

International Prospects for a Low Carbon Future

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Sustainable Development International

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EEE FORUM

ETHICS AND ECOLOGICAL ECONOMICS FORUM
<https://eeeforum.org/>

The Good, the Bad, and The Ugly



- "the Good" - Blondie - Clint Eastwood
- "the Bad" - Angel Eyes - Lee Van Cleef
- "the Ugly"- Tuco - Eli Wallach
- 1966 Italian Spaghetti Western

The Good - UNFCCC – COP25



United Nations Framework Convention on Climate Change 25th
Conference of Parties - Chile – Madrid, Spain Dec 3 – 12, 2019

The Good UNFCCC – COP25



**UNFCCC – COP25 United Nations Framework Convention –
25th Conference of Parties – Chile – Madrid, Spain Dec 3 – 12 2019**

The Good UNFCCC – COP25



**UNFCCC – COP25 United Nations Framework Convention –
25th Conference of Parties – Chile – Madrid, Spain Dec 3 – 12 2019**

The Good UNFCCC – COP25



China



Marshall Island



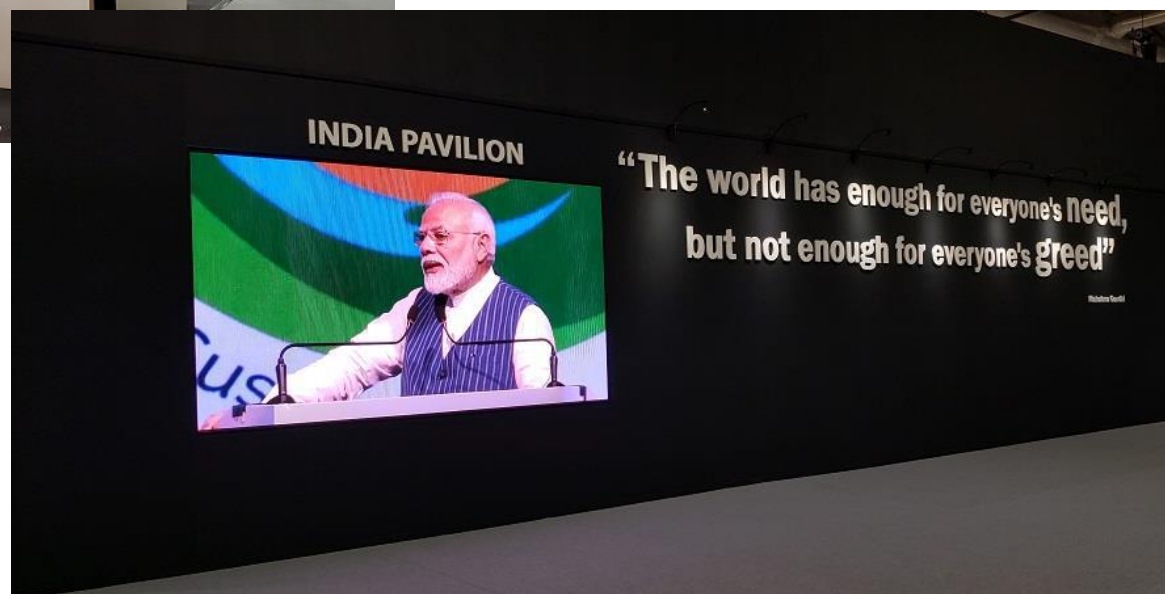
Brazil

**UNFCCC – COP25 United Nations Framework Convention –
25 Conference of Parties – Chile – Madrid, Spain Dec 3 – 12 2019**

The UNFCCC – COP25 Overview



The UNFCCC – COP25 Overview



The Good - Greta Thunberg, et al



- CNN – No. 1 News Story of the Year
- Bloomberg COP25: “I’m here because Trump isn’t.”
- Pelosi and entourage of half dozen Congressional Reps at COP25: “We will be back very soon.”
- Jeffery D. Sachs

The UNFCCC – COP25 Overview

Each day the Climate Action Network gave a 'Fossil of the Day' award.

- U.S.A. received 3
- Japan 2
- Brazil
- Australia
- Canada
- Russia
- Bosnia
- Slovenia
- Belgium

Ray of the Day:
Demark
Ray of the Year:
Indigenous
People and the
Youth



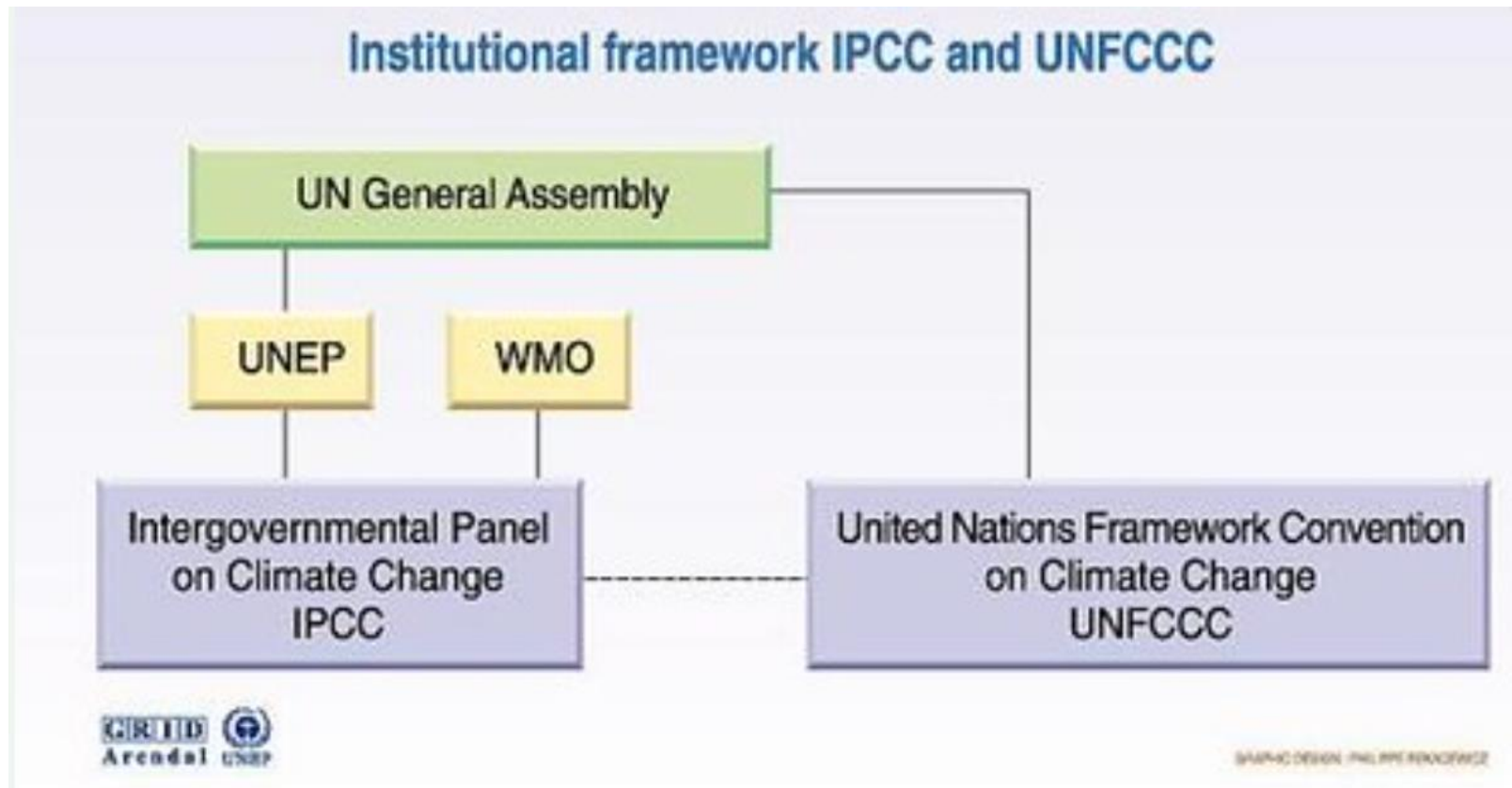
www.climatenetwork.org/fossil-of-the-day

The UNFCCC – COP25 Overview

Deputy Secretary-General, World Meteorological Organization - WMO, Elena Manaenkova served as Assistant Secretary - General at WMO from 2010 - 2016.



IPCC and UNFCCC - Institutional Framework



The UNFCCC - Timeline

UNFCCC – United Nations Framework Convention on Climate Change – International Treaty

- November 1988 - World Meteorological Organization WMO and UN Environment Programme (UNEP) establish the **Intergovernmental Panel on Climate Change - IPCC.**
- June 1992 - Rio Earth Summit – UNFCCC Opens for Signature
U.S. Signed 1992, not ratified
- March 1994 - UNFCCC Treaty Enters into Force – 50th Ratification, Russia, 196 Parties Signed
- December 1997 - Kyoto Protocol Adopted by COP3
- July 2001 –Operational rulebook for the 1997 Kyoto Protocol – minus U.S.
- February 16, 2005 – Ratified - Kyoto Protocol an international treaty – minus U.S.

Key Milestones in the Evolution of International Climate Policy
<https://unfccc.int/timeline/>

The UNFCCC – COP25 Overview

- 2013 - IPCC releases its Fifth Assessment Report (AR5) on impacts, adaptation and vulnerability.
- Reality Check – it's not working.

Reality Check

1.  **Carbon dioxide** concentration is 40% higher than in pre-industrial times.
2.  **Human activity** caused most of the warming between 1951 and 2010.
3.  Earth's surface **warmed 0.85°C** over the period 1880 to 2012.
4.  **Heatwaves and heavy rains** have become more frequent since the 1950s.
5.  Arctic sea **ice has declined** on average 3.8% per decade since 1979.
6.  Global **sea level is expected to rise** between 26 and 82 cm by 2100.
7.  Only an **aggressive mitigation scenario** can keep temperature rise below 2°C.

Key Milestones in the Evolution of International Climate Policy
<https://unfccc.int/timeline/>

The UNFCCC – Paris Agreement

- 2015 - COP21 - Paris Agreement adopted - 195 nations.
*Under the Paris Agreement, each Party shall prepare, communicate and maintain successive Nationally Determined Contributions (NDCs) that it intends to achieve. Parties shall pursue domestic **mitigation** measures, with the aim of achieving the objectives of such contributions.*
- April 2016, the United States became a signatory to the Paris Agreement
- Accepted it by executive order in September 2016, start date November 4, 2016.
- President Obama committed the United States to contributing US\$3 billion to the Green Climate Fund.
- June 1, 2017 U.S. Announced intent to withdraw – formal notice effective **Nov 4, 2020.**

Key Milestones in the Evolution of International Climate Policy
<https://unfccc.int/timeline/>

The UNFCCC – IPCC

Intergovernmental Panel on Climate Change

- The Intergovernmental Panel on Climate Change (IPCC) is the United Nations body for assessing the science related to climate change.
- 195 Member Countries - The IPCC does not conduct its own research.
- IPCC reports are neutral, policy-relevant but not policy-prescriptive.
- The IPCC prepares comprehensive reports:
 - Assessment Reports (AR6) on climate change, its causes, potential impacts and response options
 - Special Reports, which are an assessment on a specific issue
 - Methodology Reports, which provide practical guidelines for the preparation of greenhouse gas inventories.

<https://www.ipcc.ch/>

The Good, the Bad, and The Ugly

IPCC - SPECIAL REPORT

Global Warming of 1.5 °C

An IPCC special report on the impacts of global warming of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, Sustainable Development, and efforts to Eradicate Poverty.

<https://www.ipcc.ch/sr15/>

Summary for Policymakers

<https://www.ipcc.ch/sr15/chapter/spm/>

The UNFCCC – Mitigation and Adaptation

- **‘Peak’** – When will global or country reach peak CO2 emissions?
- **‘Enclave’** – slang – A country or city that refuses to help.

Mitigation - A human intervention to reduce the sources or enhance the **Sinks** of greenhouse gases. Examples include:

- Using fossil fuels more efficiently for industrial processes or electricity generation,
- Switching to solar energy or wind power or other renewable energy,
- Improving the insulation of buildings.
- **Sink** - A process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere. Forests and other vegetation are considered sinks because they remove carbon dioxide through photosynthesis.

<https://unfccc.int/topics/mitigation/the-big-picture/introduction-to-mitigation>

<https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean>

The UNFCCC – Mitigation and Adaptation

Adaptation - Adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities.

AKA Resilience. Examples Include:

- Building flood defenses,
- Setting up early warning systems for cyclones,
- Switching to drought-resistant crops,
- Redesigning communication systems, business operations and government policies.

<https://unfccc.int/topics/mitigation/the-big-picture/introduction-to-mitigation>

<https://unfccc.int/topics/adaptation-and-resilience/the-big-picture/what-do-adaptation-to-climate-change-and-climate-resilience-mean>

UNFCCC – NETs

Negative Emission Technologies

Negative Emission Technologies (NETs) – Carbon Dioxide Removal strategies (CDRs) is usually under Adaptation, and typically not recognized under Nationally Determined Contributions (NDCs) – i.e.

- Afforestation and reforestation *
- Land management *
- Bioenergy with carbon capture and storage (BECCS)
- Enhanced weathering **
- Direct air capture and carbon storage (DACCS)
- Ocean fertilization
- Carbon Capture Utilization and storage (CCUS)

*** Sometimes accepted under Mitigation**

**** Pulverized silicate rocks spread across terrestrial landscapes**

UNFCCC – NETs

Negative Emission Technologies

Negative Emission Technologies

What role in meeting Paris Agreement targets?

European Academies' Science Advisory Council (EASAC)

- NETs have “limited realistic potential” to halt increases in the concentration of greenhouse gases in the atmosphere at the scale envisioned in the IPCC scenarios.
- None of the NETs has the potential to deliver carbon removals at the gigaton (Gt) scale and at the rate of deployment envisaged by the IPCC.

<https://easac.eu/publications/details/easac-net/>

The UN – 2012 Rio+20

17 Sustainable Development Goals - SDGs

UN – 2000 - 2015 Eight Millennium Development Goals – MDGs

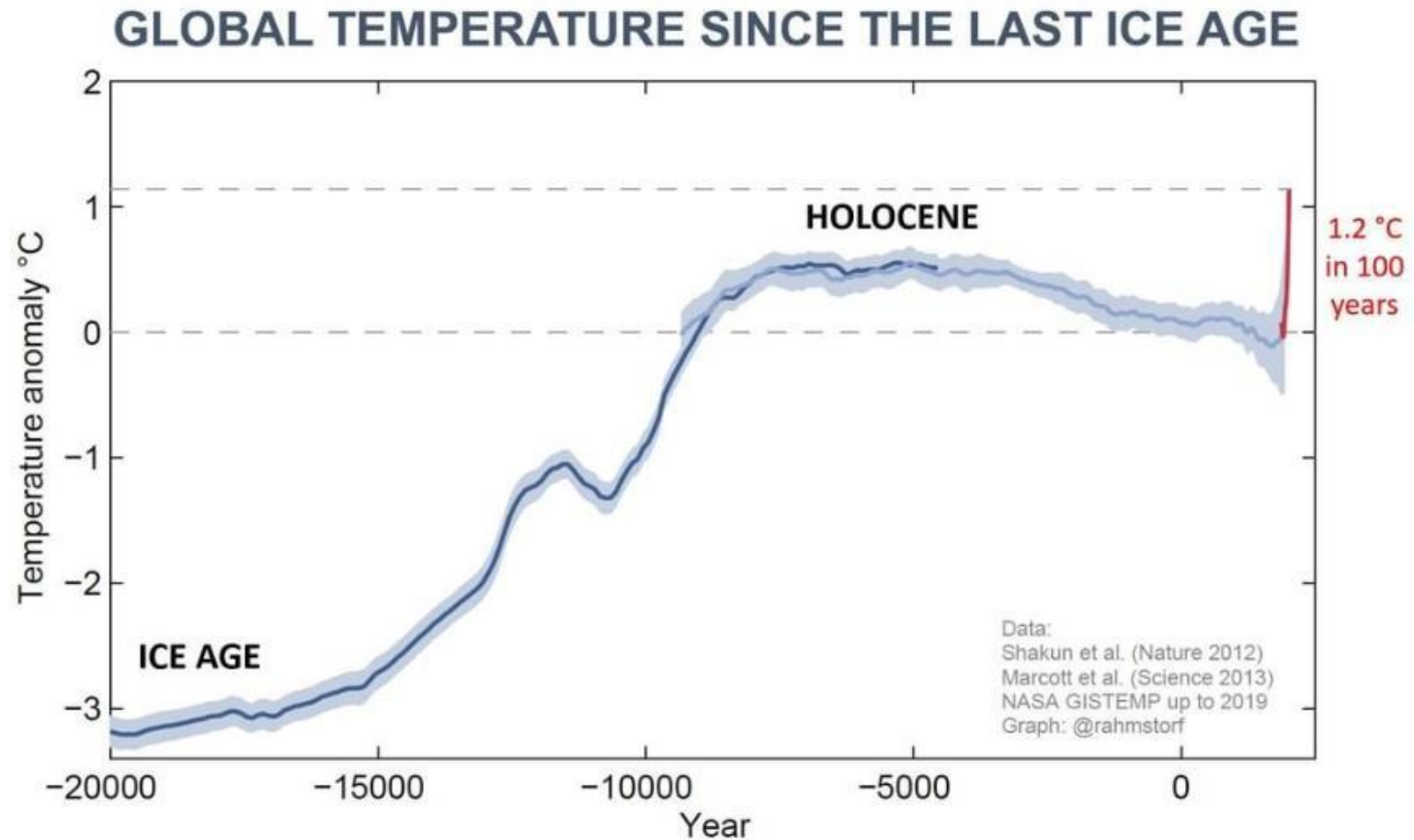
2016 - 17 SDGs and 169 targets to wipe out poverty, fight inequality and tackle climate change over the next 15 years.



Sustainable Development Goals kick off with start of new year January 2016

<https://www.un.org/sustainabledevelopment/blog/2015/12/sustainable-development-goals-kick-off-with-start-of-new-year/>

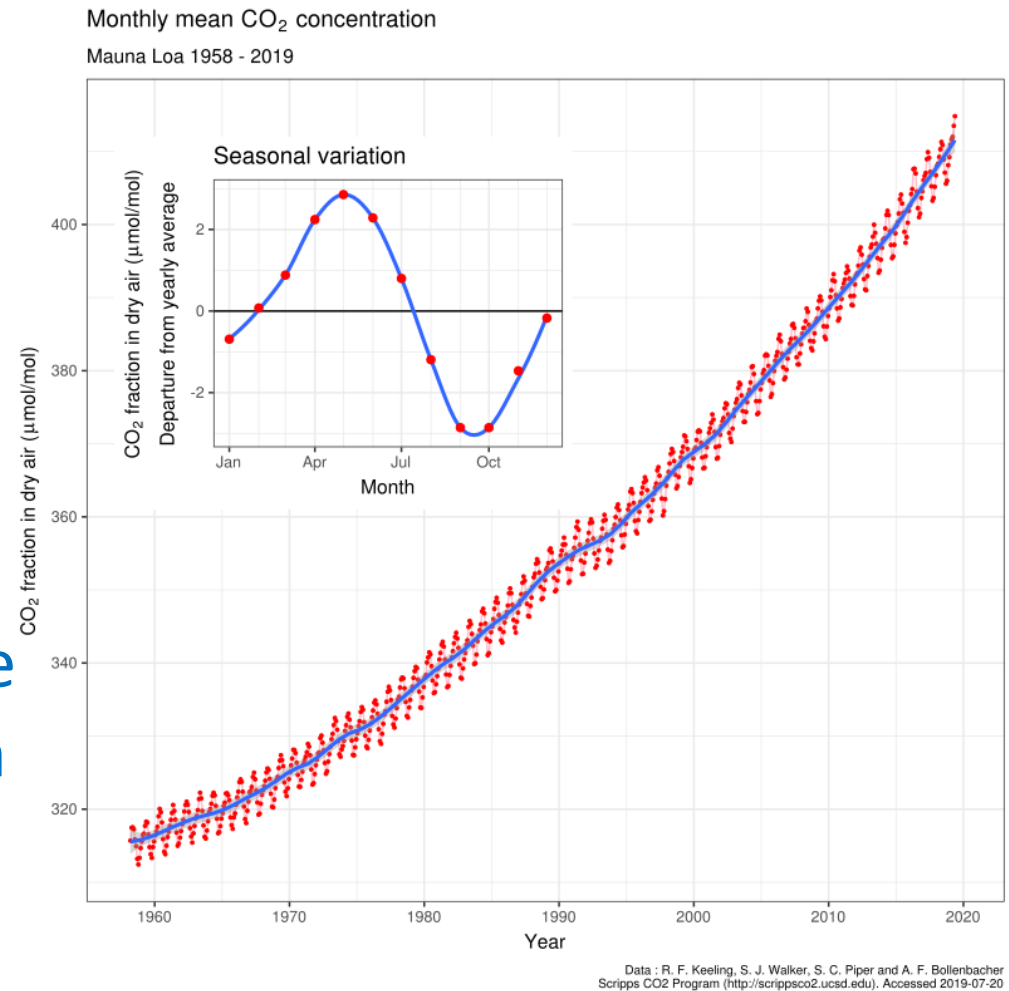
The Bad - Global Temperature Since Ice Age



Stefan Rahmstorf - Climate scientist. Professor of Physics of the Oceans at Potsdam University. Head of Earth System Analysis at PIK.

