Global Economy and Development at BROOKINGS

Delivering on the Paris Climate Goals through Accelerating Energy Transitions

US-Japan Forum: Challenges for the Global Economy and a Better Globalization

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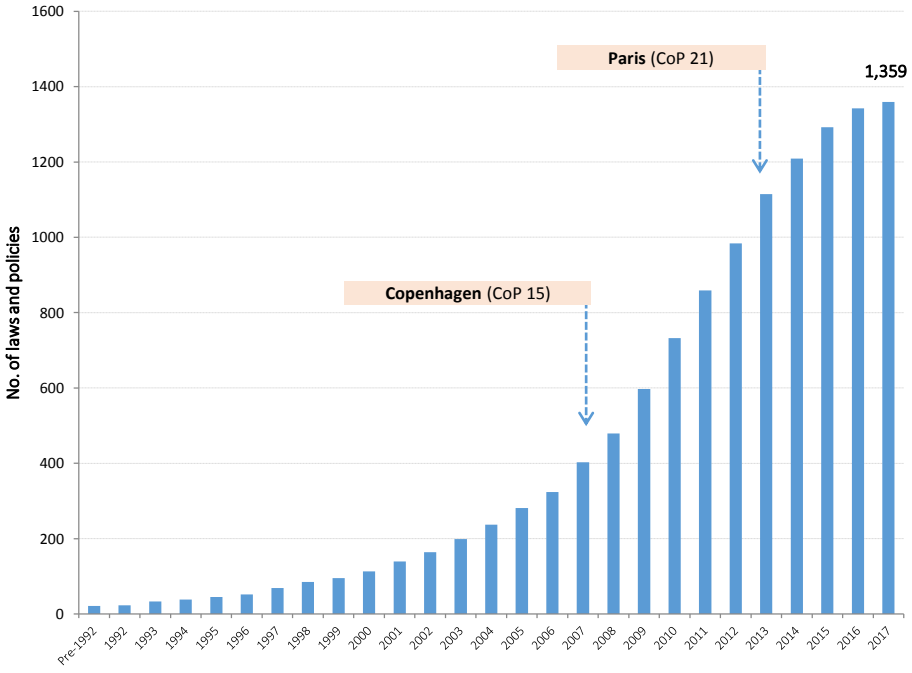
Structure

- The Paris Agreement
- The twin energy challenge:
  - Enhancing Access
  - Decarbonization
- Accelerating Energy Transitions:
  - Policy
  - Technology
  - Finance

Global action on climate change continues



Solar and wind are now some of the cheapest source of electricity in many countries, new RE plants are competitive with fossil fuels in most regions (IRENA, 2018)

Deployed energy storage reached 930 megawatts in 2016; year-on-year growth of over 50% for (non-hydro) storage (IEA, 2017)

EV car stock has reached 2 million units in circulation.

Powering Past Coal Alliance – 26 members, including 19 countries and 7 provinces/states from Canada (5 provinces) and the USA (2 states) pledged to phase out coal power.

More than 1,300 laws and policies in 164 countries representing 95% of global GHG emissions

