

Assessment of Nationally Determined Contributions of G-20 Members

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G20 Members

The Group of Twenty (G20) comprises 19 countries (Argentina, Australia, Brazil, Canada, China, France, Germany, India, Indonesia, Italy, Japan, Republic of Korea, Mexico, Russia, Saudi Arabia, South Africa, Türkiye, United Kingdom and United States) and the European Union.



The G20 members represent around 85% of the global GDP, over 75% of the global trade, and about two-thirds of the world population

Comparing emission performance of G-20 Members

Performance Metrics

- GHG Emission (Mt CO₂ eq.)
- CO₂ Emission (Mt CO₂)
- Per Capita Emission (t CO₂ / Population)
- Emission Intensity (kg CO₂ per 2017 PPP \$ GDP)

Introduction

- **Nationally determined contributions (NDCs):** NDCs are commitments by each country to reduce emissions and adapt to the impacts of climate change.
 - The Paris Agreement (Article 4, para 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve.
- **Emission Intensity:** Emission Intensity refers to the measure of the amount of greenhouse gas (GHG) emitted per unit of economic activity i.e. Gross Domestic Product (GDP). It is measured in kg CO₂ per GDP(PPP \$)

Introduction

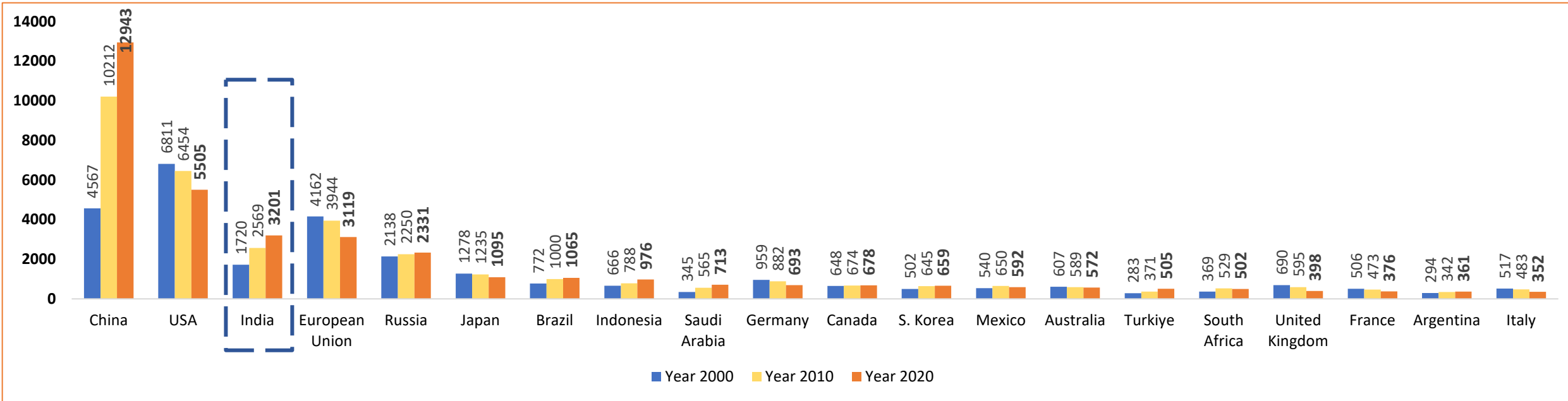
- **India & China** in their NDC commitments have pledged to reduce emission intensity w.r.t to 2005 levels by 2030.
 - India with a large population aspires to be a developed country in two and half decades and is poised to be one of the fastest-growing economies in coming years, which will in turn sharply boost energy demand.
 - India is charting a low-carbon trajectory driven by responsible development while ensuring adequate and affordable energy for a large population
 - India is poised to tread a high efficiency-low emission-high economic growth path

Emission at a Glance: G-20 Nations (1/4)



GHG emissions (Mt CO₂ eq)

The graph depicts countries in descending order of nos. based on year 2020



Total GHG emission & Avg. GHG emission of G-20 Nations for year 2020 (Mt CO₂ eq.)



36,636

GHG emission
(Mt CO₂ eq)



1,832

Avg. GHG emission
(Mt CO₂ eq)

Country wise % of emission across G-20 nations

Country	% Emission
China	35.33
USA	15.03
India	8.74
EU	8.51
Russia	6.36
Japan	2.99