The Bad – The ‘Keeling Curve’

The ‘Keeling Curve’ is a graph of the accumulation of carbon dioxide in the Earth's atmosphere based on continuous measurements of atmospheric CO₂ concentrations taken at the Mauna Loa Observatory on the island of Hawaii from 1958 to the present day.



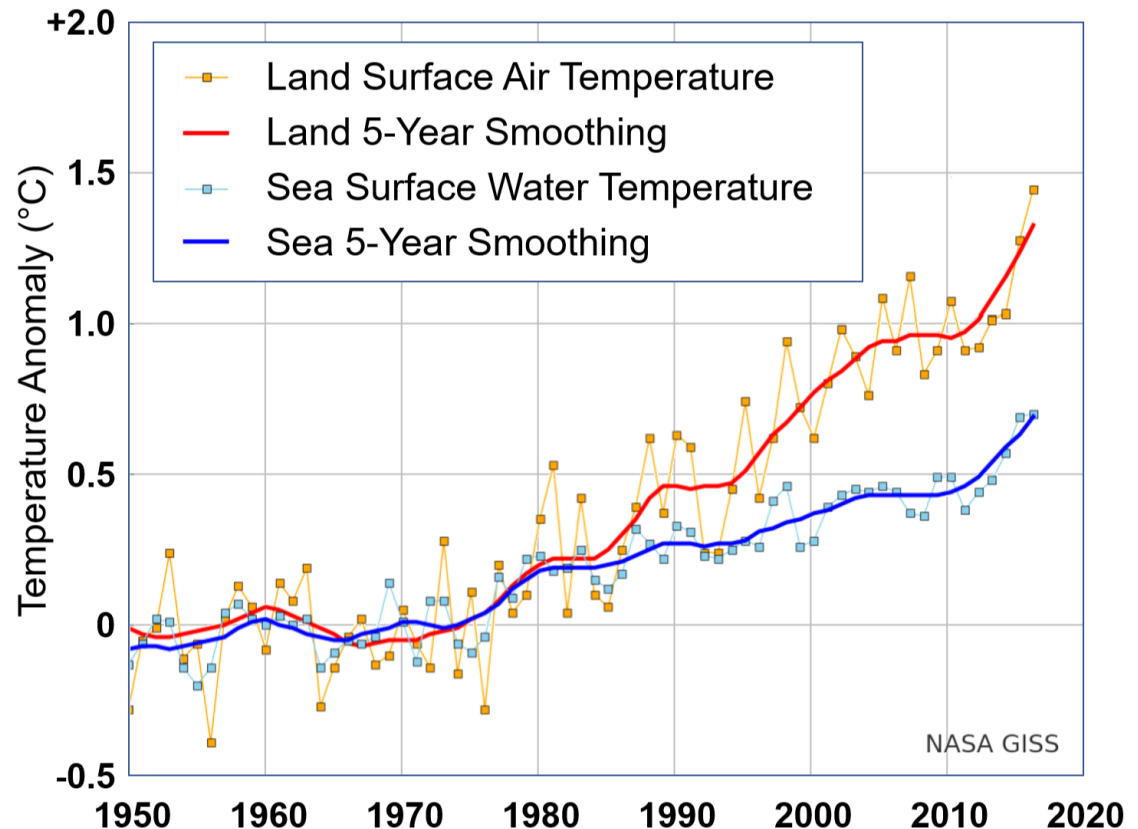
Data from Dr. Pieter Tans, NOAA/ESRL and Dr. Ralph Keeling, Scripps Institution of Oceanography

The Bad - Land Ocean Temperatures

CO₂ is released into the atmosphere from the burning of fossil fuels:

- 50% remains in the atmosphere,
- 25% is absorbed by land plants and trees,
- 25% is absorbed into areas of the ocean.

Annual Mean Temperature Change for Land and for Ocean



NASA Goddard Institute for Space Studies - 14 November 2019

<http://data.giss.nasa.gov/gistemp/graphs/>

<https://sos.noaa.gov/datasets/ocean-atmosphere-co2-exchange/>

The Ugly



The Ugly



The Ugly



The Ugly – Australia – The Good?



**Now
15+
Million
Acres**



“Australia today is ground zero for the climate catastrophe. Its glorious Great Barrier Reef is dying, its world-heritage rain forests are burning, its giant kelp forests have largely vanished, numerous towns have run out of water or are about to, and now the vast continent is burning on a scale never before seen.”

Thousands of homes destroyed, A billion native animals have been killed.

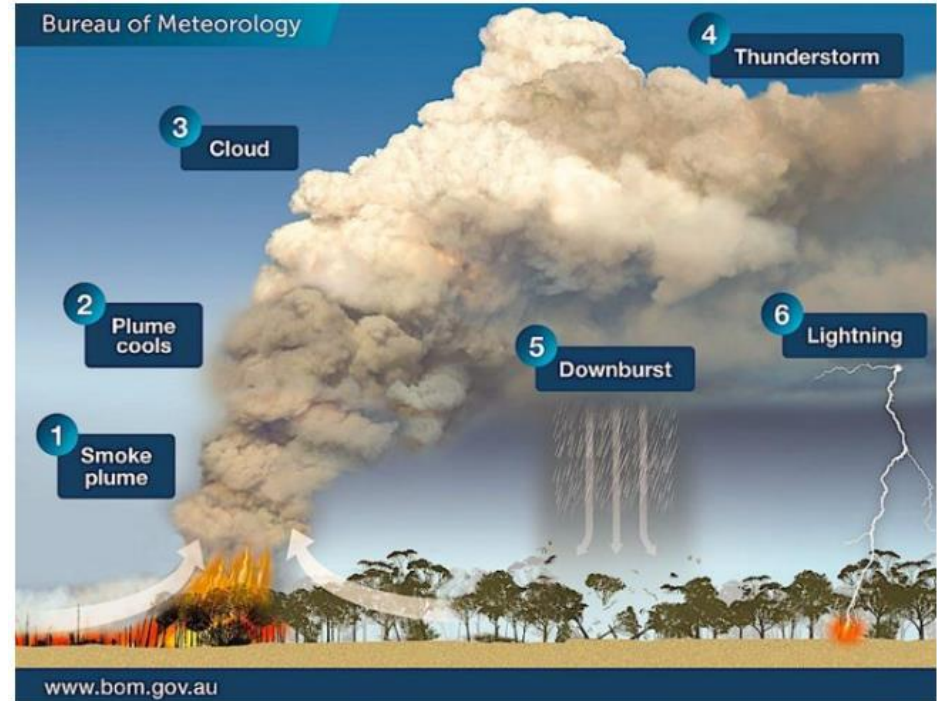
The Ugly - Australia



Fox and Franz Josef glaciers in New Zealand

The bushfires in Australia are generating their own weather — 'pyrocumulonimbus' thunderstorms that can start more fires.

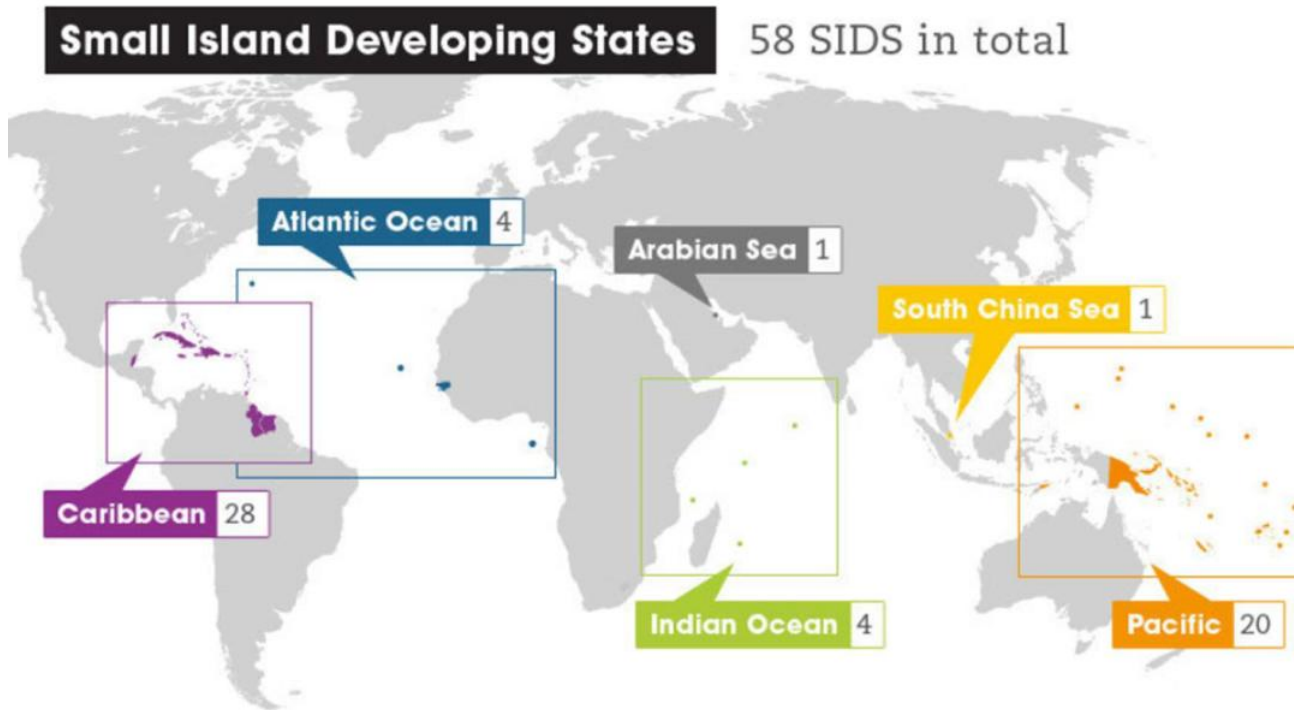
New Zealand glaciers turn brown and will melt faster because of Australia's bushfires Gianluca Mezzofiore, CNN Updated 9:33 AM ET, Jan 2, 2020



<https://news.yahoo.com/bushfires-australia-big-theyre-generating-134733341.html?guccounter=1>

The Ugly – SIDS

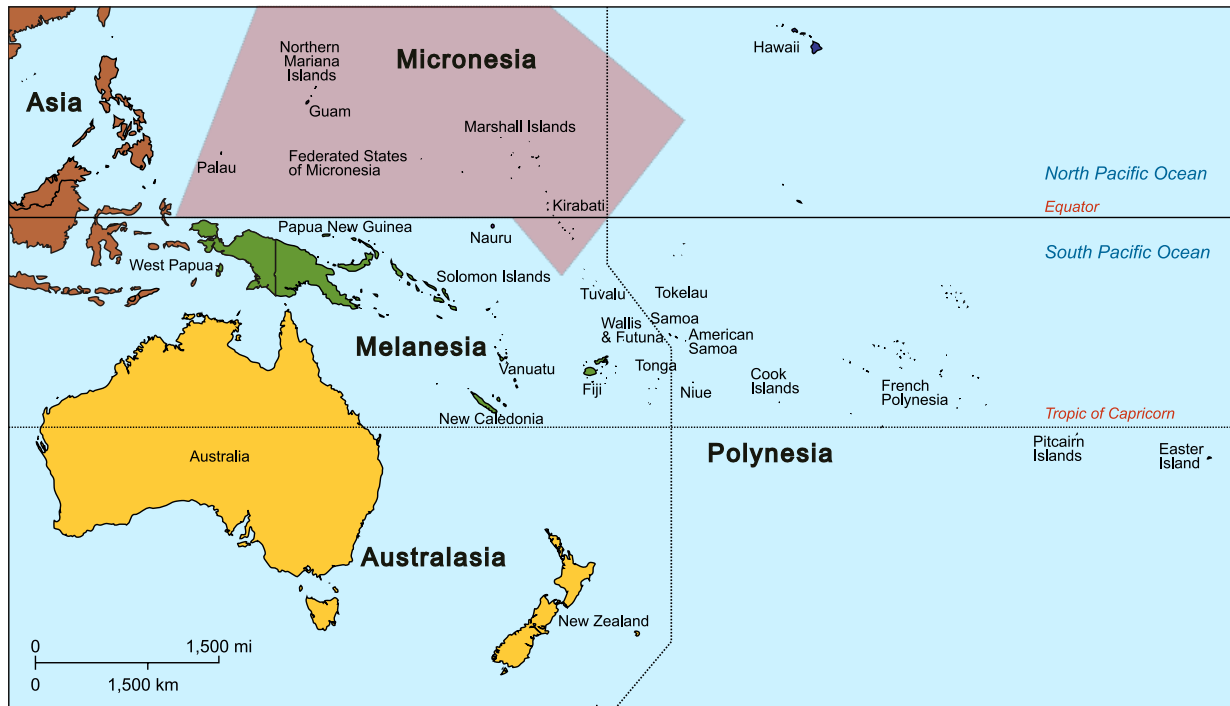
Small Island Developing States



No other group of nations is more vulnerable to the devastating effects of Climate Change than the **Small Island Developing States (SIDS)**.
Among the islands most susceptible to sea level rise are those of Tonga, Micronesia and the Marshall Islands

The Ugly – SIDS

Small Island Developing States



Among the islands most susceptible to sea level rise are those of Tonga, Micronesia and the Marshall Islands.

“Islands that are of sandy/coral origin, that have low elevations, that are small in size and those that are thin and long are the most susceptible to climate change. There other factors, such as where they are located – tropical cyclone paths, significant wave heights, etc. – that will also impact the susceptibility.”

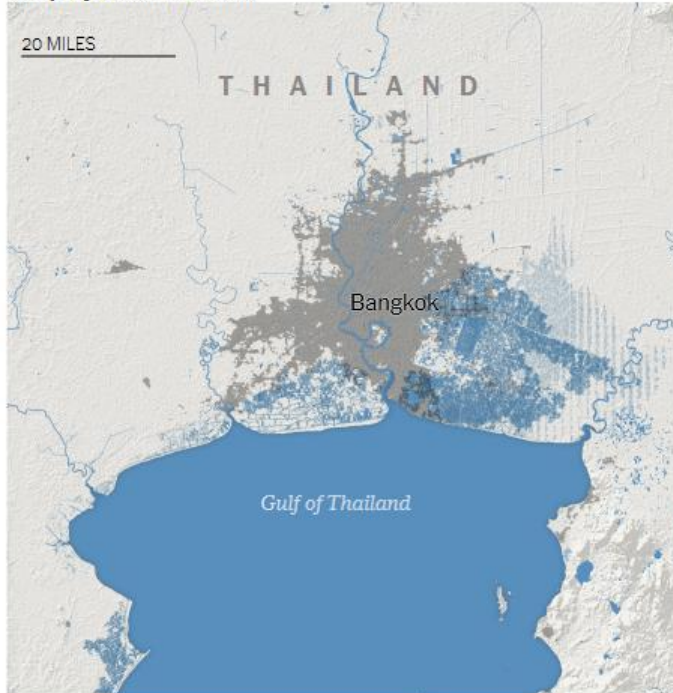
The Ugly – Rising Seas

Rising Seas Will Erase More Cities by 2050

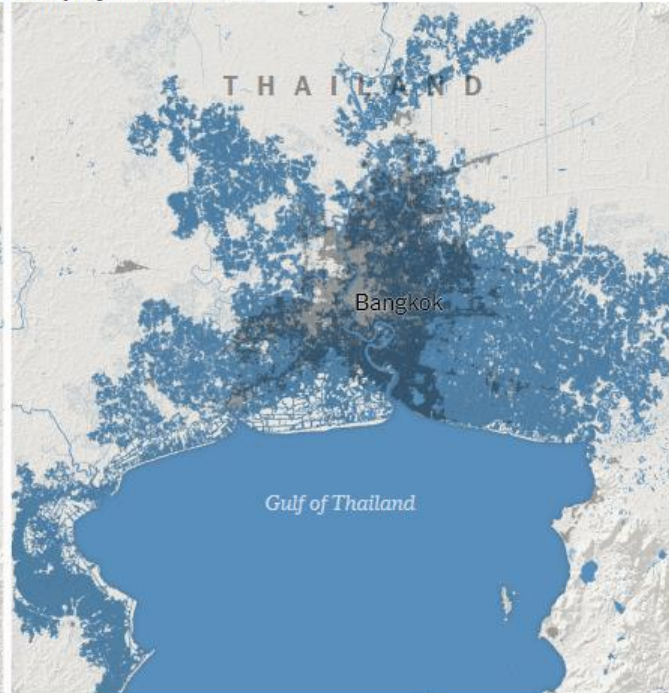
Rising seas could affect three times more people by 2050 than previously thought, threatening to all but erase some of the world's great coastal cities. Bangkok, Thailand:

■ Land underwater at high tide ■ Populated area

Old projection for 2050



New projection for 2050

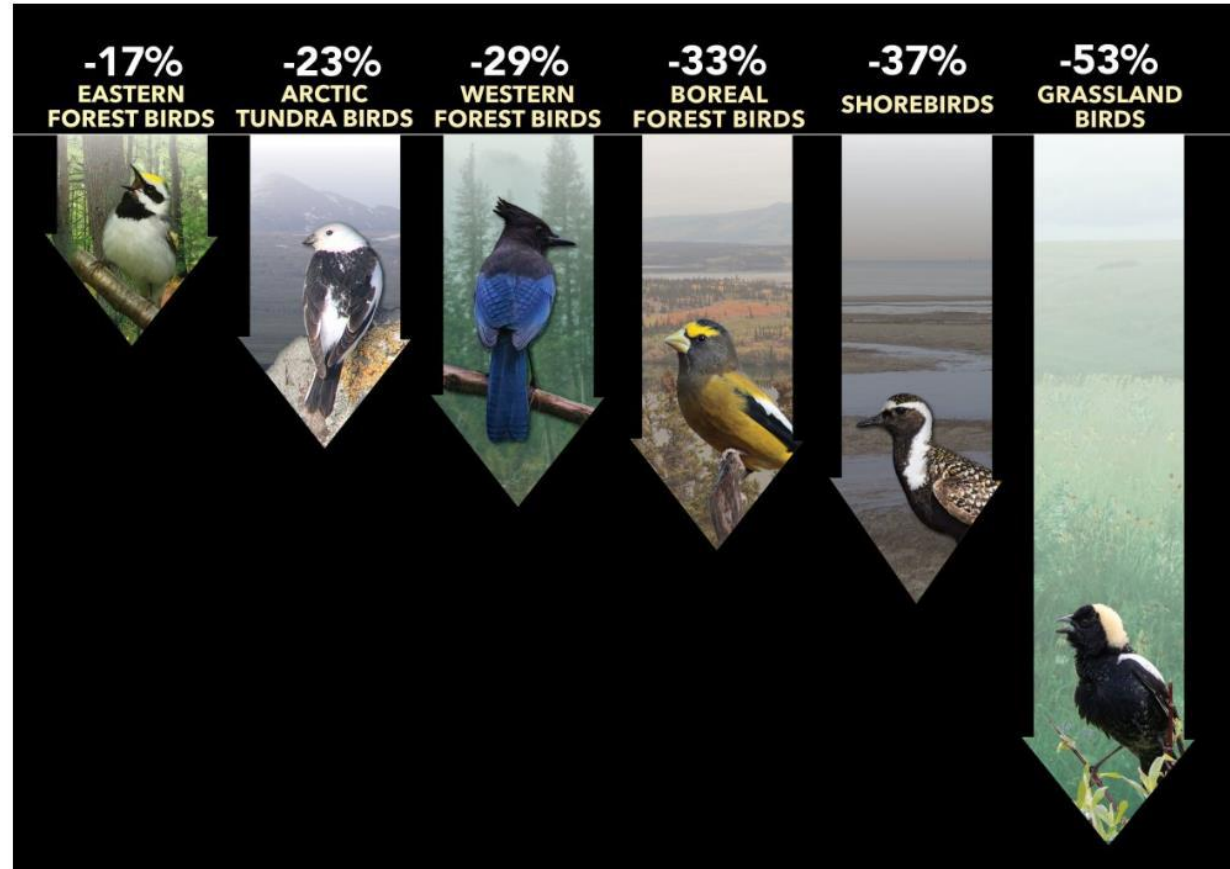


Produced by Climate Central, New Jersey, published in the journal Nature Communications. The projections don't account for future population growth or land lost to coastal erosion.

