

INDIA'S POWER OUTLOOK

VOLUME 5



INDIA'S 2030 Targets: A Stepping stone to

NET-ZERO_{by}

2070



The Power Outlook Series developed by **Vasudha Foundation** with support from **Children's Investment Fund Foundation (CIFF)** provides an overview of the current status of India's power sector with a focus on significant and emerging developments. The outlook series aims to develop a more informed understanding of the power sector and act as a tracking tool for stakeholders. '**India's 2030 Targets: A Stepping Stone to Net-Zero by 2070**' is fifth in the series of India Power Outlook Reports.

Volume 5 provides a logical overview of the climate actions at COP 26. It discusses a sentiment analysis that captures the public opinion towards the ambitious climate announcements by analysing Twitter reactions. Additionally, the series provides an understanding of India's policy announcements and tracks its progress against the 2030 targets.



All the data pertains to January 2022, unless otherwise mentioned.

CONTENTS

Introduction 1

1 India Power Sector A Snapshot 3

2 Overview of the Global Efforts at COP 26 5

3 A Tale of Targets 13

4 On the Road to Net Zero 19

5 COP 26 A Sentiment Analysis 23

Bibliography 25



INTRODUCTION

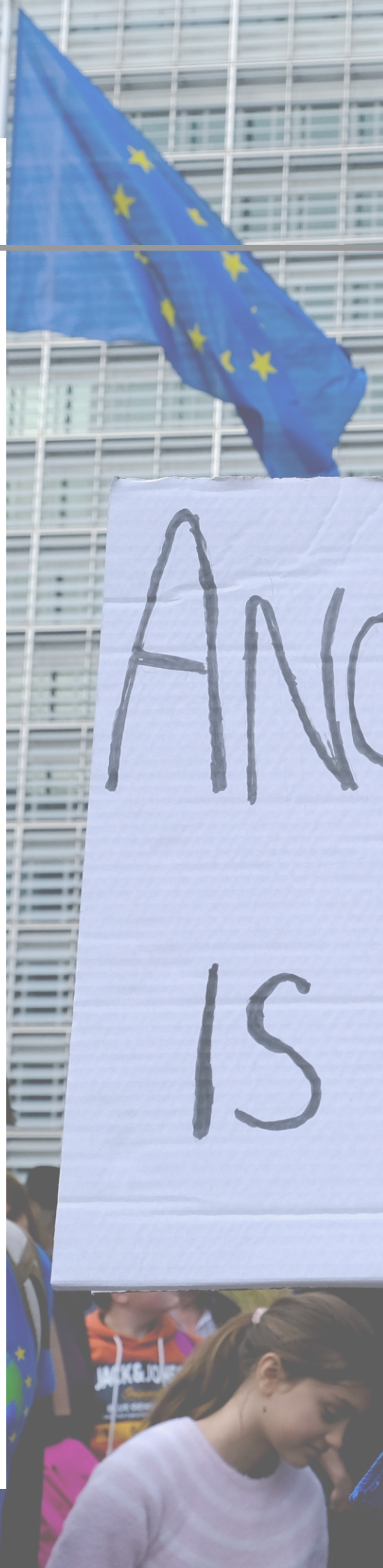
The UN Climate Change Conference of Parties in Glasgow (COP 26) brought together 195 countries with a common goal to limit anthropogenic emissions and avoid climate catastrophes in the future. The COP 26 was being described as the most significant climate event since the 2015 Paris Agreement. This is attributed to reasons like the postponement of COP in 2020 due to COVID-19, and the importance to finalize the rule book for the Paris Agreement which was hanging in the lurch for the past six years. Moreover, it brought itself notable firsts that provided the impetus to the climate movement.

For the first time ever, countries agreed to phase down coal, and further, at least 29 countries agreed to end subsidies for inefficient fossil fuels. Another major achievement was more than 450 financial institutions committing to use their total net worth of \$130 trillion of private capital to accelerate net-zero transition. Third, it saw the finalization of the guidelines for carbon trade, leading to the implementation of the Paris Agreement in full capacity. COP 26 further recognized Methane as a climate pollutant and at least 105 countries signed the global Methane reduction pledge. Notably, all key countries announced their net-zero targets.

According to Carbon Brief Analysis¹, If the countries meet their 2030 targets and further fulfill their Net-zero promises, the world will be on a 1.8°C (1.4°C to 2.6°C) degree rise by 2100. Amongst these announcements, India demonstrated a stellar performance at the Glasgow COP. The Prime Minister announced the five 'Panchamrits' to boost India's clean energy transition and committed to reach net-zero emissions by 2070.

Overall, India's 2070 net-zero target is a laudable commitment, though, there is a dire need to follow it up by targeted policy action, significant technology preparedness, availability of finance to see the light of the day. The long-term goal needs to be broken up sector-wise in short and medium-term steps for meaningful actions. With India at the cusp of two major transitions- economic and energy; there is a need to understand the interplay of varied elements like jobs, industrial growth, energy production and consumption, incomes & affordability, etc., for accomplishing a 'just transition'. According to World Economic Forum², India's transition to a net-zero economy can create over 50 million net new jobs and contribute more than \$15 trillion to its GDP by 2070. Hence, Net-Zero should not be solely looked at as a target to be achieved in 2070, but an opportunity to bounce to an equitable, advanced, and cleaner nation.

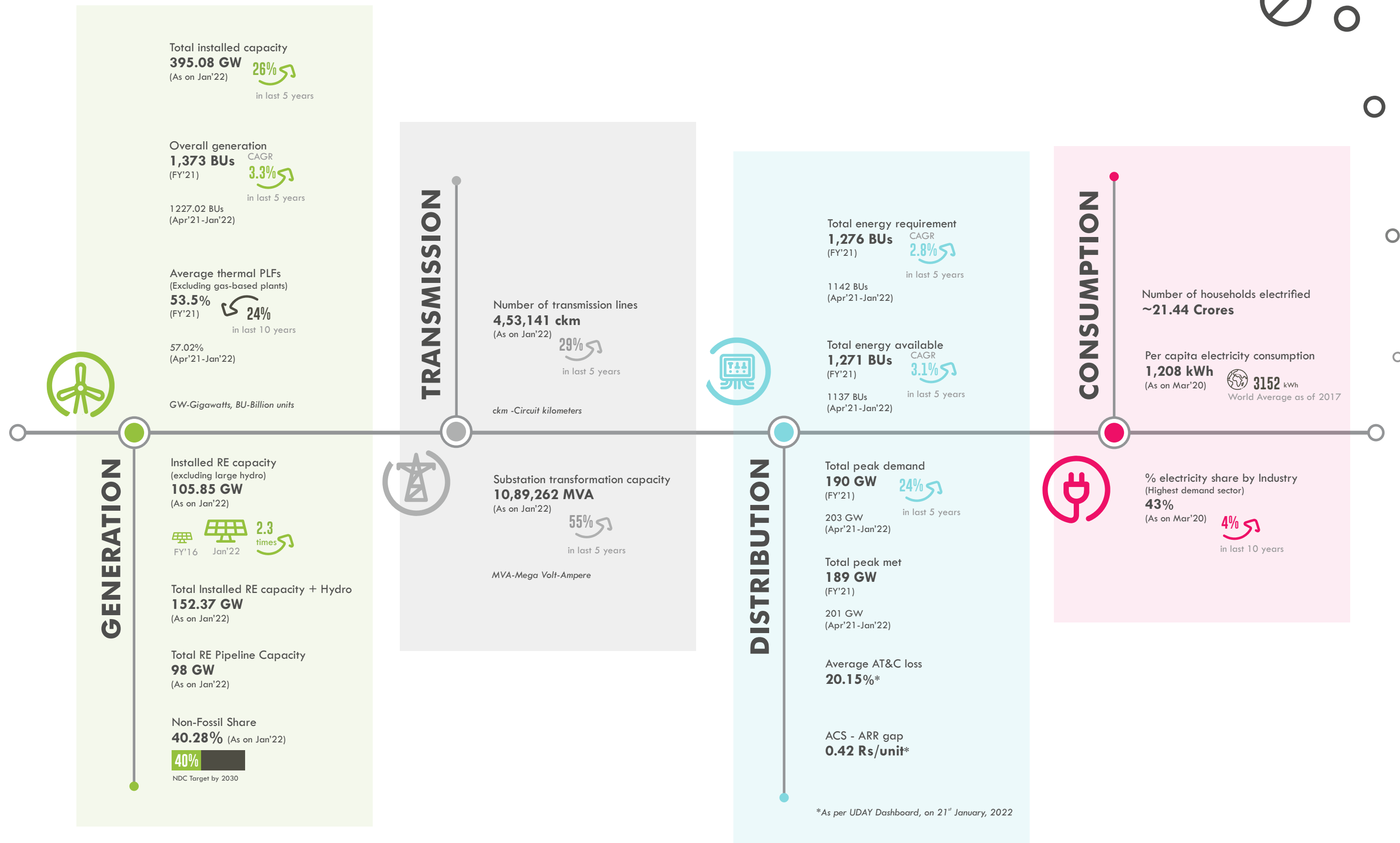
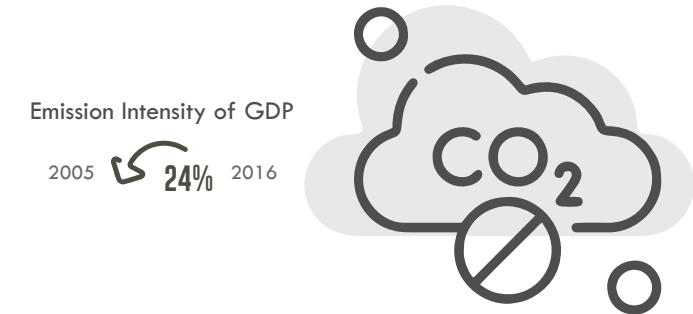
With this background, this outlook series looks at the high-level insights of the COP 26, which forms the stepping stone to India's net-zero journey and further facilitates its clean energy transition.



OTHER FUTURE
POSSIBLE

INDIA POWER SECTOR

A SNAPSHOT



All the percentages were calculated based on financial year (except average AT&C loss and ACS-ARR gap).

Source - Vasudha Power Info Hub³

OVERVIEW OF THE GLOBAL EFFORTS AT COP 26

2



To limit the physical impacts of climate change and stay on track to meet the goals of the 2015 Paris Agreement, greenhouse gas emissions (GHG) must halve over the next decade, falling 7% every year through 2030⁴. COP 26 was the last opportunity for the countries to raise their ambitions and make this happen. While we are still not on track to meet the goals of the 2015 Paris Agreement; a range of events, pledges, and announcements unfolded at the Glasgow COP to enable a net-zero. In this section, we provide a glimpse of the COP 26 objectives and achievements.

2.1 Tracking Nationally Determined Contribution (NDC) targets⁵

131

Countries that
Submitted/Proposed
New NDC targets

36

Countries that
did not update
their NDC targets

- India has announced a new and enhanced NDC target and their official submission to the UNFCCC is pending.
- Many key countries like China, EU, Japan, South Korea, the UK, and USA all have enhanced their NDC targets.

2.2 Net-Zero Announcements

According to IPCC⁶ “Net-zero emissions are achieved when anthropogenic emissions of greenhouse gases to the atmosphere are balanced by anthropogenic removals over a specified period beyond the carbon budget. However, Net-zero carbon dioxide (CO₂) emissions are achieved when anthropogenic CO₂ emissions are balanced globally by anthropogenic CO₂ removals over a specified period. Net-zero CO₂ emissions are also referred to as carbon neutrality”.

Over the recent years, 'Net-zero' has been the only hope to reach the global temperature goal by striking the right balance of emission sources and sinks by each country. Almost 135 countries have announced their net-zero targets under different setups and institutional arrangements. Countries have adopted diverse approaches to become net-zero.



