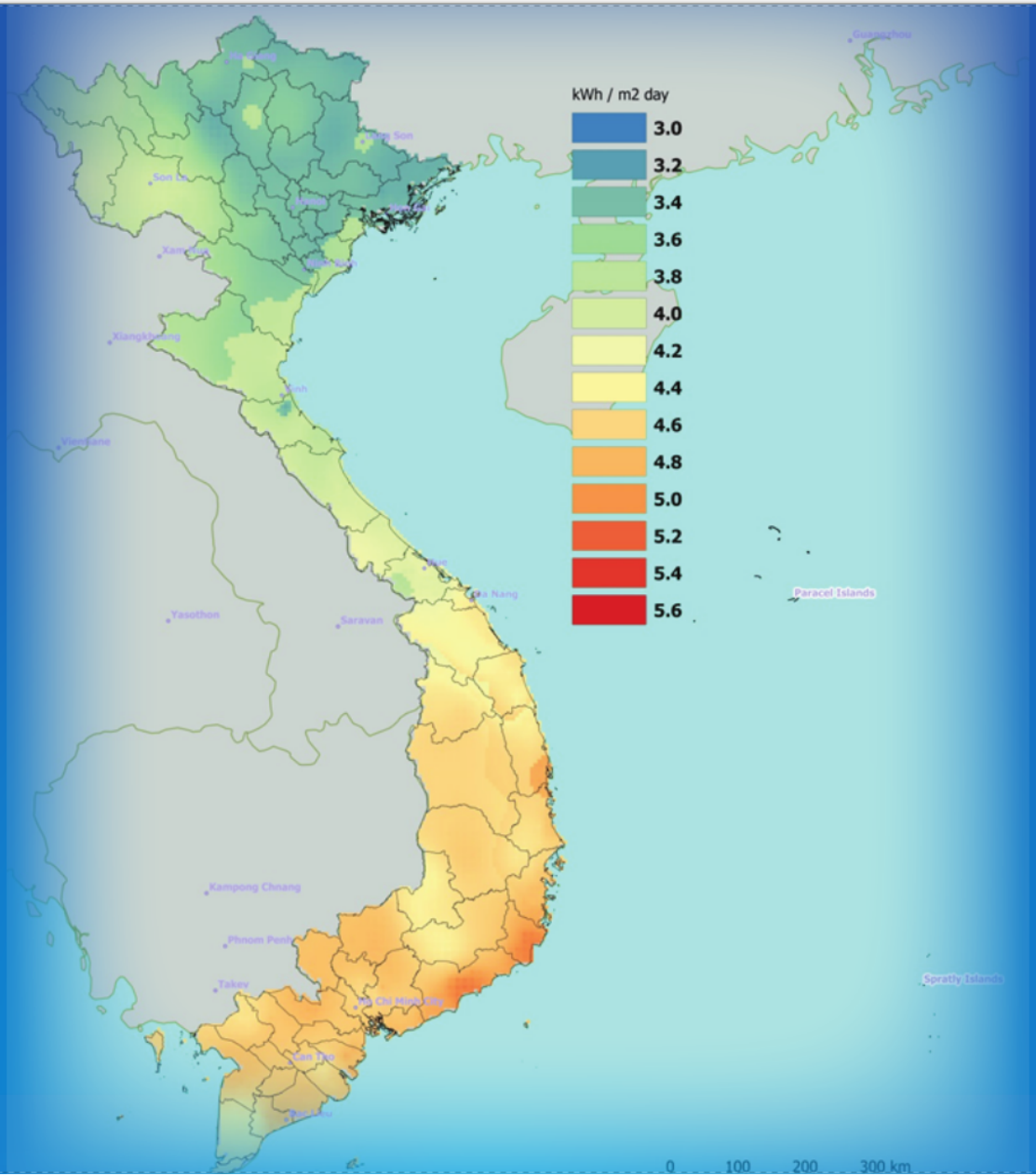
By year's end, renewables comprised an estimated **30%** of the world's power generating capacity and **24.5%** of global electricity demand