Top Emitters

China: 12,943
USA: 5,505
India: 3,201

Least Emitters

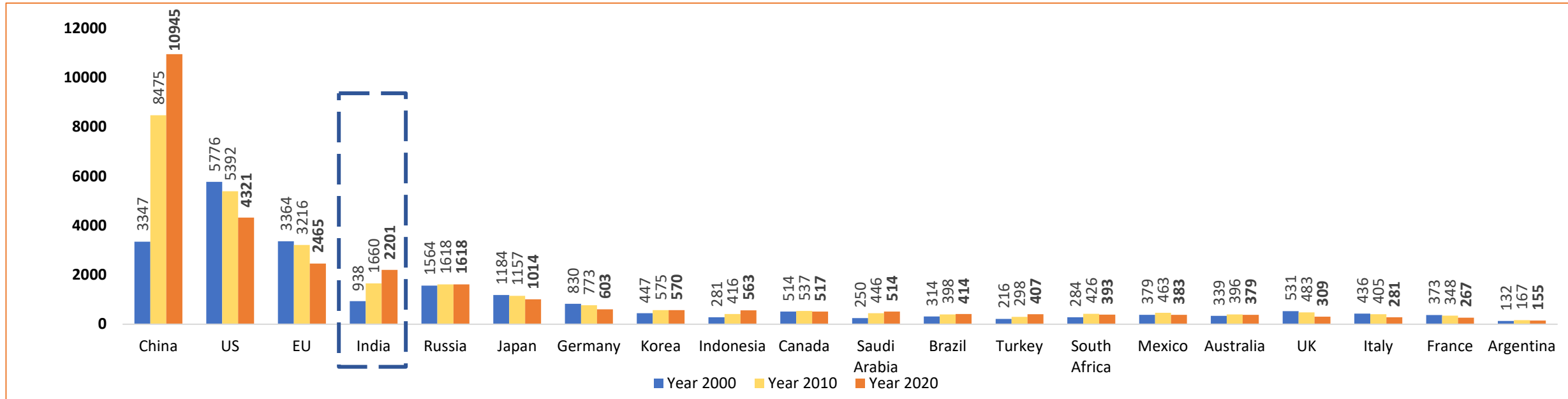
Italy: 352
France: 361
Argentina: 376

Emission at a Glance: G20 Nations (2/4)



CO₂ emission (Mt CO₂)

The graph depicts countries in descending order of nos. based on year 2020



Total CO₂ emission & Avg. CO₂ Emission of G-20 Nations for year 2020 (Mt CO₂)



28,319

CO₂ Emission (Mt CO₂)



1,416

Avg.CO₂ Emission (Mt CO₂)

Top Emitters

China: 10,945

USA: 4,321

EU: 2,465

Least Emitters

Argentina: 155

France: 267

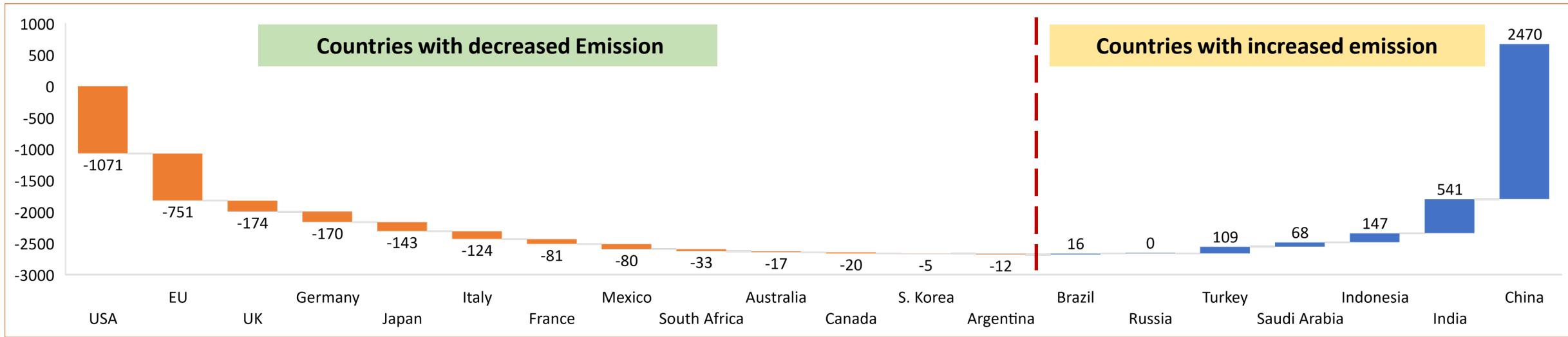
Italy: 281

The share of China, USA and India constitute ~39%, ~15% and 7.7% of total CO₂ emission respectively among G20 countries.