FIGURE 1 - UNDERSTANDING NET-ZERO DIMENSIONS⁷

- Target status - This is an important parameter in understanding how the net-zero announcement translates into meaningful decision-making and long-term actions. An in-policy or in-law status implies that the net-zero target is integrated into the country's national policy such as an NDC, climate action plan, etc.
 - An in-law status could further tighten its implementation due to legally binding measures. To date, only ten countries have enacted domestic law on net-zero and 17 have announced policies⁸; but still, the majority of countries have either proposed or pledged a target. Moreover, while policy pronouncement is important, compliance can only be assured through law since, in many nations, climate ambition changes quickly with a change in the political landscape.
 - Terminology- Terms like Carbon neutral and Net-zero emissions are used interchangeably, but they are not the same. They become significantly different when looked at from the offset point of view. While net-zero will always be about reducing greenhouse gas emissions through renewable energy, clean technologies, etc, and then using carbon offsetting measures as a last resort. However, carbon-neutral is about balancing the carbon emissions in the atmosphere by offsetting. It does not necessarily mean that by being carbon neutral, one will reduce Greenhouse Gas (GHG) emissions. Carbon neutral is similar to Net-Zero CO₂ emissions.
- The diversity of definitions and the lack of clear understanding of some of these climate targets can lead to confusion and inaction by countries and their state/regional/local actors. There is a need for greater clarity on the scope of emissions and sectors and how the countries plan to meet their stated commitments.

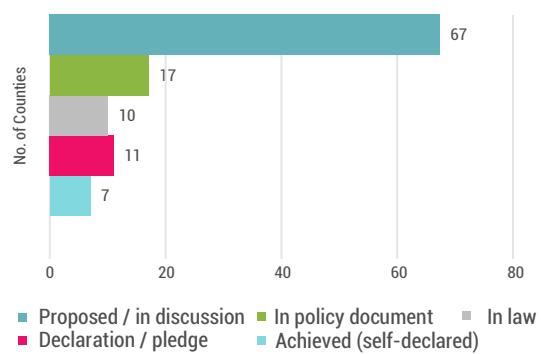


FIGURE 2 - TARGET STATUS OF THE NET-ZERO ANNOUNCEMENTS BY COUNTRIES

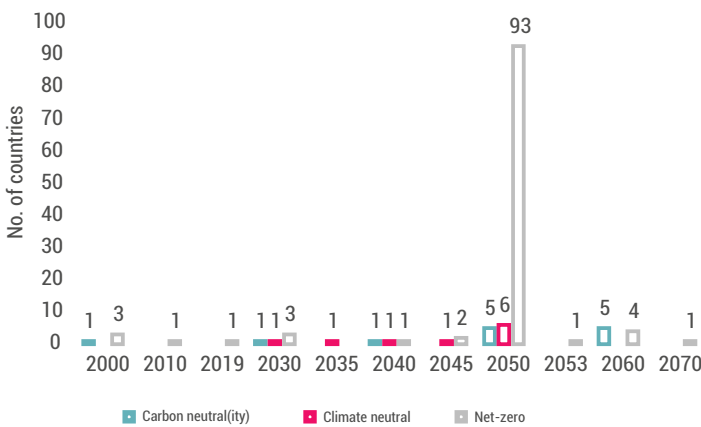


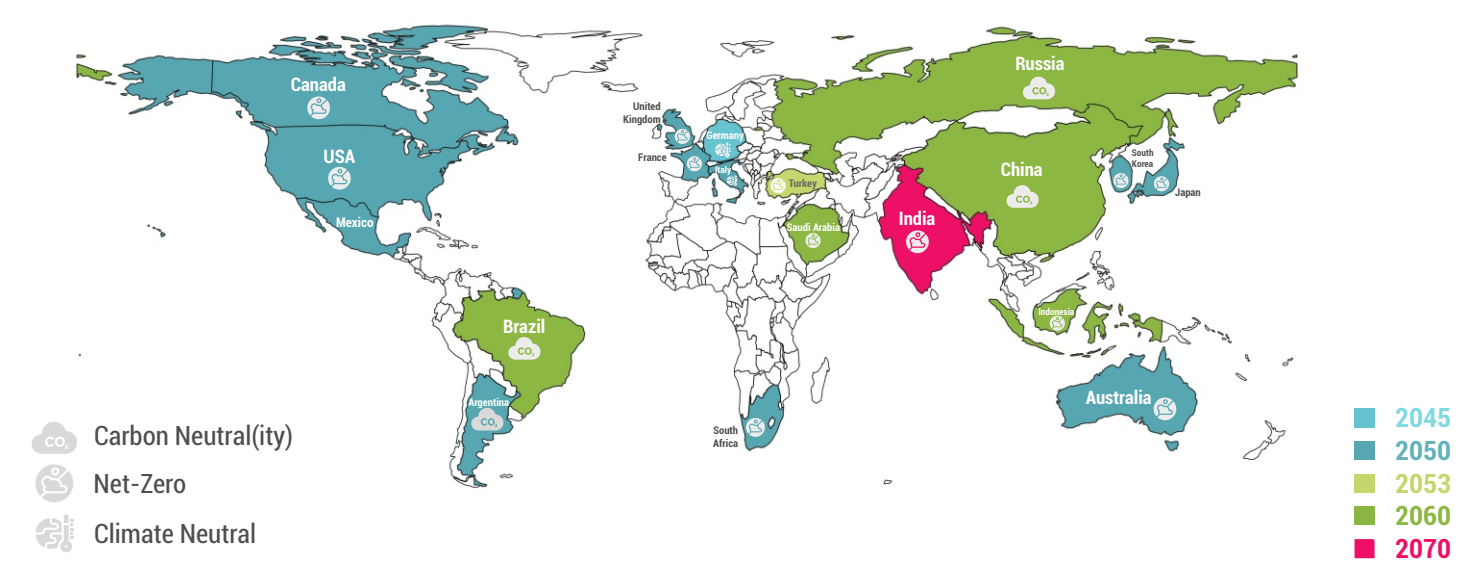
FIGURE 3 - CLIMATE AMBITION TERMINOLOGY USED BY COUNTRIES

- Timelines & Scope - While early movers and countries with dense forest cover like Bhutan and Suriname have been carbon-negative for quite some time, smaller countries such as Benin, Gabon, Guyana, Cambodia, Liberia, Madagascar, and Georgia have also declared their net-zero achievement. Unlike most net-zero commitments around 2050, countries like Bangladesh and Maldives committed to Net-Zero by 2030. China and India - the two largest GHG emitting countries will be meeting their net-zero targets by 2060 and 2070 respectively⁹.
- Notably, countries are setting various interim targets to keep track of their net-zero commitments. This could be in a form of a 5-to-10-year target, an NDC target (such as EU) or a carbon budget (such as the UK), sectoral milestones (such as net emission removal from LULUCF (Land Use, Land-Use Change, and Forestry) sector, phasing out of coal-fired power plants) or a peaking emission target for developing countries.

2.3 G-20 Countries and their commitments

The G20 group together accounts for 80% of global GDP, 75% share of total GHG emissions, and two-thirds of the total world population are the most critical to limit warming to 1.5 degrees Celsius¹⁰.

All the G20 countries have committed to reaching net-zero by 2070 with the majority of them reaching net-zero by 2050. According to the Climate Action Tracker(CAT), only two of the G20 countries namely the United Kingdom and European Union define their targets in an acceptable way that clearly defines the scope, architecture, and transparency of their target. It suggests that there is a need for countries to improve their net-zero design and declare robust short-term plans/pathways till 2030 to begin with.



Change in size of the countries is based on their total emissions

FIGURE 4 - A CARTOGRAM REPRESENTING G20 COUNTRIES WITH THEIR CLIMATE TARGETS

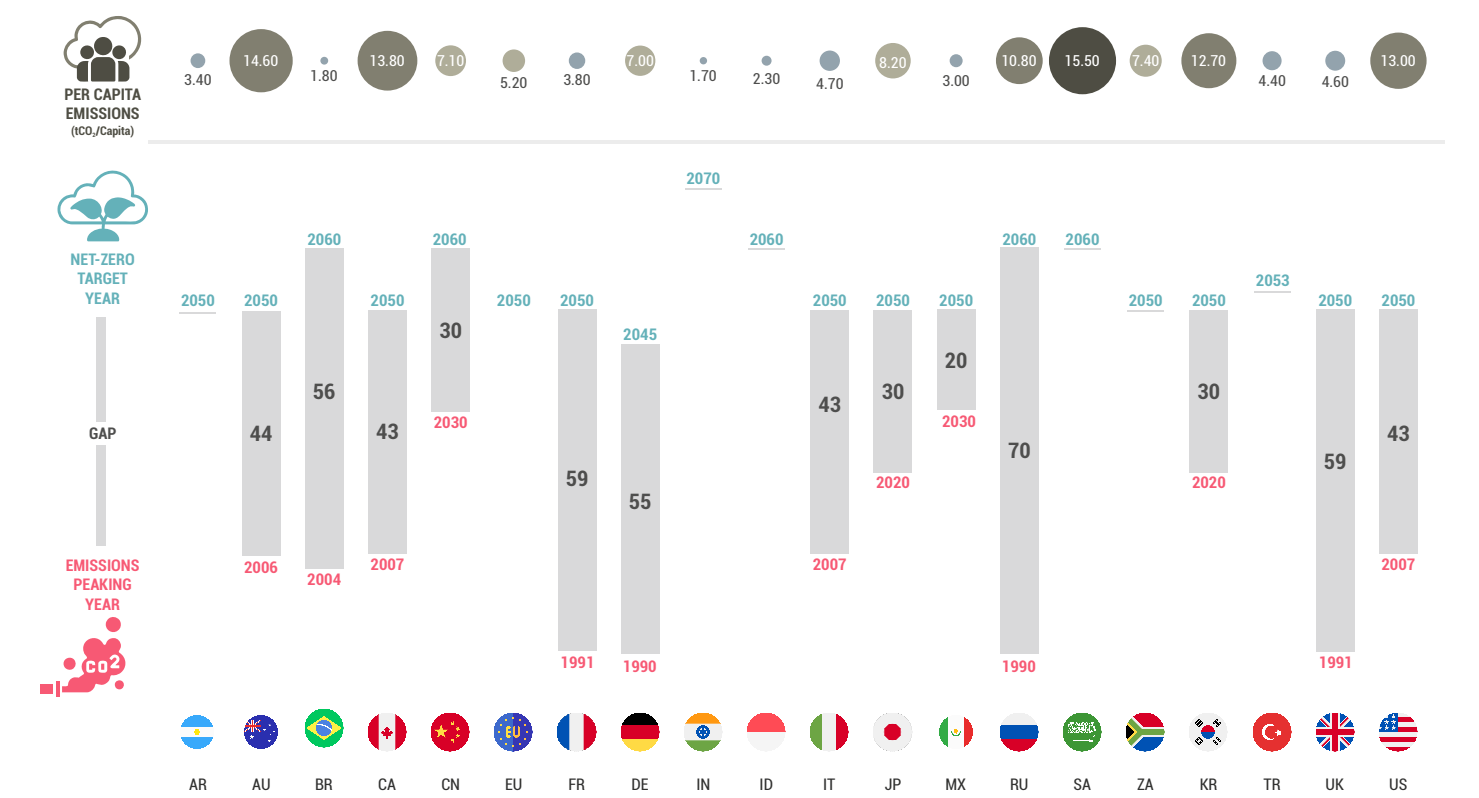
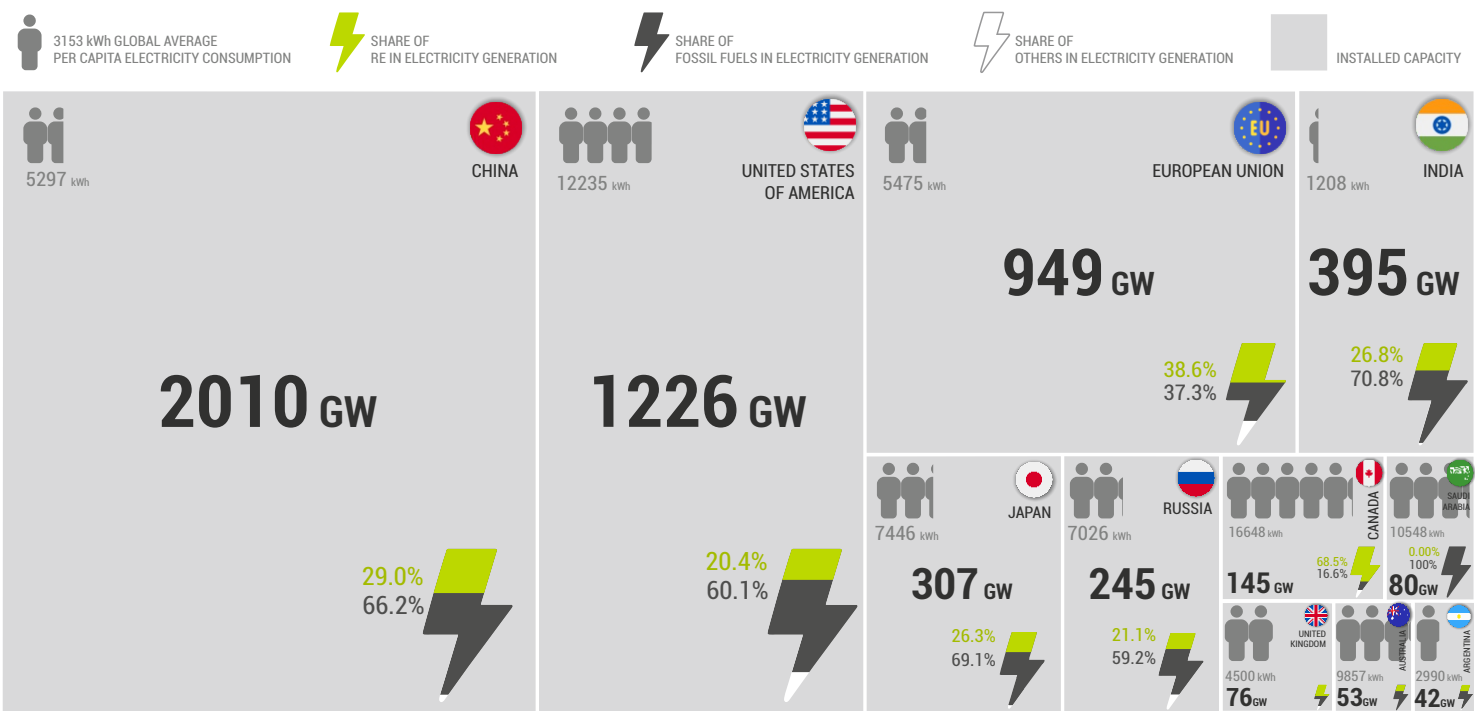