<https://www.nytimes.com/interactive/2019/10/29/climate/coastal-cities-underwater.html?searchResultPosition=3> By Denise Lu and Christopher Flavelle Oct. 29, 2019

The Ugly – Birds

2.9 Billion Birds
Gone since 1970 –
A Cornell – Rocky
Mountain Bird
Conservancy.
If you were alive in
1970, 29% of
breeding birds in
the U.S. and Canada
have disappeared
within your lifetime.



<https://www.birds.cornell.edu/home/bring-birds-back/>

The Ugly – 9 Tipping Points

Nine active tipping points:

AMOC - Atlantic Meridional Overturning Circulation

West Antarctic Ice Sheet

Parts of East Antarctica

Arctic sea ice

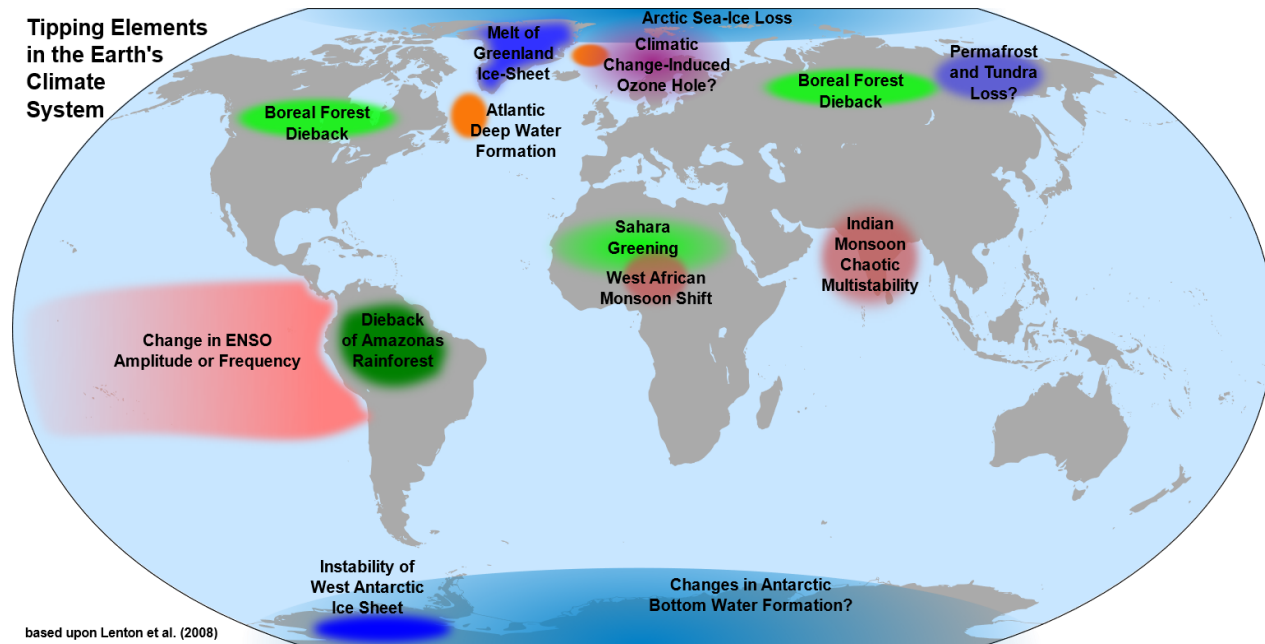
Greenland ice sheet

Boreal forests

Permafrost

Amazon rainforest

Warm-water corals

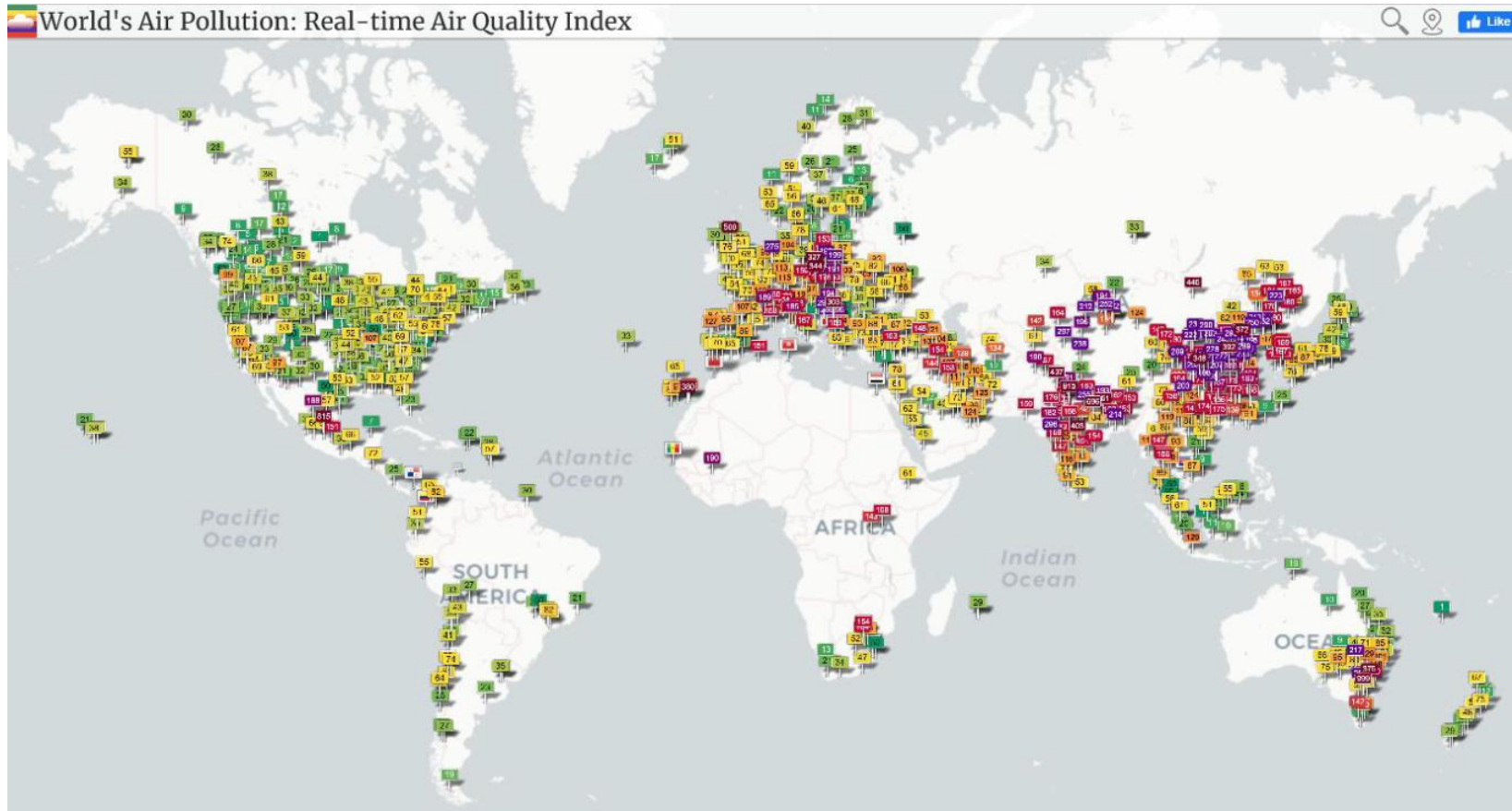


University of Exeter. "Nine climate tipping points now 'active,' warn scientists."

ScienceDaily. ScienceDaily, 27 November 2019.

www.sciencedaily.com/releases/2019/11/191127161418.htm

The Ugly – Air Quality Index



Air Quality Index (AQI) Calculation - based on measurement of particulate matter (PM2.5 and PM10), Ozone (O3), Nitrogen Dioxide (NO2), Sulfur Dioxide (SO2) and Carbon Monoxide (CO) emissions. January 2, 2020 14:40 RMT

<https://waqi.info/#/c/6.407/9.819/2.4z> <https://aqicn.org/map/world/>

Greenhouse Gas Protocol (GHGP)

2011 - World Resources Institute (WRI)
World Business Council for Sustainable
Development (WBCSD).

GHGP - provides accounting and reporting standards, sector guidance, calculation tools, and trainings for business and government.

ISO (International Organization for Standardization),
WRI and WBCSD

MoU jointly promote the ISO 14064

Scopes 1, 2, 3

Greenhouse Gas Protocol (GHGP)

GHGP – Scopes 1, 2, 3

Scope 1: Direct GHG emissions

- All direct GHG emissions by a company. It includes fuel combustion, company vehicles and fugitive emissions.

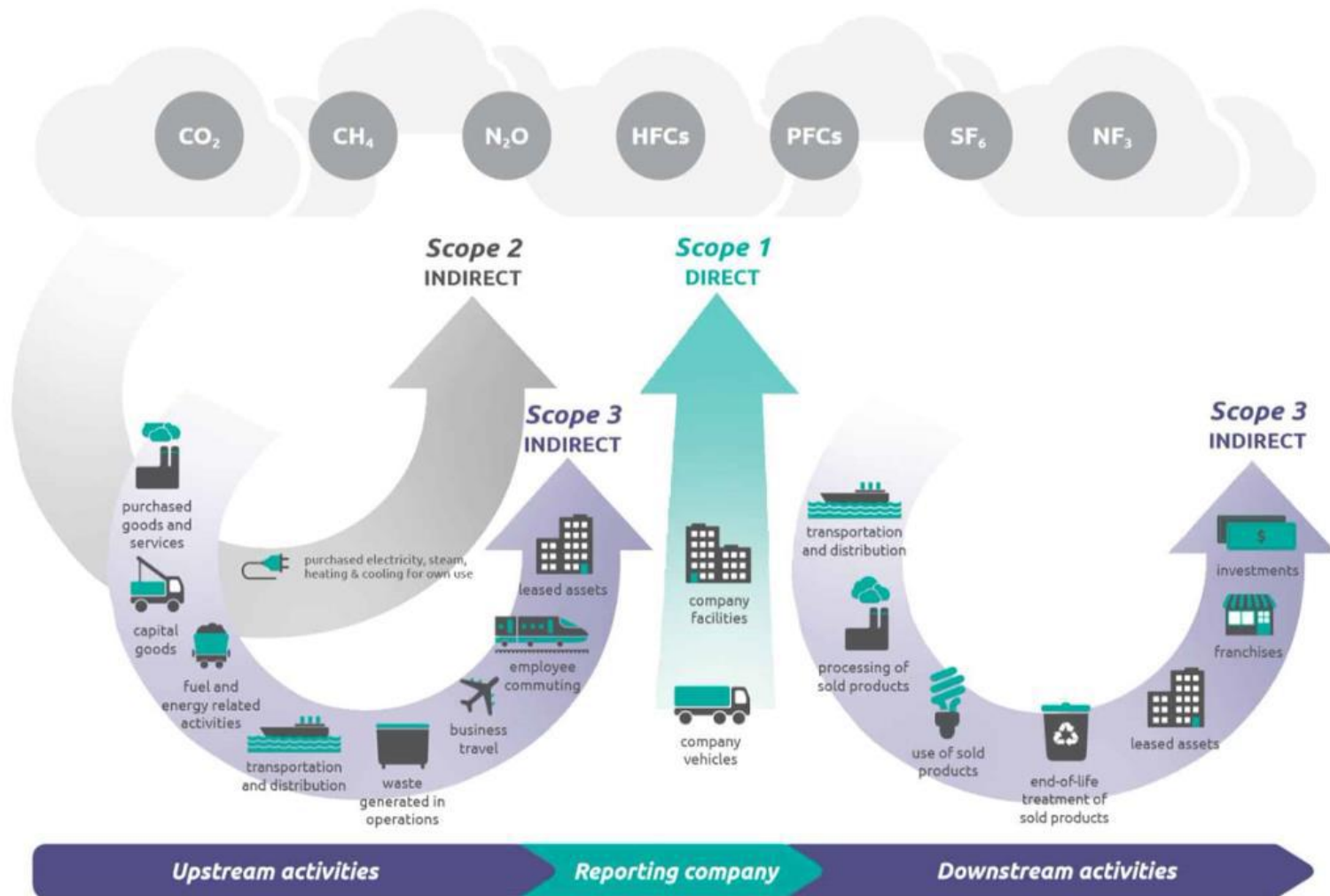
Scope 2: Electricity indirect GHG emissions

- Indirect GHG emissions from consumption of purchased electricity, heat or steam.

Scope 3: All Other Indirect Emissions

- Occurring from sources that they do not own or control. These are usually the greatest share of the carbon footprint, covering emissions associated with business travel, procurement, waste and water.

Greenhouse Gas Protocol (GHGP)



Source: GHG Protocol

The Good The Bad The Ugly

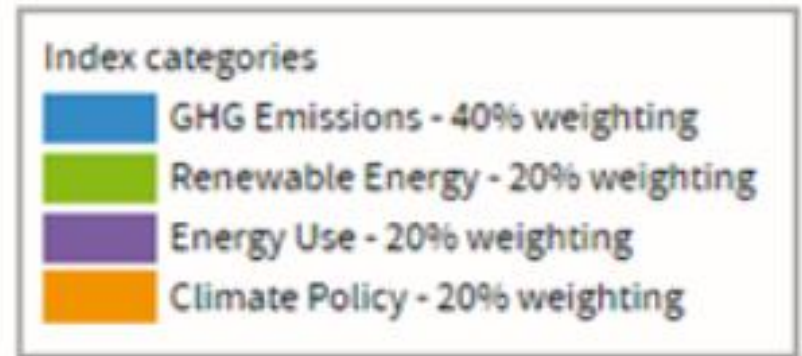
CCPI – Climate Change Performance Index

The top 3 in this year's CCPI ranking:

- Sweden (4)
- Denmark (5)
- Morocco (6)

Bottom five are:

- Islamic Republic of Iran (57),
- Republic of Korea (South) (58),
- Chinese Taipei (Taiwan) (59),
- Saudi Arabia (60)
- United States (61), rated low or very low across almost all categories.

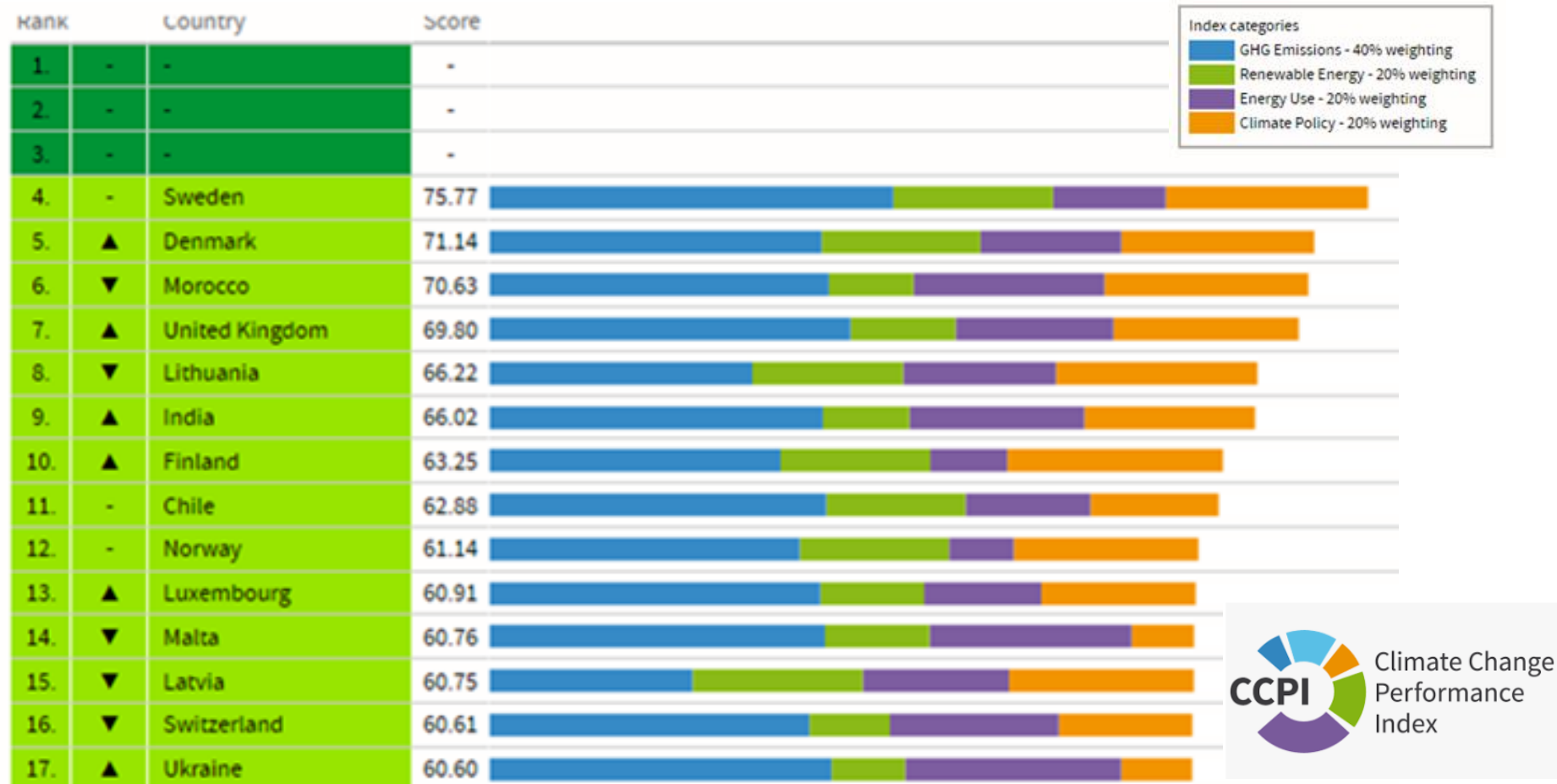


Published annually since 2005 by Germanwatch, the NewClimate Institute and the Climate Action Network <https://www.climate-change-performance-index.org/>