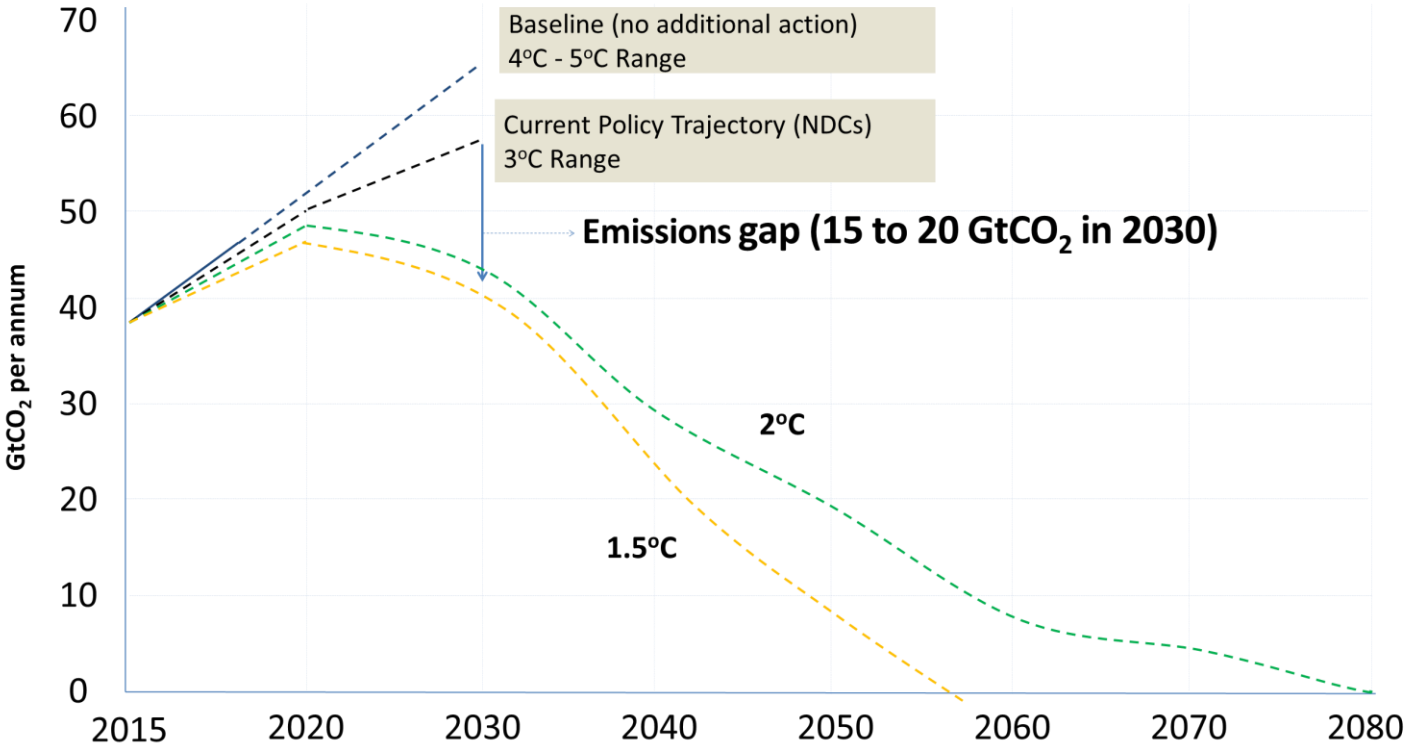
The Paris Agreement

- Paris Agreement was a turning point and forms the basis of new, international, cooperative, long-term action on climate change—building on the broader commitment to the sustainable development goals embodied in the 2030 development agenda and financing for development in Addis in July 2015.
- Key pillars of the Paris Agreement:
  - Ambitious goals both to **hold the increase in global average temperatures to below 2 degrees and to achieve net zero emissions in the second half of this century**;
  - Continuously **review and update emission targets every five years**;
  - Call for countries to **indicate national commitments (NDCs) and their long-term strategies** for low-emission development by mid-century;
  - Enhancing **resilience through adaptation**;
  - **Mobilization of finance.**

Drivers of the agreement in Paris;
view shifted from the "costs of action" to "investment and growth"

- **Paris was agreed based on the recognition that growth, sustainable development, poverty reduction and climate action** are complementary and interwoven. **There is no "horse-race".**
- The notion of "*costs of action*" is being **transformed** by rapid technological advances:
  - Efficiency, demand management; renewable energy (solar, wind) and energy storage technology.
- **Opportunity to:**
  - Boost shorter-run growth from increased investment in the low-carbon transition (sustainable infrastructure);
  - Spur innovation, creativity and growth in medium term;
  - Offers the only feasible longer-run growth on offer (high-carbon growth self destructs)
- Better understanding of dynamics of change and learning; and of the **consequences of dirty infrastructure** (e.g. air pollution from burning fossil fuels).

While action is happening there is still a large gap between current NDCs and what is required to reach the Paris temperature targets



The challenge is now to <u>implement</u> and <u>accelerate</u> to 2020 to close the gap

What to do to hold warming "below 2°C"

- Can do a little more earlier and a little less later and vice versa but **shape of feasible paths similar.**
- Stabilising temperatures **requires stabilising concentrations, which will require net-zero emissions**. The lower the target temperature, the earlier the necessary achievement of net-zero; balancing sources and sinks.
- **Paths to achieve under 2°C likely to require:**
  - **zero total emissions** well before the end of century (2070 - 2080),
  - **Net negative emissions in major sectors** (because some sectors likely to be positive).
- Total current Paris pledges (NDCs) are for emissions of around 55-60 $GtCO_2e$ per annum in 2030 (10% increase as compared to today). Whilst improvement on BAU (ca. 65-68 $GtCO_2e$ per annum), need to be around **40 $GtCO_2e$ or less per annum by 2030** (20% decrease).
- **Current NDCs (if met) point us to 3°C path, temperature not seen for around 3 million years**. **Holding temperature to below 2°C requires immediate and rapid action** across whole world; **focus on energy, cities and land**.

Further delay in action is dangerous

- The **window for making the right choices is uncomfortably narrow**. Remaining carbon budget is shrinking rapidly.
- **Further delay in action to learn more would be a profound mistake:**
  - The **"ratchet effect"** from flows of GHGs to concentrations (CO_2 hard to remove)
  - **Dangers of "locking in"** long-lived high-carbon capital/infrastructure. This involves **either** commitment to high emissions **or** early scrapping of capital/infrastructure.
  - Rapid urbanisation and building of infrastructure.
  - Potential devastating impacts on ecosystems, biodiversity, forests, water, air quality; tipping points.
- **Delay increases reliance** on unproven future technologies (e.g. negative emissions) or more ambitious action in future (politically feasible?).