FIGURE 5 - G20 COUNTRIES WITH THEIR EMISSION PEAKING YEAR AND NET-ZERO TARGET YEAR

Source: IEA, Net-Zero Tracker, and WRI¹¹

KEY INSIGHTS

- Within the G-20 group, **Russia** with its **fifth-highest** GHG emissions has the maximum gap of **70 years** between its peak emission year and becoming net-zero.
- Developed countries like **UK, France & Germany** reached their peak emissions way back in **1991** and **1990** respectively. This accentuates that not just a higher historical emission stake but these countries would take the maximum time to decarbonize their economies.
- Saudi Arabia** with the highest per capita emissions and almost **100% fossil fuel-based** electricity generation has not announced a peaking year yet.
- Mexico** could be the fastest G-20 country to become net-zero in **2050** after peaking in 2030.
- For emerging and fossils fuel-dominated countries like **India and Indonesia**, it becomes imperative to realize an **emission peaking year** as a key interim target before turning net-zero and looking at an effective phase-down path for thermal power.
- Canada's** per capita electricity consumption is roughly **14 times** that of India. Incidentally, as per figure 5, India has the lowest per capita electricity consumption amongst major GHG emitting countries.
- With its **26.8%** RE generation share, **India** outshines some key G20 countries such as the United States of America , Russia, Australia in its clean energy production.



The installed capacity has been collated from multiple websites and hence provides a tentative power system size for that country. The data ranges from 2019 to 2021.

FIGURE 6 - COUNTRIES WITH THEIR ELECTRICITY INSTALLED CAPACITY, GENERATION MIX AND PER CAPITA CONSUMPTION

2.4 .Glasgow Financial Alliance on Net Zero (GFANZ)

Over the last decade, global climate finance flows increased considerably from \$364 Billion in FY 11 to \$632 Billion in FY 20¹². However, in order to transition to a net-zero pathway and limit GHG emissions, conservative estimates by a study assessing that global climate investments need to be roughly between \$4.5-\$5 trillion(T) annually¹³.

It is estimated that¹⁴ over \$100T-\$150T of cumulative investments are required between 2021-2050 for transition to net- zero 2050 with roughly \$32 T of investments over the next decade across six key sectors – Electricity (\$16.0T), Buildings (\$5.2 T), Transport (\$5.4 T), Industry (\$2.2 T), Low Emission Fuels (\$1.5 T), AFOLU (\$1.5 T).

Out of this, India alone has an investment opportunity(need) of \$2.5 trillion till 2030 to further its path to becoming Net- Zero by 2070. Climate finance as reiterated by the developing nations needs to count in trillions and not billions.

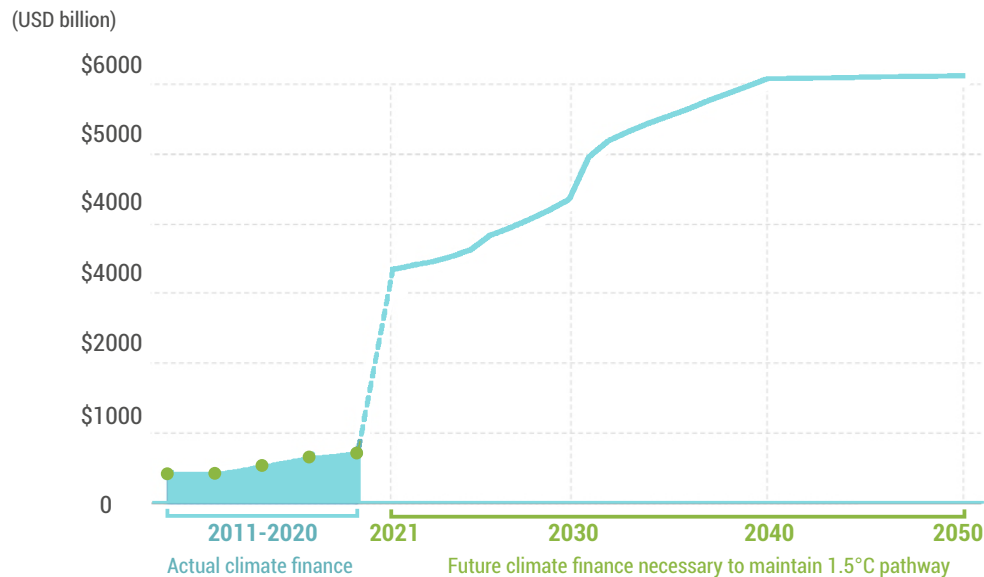


FIGURE 7 - PROJECTED ANNUAL CLIMATE INVESTMENT NEEDED GLOBALLY TILL 2050

Source: Global Landscape of Climate Finance 2021¹⁵

With this background, Glasgow Financial Alliance for Net Zero (GFANZ) was conceptualized to form a global coalition of financial institutions to accelerate the finances and unlock system-level changes across the financial sector value chain to reach Net-Zero by 2050. This includes- asset owners, insurers, asset managers, banks, investors, audit firms, etc. Launched in April 2021, the alliance has over 450 major financial institutions from across 45 countries, controlling assets worth \$130 trillion (As of November 2021).

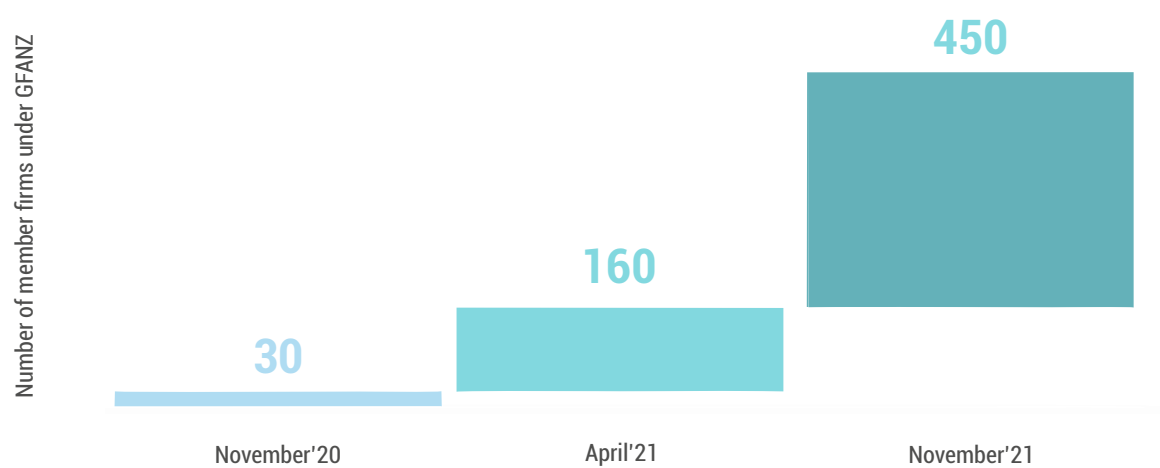


FIGURE 8 - TOTAL NUMBER OF MEMBER FIRMS UNDER GFANZ WITH THEIR COMBINED FINANCIAL ASSETS

Source: GFANZ 2021¹⁶

2.5 First Movers Coalition

Technology and Finance are the two key pillars to realise the targeted Net-Zero emissions by countries. According to IEA¹⁷, more than 50% of the carbon reductions expected in 2050 will be met by technologies that are still at various developmental and demonstration stages. Hence, it becomes crucial for big companies to provide a market for such technologies and help them achieve scale. Accordingly, to bridge the demand-supply gap for new clean energy technologies and ensure its commercialization by 2030, the First Movers Coalition was announced at COP 26. It's a group of few forward-looking companies that will help leapfrog the existing technologies and create markets for zero- carbon technologies.

Currently, the coalition has 35 founders that will act as 'strategic advisors' and have made at least one purchasing commitment across any of the eight hard-to-abate sectors that together account for more than one-third of the world's carbon emissions. These are – Aviation, Shipping, Trucking, Steel, Cement, Aluminium, Chemicals. The last 'Direct Air capture' also requires technological innovation to reach commercial viability.