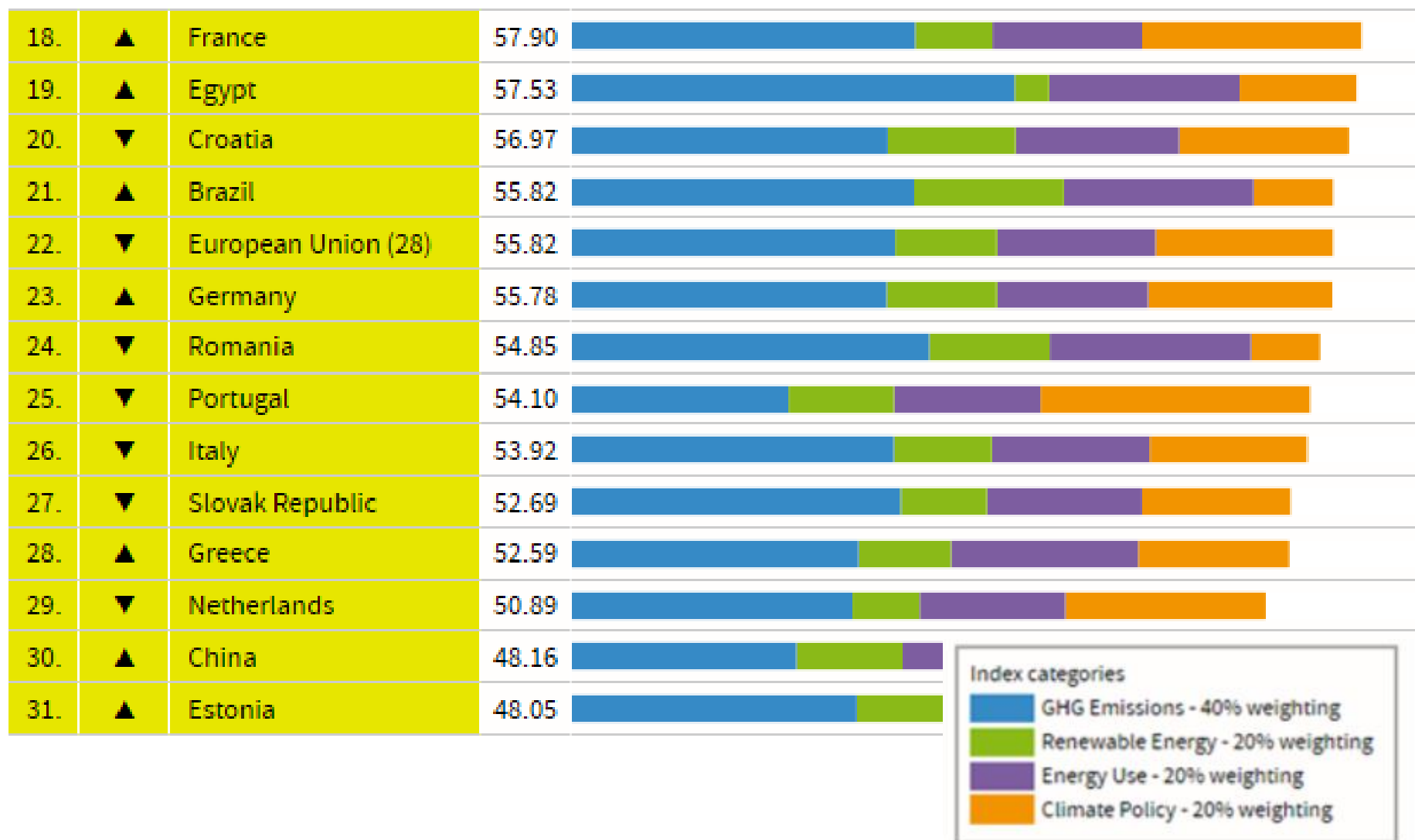
The Good The Bad The Ugly

CCPI – Climate Change Performance Index

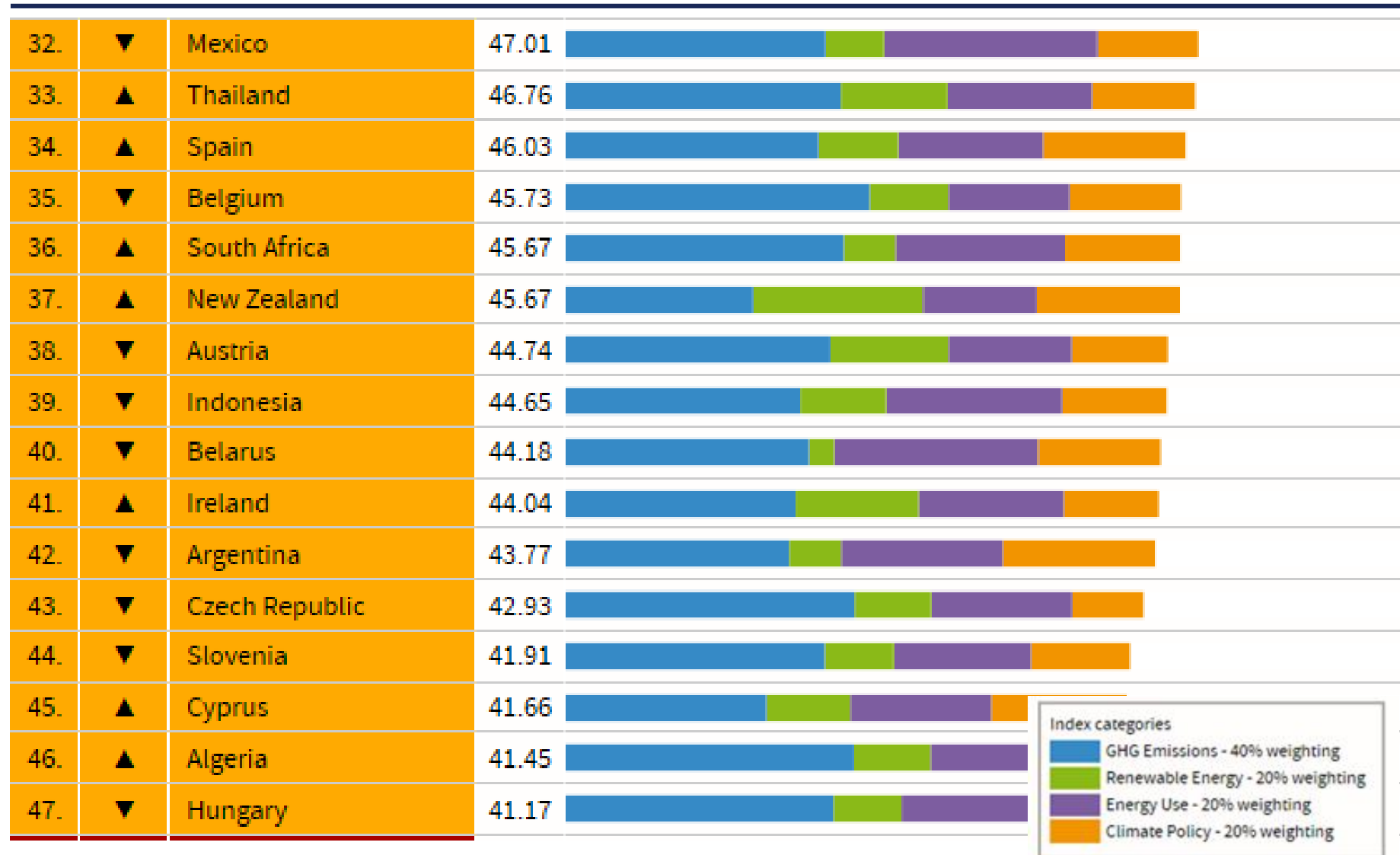
The ranking is an aggregated performance in 14 indicators within four categories: GHG Emissions - Renewable Energy - Energy Use - Climate Policy



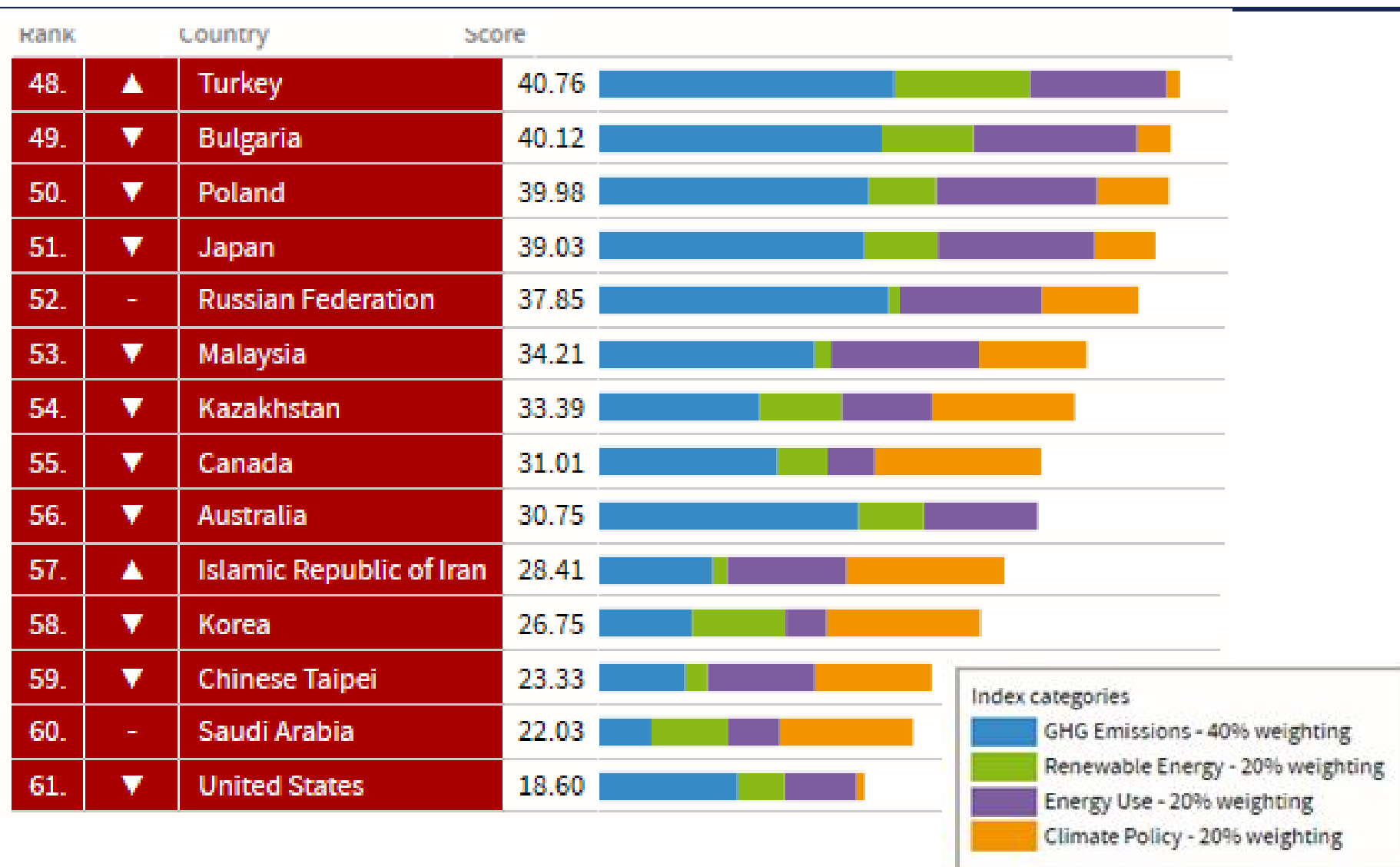
CCPI - The Bad



CCPI - The Bad



CCPI - The Ugly

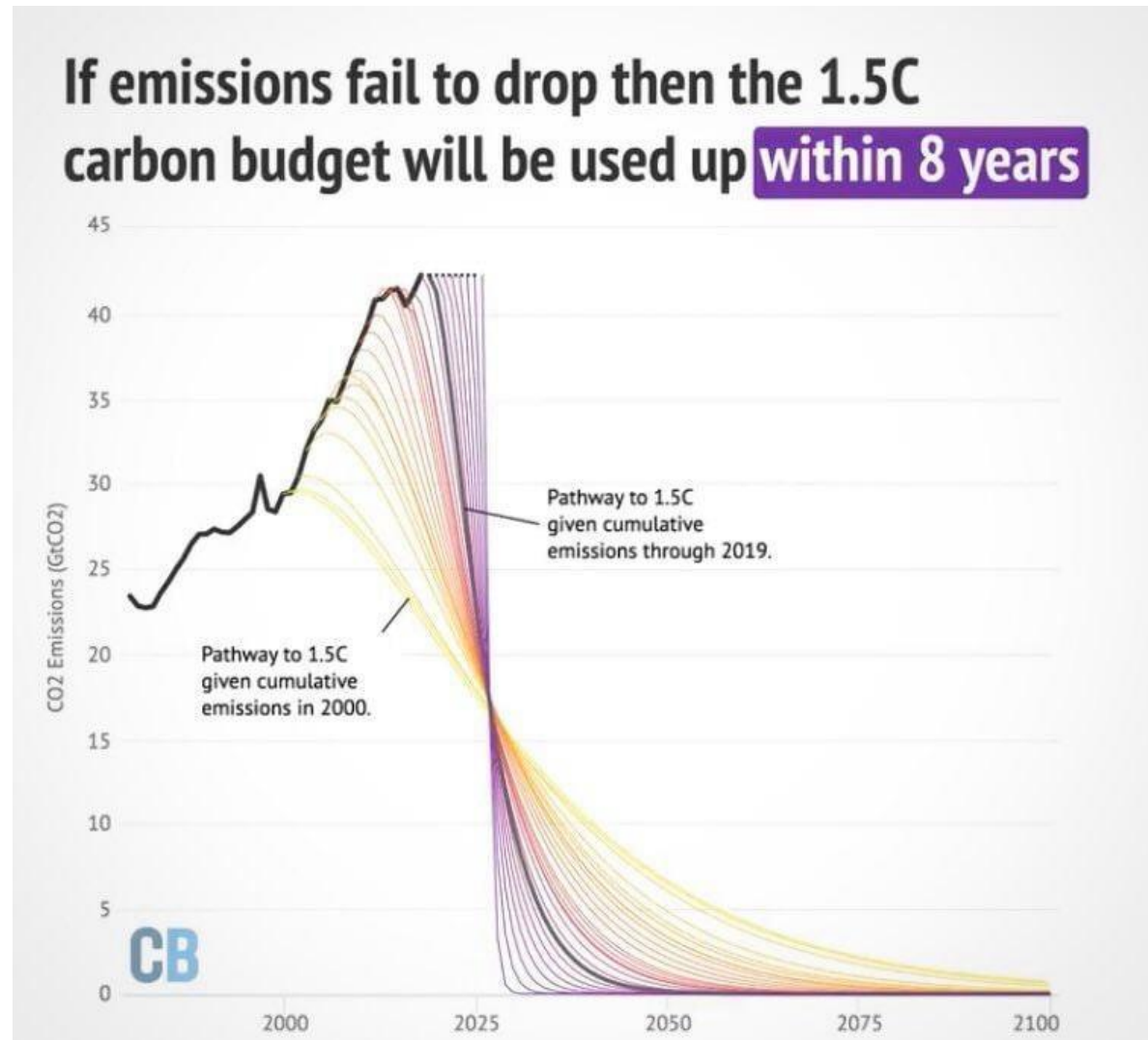


Global Carbon Budget

FOR A 67% CHANCE OF STAYING BELOW 1,5° C OF AVERAGE TEMP RISE.

DOES NOT INCLUDE:

- GLOBAL ASPECT OF EQUITY
- MOST FEEDBACK LOOPS,
- NON-LINEAR TIPPING POINTS
- ADDITIONAL WARMING HIDDEN BY AIR POLLUTION

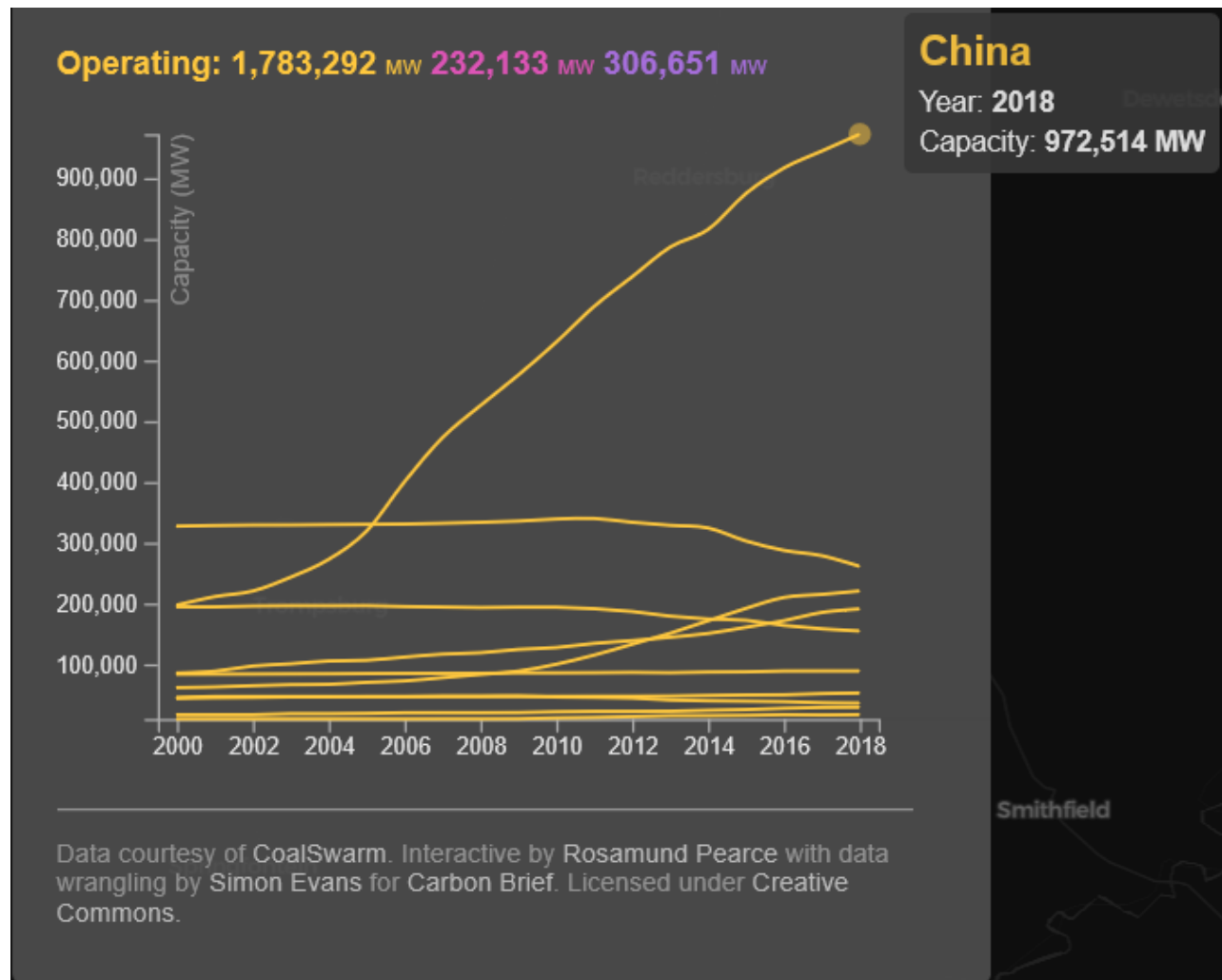


The Top Five Global Coal **Producing** Countries

- China - 3,474mt (metric tonnes) rising 2.9%, peak of 3,749mt in 2013 - projected peak in 2023.
- India - 764mt, a rise of 5.3%
- U.S. - 684mt, 2019 610mt, 2020 540mt
 - *2019 - 25% coal power, 2020 - 22% coal power*
- Australia – 500mt – steady
- Indonesia – 474mt – steady (10mt in 1990)