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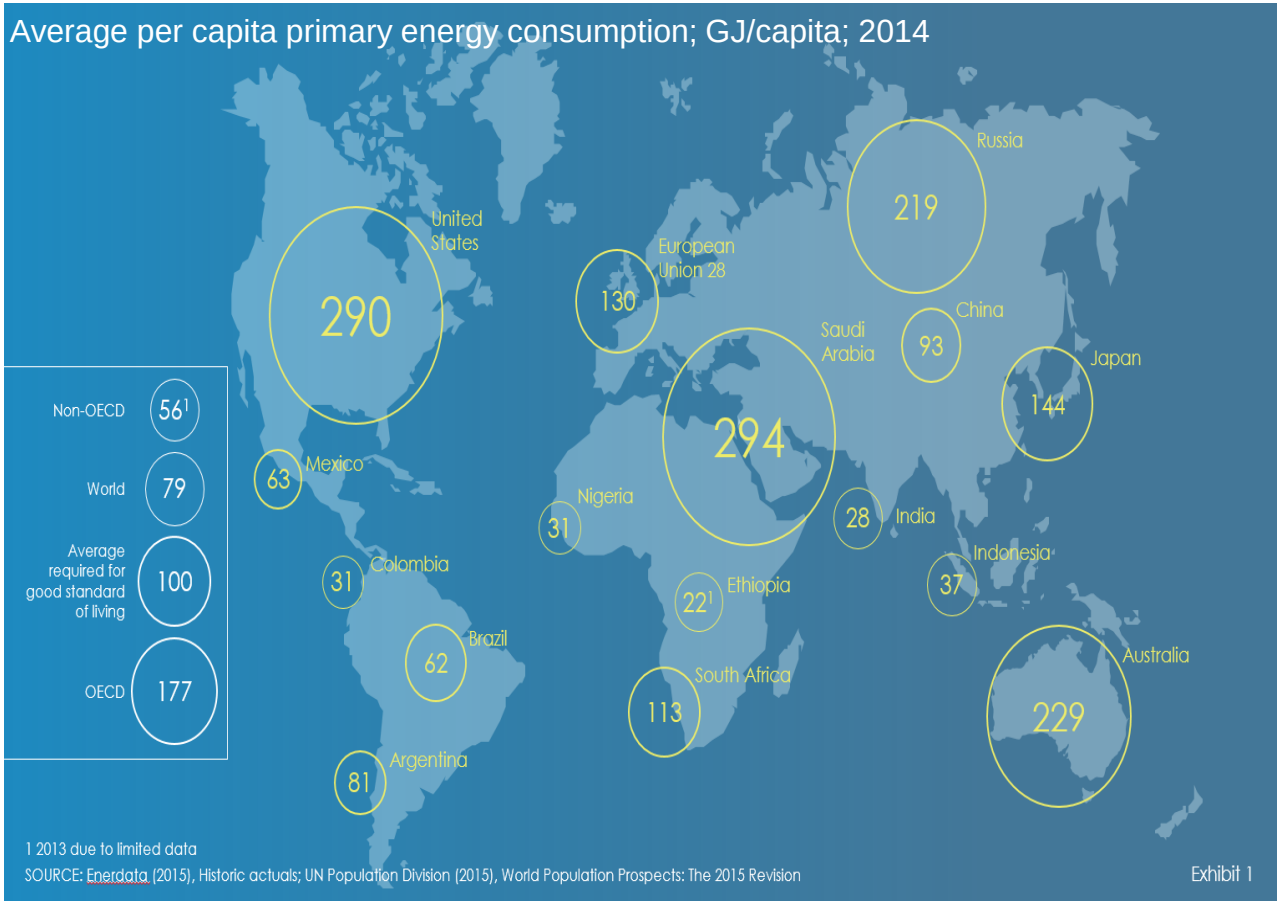
Challenge to low-carbon energy transition: Improving energy access