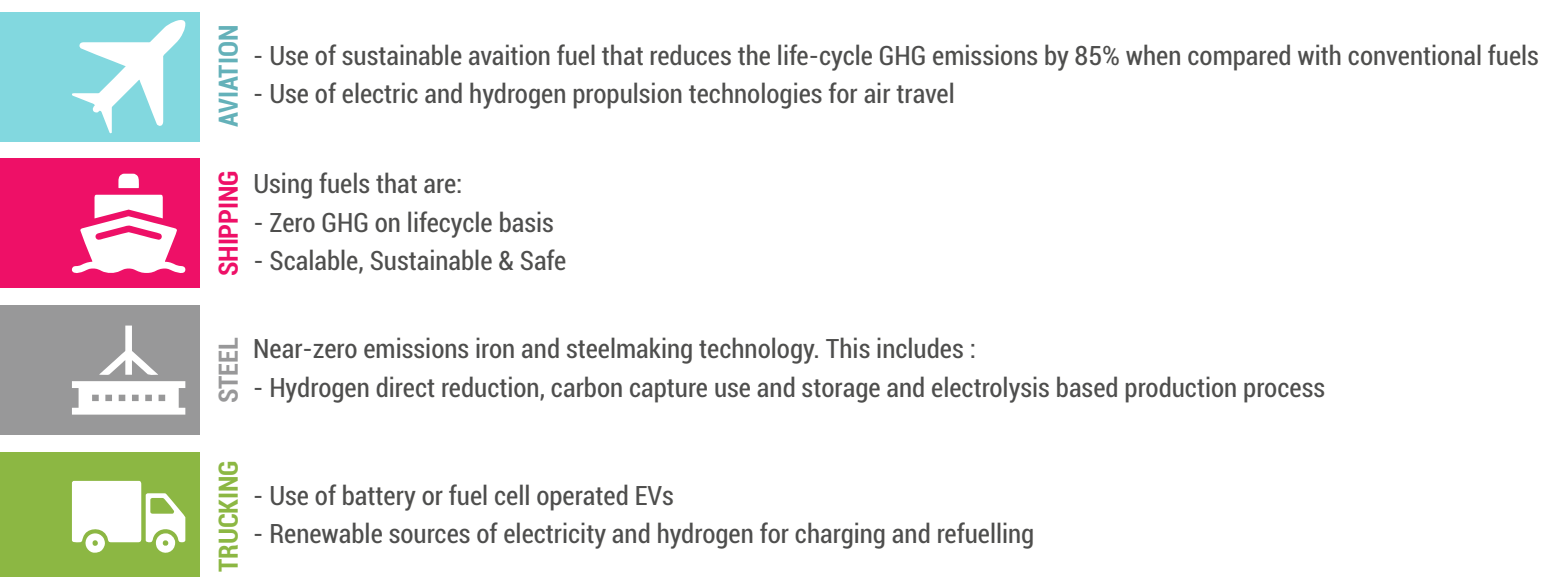


FIGURE 9 - COMPONENTS OF PHASE 1 COMMITMENTS UNDER THE FIRST MOVERS COALITION

Source: World Economic Forum¹⁸

Global giants like Amazon and Apple as well as Mahindra Group, Dalmia Cement (Bharat), and Renew Power from India have also joined as strategic advisors of the 'First Movers Coalition'.

2.6 Global Methane Pledge

Reducing human-caused Methane emissions is one of the low-hanging fruits to put the world on track to limit to 1.5 degree temperature rise. Methane is a powerful but short-lived greenhouse gas that warms the planet 28-36 times as much as CO₂ within a timeframe of 100 years and has contributed to a 0.5 degree rise in global temperatures as against the 0.8 degree contribution from CO₂¹⁹ since the industrial revolutions. Rapidly reducing methane emissions from key contributing sectors (mentioned in Figure 11) can greatly help in limiting global warming (to 1.5° C), while yielding co-benefits in terms of improving public health, agriculture productivity, and waste management.

The Global Methane Pledge launched at COP 26 seeks to curb the global methane emissions by at least 30% from 2020 levels by 2030 and to enhance the quality of available data inventory, with a particular focus on high methane emission sources. The initiative was proposed by the USA and European Union and formalized at the Glasgow Climate Meeting. However, a total of 45% methane emission reduction is possible till 2030 to attain a 0.3 degrees Celsius saving by 2045.

2nd largest polluter after CO₂

Global Warming Potential (100 years) = **28-36 times**

Global Warming Potential (20 years) = **84-87times**

A **dangerous** air pollutant

Accounts for about **10%** of the global emissions

Primarily caused by human activity- fossil fuels (**37%**), agriculture (**40%**), and waste (**23%**)

FIGURE 10 - WHY METHANE?

Source: IEA, 2022²⁰

While more than 100 countries have signed the pledge which also includes close to 22 African countries but interestingly, India, China, and Russia, some of the top emitters of methane, are not a signatory to the pledge²¹. While the methodology and data sources for methane emissions are still under discussion, the global methane emissions globally are projected to rise to ~10 billion tonnes of CO₂eq (see graphic below) constituting 60% of the total non-GHG emissions in 2050. Studies²² suggest that it is crucial to alter the methane trajectory now since it recorded the highest growth rate in NOAA's (National Oceanic and Atmospheric Administration) 37-year record and also due to the reasons highlighted in Figure 11.

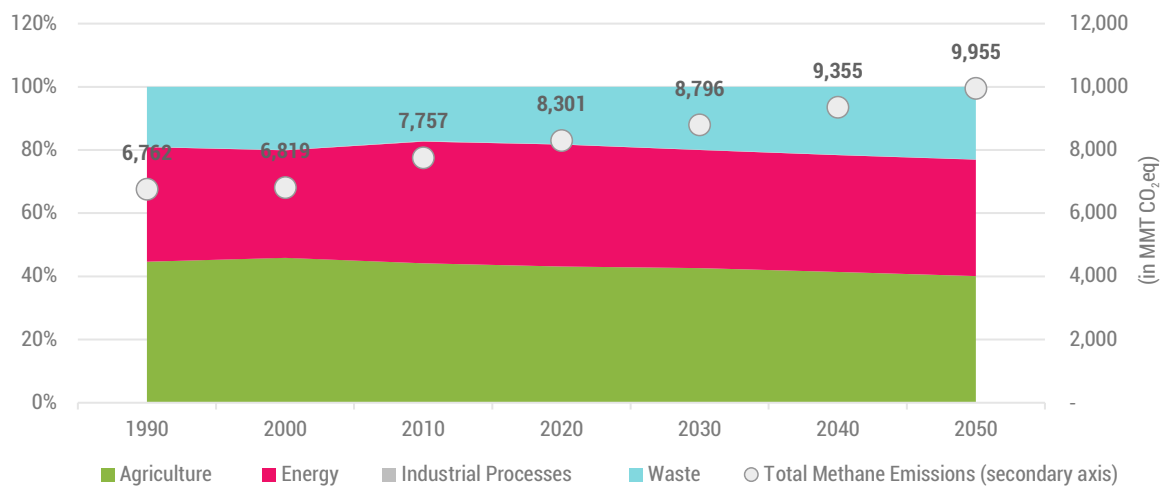


FIGURE 11 - GLOBAL METHANE EMISSION ASSESSMENT

Source: Global Methane Initiative²³

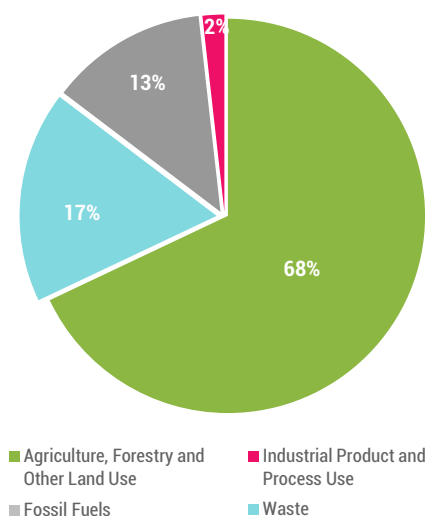


FIGURE 12 - INDIA'S METHANE EMISSION ESTIMATES (2015) ~598 MMT CO₂eq

Source: GHG Platform India²⁴

India is the third-largest emitter of methane. Agriculture remains the hotspot for India's Methane Emissions. A large portion of which comes from livestock followed by rice cultivation. India's decision to not be a part of the Global Methane Pledge stems from a variety of reasons. The agriculture sector houses many small farmers who are poor and practice old-fashioned methods for crop cultivation. Also, there is a lack of cost-effective technologies that would together boost crop productivity and be climate-friendly. Further, there is an urgent need for proper data and measurement techniques to assess methane emissions from these sources.

While little attention has been given to this short-lived climate pollutant, mitigating methane will become crucial on our road to Net-Zero emissions. With a huge bovine population, methane emissions can be controlled by improving the cattle feed or by improving milk/meat yield. For crop cultivations, the use of biogas slurry instead of unfermented farmyard manure can help reduce emissions²⁵. Another UNEP study²⁶ identifies a huge mitigation potential for methane emissions from India's waste sector.

2.7 Zero Emission Vehicle (ZEV) Pledge

The UK and 38 other countries including India, signed the ZEV pledge for the sale of only zero-emission light-duty vehicles- cars and vans by 2035 for developed countries and 2040 for developing nations. For India, the pledge meant the sale of all cars and vans to be zero emissions by 2040.

Another pledge on zero-emission medium and heavy-duty (ZE-MHDV) trucks and buses were started by Netherlands and CALSTART (A not-for-profit) to work towards 30% ZE-MHDV sales by 2030, and 100% ZE-MHDV sales by 2040 and was further joined by the UK and Canada²⁷.

However, the world's largest auto markets, including the U.S., China, Germany, South Korea, and Japan, were absent from the pledges, and the top two global automakers (Toyota and Volkswagen) also were absent from commitments under clean transport²⁸.

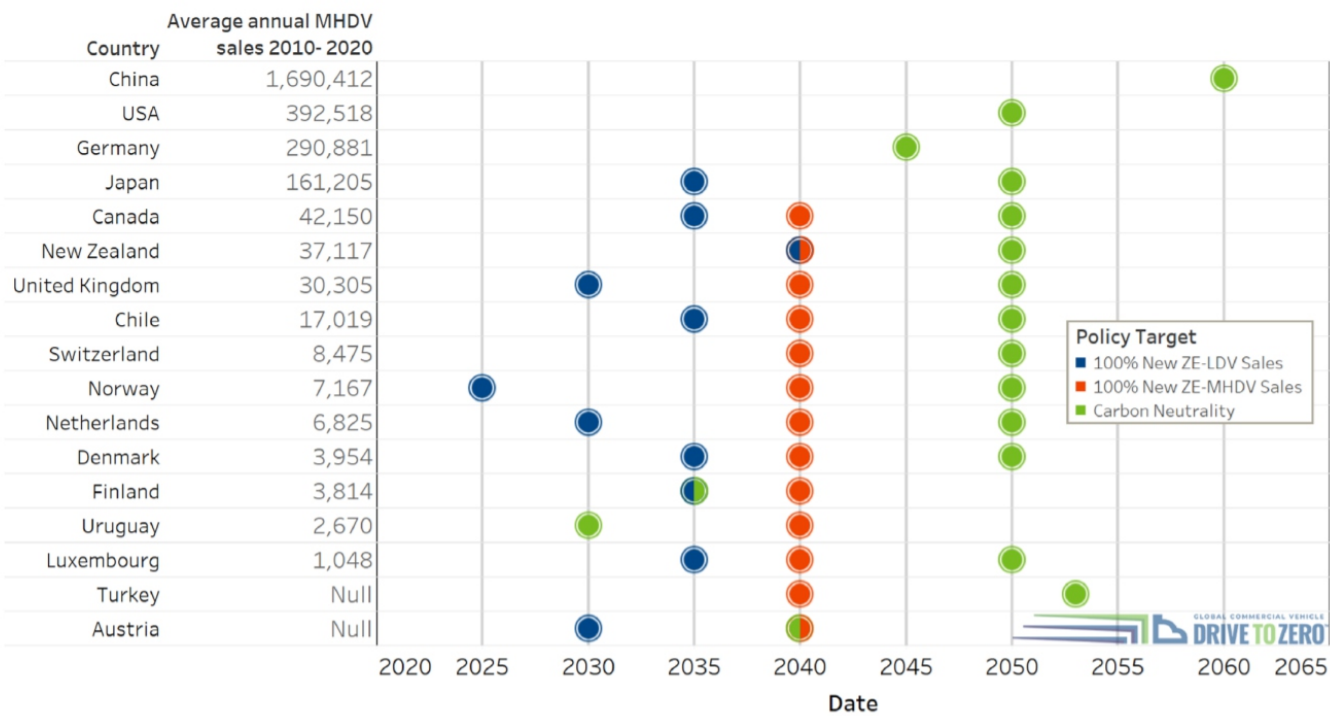
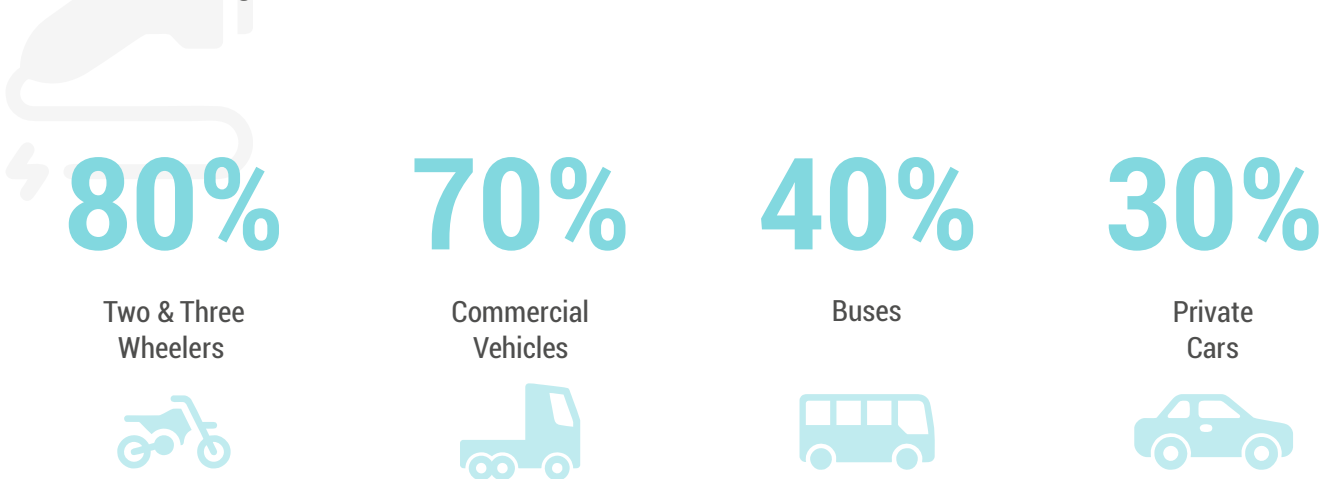