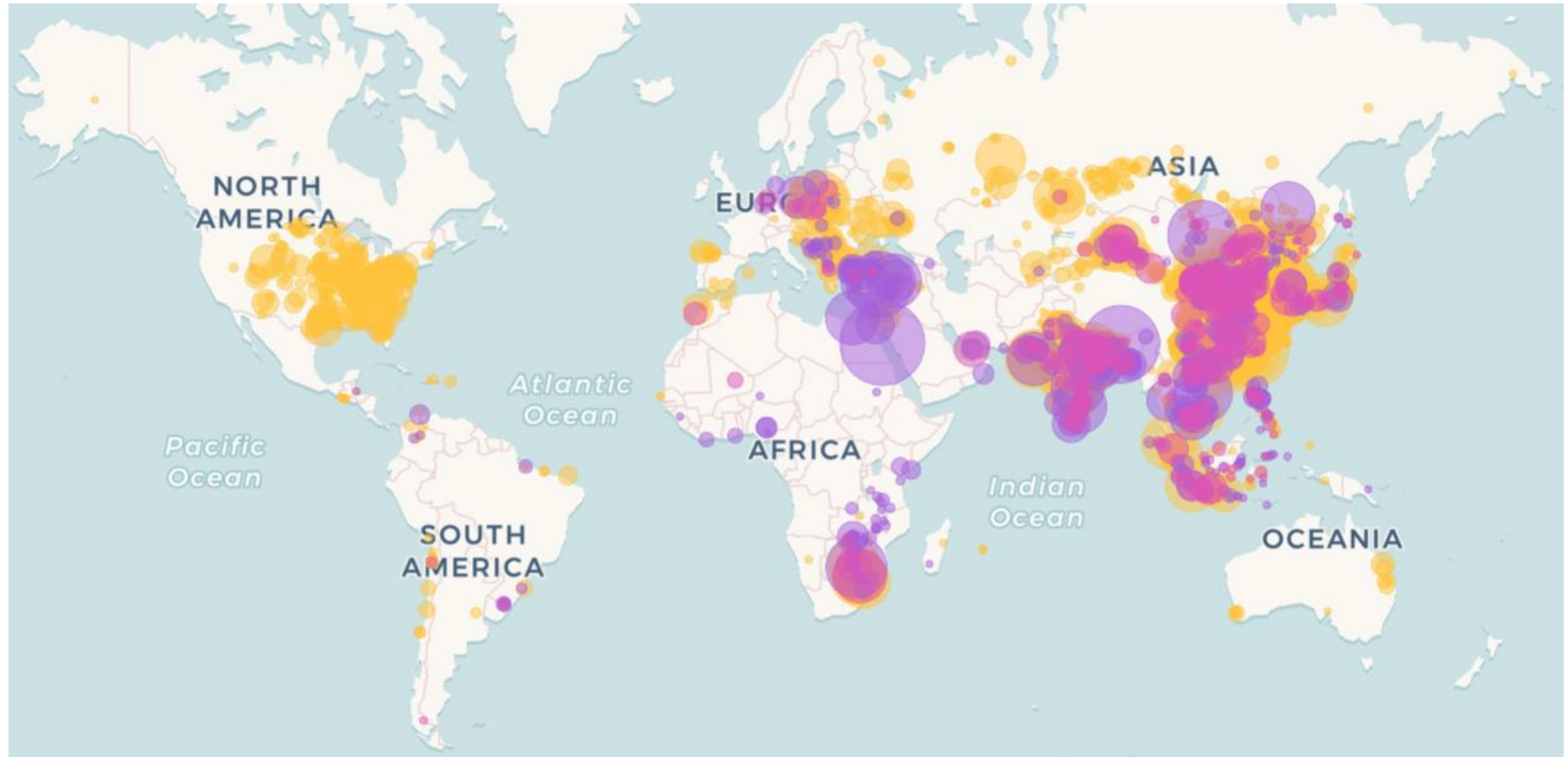
<https://www.power-technology.com/features/top-five-coal-producing-countries-world/>

Global Coal Power



<https://www.carbonbrief.org/mapped-worlds-coal-power-plants>

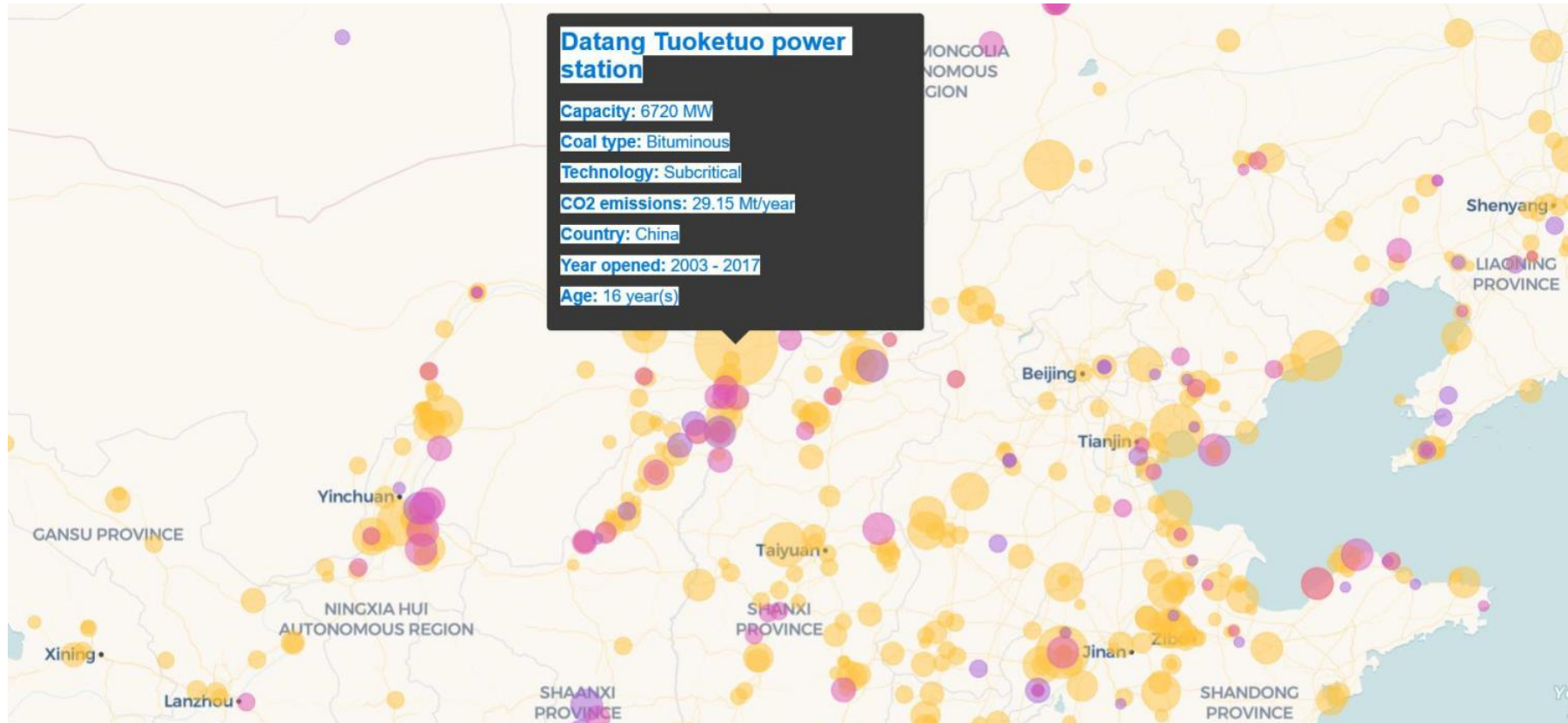
Global Coal Power - 2,024,100 MW



Future – Operating 1,783,292MW
Planned 232,133MW – 306,651MW

● Closing ● Operating ● New ● Under construction
● Planned

China Coal Power



<https://www.carbonbrief.org/mapped-worlds-coal-power-plants>

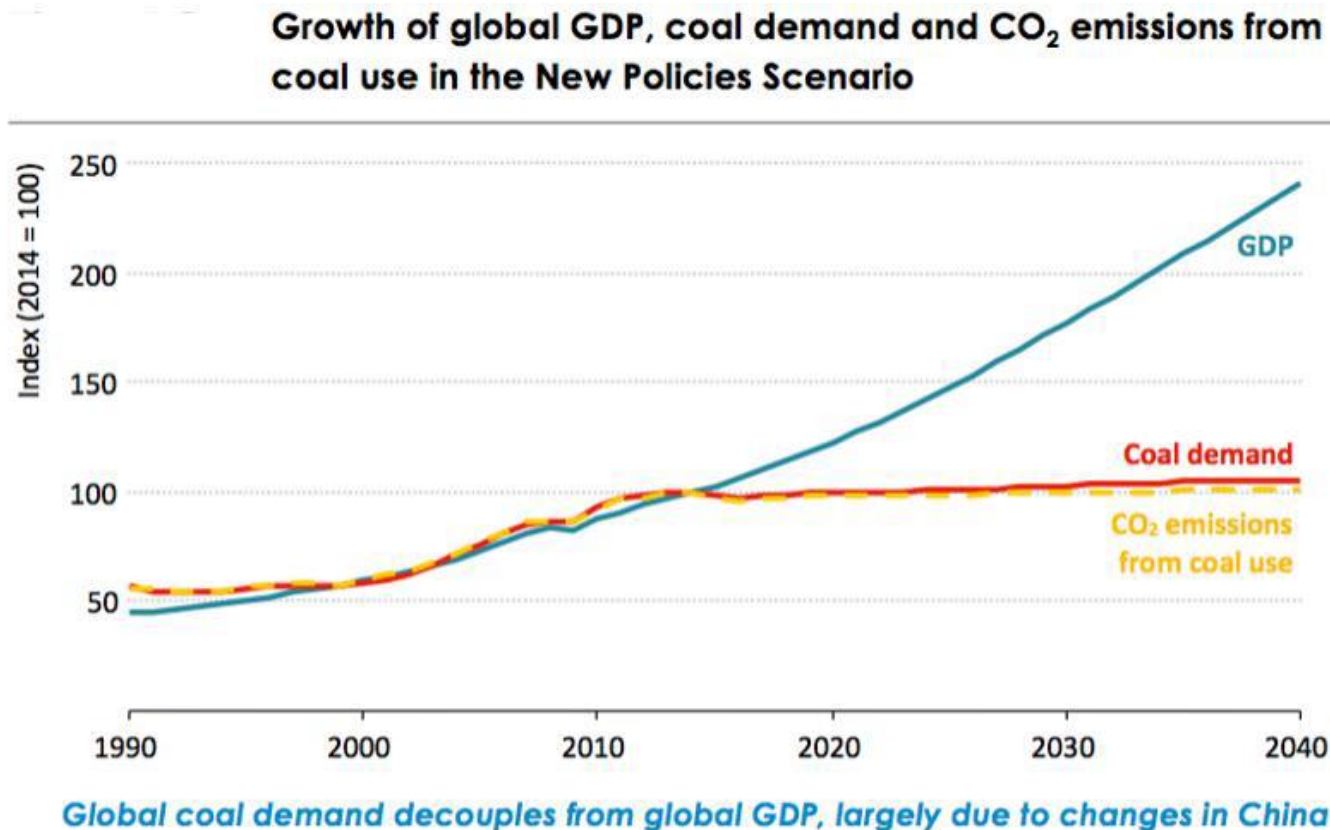
Global Population

It may not come as a surprise, but more people live inside the circle than outside of it.



49 LDCs – Least Developed Countries - 10 in Asia, 33 Africa, 1 Caribbean, 5 Pacific

Global Coal Power



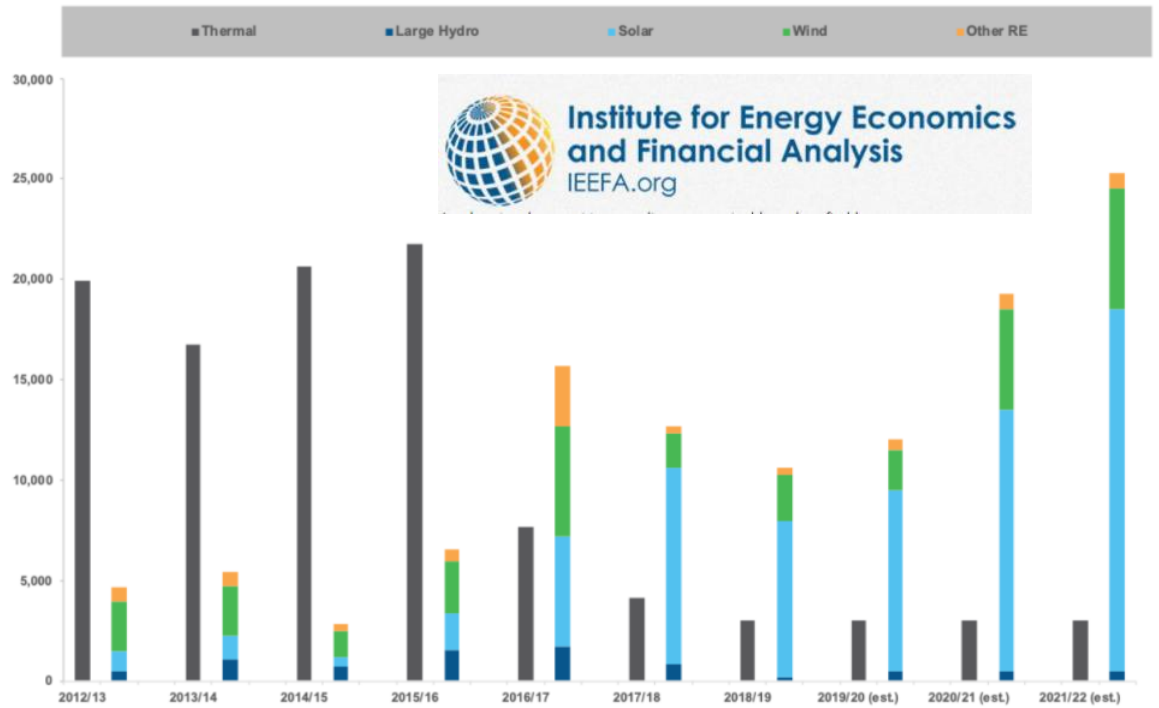
Economic – Energy Nexus

International Energy Agency (IEA) has dramatically scaled back its outlook for coal demand growth over the next 25 years

The Good

IEEFA - India gets out of coal and into renewables

India Thermal and Renewable Power Capacity Additions (MW)

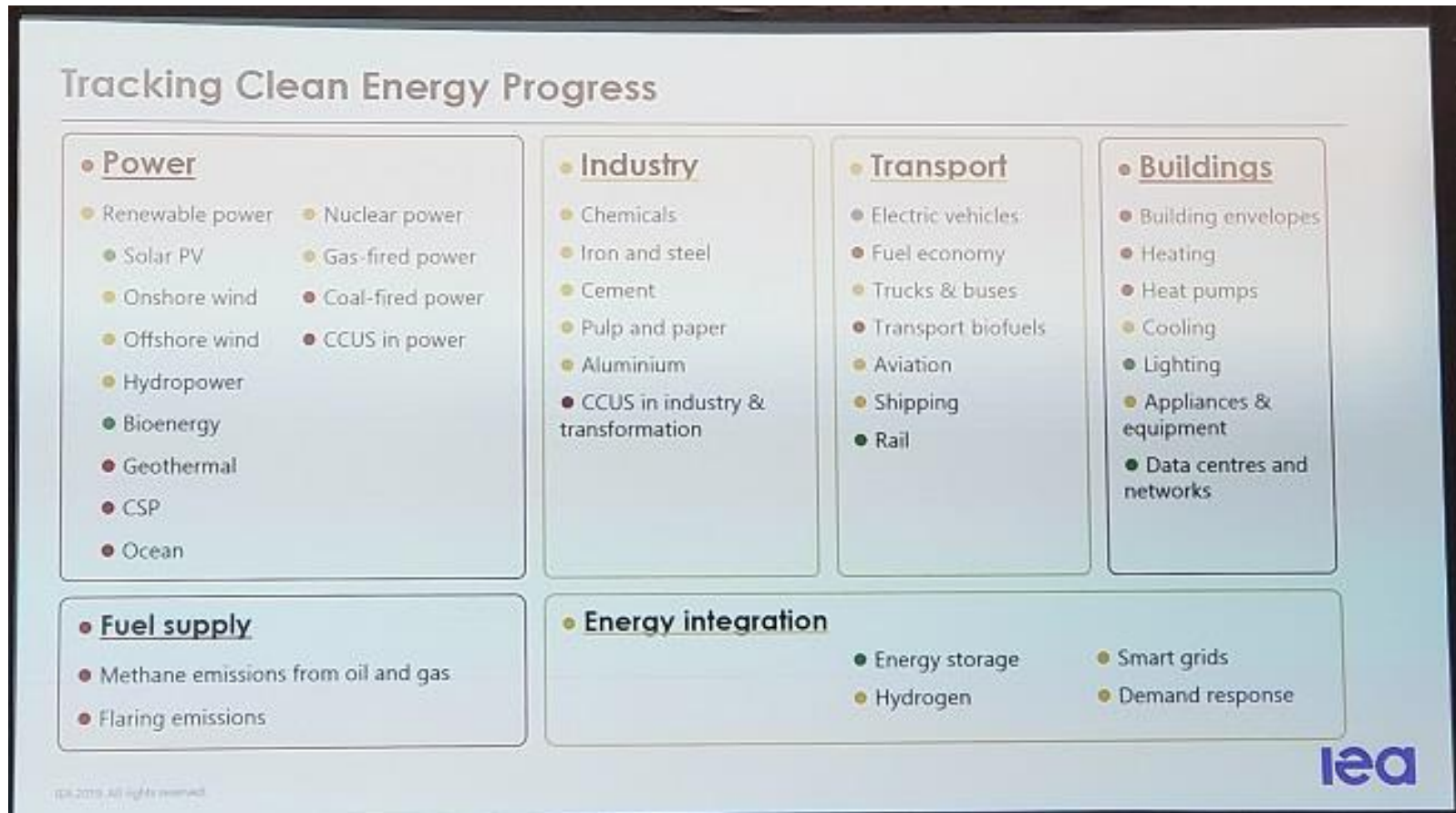


\$40 billion of new investment, a doubling of renewable energy capacity in three years, to 83 gigawatts by September 2019, with another 45 gigawatts of large scale hydro-electricity. Solar USD 3 Cents per kilowatt-hour.

India's initial target of 175 gigawatts of renewable energy capacity by 2022 was expanded to a target of 275 gigawatts by 2027. In September 2019, Prime Minister Modi proclaimed a new target of 450 gigawatts by 2030, or another \$500 billion of investment in the coming decade.