Estimated Renewable Energy Share of Global Electricity Production, End-2016



REN21 *Renewables 2017 Global Status Report*

Solar potential 4-5 W / m²



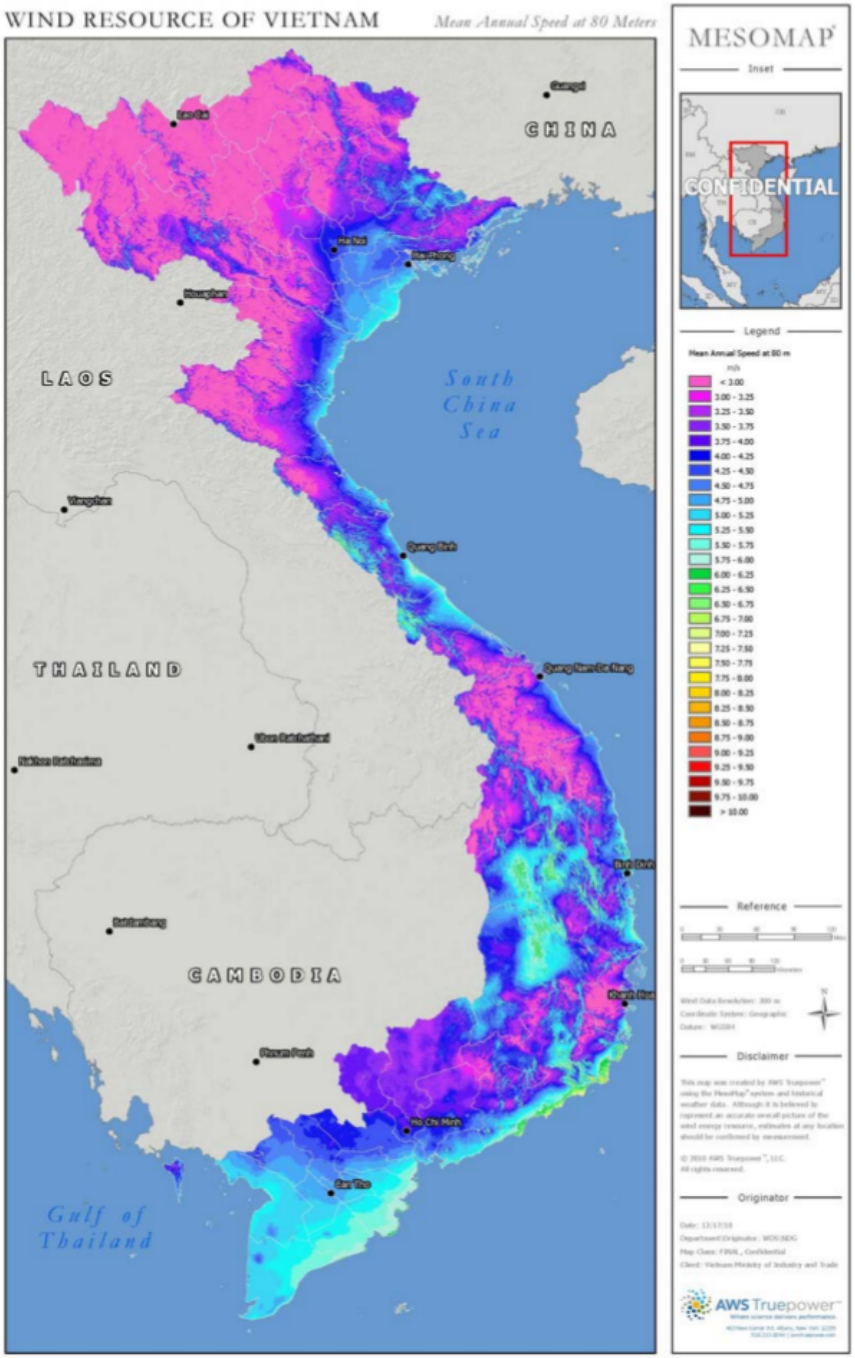


Figure 3. Wind speed map of Vietnam for a height of 80 m.

Wind and Solar in Vietnam

Wind and Solar farms i...

Solar (new): Orange: in operation, Blue: Under development
Wind: Green: Operation, Red: Construction,
8,680 views

SHARE

Wind farms in Vietnam

- Tuy Phong wind park - 30MW
- Bạc Liêu wind power plant - 99MW
- Phú Lạc wind power plant - 24MW
- Phú Quý island hybrid wind power plant - 6...