FIGURE 13 - COUNTRY-WISE POLICY TARGETS

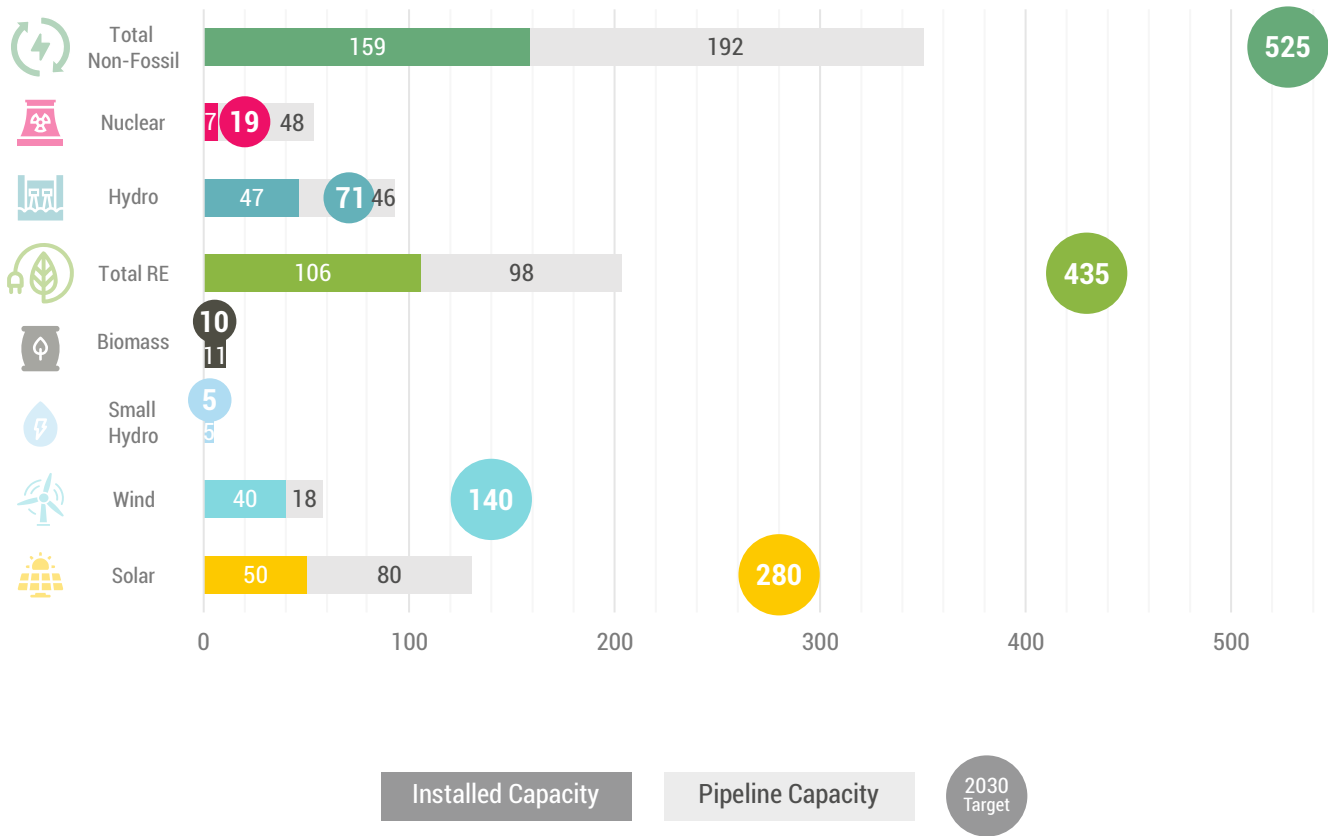
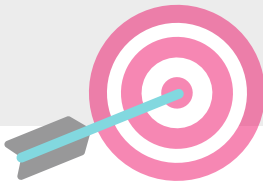
Source: Drive to Zero, December 2021²⁹





India 2030 EV Sales Target





India's 2030
NDC & New Target
Progress



Capacity in GW Jan 2022	 Installed	 Under- construction	 Pipeline	 2030 Target
Solar	50	13.1	66.9	280
Wind	40	5.6	11.9	140
Small Hydro	5			5
Biomass	11			10
Total RE	106	18.7	78.8	435
Hydro	47	11.4	35	71
Nuclear	6.8	7.2	40.9	19
Total Non-Fossil	159.1	37.4	154.75	525

Source: Vasudha Power Info Hub²⁰

Time and again, India has demonstrated a higher appetite for clean energy by announcing ambitious targets whether it's the 175 GW RE by 2022 or 450 GW RE by 2030 or the most recent 500 GW of non-fossil fuels by 2030. Not just making bold announcements; this has been further followed up by effective decision making and a conducive policy environment boosting investor confidence and expediting on-ground implementation. Presented below is a juxtaposed visual between the current NDC and India's climate announcements 'Panchamrits' at the Glasgow COP.

India's NDC **2015**

To increase the share of non-fossil-based energy resources to **40%** of installed electric power capacity by 2030 (~327 GW)

An economy-wide emissions intensity target of **33%–35%** below 2005 levels.

To create an additional (cumulative) carbon sink of **2.5–3 GtCO₂e** through additional forest and tree cover by 2030.

India's COP 26 announcements **2021**

India will reach its non-fossil energy capacity to **500 GW** by 2030.

India will meet **50%** of its energy requirements from renewable energy by 2030.

By 2030, India will reduce the carbon intensity of its economy by less than **45%**

India will reduce the total projected carbon emissions by **1 billion** tonnes from now onwards till 2030.

By the year 2070, India will achieve the target of **Net-Zero**.

Source: PIB²¹

3.1 .Walking the talk

Helen Keller famously said, “A bend in the road is not the end of the road.... unless you fail to make the turn.” Faced with the crisis of the century, climate change, India has made many turns. Not just the targets underscored above, India is also leading the climate war by bridging the gap between knowing and doing.

The scale of transformation in India is exhilarating. In November 2021, India achieved 40% of its installed electricity capacity from non-fossil fuel energy sources and became one of the few countries to achieve targets set under the NDCs for 2030. As a large developing economy with over 1.3 billion people, India's climate adaptation and mitigation ambitions are not just transformational for India but the entire planet.

There are five quantified targets in the recent COP 26 announcement as compared to the three under India's NDCs on climate change mitigation. The net-zero target and 50% RE energy share in electricity generation targets were pledged over and above the NDC target.

In Glasgow, India committed to reaching 500 GW non-fossil capacity by 2030. The 21st report by Standing Committee³² on Energy presented in the parliament on 3rd February 2022, reiterated Central Electricity Authority (CEA) projections of 525 GW of non-fossil electricity capacity³³ by 2030. This is reasonably higher than the target exclaimed. Against this, India has currently installed 157 GW of non-fossil capacity with another 190 GW of non-fossil capacity in the various pipeline and under-construction stages. A source-wise breakup for the 500 GW of the non-fossil capacity target is still awaited from the Ministry of Power.

Second, India aims to achieve 50 percent of its energy requirement to be met through renewable energy by 2030. While much-needed clarity on this 50% the energy requirement target is still required, our high-level estimates suggest that the target holds almost similar meaning for both/either installed capacity and/or electricity generation.

The explanation is as follows: As per the CEA report, the expected electricity demand in 2030 is around 2,325 BUs and out of this, nearly 50% (~1110 BUs) is expected to be met through renewable energy.

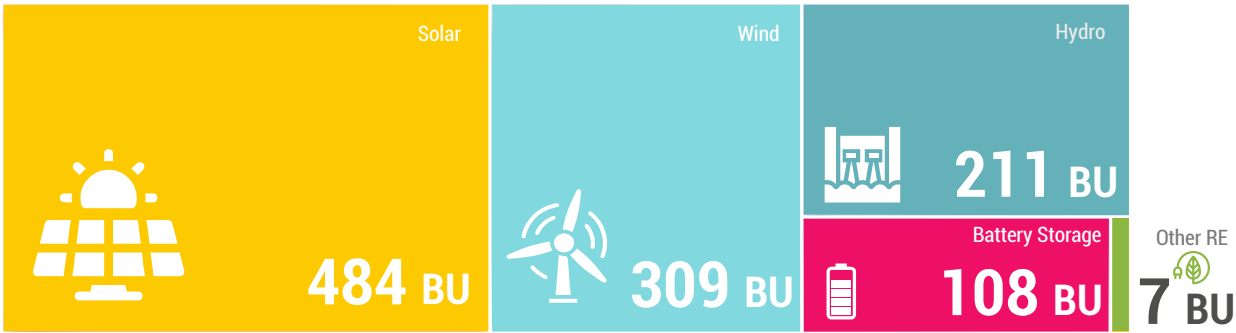


FIGURE 14 - LIKELY GROSS GENERATION FROM RE SOURCES IN 2029-30

Likewise, when considered in terms of installed capacity, CEA plans to install 817 GW of installed power capacity in 2030. Out of this, more than 50% of this capacity ~435 GW is expected to be met through RE (excluding large hydro). However, the former clarification on meeting 50% of electricity requirement with RE holds higher concurrence³⁴. Whichever is the line of thought behind the announcement; India's unwavering commitment towards becoming low carbon and progressively net-zero is testified.

As per the BUR-III report, India has realized a 24% reduction in its emission intensity between 2005 and 2016. The COP 26 announcements further enhanced the emission intensity reduction target from 35% to 45% since 2005 levels.

As per our analysis, the 10% increase in the emission reduction target will result in a 15% additional reduction in India's GHG emissions in 2030.