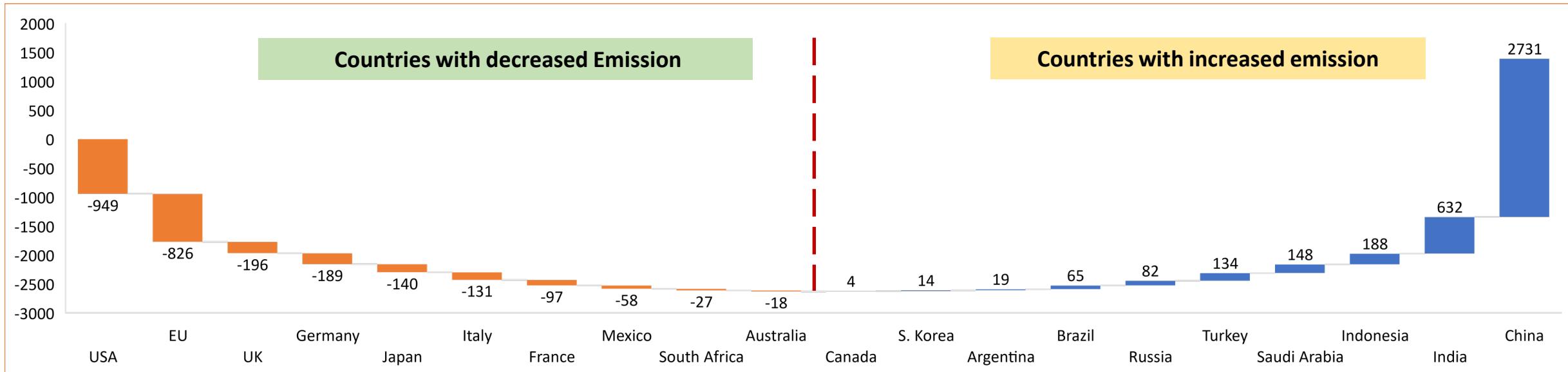
Comparative Analysis of GHG Emission and CO₂ Emission



Change in CO₂ Emission during the decade (2010 to 2020) (Mt CO₂)



Change in GHG Emission during the decade (2010 to 2020) (Mt CO₂ eq)

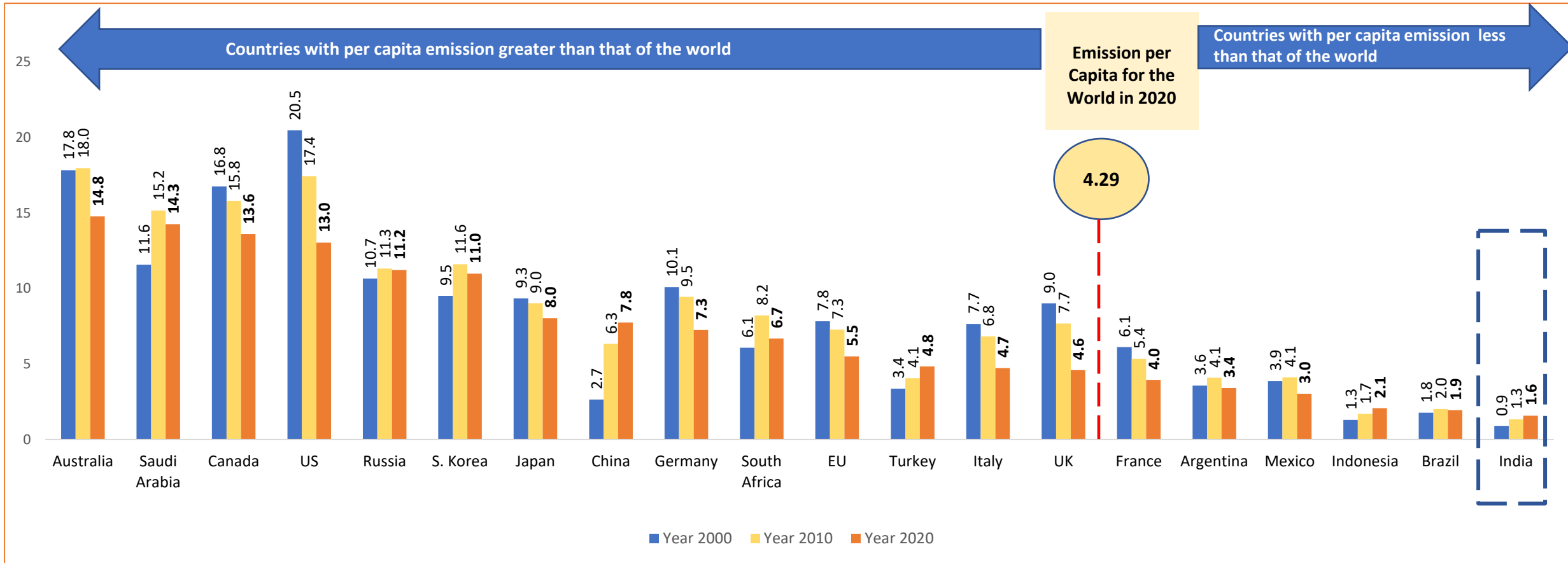


Emission at a Glance: G-20 Nations (3/4)



