NET ZERO

WHAT IS NET ZERO?

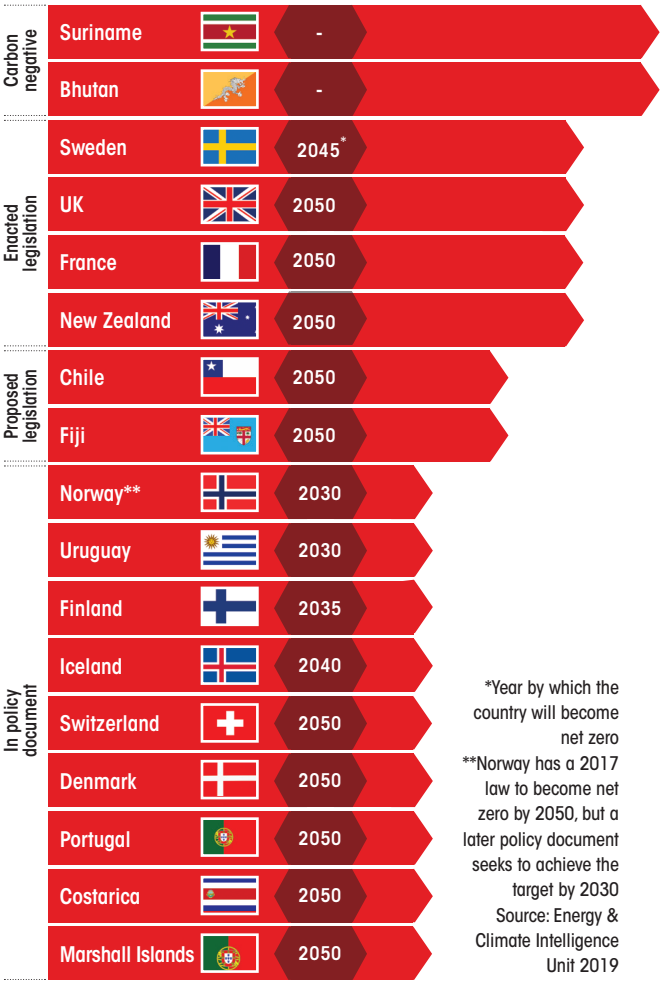
- The world emitted 37 Gt of CO_2 in 2018. If we include other greenhouse gases (GHGs) such as methane, it emitted more than 53 Gt of carbon dioxide equivalent (CO_2e) in the same year.
- According to a 2018 IPCC report *Global Warming of 1.5°C*, to keep global temperature rise since the beginning of the industrial revolution below 1.5°C, the world must become a **'net zero' carbon emitter by 2050**.
- In this scenario, total GHG emissions need to reach zero between 2063 and 2068.
- To stay under 2°C, the world needs to reach carbon net zero between 2070 and 2085.
- After reaching net zero, the world needs to move to a carbon **negative** trajectory—taking out more carbon each year from the atmosphere than it puts in.
- Reaching net zero needs two types of action:
  - Reducing emissions fast—to stay within 1.5°C, the world must completely stop using coal by 2050, and shift most electricity generation to renewables and gas.
  - Removing large amounts of carbon from the atmosphere through natural or technological solutions (see *Carbon removal: An uncertain prospect*).
- 2050 is a **global** deadline—it needs to be interpreted in the light of equity and common but differentiated responsibility (see *National net zero action so far*).

NATIONAL NET ZERO ACTION SO FAR

- **Every country cannot wait till 2050** to become net zero. IPCC makes it clear that by 2030 global emissions need to be 45 per cent lower than 2010 levels to keep us under the 1.5°C threshold.

AHEAD OF THE CURVE

These 17 countries have enacted laws, proposed legislations or framed policies to achieve net zero carbon emissions



*Year by which the country will become net zero
**Norway has a 2017 law to become net zero by 2050, but a later policy document seeks to achieve the target by 2030
Source: Energy & Climate Intelligence Unit 2019

- For a 2°C-compliant trajectory, emissions in 2030 need to be 25 per cent lower than 2010 levels.

- The 2050 discussion is inconsequential unless it focuses on heavy reductions before 2030. Hence, **developed countries must push towards net zero by 2030**.

- Developed countries also need to reach net zero sooner to make technology viable and cheap for developing countries. This is especially critical for currently untested carbon removal technology (see *Carbon removal: An uncertain prospect*).

- Current net zero targets in developed countries violate the principles of equity and common but differentiated responsibility. Of the five developed countries with national net zero legislation—France, New Zealand, Norway, Sweden and UK—only Sweden aims to become net zero before 2050, in 2045.

- Recent updates to national targets continue to be inequitable.
  - New Zealand's net zero target, announced in 2019, excludes methane from agriculture from its net zero framework, which is the largest contributor to the country's GHG emissions. New Zealand is the world's largest per capita methane emitter, emitting six times the global average.
  - UK 'upgraded' its target in 2019—from an 80–95 per cent reduction by 2050 to complete decarbonization by 2050. This will not deliver the action needed before 2030.

CARBON REMOVAL
AN UNCERTAIN PROSPECT

- Most projections of a 2050 net zero rely on removing CO_2 from the atmosphere. This can be done by enhancing the planet's natural carbon sinks, or through technological solutions.

- **Natural carbon sinks** include soil, oceans and (most importantly) trees. However, even in the best case scenario, they cannot sequester all the carbon we currently emit each year. A 2019 IPCC report *Climate Change and Land* estimates that through
  - afforestation and reducing deforestation, forests can sequester between 0.4 and 5.8 Gt of CO_2 per year.
  - sustainable land management policies, the soil can sequester between 0.4 and 8.6 Gt of CO_2 per year.

- Among **technological solutions,** the best known are Carbon Capture and Storage (CCS), Direct Air Capture and Storage (DACS) and Bio-Energy Carbon Capture and Storage (BECCS).

- **Carbon capture and storage (CCS)** captures waste CO_2 from large sources such as factories or fossil fuel power plants, and stores it underground.
  - IPCC's 1.5°C report sees a limited role for this technology because electricity production needs to be largely shifted to renewables by 2050.
  - Even with CCS, coal power needs to be completely phased out by 2050.
  - For natural gas, even if it is combined with CCS, IPCC indicates that its share in the electricity mix will be limited to 8 per cent by 2050.

- **Direct Air Capture and Storage (DACS)** captures carbon directly from the air.
  - It consumes large amounts of electricity, making it expensive. The cost is estimated at US $94–232 per tonne CO_2e.
  - IPCC's 1.5°C report does not indicate a big role for DACS in the push towards net zero.

- **Bio-Energy Carbon Capture and Storage (BECCS),** which captures CO_2 from biomass-based power plants, has been granted a bigger

role in IPCC's 1.5°C report.

- IPCC says that BECCS needs to sequester up to 8 Gt CO_2e each year by 2050.
- Currently, all active BECCS projects sequester a total of 0.0015 GtCO_2e per year.
- The economic viability of the technology is highly uncertain—the cost is estimated at US $15–400 per tonne CO_2e.
- Besides, BECCS threatens food security by promoting diversion of land to bio-fuel production.
- Hence, the world can only significantly increase its reliance on BECCS after 2050, to achieve global net-negative emissions. BECCS will have a limited role in the push towards net zero by 2050.

A true national net zero target should be based on scientific estimates of the potential to enhance natural sinks, and a conservative estimate of the technological potential to remove CO_2 at scale.