	FY 2005	2030
GDP (Constant prices) (₹Lakh)	28,07,53,046	
Total Emissions (Mt CO ₂ e)	1,465	
Emission intensity in 2005 (Kg CO ₂ e/1000 ₹)	52.18	
Emission Intensity Target (NDC)		35%
Emission Intensity Target (COP 26)		45%
Emission intensity (NDC) (Kg CO ₂ e/1000 ₹)		33.9
Emission intensity (COP 26) (Kg CO ₂ e/1000 ₹)		28.7
Net Emissions		-15%

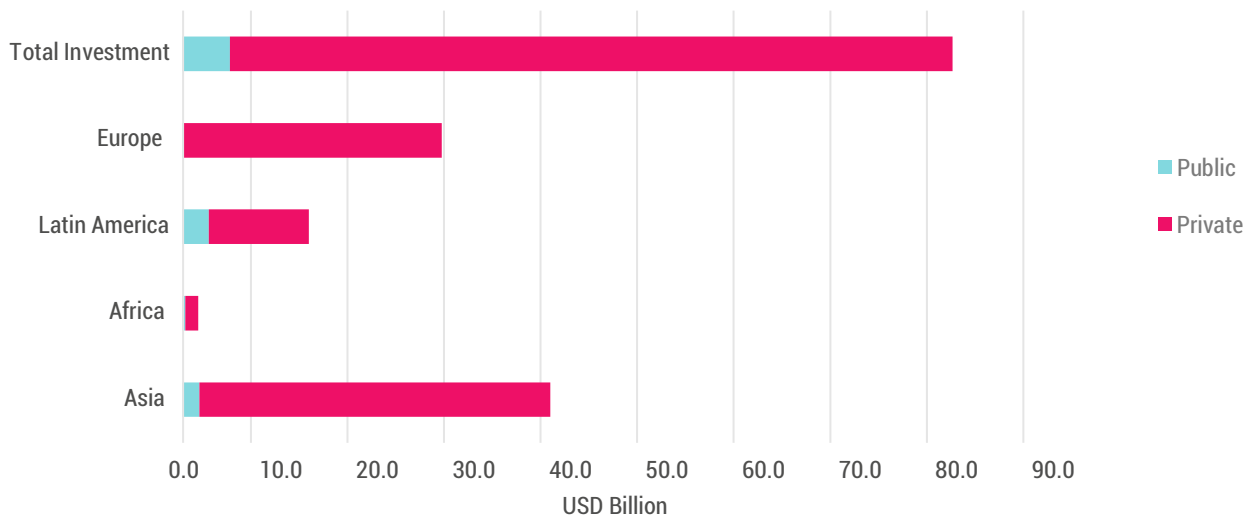
Source: RBI³⁵ and GHG Platform India³⁶

3.2 .Recent steps pioneered by India

Exemplifying its commitment to be a front-runner in the fight against climate change, India launched two key initiatives at COP 26.

3.2.1.Green Grids Initiative- One Sun One World One Grid

International Solar Alliance (ISA), the first intergovernmental body with an exclusive focus on solar energy, aims to make solar energy more accessible, reliable, and easier for people to connect to the grid and contributes to universal access to clean energy. The ISA's objective is to actively work towards the achievement of SDG 7: 'Affordable and Clean Energy' and SDG 13: 'Climate Action', promoting a clean energy transition, enabling energy access and energy security, and delivering a new economic driver for all countries. ISA has an ambitious goal to mobilize 1 trillion USD for 1,000 GW of solar capacity by 2030. Most of this investment will come from the private sector as validated from the experience seen in Figure 15. However, to achieve investment of this scale, well-designed policies must be at the helm.



Nearly 90% of new solar investments globally have come from the private sector

FIGURE 15 - INVESTMENTS FOR ISA MEMBER COUNTRIES
Source: IRENA

Furthermore, the honorable prime minister of India, Shri Narendra Modi, at the First Assembly of the ISA in October 2018 put forth the idea of the One Sun One World One Grid (OSOWOG) initiative. Based on the tenet that the sun never sets – every hour, half the planet is bathed in sunshine. By trading electricity generated directly from the sun, or indirectly via wind, and water across borders, we can deliver more than enough clean energy to meet the needs of everyone on earth. This trading is seeing the light of the day already through discrete bilateral and regional arrangements. But to meet the sheer scale of the challenge, these efforts need to be brought together and supplemented to create a more inter-connected global grid. This vision is called: One Sun One World One Grid. This vision will be executed in three phases as depicted in Figure 16.

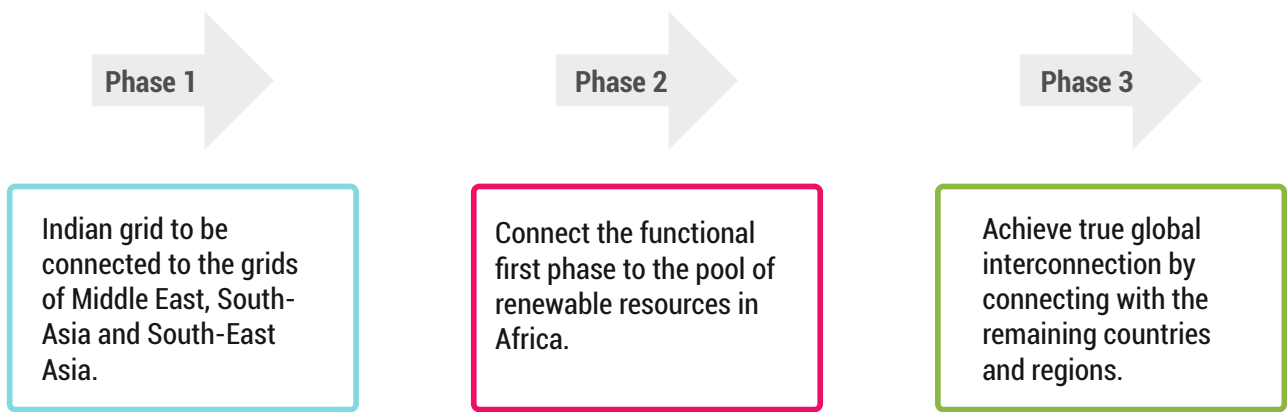


FIGURE 16 - OSOWOG VISION EXECUTION

This idea was taken forward at COP 26 World Leaders Summit, where the world's first partnership for interconnected solar grids, was launched. This partnership is headed by the Government of India and the UK in partnership with the ISA and the World Bank Group to connect 140 countries to round-the-clock solar power. This initiative will bring together a global coalition of national governments, international financial and technical organizations, legislators, power system operators, and knowledge leaders aiming to address the intermittency issues of solar and wind resources and driving down the need for storage and in effect reduce the costs of the energy transition. The timeline for the same can be seen in Figure 17.

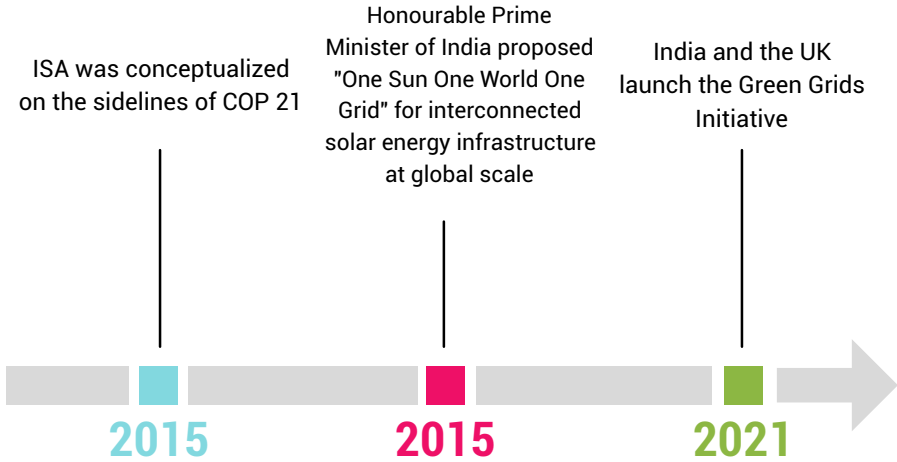


FIGURE 17 - OSOWOG INITIATIVE TIMELINE

Additionally, the role of these larger initiatives becomes critical in vulnerable geographies such as Sub-Saharan Africa (SSA), when viewed from an energy access perspective. As depicted in Figure 18, business as usual growth trends in energy access portray that the population in SSA is bound to continually outgrow access.

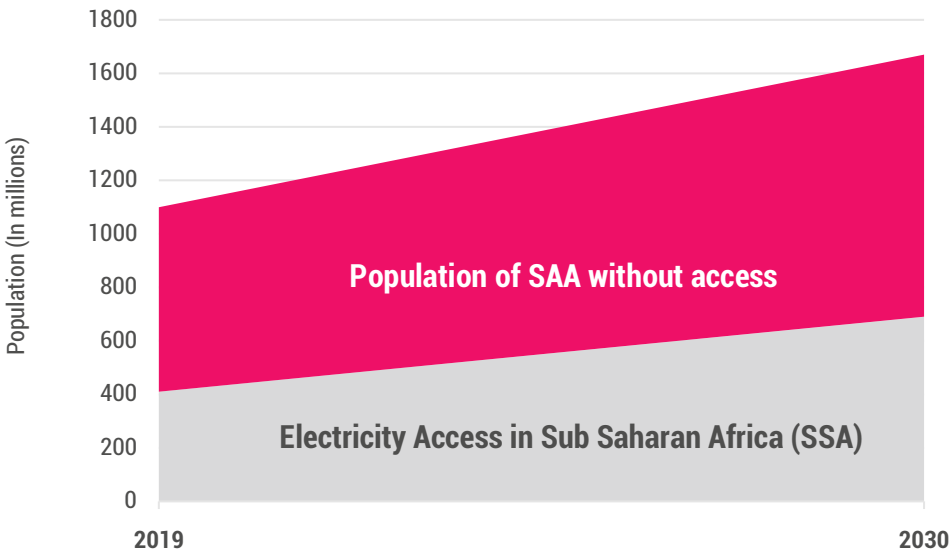


FIGURE 18 - ESTIMATED SSA POPULATION WITH ACCESS TO ELECTRICITY

3.2.2..E-Amrit portal launched on the Transport Day

India has taken several steps to accelerate the country's decarbonization of transportation and adoption of electric mobility. Schemes like FAME and PLI are particularly crucial in establishing an ecosystem for the early uptake of electric vehicles. Along the same lines, the Government of India's NITI Aayog, in collaboration with the United Kingdom's government, has launched the e-AMRIT (Accelerated e-Mobility Revolution for India's Transportation) Portal, on 10th November 2021 (i.e., on Transport Day) at the COP26, Glasgow. This portal is an attempt to raise awareness about electric mobility in India. The portal serves as a one-stop-shop for information on electric vehicle adoption, benefits, myths around their use, and financing choices, assisting users in making a cleaner, greener, and more cost-effective decision. This will persuade a broad range of stakeholders, including millions of users, to switch to electric vehicles, resulting in increased industry investment.

The portal compares EV policies in 25+ states based on four main criteria: overview, manufacturing, infrastructure, and consumer as seen in Figure 19.