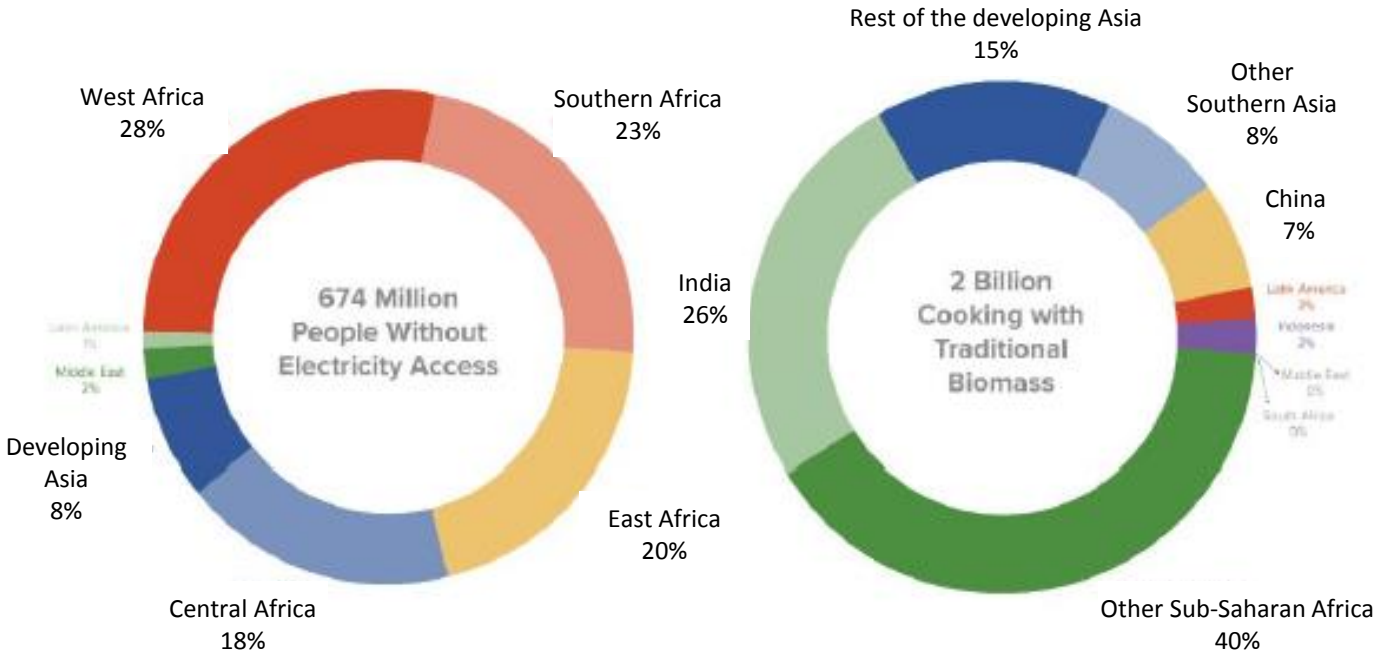


- Historically, about 100 GJ of primary energy per capita per year has been required to achieve energy access.
- By 2050, the world's population is expected to be 9-10 billion, all of whom deserve a good standard of living.
- Currently about 1 billion people still have little or no access to electricity and around 3 billion do not have access to clean cooking facilities, mostly in Africa and Asia (SE4all, 2016).
- The central question is: how can we create an energy-abundant future that supports development and keeps temperature rises "well below 2°C"?

Source: Energy Transitions Commission, 2016

Challenge to low-carbon energy transition: Improving energy access

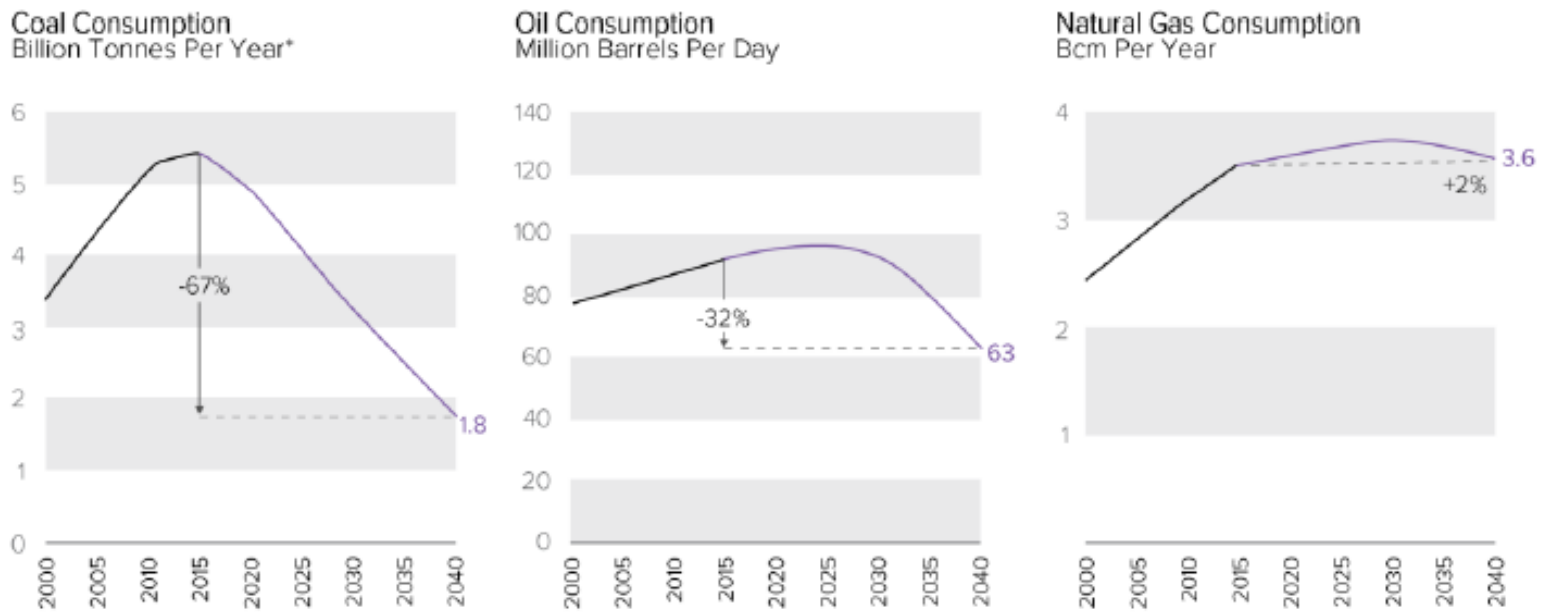
2030 Gaps in access to electricity & clean cooking - planned and current policies