<https://ieefa.org/india-gets-out-of-coal-and-into-renewables/>

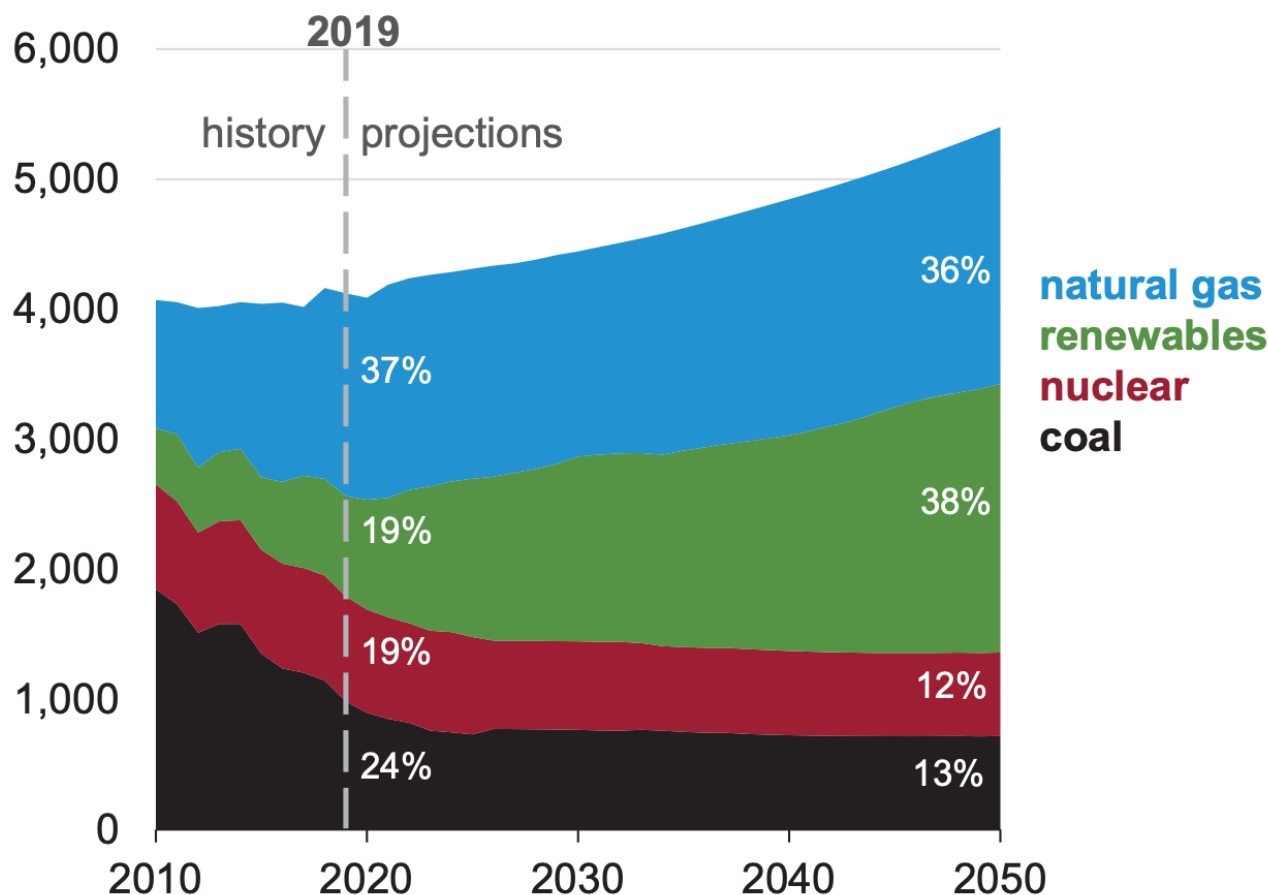
The Bad – The Four Major Economic Sector CO2 Emitters



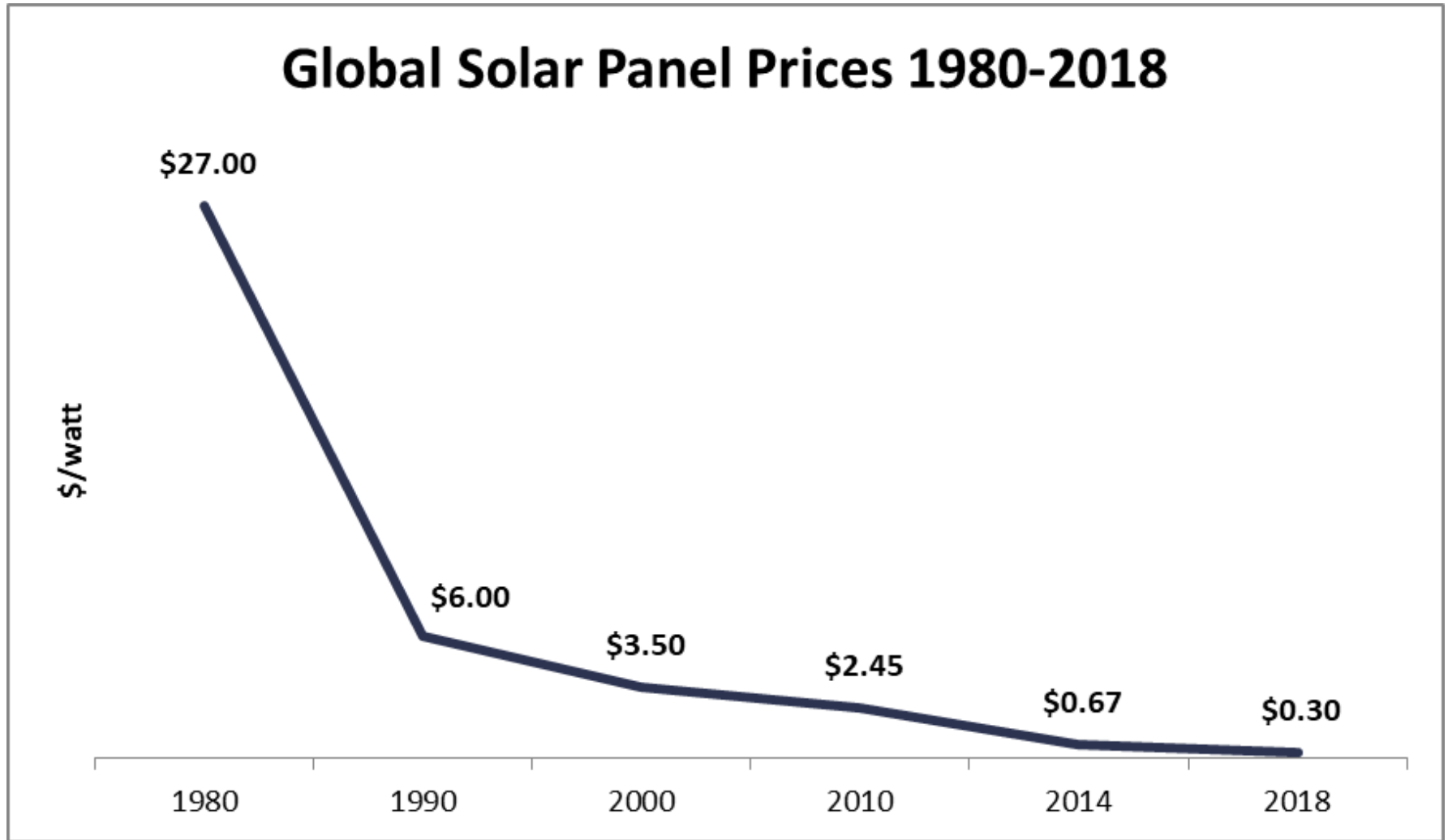
The four major economic sector CO2 emitters.
Power Industry Transport Buildings

EIA 2050 Projections - Electrical Generation

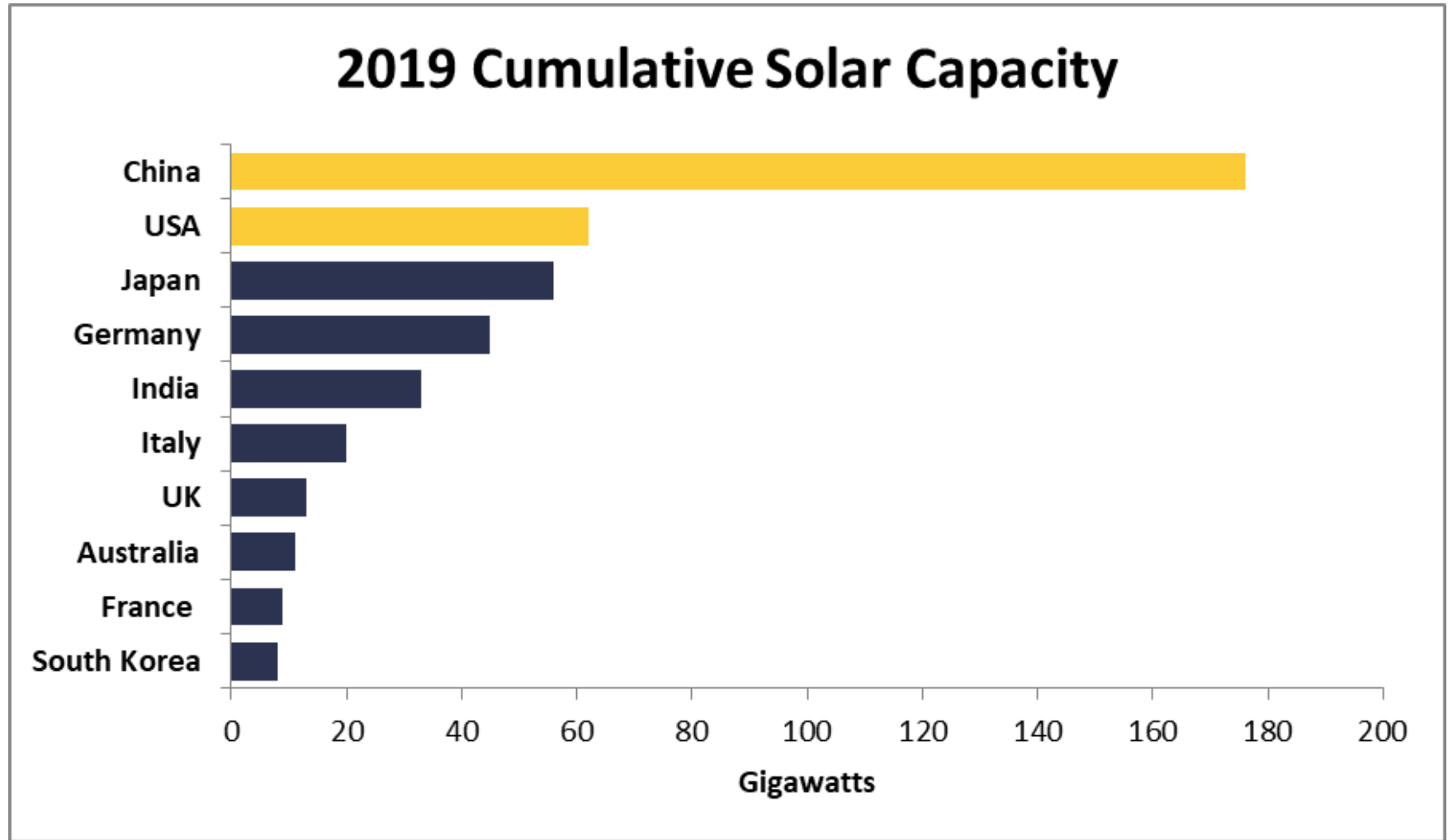
**Electricity generation from selected fuels
(AEO2020 Reference case)**
billion kilowatthours



Good - Global PV Panel Prices

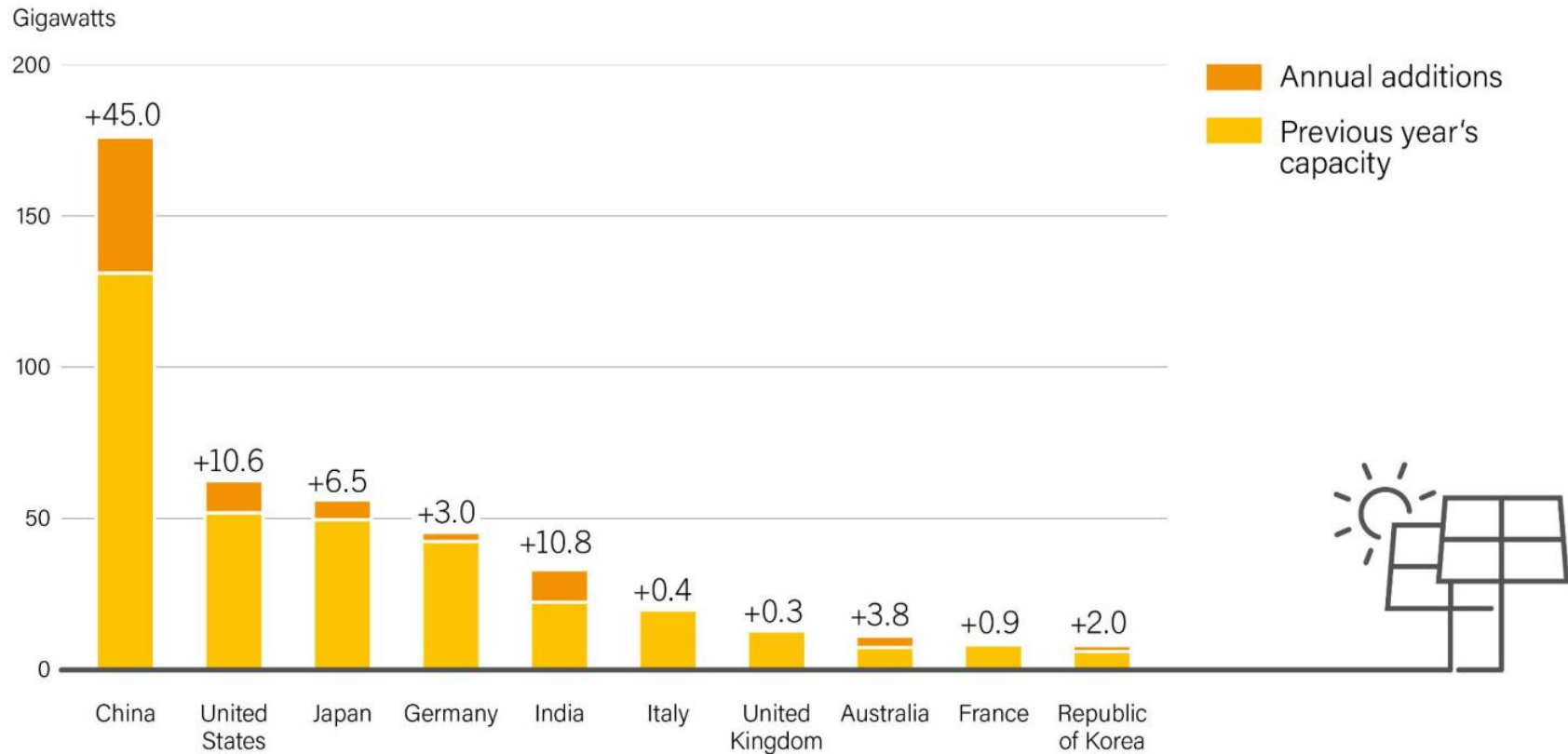


Good - Global PV Capacity = 505 GW at end of 2018



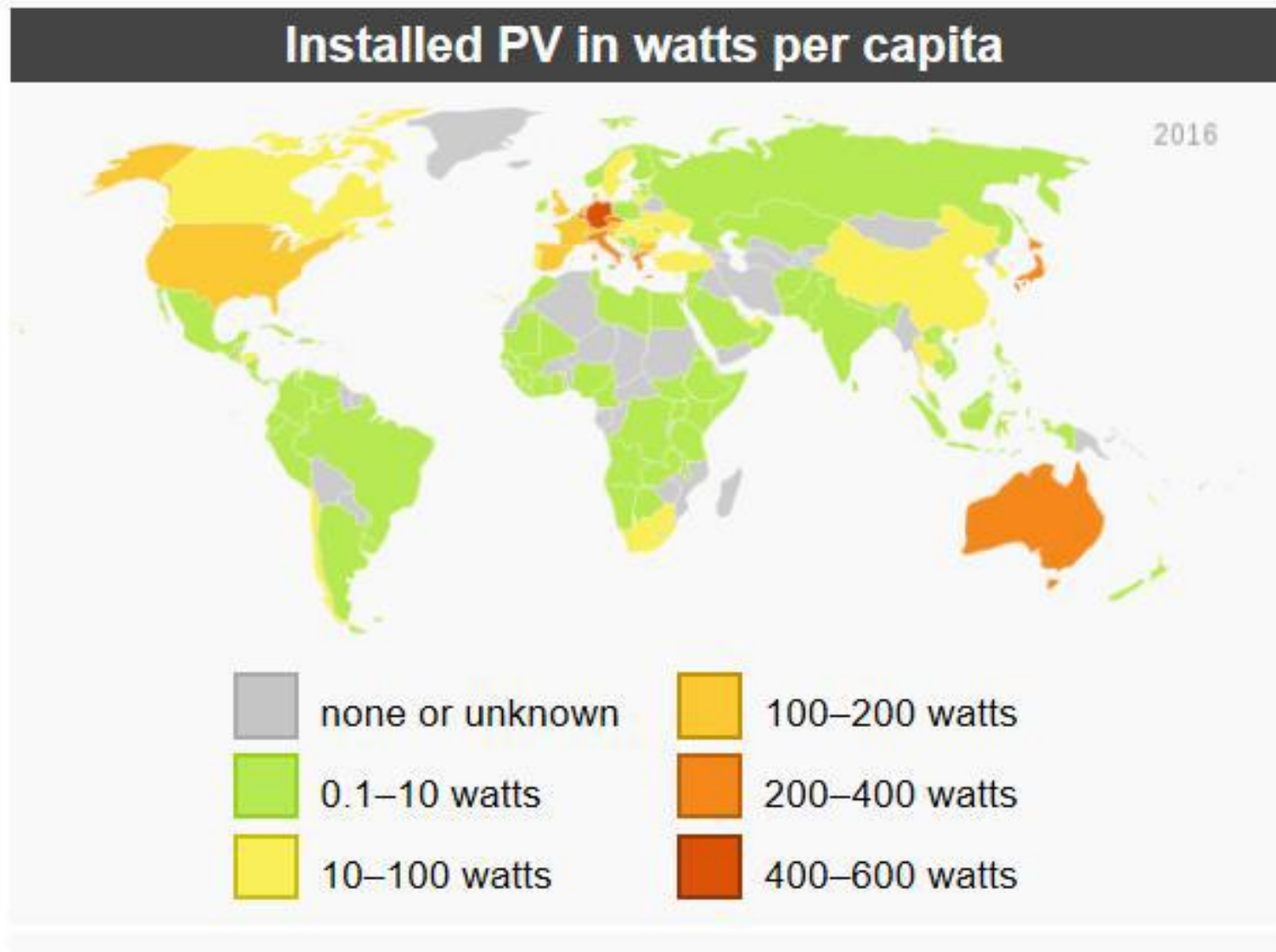
Global PV Capacity Additions: Top 10 Countries