Emission per Capita (tCO₂/Population)

The graph depicts countries in descending order of nos. based on year 2020



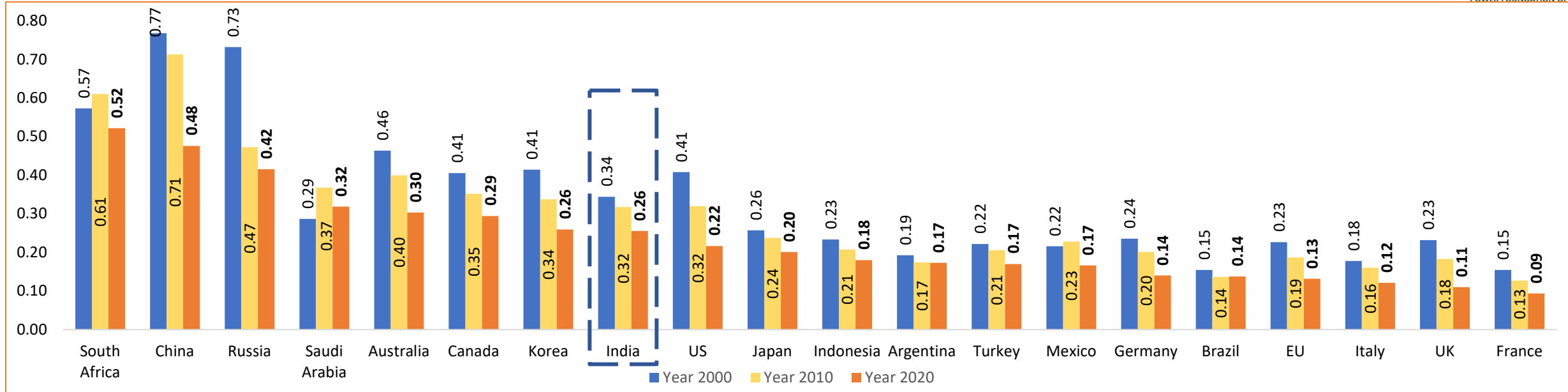
Per capita emission of India is the **lowest among G20 countries and about one-third (1/3rd) of the world's per capita emission.**

Emission at a Glance: G-20 Nations (4/4)

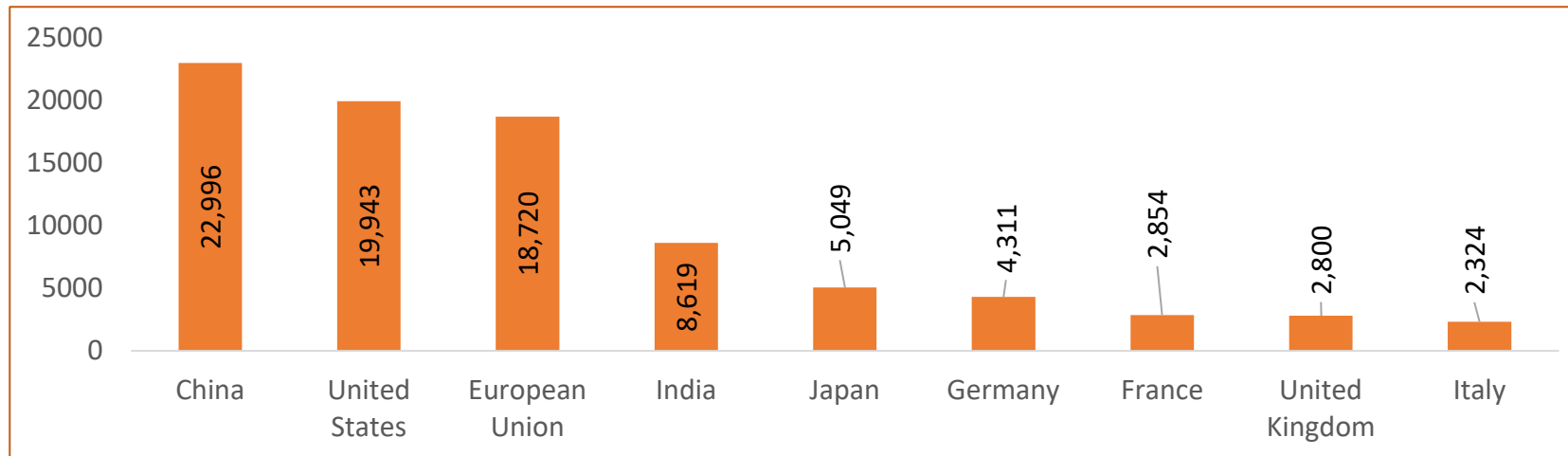


Emission Intensity (kg CO₂ per GDP, PPP (constant 2017 international \$))