Source: IEA Energy Access: From Poverty to Prosperity, WEO Special Report, 2017

Challenge to low-carbon energy transition: Decarbonization

Fossil fuel consumption by 2040 in a 2˚C scenario



Source: Copenhagen Economics for the Energy Transitions Commission, 2017. The Future of Fossil Fuels

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Accelerating Energy Transitions

- Even with radical improvements in **energy productivity**, global energy use will need to grow by around 80 percent to meet the needs of a global population likely to reach 9 billion by 2030.
- Limiting global mean temperatures to less than 2 degrees (with a probability of 66%) would require an energy transition of exceptional, scope, depth and speed. A **fundamental ramp up in low carbon technologies** is needed in all countries driven by improvements in energy and material efficiency and a fundamental reorientation of energy supply investments with much higher deployment of renewable energy.
- **The required transition will require progress along four dimensions:**
  - Decarbonization of power combined with extended electrification;
  - Decarbonization of activities which cannot be easily electrified;
  - Acceleration in the pace of energy productivity improvement; and
  - Optimization of fossil fuels use within the overall carbon budget constraints.

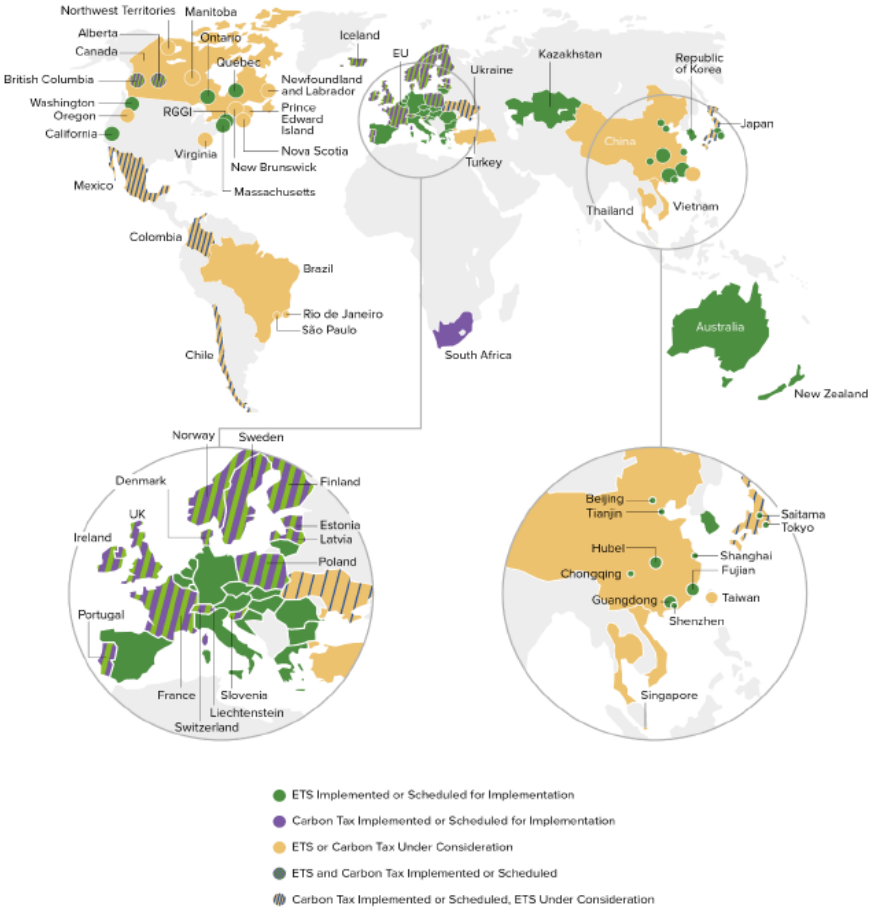
Opportunities for developing regions: Africa and South Asia

- Poor people are hit hardest by pollution and earliest by climate change. They often live in vulnerable places, have less resilience to shocks and are more exposed to deteriorating environments.
- Rapidly developing countries and cities offer the **opportunity to integrate RE and energy flexibility from the early stages**; design of network infrastructures (electricity, transport, water…)
    - Poor people benefit the most from ability to travel (e.g. public transport)
- To achieve SDG 7 (affordable and clean energy), the **current pace of electrification expansion must double**. Mostly needed in developing regions of Africa, Asia and Latin America.
    - To meet climate change goals, **almost all new electricity infrastructure must be clean and green starting now** (Pfeiffer et al., 2016)
- For many, **centralised grids are high costs and low access**. The falling costs of RE and improved reliability strengthen the case for a decentralised approach.
- Increases in RE use can not only support reaching 100 GJ of primary energy per capita per year, but also support environment, social and economic development.