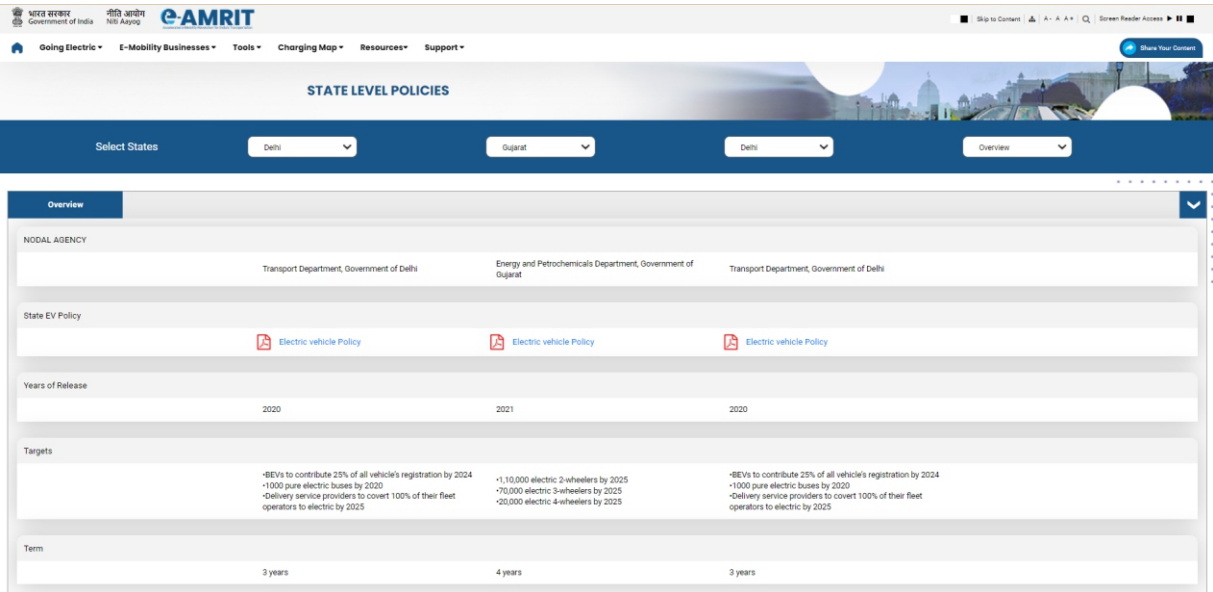


FIGURE 19 - E-AMRIT PORTAL SNAPSHOT

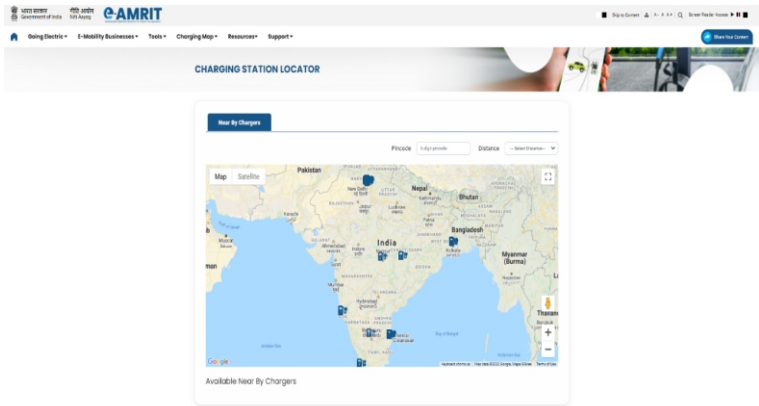


FIGURE 20 - E-AMRIT (CHARGING STATION LOCATOR) SNAPSHOT

The portal also manifests the number and location of chargers installed in India. To date, India has a network of 934 public charging stations in operation. Moreover, there is a functionality that allows the users to locate a local charging station based on their pin code as seen in Figure 20.

Broadly speaking, the portal helps users by providing access to information on the following 4 tenets:



1 Feasibility research on switching to EV

By providing information on electric car technologies, manufacturers, electric vehicle kinds, insurance alternatives, and financial possibilities, you may make the switch to electric automobiles.

3 Tools to calculate EV benefits

Assess the benefits of electric vehicles using specially built tools to determine how much money customers can save by driving electric vehicles instead of gasoline or diesel vehicles.

2 Knowledge repository on EV

Establish an electric vehicle or related business by giving information on the federal and state governments' major programs.

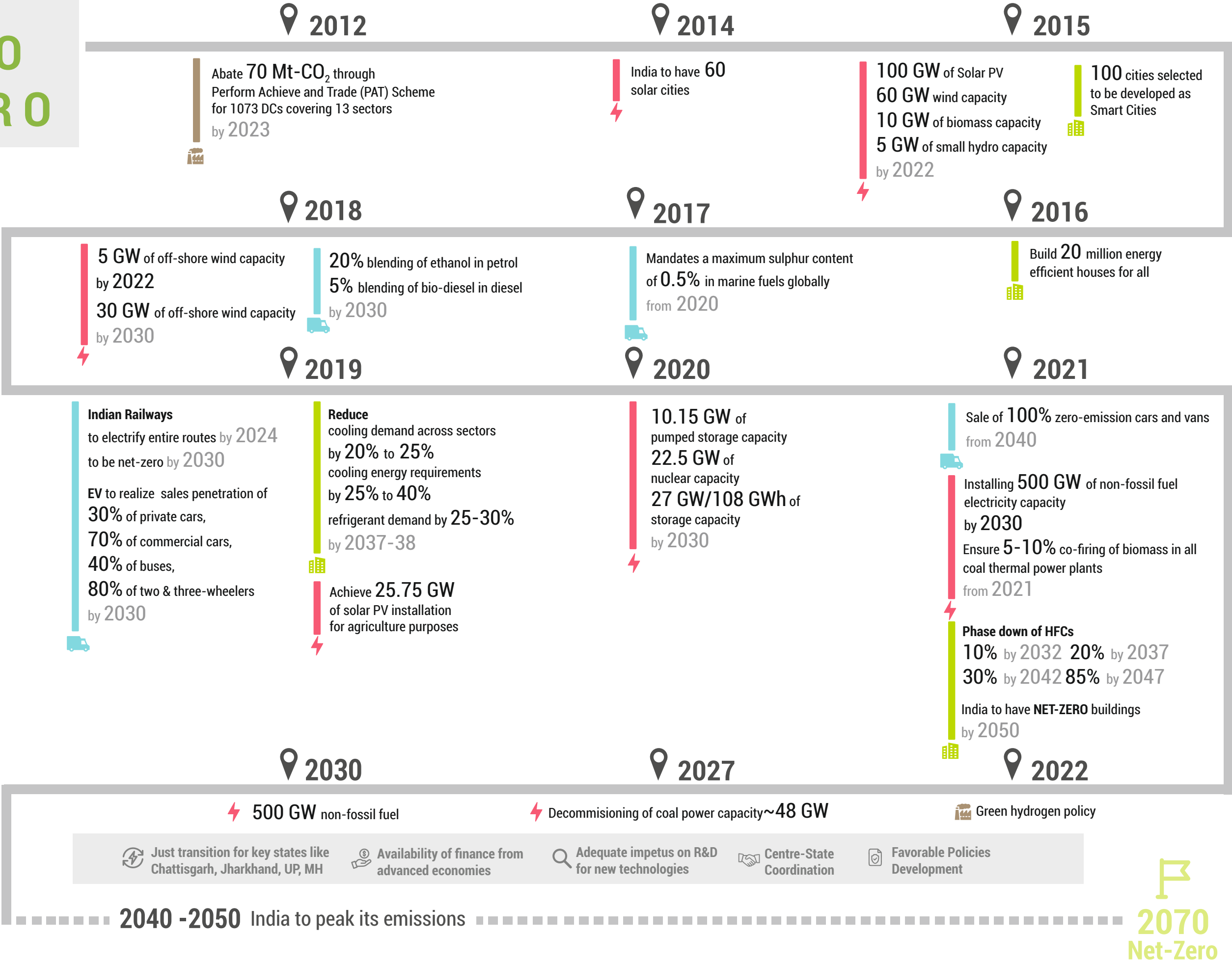
4 Information about EV businesses

Find out everything there is to know about the Indian electric car market and industry, as well as the major innovations that are propelling the e-mobility ecosystem forward.

The portal has been created to address the needs and goals of future electric vehicle consumers, early electric vehicle adopters, academia, government, industry, the research community, and enterprises.

ON THE ROAD TO NET-ZERO

4



At COP-26, India announced its goal to achieve net-zero carbon by 2070. Net-zero is intrinsically a scientific concept where there is a finite budget of carbon dioxide that is allowed in the atmosphere, alongside other greenhouse gases. Beyond this budget, any further release must be balanced by removal into sinks. One of the critical requirements of net-zero announcements is the need for front-loading emissions reductions.

There are close to 200 scenarios identified by IPCC to bring down greenhouse gas emissions that are in consonance with either 1.5°C or 2°C global warming scenarios. And the majority of these scenarios weigh in to reduce emissions as much fast as possible. This in turn brings several co-benefits to the table. It maximizes the growth potential of clean innovation and reduces the risk of stranded assets, particularly in developing economies. Moreover, it preserves optionality to further tighten remaining carbon budgets in light of new scientific findings. In order to confirm these reasons, India has come up with numerous short-to-medium term targets that have set the tone for India's role in the fight against climate change.

Capturing India's energy demand targets

In the last decade, climate change action has become a global priority and correspondingly India has proactively set sector-wise energy targets. The emission-intensive sectors of Energy generation, Industry, and transportation have been examined in detail. The energy production in India has seen a revision in targets to enable higher penetration of renewable sources into the energy mix, with a string of short-term targets set to be achieved by 2022. The Ministry of New and Renewable Energy (MNRE) has ensured diversification of energy sources, by relaying energy targets for off-shore wind, biomass, and small hydro technologies. The Government also recognizes the need for energy storage with the influx of variable renewable energy sources and has set a target to achieve 27 GW of energy storage by the end of this decade.

On the transportation front, the targets set for Indian Railways are commendable. The sector aims to be net-zero by 2030 and also has set a short-term goal of complete electrification of its network by 2024. Initiatives such as the India Cooling Action Plan aim to sustainably meet the country's growing energy requirement from the building sector and cross-sectoral cooling demand. Cumulatively, the targets support India's NDC goals and serve as a stepping stone to model policies towards achieving net-zero carbon.

Next Steps for India

Going forward, India should look into other vital facets to further reduce emissions. First, with a clarion call to boost domestic manufacturing, the mode of further reducing emission intensity while promoting a carbon-intensive sector must be strategized. Second, green hydrogen must be seen as a stellar opportunity to decarbonize hard-to-abate sectors such as steel, cement, long-haul transport, etc. Third, focusing on building a diverse technology mix of renewables including off-shore wind, biomass, etc will offer the desired flexibility and resilience to our power systems. Fourth, keep the benefit of citizens at the center of policies on climate and clean technology to ensure just transition. Finally, be wary of ambiguities in meeting the net-zero target by carrying out a sector-wise carbon budgeting.

The rapid transformation to reduce GHG emissions and meet the above-mentioned 2030 goals will require timely mobilization of climate-responsible investments from various sources of finance. National and International public support and private finance, are all critical in realizing the climate goals. The need for public finance to leverage private capital cannot be underscored. This could be in the form of Market creation for opportunities like EV charging, rooftop solar and energy storage, R&D for early technologies and new maturing technologies like green hydrogen, support to established investment opportunities such as building retrofits and efficiency.

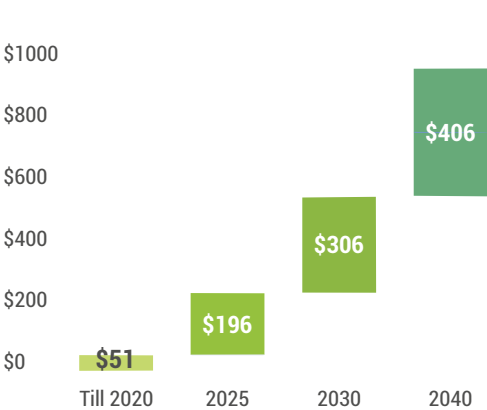


FIGURE 21 - ANNUAL PROJECTED DECARBONIZATION INVESTMENTS FOR INDIA (IN \$ BILLION)

It is estimated that by 2030, 70-80%³⁷ of the decarbonization technology investments could be a better value proposition than conventional options. The example of favorable cost-economics of Solar-PV over emission-intensive coal has already shifted investors' interests from coal-fired power plants to cleaner power generation options.