The graph depicts countries in descending order of nos. based on year 2020



GDP, PPP Billion US \$ 2017

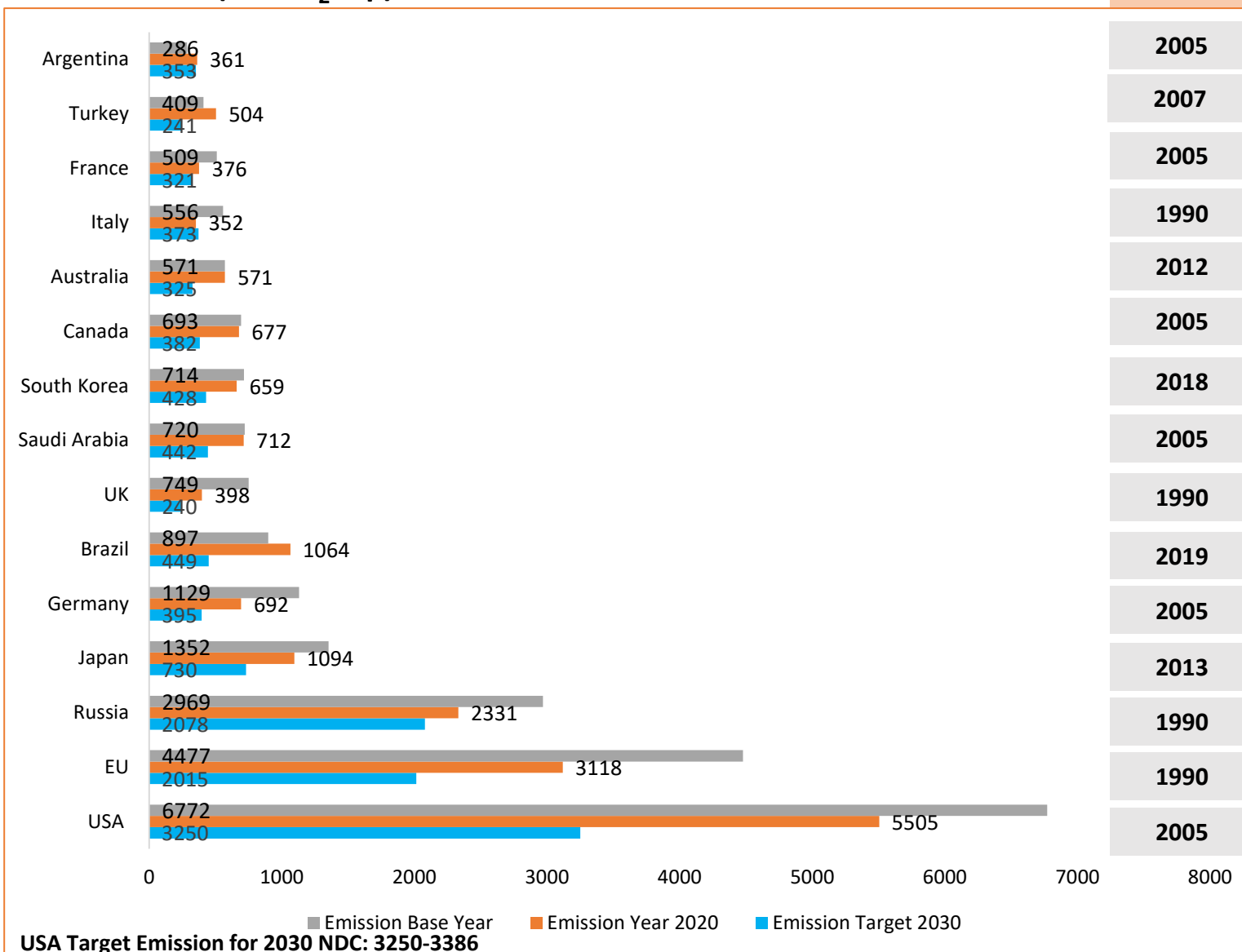


India's GDP in 2020 (2017 PPP \$) was 40% of China, whereas CO2 emission was 20% of China's. The emission intensity is lower than China by 46%, signifying that the emission is better controlled in India through energy-efficient practices