Drivers of change: Policy

A well-designed carbon price is an indispensable part of a strategy for reducing emissions in an efficient way

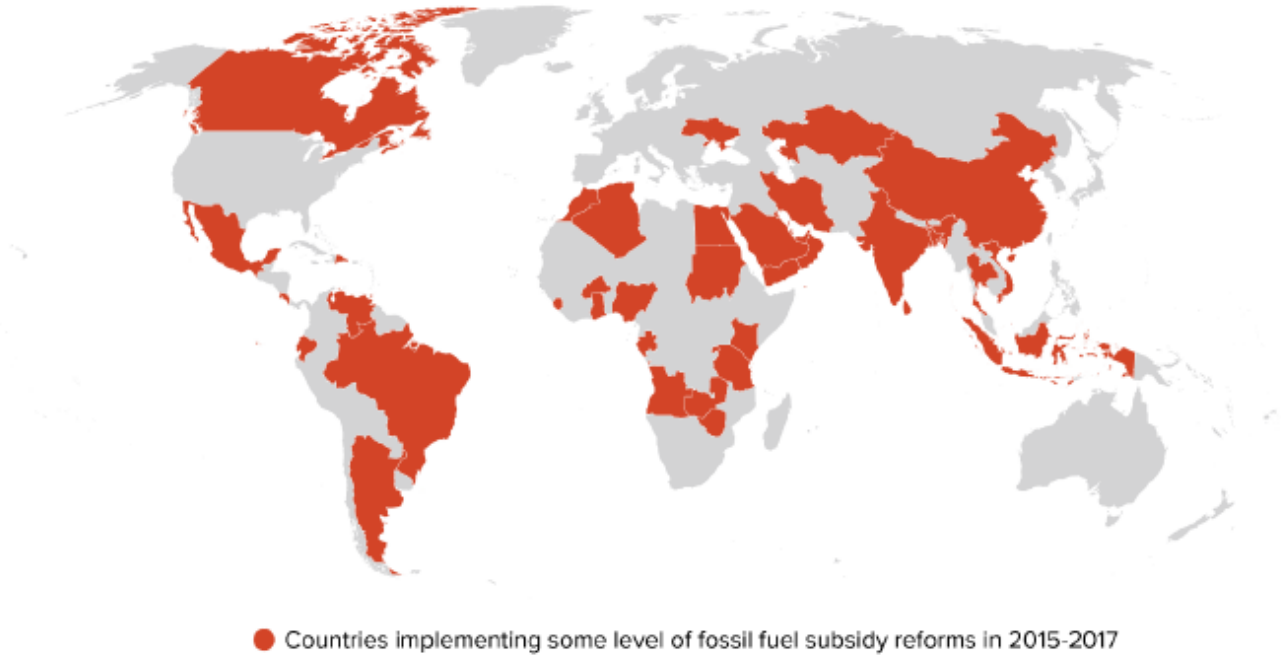
Map of carbon pricing systems in place or planned worldwide



Source: World Bank Group, 2017. Carbon Pricing Dashboard.

Drivers of change: Policy

At least 40 countries at least partially reduced subsidies for fossil energy between 2015-2017



Source: International Institute for Sustainable Development, 2017; based on data from IEA, World Energy Outlook 2016.