As per the GFANZ data (on the left), it is estimated that India's annual climate finance requirement³⁸ will need to rise from \$50 billion up to 2020 to \$306 Billion annually in 2030. This leads to a cumulative investment of \$2.5 trillion between 2021 and 2030 and ~\$6.5 trillion between 2021 and 2040. However, the CAT tracker for countries expected to provide financial support weaves an unsatisfactory story of low finance ratings with major countries displaying low levels of international climate finance contribution.

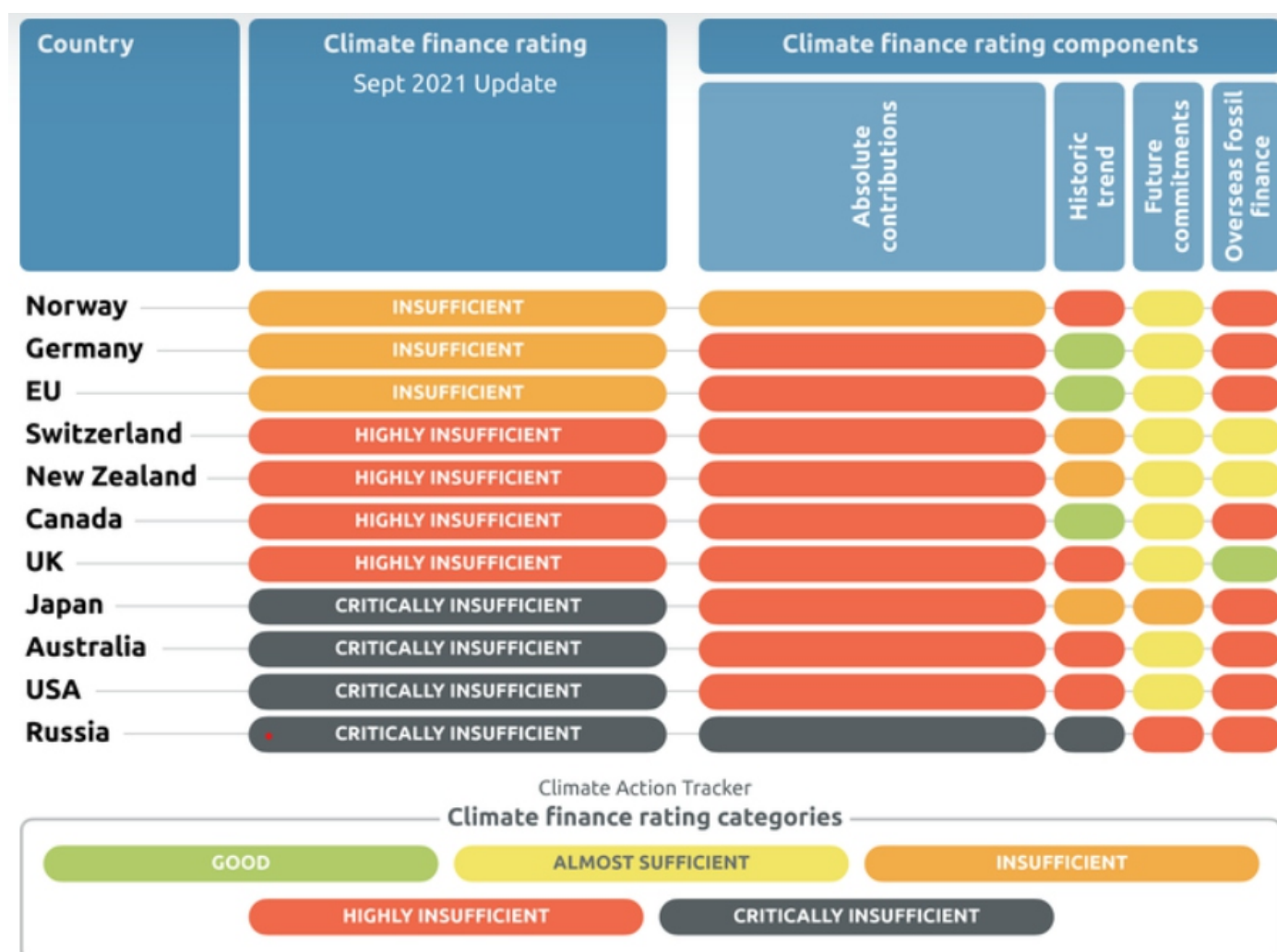


FIGURE 22 - CLIMATE FINANCE RATING FOR COUNTRIES

Source: Climate Action Tracker²⁹



Sentiment Analysis, a type of text analytics, measures the attitude of the general population towards an event, policy, product, or service described through text. It involves taking the piece of text, whether it is a tweet, comment, or a review, and returning a score that measures how positive or negative the text is. It is an extremely useful tool for social media monitoring as it allows to gather wider public opinion behind certain topics. This ability to quickly gather public opinion and react accordingly through better policymaking is an immortal tool at the disposal of the governments.

In this exercise, we aim to analyze what people think about the COP26 summit. More specifically, we also gauged the public sentiment towards the more ambitious climate announcements made by India on the first day of this summit by analysing Twitter reactions. The average sentiment deduced from these tweets will act as feedback to the policymakers on their actions and interventions and will allow them to tailor the schemes and policies to rapidly address climate change.

Figure 23 highlights the process followed to carry out sentiment analysis. Before scraping tweets from Twitter, we acquired the Twitter Developer Account post the application review by Twitter. Then, we scraped the tweets from Twitter using keywords and hashtags related to COP 26 and India's target announcements at COP 26. We were able to scrape 4074 tweets in total. These tweets were cleaned, tokenized, lemmatized, and then matched with the sentiment lexicon to obtain polarity scores. These polarity scores vary between -1 and 1. Here, -1 indicates negative sentiment, +1 indicates positive sentiment, and a score closer to 0 is treated as neutral.

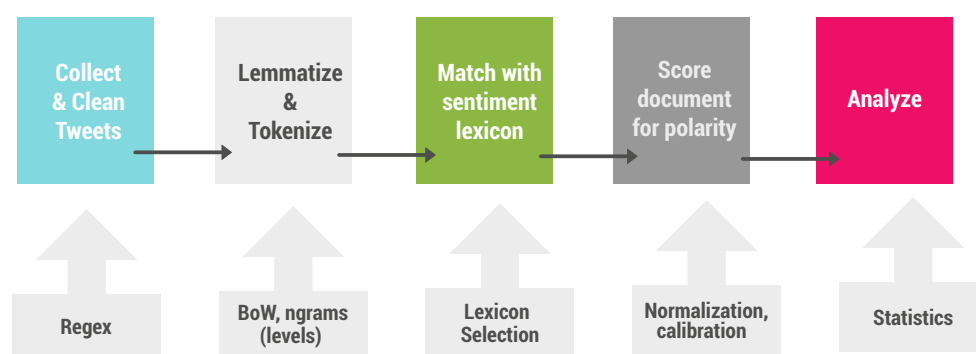


FIGURE 23 - METHODOLOGY FOR CONDUCTING SENTIMENT ANALYSIS

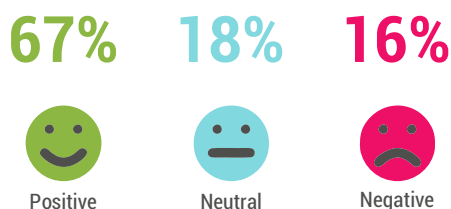


FIGURE - 24 - ANALYSIS OF TWEETS ON COP26

Moreover, Figures 25 and 26 represent the word clouds for the bifurcated positive and negative tweets. These word clouds represent the most used words that provide the sentiment context to these tweets. Clearly, in the former, words like COP, NetZero, nature, earth, save, more, etc., got prominence. In the latter, more emphasis was on words like catastrophic, meaningless, wronged, battle, etc., that manifests loss of hope.

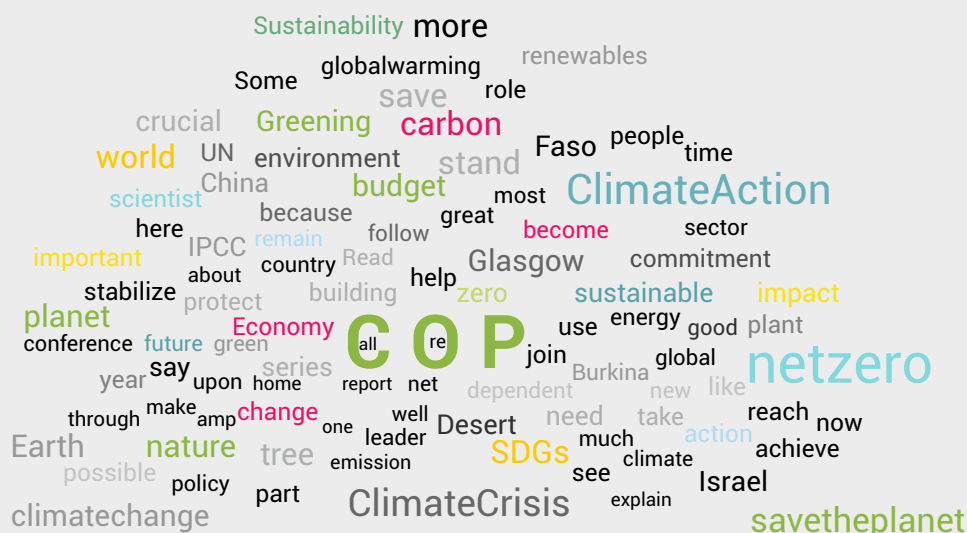


FIGURE 25 - WORD CLOUD FROM POSITIVE TWEETS

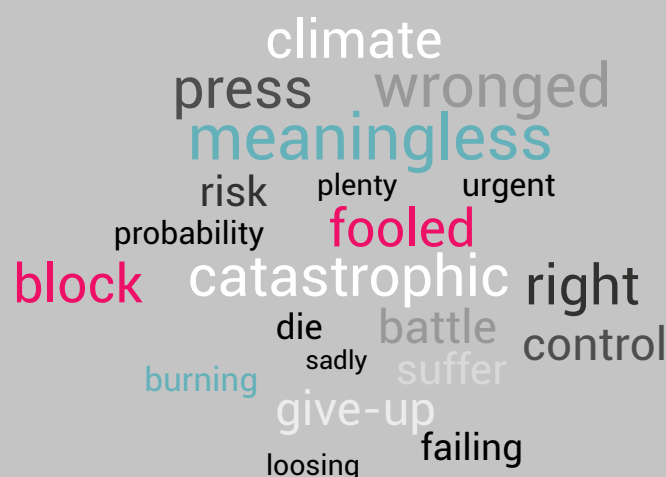


FIGURE 26 - WORD CLOUD FROM NEGATIVE TWEETS

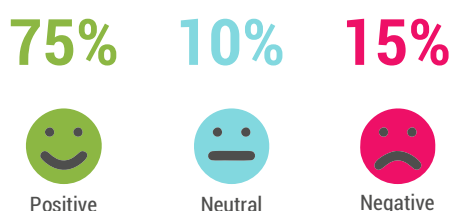


FIGURE 27 - SENTIMENT ANALYSIS ON INDIA'S TARGET ANNOUNCEMENT

Based on our analysis, 67% of the tweets showcased positive emotion on COP26. This showcased that the general opinion was hopeful that COP 26 will be able to cajole countries to come up with revised targets and substantive actions to achieve those targets. Figure 24 showcases the division of tweets based on their emotional tone.

In the Indian context, around 75% of tweets showcased positive emotions towards the targets announced by the honorable prime minister of India at COP 26. This is a pleasant validation of the work carried out by India in the last few years that has placed it as the leader in addressing climate change on the world map.

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