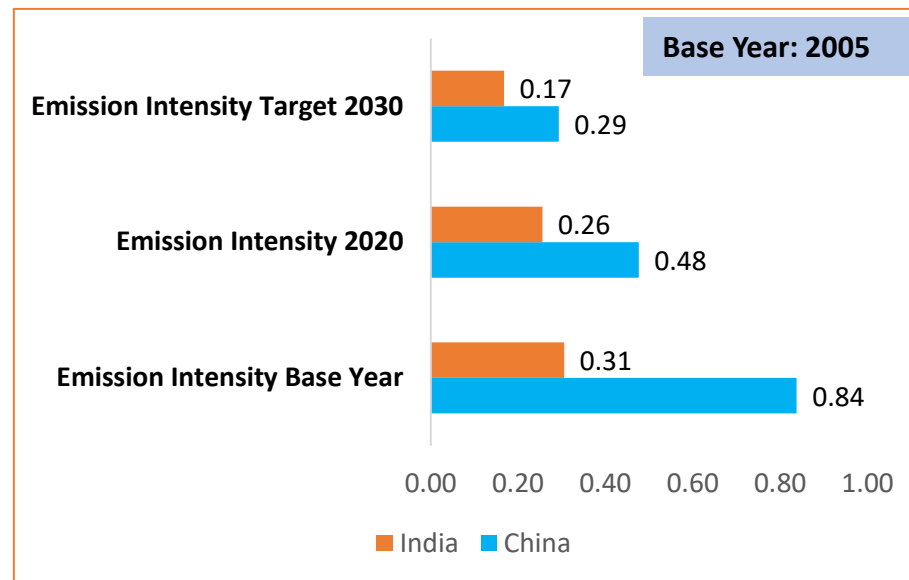
NDC Commitments and Performance (1/2)