Drivers of change: Technology

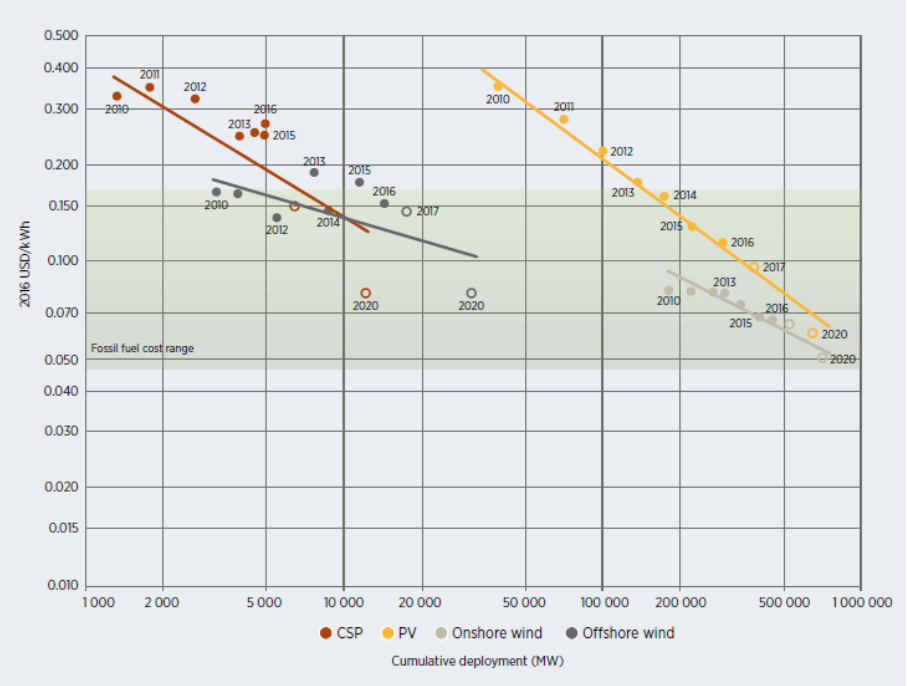
Renewable energy costs are now cheaper than fossil fuels in many countries

- Record lows for renewable energy are being achieved in many countries through auctions:

Country	Solar	Wind - Onshore
India	Rs 2.44 (2017)	Rs 2.43 (2017)
Mexico	US$ 0.0197 (2017)	US$ 0.0177 (2017)
Japan	US$ 0.153 (2017)	
Germany	Euro 0.049 (2017)	Euro 0.038 (2017)
Chile	US$ 0.0325 (2017)	

All prices per kWh (year record achieved)
Rs 65 to 1 USD

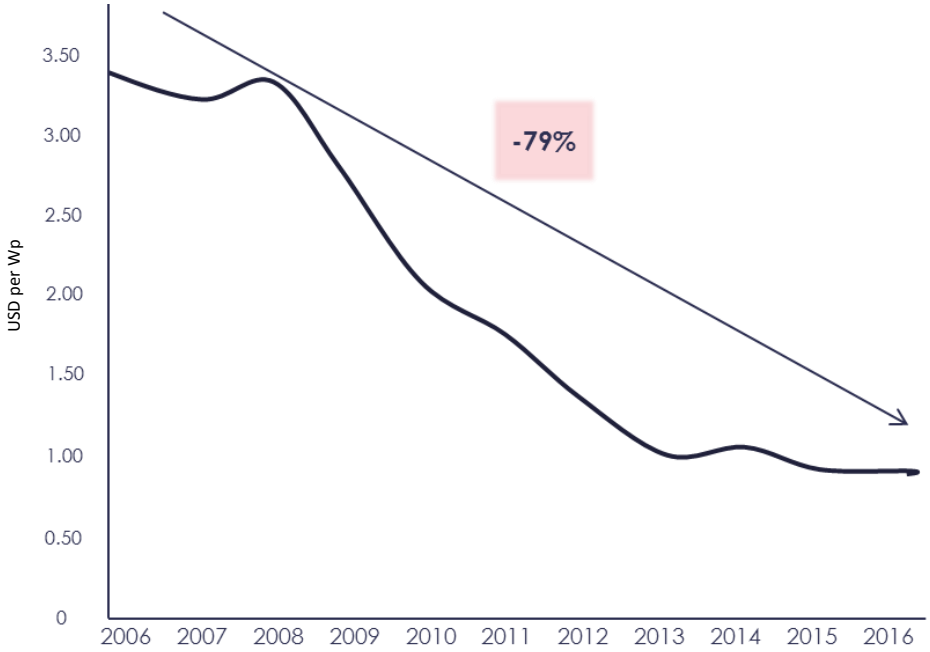
Global weighted average CSP, solar PV, onshore and offshore wind project LCOE data to 2017 and auction price data to 2020, 2010-2020