Solar PV Capacity and Additions, Top 10 Countries, 2018

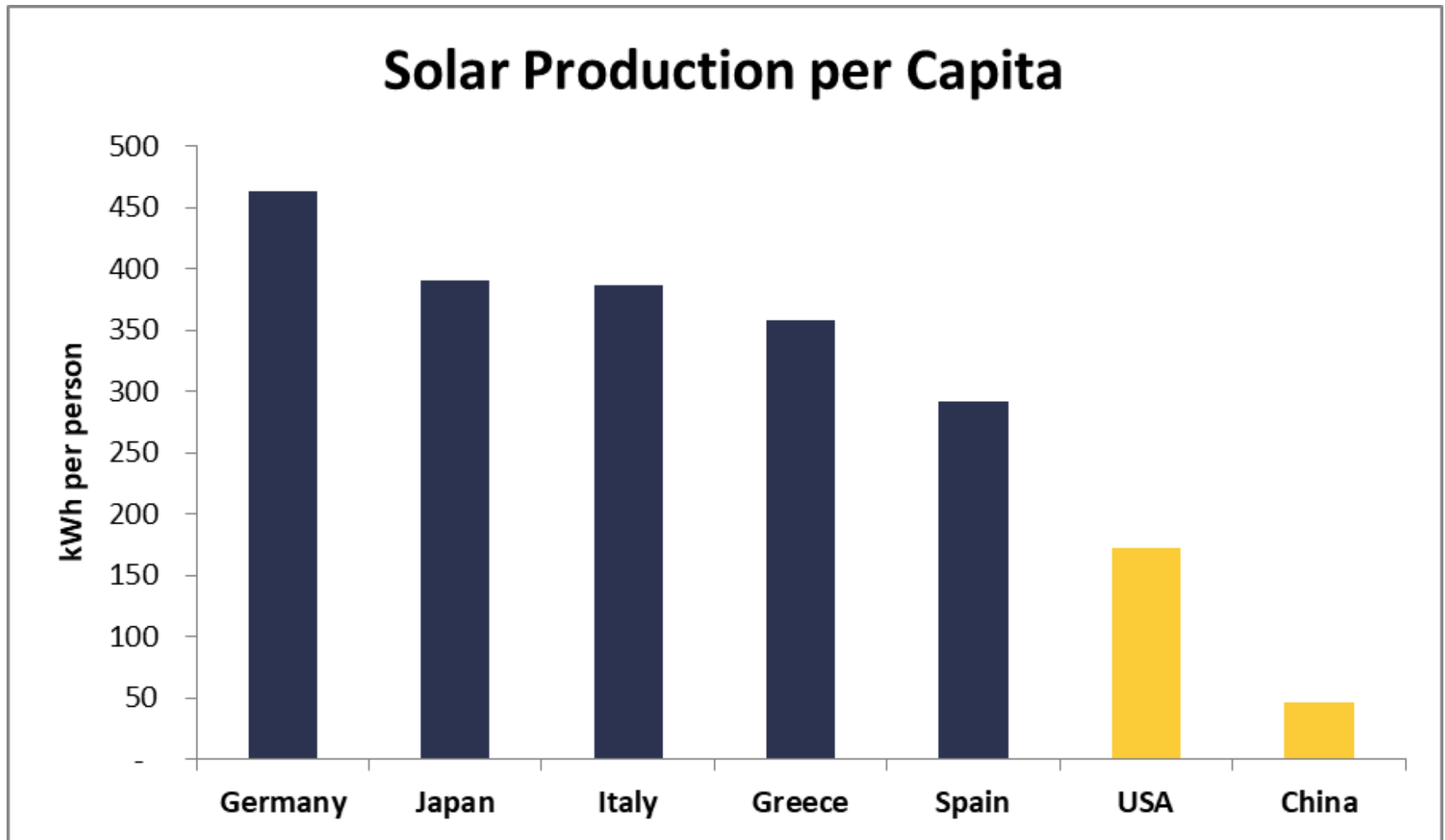


Note: Data are provided in direct current (DC).
Data for India are highly uncertain.

Good - Global PV Capacity = 505 GW at end of 2018

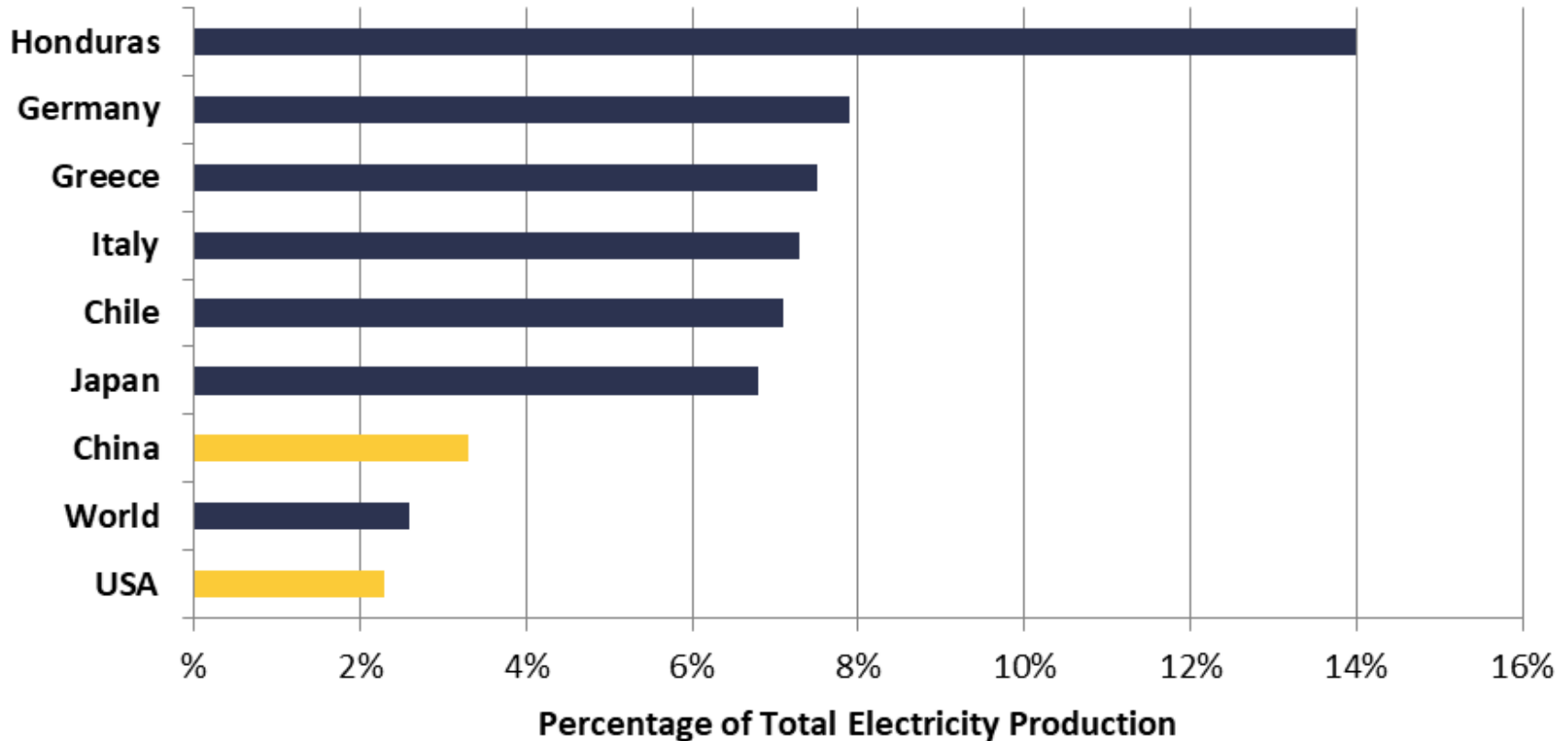


Good - Global PV Capacity = 505 GW at end of 2018



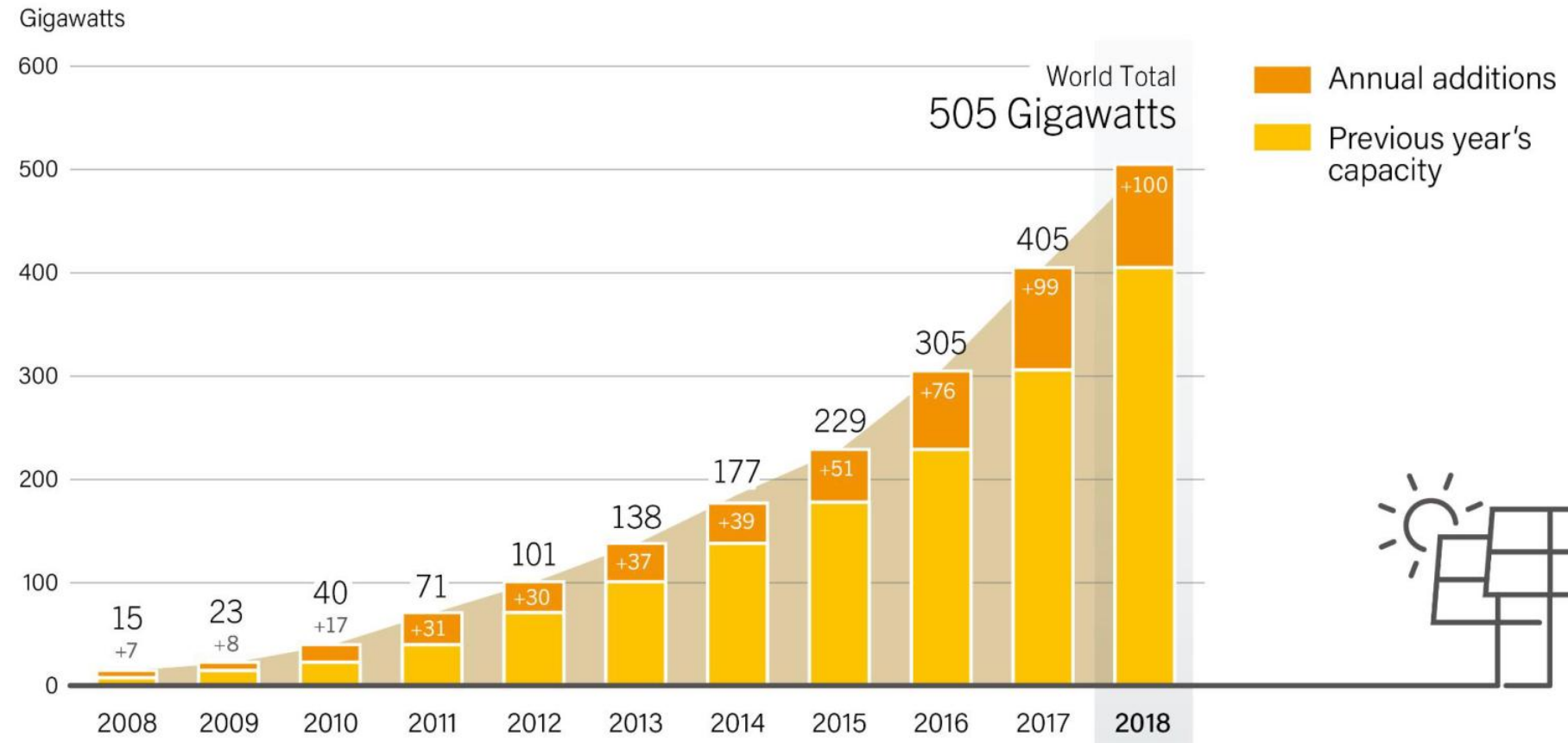
Good - Global PV Capacity = 505 GW at end of 2018

2019 Solar Penetration



Good - Global PV Capacity = 505 GW at end of 2018

Solar PV Global Capacity and Annual Additions, 2008-2018



Note: Data are provided in direct current (DC).
Totals may not add up due to rounding.

Source: Becquerel Institute and IEA PVPS.

The Good - Top 5 Largest Solar Power Plants of the World - 11/4/19

Honorable Mention – Kamuthi Solar Power Project – 648MW – India

Honorable Mention – Longyangxia Dam Solar Park – 850MW – China

5a. Kurnool Ultra Mega Solar Park – 1,000 MW – India

5b. Datong Solar Power – 1,000MW – China

4. Noor Solar Park – 1,117MW – Abu Dhabi

3. Pavagada Solar Park – 1,400MW – India

2. Tengger Desert Solar Park – 1,500MW – China

1. Bhadla Solar Park – 2,245MW – India

At 350W per panel= 6.3 million panels

IEA – 70% of new power generation through 2050 will come from solar, 20% from wind.



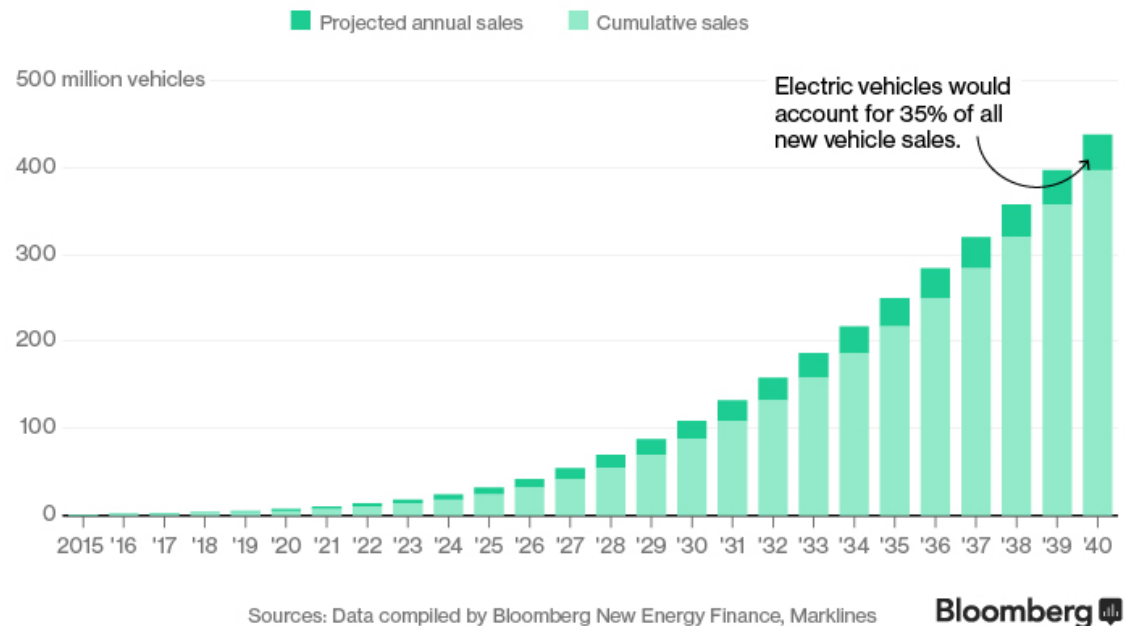
<https://www.solarinsure.com/largest-solar-power-plants>

How Electric Cars Will Cause the Next Oil Crisis

By 2040, long-range electric cars will cost less than \$22,000 Thirty-five percent of new cars worldwide will have a plug.

The Rise of Electric Cars

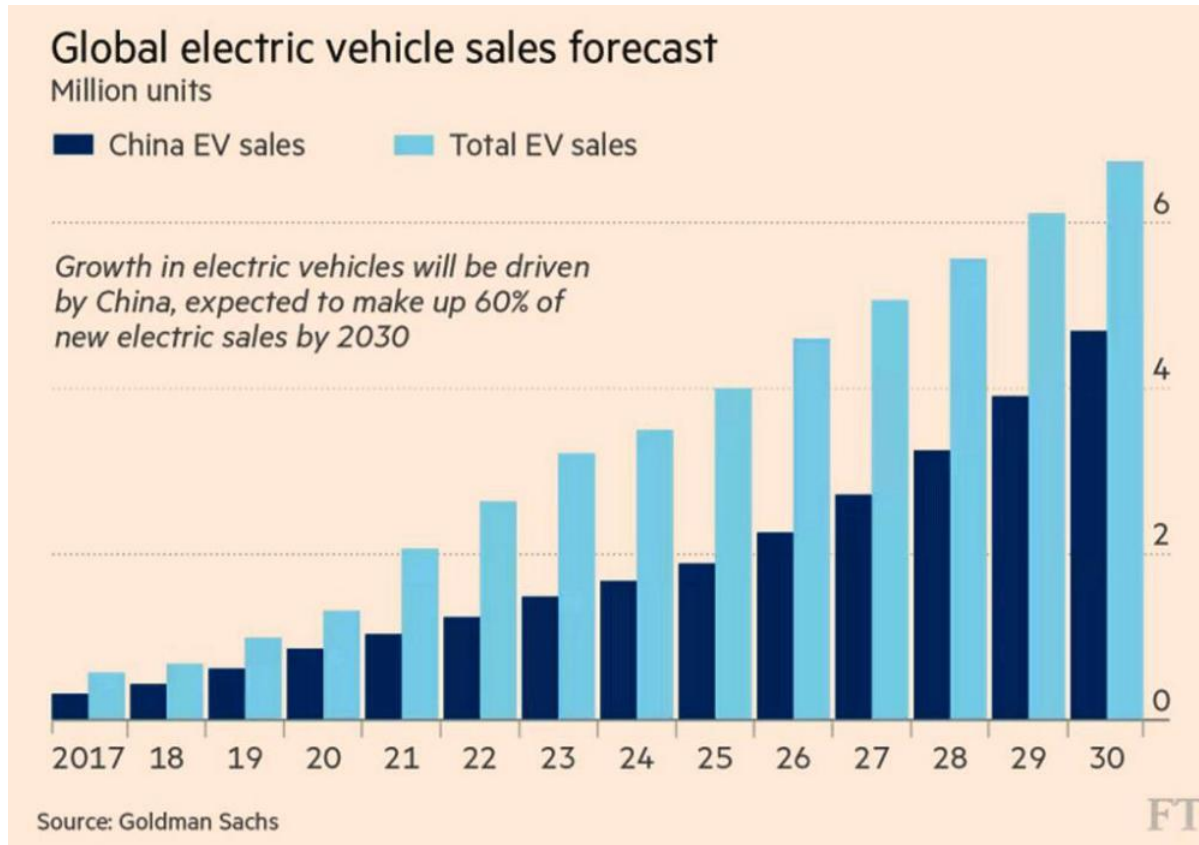
By 2022 electric vehicles will cost the same as their internal-combustion counterparts. That's the point of liftoff for sales.