GHG Emission (Mt CO₂ eq.) for NDC Commitment

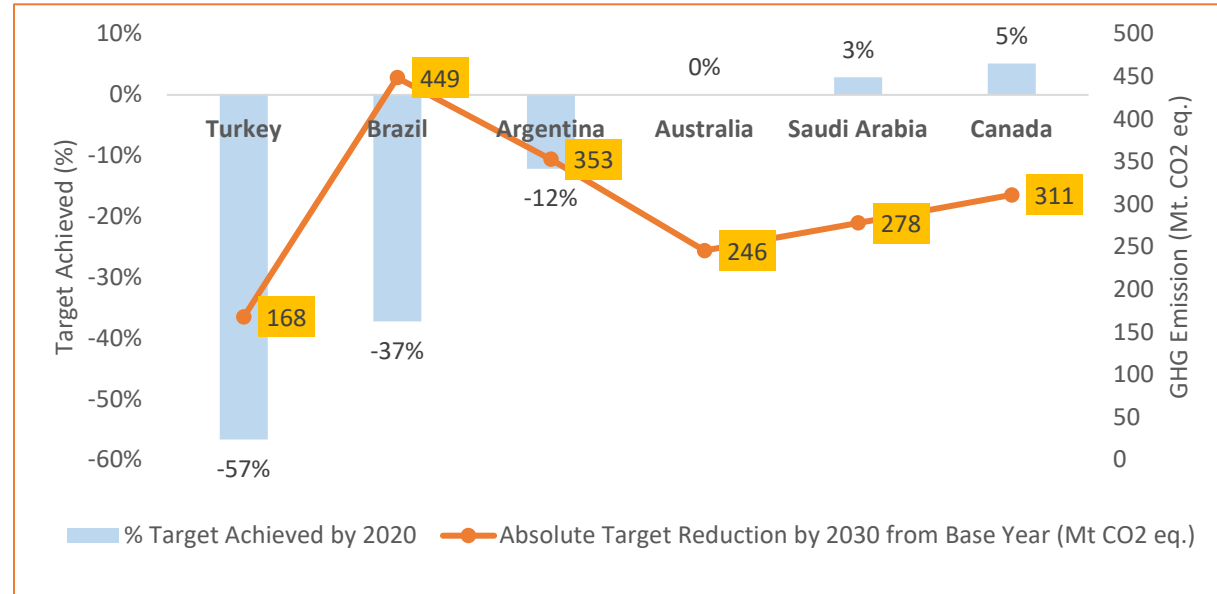


Emission Intensity CO₂ emission (kg per 2017 PPP \$) of GDP

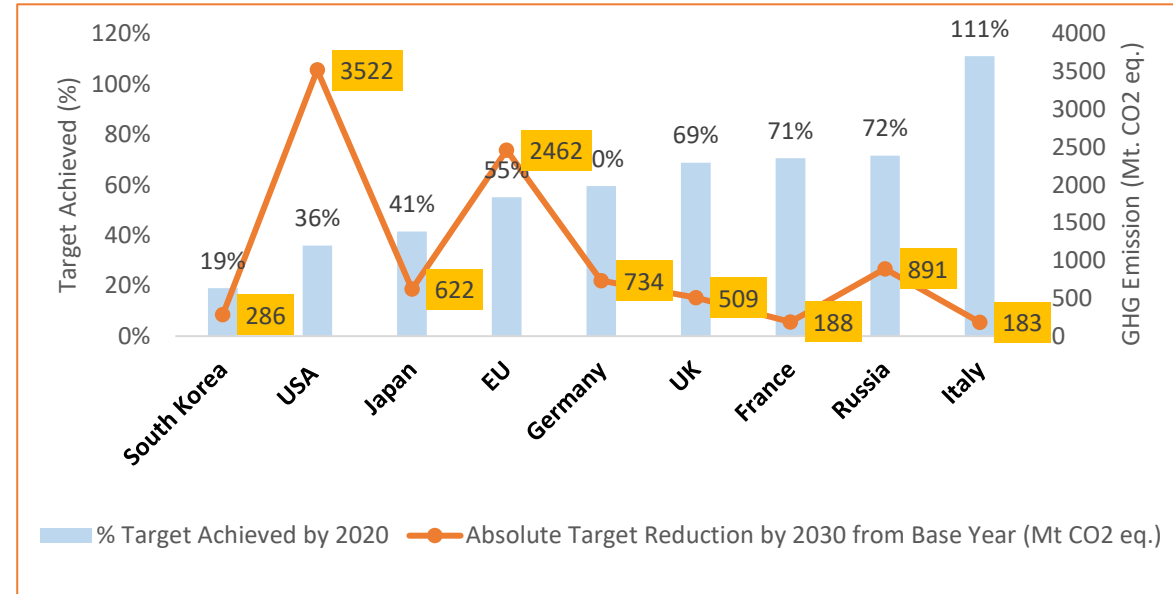


NDC Achievements of G20 Countries (2/2)

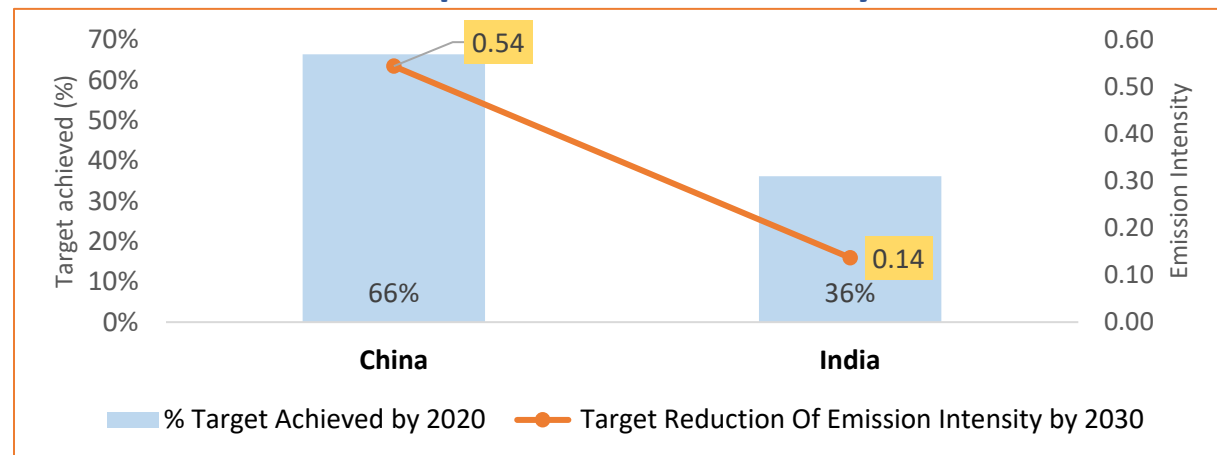
NDC Achievement as per GHG Emission (Low Achievement)



NDC Achievement as per GHG Emission (High Achievement)



NDC Achievement as per Emission Intensity



- Italy has over-achieved the NDC Target set for 2030 in 2020
- Argentina, Turkey and Brazil in 2020 witnessed higher emission as compared to their base emission because they are in peak phase of emission
- India and China who have Emission Intensity as their target of reduction have reduced it by 36% and 66% respectively
- USA and EU have highest emission reduction target at 3522 Mt CO₂ eq. & 2462 Mt CO₂ eq. respectively

Mapping of G20 Countries

NDC Commitments, Current Scenario & Action Plans

NDC Commitments, Current Scenario & Action Plans



India



Net Zero Target Year : 2070

NDC Commitments

- **Achieve about 50 percent cumulative electric power installed capacity from non-fossil fuel-based energy resources by 2030**
- **Reduce Emissions Intensity of its GDP by 45 percent by 2030 from 2005 levels**
- **Adoption of Lifestyle for Environment (LiFE)**

Current Scenario & Action Plans

- India currently has an installed capacity of 184 GW from non-fossil fuel sources (including Large Hydro & Nuclear) power, growing from 28 GW in 2013.
- India plans to expand RE installed capacity to 527 GW by 2030, including PSP & Battery Storage.
- India plans to expand its solar and wind capacity to 293 GW & 100 GW respectively by 2030.
- India is promoting clean energy transitions by PLI schemes in manufacturing of solar panels and EV battery manufacturing
- India is contributing to Net-Zero Transitions through Energy Efficiency programs, Bio-mass program and SMR programs

Rapid Expansion in Renewable Energy- Solar & Wind



Globally **4th position** in overall Renewable Energy



3rd highest RE capacity addition of 63 GW in last 5 years



Renewable Power generation increased 1.5 times from **196 BU to 291 BU** since 2014.