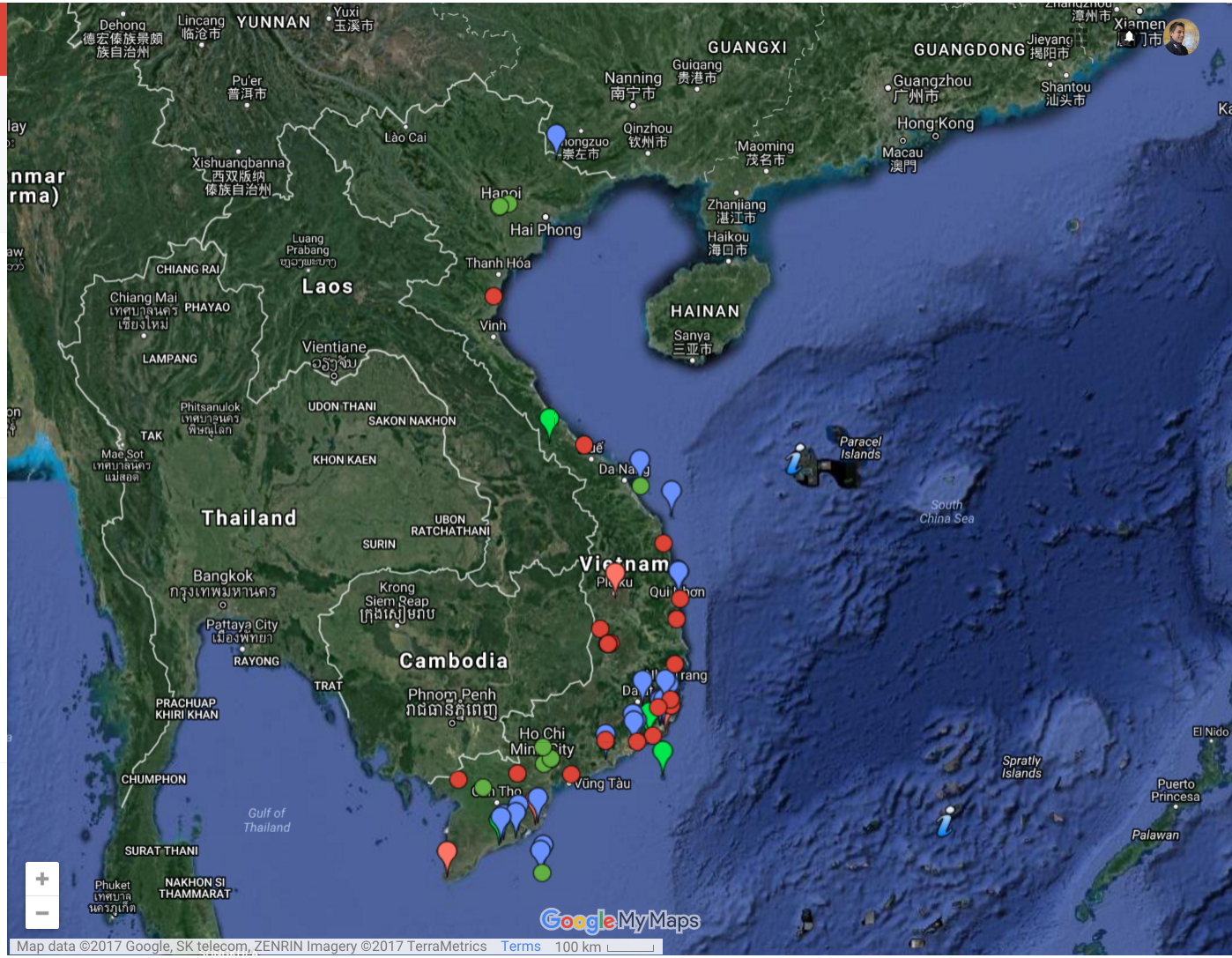
... 33 more

Solar farms in Vietnam

- Sao Mai 1.06MW rooftop
- BigC 212kWp - Bình Dương
- Intel Products 200kWp
- BK TPHCM - 160kWp

... 29 more

Made with Google My Maps



What do you think about green electricity at Officience?