Understanding Decarbonisation Pathways

1. **Greenhouse Gas (GHG):** Greenhouse gases (GHGs) like carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), that trap heat in the atmosphere, contributing to global warming. As greenhouse gases have different global warming potential, their impact is typically converted into a CO_2 equivalent to make comparisons meaningful.

2. **Decarbonisation:** The process of reducing emissions from activities like energy use, transport, and industry. This is done by shifting to clean energy (like solar and wind), improving energy efficiency, and adopting low-carbon technologies to limit greenhouse gas emissions.

3. **Low-Carbon Pathways:** Development strategies that aim to reduce greenhouse gas emissions over time by promoting clean energy, energy efficiency, and sustainable practices across sectors like industry, transport, agriculture, and waste.

4. **Climate-Resilient Pathway:** Development approaches that strengthen the ability of systems, communities, and economies to withstand and adapt to the impacts of climate change, such as extreme weather events, water stress, and rising temperatures.

5. **Emissions Scenario:**
   A plausible representation of the future emissions of greenhouse gases based on a coherent and internally consistent set of assumptions about key driving forces and their relationships. These driving forces may include demographic and socio-economic development, technological change, and trends of energy and land use. Emissions scenarios are often used as inputs to climate models, either directly or through the derivation of concentration scenarios, to assess future climate change. (*Adapted from IPCC AR5 Glossary, 2014*)

   5.1. Business-as-Usual (BAU) Scenario: A scenario that projects future greenhouse gas emissions, based on energy demand and supply projections, current policies and historical trends, assuming that improvements in energy efficiency, fuel switching, and sequestration shall remain constant at current levels. Existing policies and plans are taken into account while projecting emissions under BAU by 2047.

   5.2. Decarbonisation Scenario (DCS): A mitigation-focused scenario that uses BAU pathway as a reference to proposed abatements. It outlines an ambitious strategy to decarbonise the district, prioritising energy security and substantial emissions reductions. Widespread electrification, energy efficiency measures, and other strategies for waste

management, agriculture and allied sectors are considered. Abatements under this scenario are over and above those projected due to policy shifts and market levers in the BAU.

5.3. Residual Emissions: Emissions of greenhouse gases that remain after all technically and economically feasible mitigation measures have been implemented. These emissions typically arise from hard-to-abate sectors such as industrial processes, long-distance transport, and agriculture where complete elimination of emissions is currently not possible.

5.4. Mitigation Potential: The amount of greenhouse gas emission reductions that can be achieved by implementing a specific set of mitigation measures or technologies, compared to a baseline or reference scenario such as Business-as-Usual. It reflects both technical feasibility and, in some cases, economic viability under defined conditions.

6. Sources of Emissions by Sectors

6.1. Energy: Emissions arising from the production, transformation, and use of energy, including electricity generation, fuel combustion in industries, transport, agriculture, buildings, and other sectors.

6.2. Agriculture, Waste, and Carbon Sink: Emissions and removals related to agricultural activities (e.g., rice cultivation, livestock, soils), waste management (solid waste and wastewater), and carbon sinks such as forests and land that absorb and store carbon dioxide from the atmosphere.

6.3. IPPU (Industrial Processes and Product Use): Emissions resulting from industrial processes and product use, where greenhouse gases are released from chemical reactions or product applications rather than fuel combustion (e.g., cement production, chemicals, iron and steel production, etc).

7. **Emission Projections:** This refers to the estimates of future levels of greenhouse gas emissions, which are based on assumptions of population and economic growth, increasing incomes, energy use, technologies, and government policies. These projections were performed for the Business as Usual scenario (BAU), which considers existing government policies without any interventions, and a Decarbonisation scenario encompassing a set of interventions over and above current policies for emission abatement.

8. **Emission Abatement:** The reduction of greenhouse gas emissions (like Carbon dioxide CO2, Methane CH4 and others) through measures such as improving energy efficiency, switching to cleaner fuels, adopting low-carbon technologies, or enhancing carbon sinks, compared to a baseline or reference scenario.

9. **Emission Intensity:** Emission intensity in the context of greenhouse gases is the amount of emissions produced per unit of a specific activity or output. This metric measures the environmental impact of specific activity or output which can facilitate its comparison across industries or countries. The emission intensity differs from total emissions as intensity can reduce with technological change while total emissions continue to rise due to increased production and economic growth. Tracking emission intensity for climate targets is critical in cases where economic growth and its drivers need to be decoupled from emissions.

10. **Carbon Sequestration :** Carbon sequestration involves "removing C from the atmosphere and depositing it in a reservoir" (UNFCCC 2006). Carbon can be sequestered in two major ways: biological and geological.

11. **Net Zero:** Net Zero as a concept is defined as a scenario where the emissions being made at an economy/sector level are counterbalanced by capturing/sequestering equal amounts through interventions like Carbon Capture, Utilisation and storage (CCUS), agroforestry, social forestry, mangrove plantation etc. It does not imply a no-emission scenario.

12. **Gross emissions:** The total amount of greenhouse gases emitted from all sources (such as energy use, industry, agriculture, and waste) within a defined boundary, before accounting for any reductions or removals.

13. **Net emissions:** The amount of greenhouse gas emissions remaining after subtracting any removals, such as carbon captured through forests, soils, or technologies like CCUS. Net emissions reflect the overall impact on the atmosphere.
    Net Emissions = Gross Emissions - Removals

References

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