<https://www.bloomberg.com/features/2016-ev-oil-crisis/>

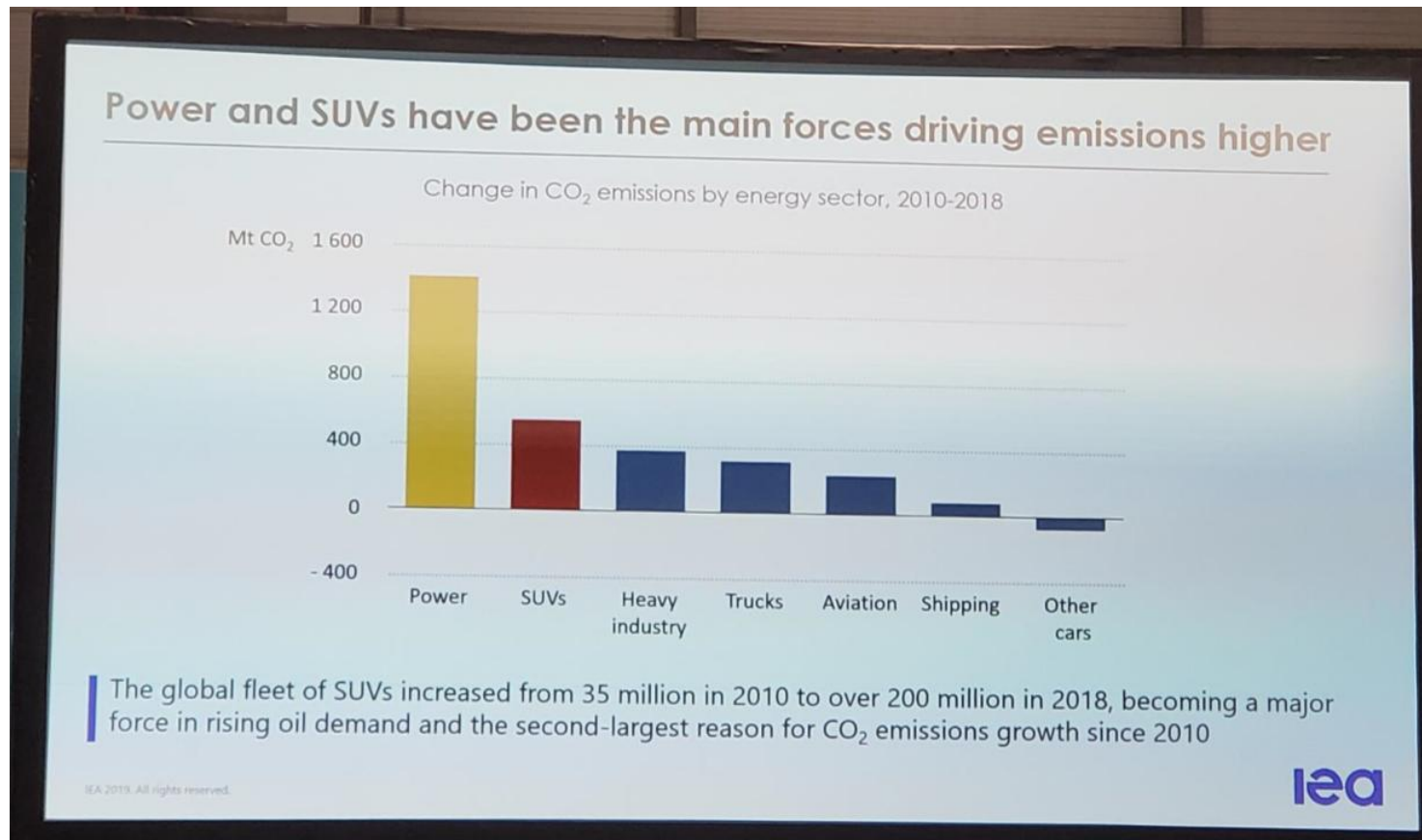
Transportation - EVs

ELECTRIC VEHICLE ADOPTION



<https://static.financialsense.com/historical/users/u4763/images/2017/0821/08-global-electric-vehicle-sales-forecast.png>

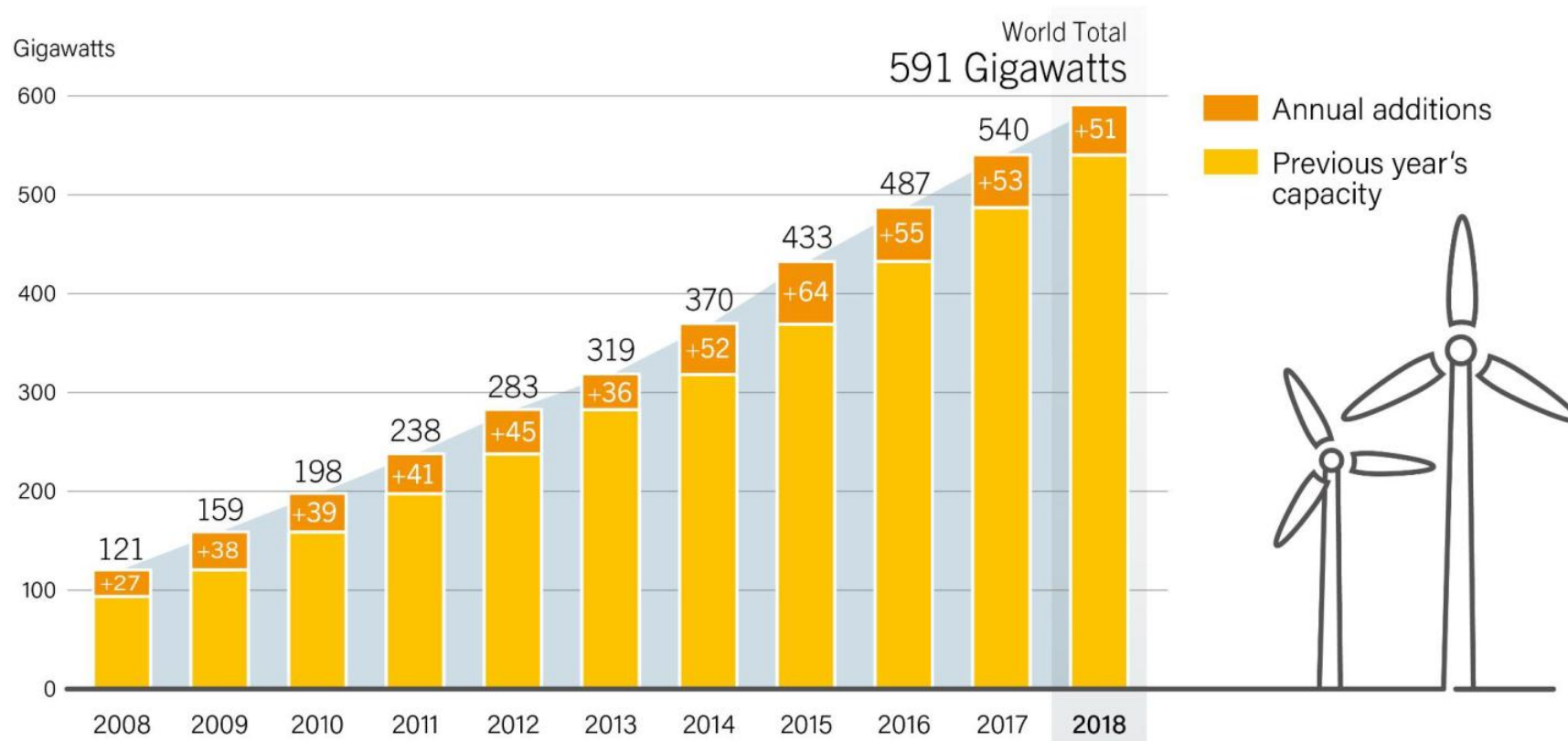
The Ugly



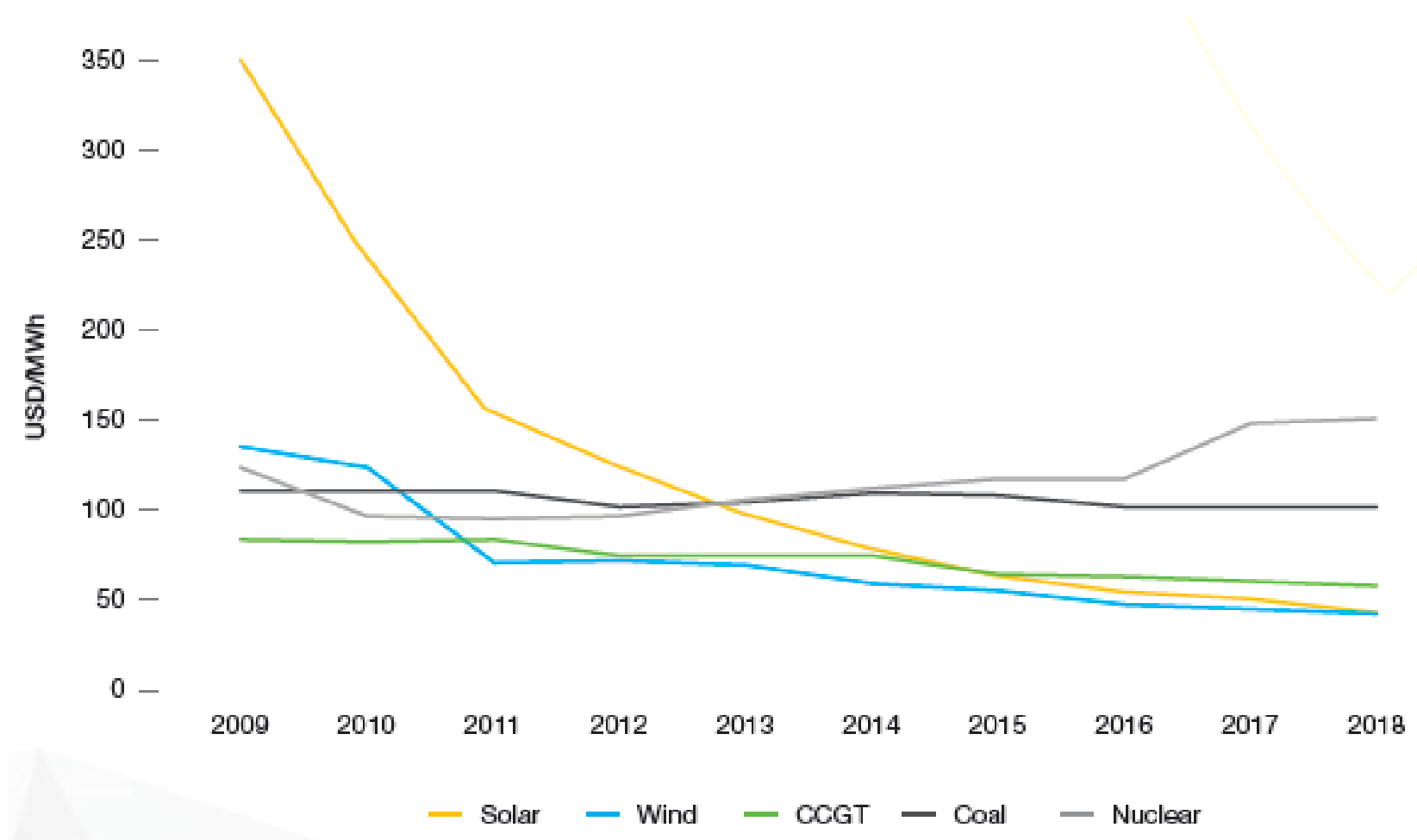
SUVs – “... the second largest reason for CO₂ emissions growth since 2010” – IEA

Global Wind Capacity = 591 GW at end of 2018

Wind Power Global Capacity and Annual Additions, 2008-2018



Renew Energy Generation Costs Continue to Drop



Source: SPE GMO 2019

CCGT Combine Cycle Gas Turbines

The Bad The Good – Fossil Fuel Investments

The Bad

33 Global Banks, Led by JPMorgan Chase, Invested \$1.9 Trillion in Fossil Fuels Since Paris Climate Pact

Top 4 - JPMorgan Chase, Wells Fargo, Citi, and Bank of America.

The Good - Times changing – Climate Risk Is Investment Risk

“BlackRock, \$7 trillion, will ditch investments that it considers a sustainability risk, including thermal coal producers.”

JP Morgan – Feb 2020 – “The most extreme risks of climate change can’t be ruled out - including the collapse of human civilization.”

“We cannot rule out catastrophic outcomes where human life as we know it is threatened.”

The Good – International Solar Alliance

ISA Framework Agreement – COP22 – Marrakesh Nov 2016

- Address the specific financial and solar technology deployment needs of the solar resource rich countries located between the Tropic of Cancer and the Tropic of Capricorn.
- 84 countries have signed the ISA Framework Agreement
- 63 countries have signed and ratified the ISA Framework Agreement. Headquarters in India - France
- Initial goal to raise and invest **\$1 Trillion by 2030 for 1 Trillion watts installed solar capacity.**

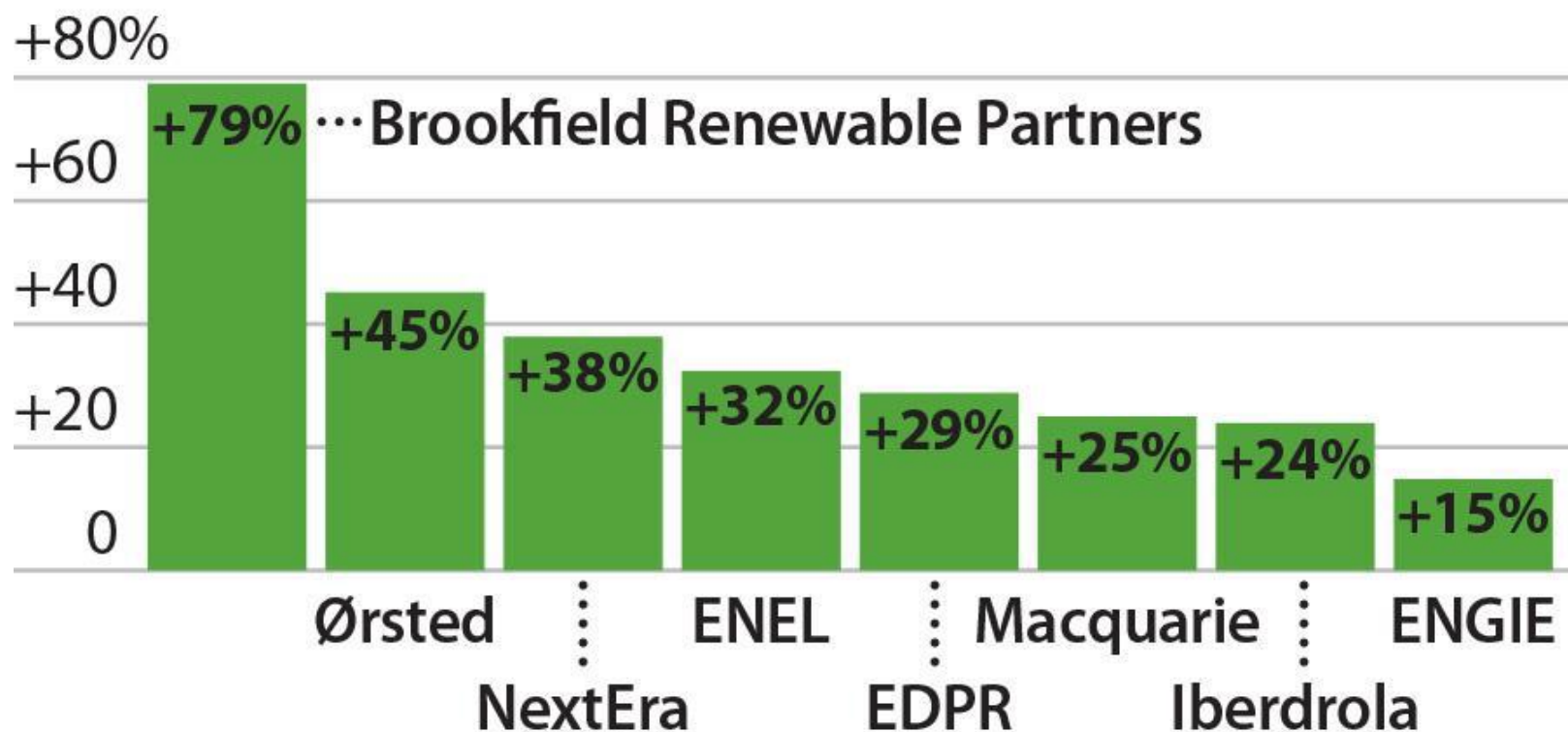
isolaralliance.org/Index.aspx



Challenge – Financial Tipping Point

Big Renewable Companies Perform Well in 2019

Year-to-date share price return in local markets



<https://ieefa.org/u-s-coal-companies-battered-by-investors-in-2019-leading-sector-index-drops-53/>

The Good - Clean and Renewable Energy

- Denmark national 100% RE Target
- Wind and solar generated 50% of Denmark's electricity in 2019
- Danish Pension Funds Announce \$50 Billion in Commitments Towards Climate Investments
- Spain's coal-fired electric generation fell to record low 4% of total demand in 2019 – 5X increase in solar installations in 2018
- RE100 - 221 Companies - committed to 100% Renewable Power
- Sierra Club's Ready for 100 has signed up over 150 Cities with a 2050 target for 100% clean RE
- World's largest floating wind turbine off Portuguese coast

"Towards 100% Renewable Energy" by IRENA Coalition for Action, 2019 – Dave Renné Co-Author

https://coalition.irena.org/-/media/Files/IRENA/Coalition-for-Action/IRENA_Coalition_100percentRE_2019.pdf

<https://www.reuters.com/article/us-climate-change-un-denmark-idUSKBN1W80NP>

<http://there100.org/companies>

<https://www.sierraclub.org/ready-for-100>

<https://ieefa.org/spains-coal-fired-electric-generation-fell-to-record-low-4-of-total-demand-in-2019/>

<https://ieefa.org/worlds-largest-floating-wind-turbine-begins-generating-power-off-the-portuguese-coast/>

Good - Costa Rica Plans To Be The First Plastic-Free AND Carbon-Free Country In The World By 2021

Costa Rica one of the top 5 of countries in renewable resources. Since 2014 the country's energy has come from 99 percent renewable sources and running on 100% renewable energy for more than two months twice in the last two years.

A mix of Hydropower, Geothermal, Wind and Solar.

Set on eradicating single-use plastic by 2021.

Aims to be completely carbon-neutral by the year 2021.



<https://educateinspirechange.org/nature/costa-rica-plans-to-be-the-first-plastic-free-and-carbon-free-country-in-the-world-by-2021/>

Good – Norway?

- Norway is the first country in the world to commit to zero deforestation in its public procurement. Norway has funded several \$Billions in forest conservation projects in Brazil (\$1B), Liberia (\$150M), Guyana (\$250M), and Indonesia (\$1B).
- Norway recycles 97% of its plastic bottles: a blueprint for the rest of the world?
- Norway's \$1Trillion Government Pension Fund Global - GPFG AKA "Oil Fund" to invest up to \$25B (2.5%) in renewable energy portfolio.
- Twenty-six percent of Norway's annual budget revenues and 17 % of its GDP are tied to the oil and gas market – increasing profit squeeze.
- Norway opening up new oil and gas fields - Total carbon emissions from the fossil fuel-rich country are forecast to climb by 16% this year compared with the year before, after oil companies drilled 130 oil and gas wells in 2019.
- Protesters claim Norway's total exported greenhouse gas emissions are 10 times larger than the domestic emissions from its production.

Key Take-Away Messages

- The Good:
 - Renewables making real progress
 - The energy transformation is driving, and being driven by, massive renewable energy deployments; much due to local, regional, and private-sector initiatives, and stakeholder engagement
- The Bad:
 - Urgency of climate change means the transformation has to be accelerated
 - Renewable electricity alone will not solve the problem; must decarbonize all end use energy
 - There must be more political will, especially at national and international levels
- The Ugly:
 - All new major carbon-based investments need to be phased out; otherwise we are locked in to significant GHG emissions for years to come

Continued R&D to address climate mitigation is necessary, and will help unleash more private finance by lowering risk and improving investor confidence, and stimulate more responsive and informed policies

The Good – Will China Save the Planet?

‘Will China Save the Planet?’ by Barbara Finamore, NATURAL RESOURCES DEFENSE COUNCIL - NRDC’s senior strategic director for Asia, witnessed the birth of China’s clean energy movement in June 1991. NRDC’s China Clean Energy Project – 30 people work in NRDC’s China office.

- China led global investment in solar - 7th successive year - \$91.2 B
- China accounted for 32 per cent of the global total investment,
- China has 95%+ of the world’s electric buses,
- **Carbon program in 82 cities and 5 provinces to reach ‘Peak Carbon’ in 2-3 years and continue reducing after that.**

<https://www.nrdc.org/stories/will-china-save-planet>

<https://www.nrdc.org/stories/keeping-close-watch-chinas-climate-transition>

<https://www.renewableenergyworld.com/2019/03/06/chinas-renewable-energy-installed-capacity-grew-12-percent-across-all-sources-in-2018/>

Climate Change Urgency

- **Only 10 Years Left** to Prevent Irreversible Damage from Climate Change – (**Now 8?**)
- **Ambition, Urgency**, Needed to Address Global Emergency, UN Secretary-General, UN General Assembly
- The clean power today makes up about one-third of global electricity generation, however this amounts to a mere 7% of what we will need by 2100 to limit warming to 2° C.
- **Financing** – Least Developed Nations
- Government commitment, policy, funding.
- Stop fossil fuel subsidies!!!
- **Vote!!!!!!**

<https://www.un.org/press/en/2019/ga12131.doc.htm>

The Good - Greta Thunberg



Thank You!

International Prospects for a Low Carbon Future Questions?

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February 24, 2020

EEE FORUM

ETHICS AND ECOLOGICAL ECONOMICS FORUM

<https://eeeforum.org/>