Source: IRENA, 2017

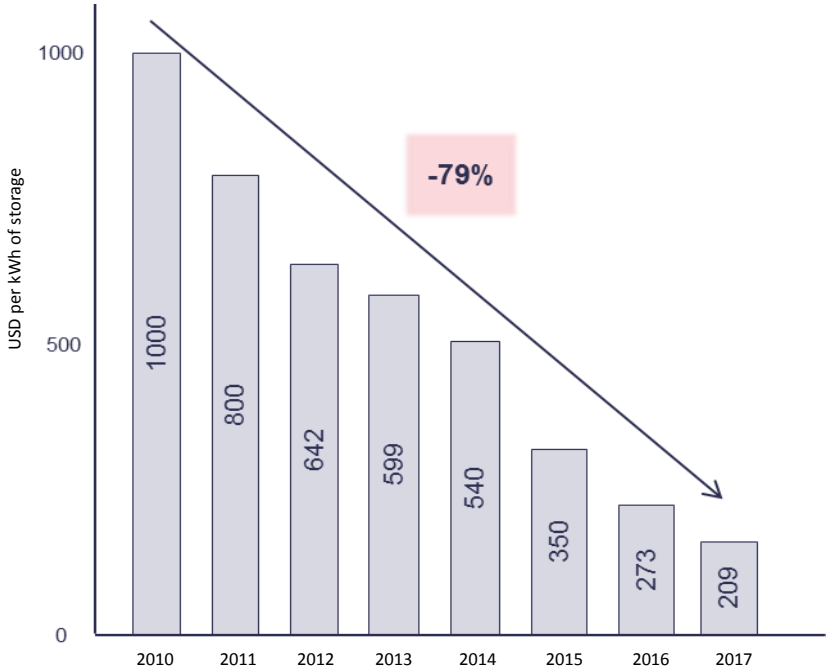
Drivers of change: Technology

Solar PV Module Prices



Source: EIA, 2017

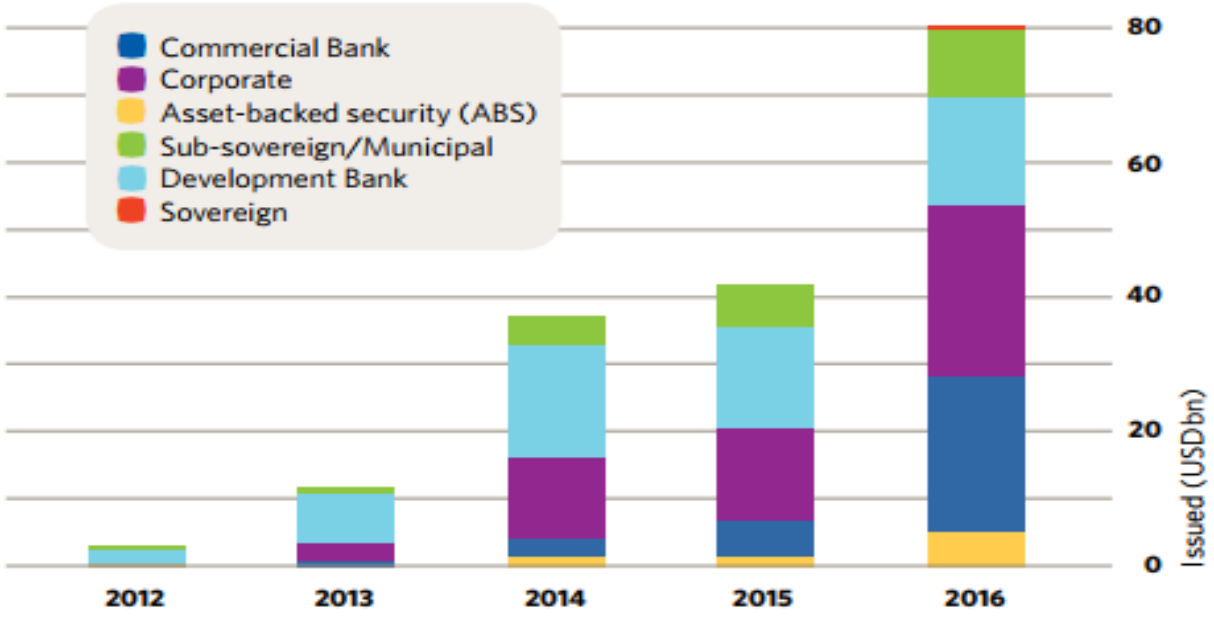
Observed Battery prices



Drivers of change: Financing

The rapid growth of the green bond market shows the potential of green finance

The green bond market 2012-2016



Source: Climate Bonds Initiative

Drivers of change: Financing

*The recommendations of the **Task Force on Climate-related Financial Disclosures** should be considered for designing a policy and institutional framework for climate finance*

Governance
The organization's governance around climate-related risks and opportunities

Strategy
The actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning

Risk Management
The processes used by the organization to identify, assess, and manage climate-related risks

Metrics and Targets
The metrics and targets used to assess and manage relevant climate-related risks and opportunities

Source: Task Force on Climate-related Financial Disclosures

Financing: The key role of MDBs

- **Key role for MDBs** around supporting investment by enhancing the quality of the project, reducing risk and **crowding in private finance.**
- Their presence can impart **confidence, reduce risks** (particularly government-induced policy risk), bring relevant instruments for managing risks (equity, guarantees, long-term loans…) and encourage **participation of other sources of financing.**
- This can **bring down the cost of capital:** crucial for volume and sustainability (quantity and quality).
- They are **trusted conveners** that can help coordination and help establish replicable and scalable models.
- They play a crucial role in getting projects through **difficult early stages**. After that institutional investors can be attracted by stable long-term returns; great potential scale. Development banking can be profitable.
- A **major expansion of MDB financing will be needed** to support energy access and the acceleration of energy transitions.

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Thank you!