About **\$78 Billion investments** since 2014 (including \$10.27 Bn of FDI)

Solar

- India ranks 4th globally in solar energy with installed capacity of ~70 GW
- Solar Power installed capacity increased 25 times from 2.6 GW to ~70 GW since 2014
- 8.8 GW of Solar Rooftop Installed Capacity
- **Solar Cell/Module Manufacturing Capacity:** 3GW/10 GW per year
- **Solar Tariff Trend:** Rs. 2.21/kWh in 2021-22 from Rs. 17/kWh in 2009-10

Wind

- India has the 4th highest installed capacity globally at 42 GW, increasing 2 times from 21 GW to 42.6 GW since 2014.
- Leading States for the assessed potential for wind power are Gujarat (143 GW), Rajasthan (128 GW) and Karnataka (124 GW).

Innovative policy interventions such as ISTS waiver, RPO trajectory till 2029-30, Green Open Access Rules introduced

NDC Commitments and Net Zero Targets



USA



Net Zero Target Year : 2050

NDC Commitments

Target of reducing net GHG emissions by 50%–52% below 2005 levels (6772 Mt CO₂ eq.) by 2030 (3250-3386 Mt CO₂ eq.).

Current Status & Action Plans

Generation

- RE Generation in 2022 was 913 million MWh which was 22% of the total generation
- Reach 100 percent carbon pollution-free electricity by 2035

Energy Transition Initiatives

- In August 2022, Congress passed the Inflation Reduction Act (IRA), which is poised to drive deployment of energy transition technologies in the shorter term. IRA includes several provisions for tax credits to support the uptake of wind, solar, storage and EVs, while also fostering the development of US supply chains for these technologies.
- The Infrastructure Investment and Jobs Act (IIJA), passed in November 2021, allocates \$80 billion to the energy transition, primarily for building supporting infrastructure and the development of next-generation technologies for hydrogen, carbon capture and storage and advanced nuclear.

NDC Commitments and Net Zero Targets

China



Carbon Neutral Target Year : 2060

NDC Commitments

- Aims to have CO2 emissions peak before 2030 and achieve carbon neutrality before 2060
- Lower CO2 emissions per unit of GDP by over 65% from the 2005 level of 0.84 to 0.30 by 2030
- To bring its total installed capacity of wind and solar power to over 1200 GW by 2030
- To increase the share of non-fossil fuels in primary energy consumption to around 25% by 2030

Current Status & Action Plans

- To increase the share of non-fossil fuels in primary energy consumption to around 25%; Increase the installed capacity of wind and solar power to over 1,200 GW by 2030.
- China remains the global leader in the volume of RE capacity additions: it is expected to reach 1200 GW of total wind and solar capacity in 2026 – four years earlier than its current target of 2030.
- The installed RE capacity reached 1021 GW in 2021, showing an exponential trajectory from 235 GW RE installed in 2010
- Solar & wind capacity accounted for 307 GW and 329 GW respectively in 2021
- For renewable energy, China launched its renewables portfolio standards (RPS) in 2020, mandating power consumers and retailers to source a set share of clean energy.

NDC Commitments and Net Zero Targets

European Union



Net Zero Year: 2050

NDC Commitments

European Union has set a target of reducing net domestic emissions by at least 55% below 1990 (4477 Mt CO₂ eq.) levels by 2030 (2014 Mt CO₂ eq.).

Current Status & Action Plans

- Strengthening its 2030 renewable energy share target from 32% to 42.5%, with an additional tentative target to bring it up to 45%
- Strengthening the emissions reduction targets from 43% to 63% below 2005 levels in its Emissions Trading Scheme (EU ETS), which targets emissions from electricity, industry and aviation
- Effort Sharing Regulations , initially adopted in 2018 and amended in 2023, with new national targets of Member states, who collectively contribute to an emission reduction to the tune of 40% compared to 2005 levels, at EU level, in the Effort Sharing sectors.
- EU* plans to increase energy efficiency by 11.7% by 2030 from 2020 levels binding energy consumption target of 760 Mtoe and indicative primary energy consumption target of 992.5 Mtoe by 2030

*The Effort Sharing Regulation establishes for each EU Member State a national target for the reduction of greenhouse gas emission by 2030 in the following sectors: domestic transport (excluding aviation), buildings, agriculture, small industry and waste. In total, the emissions covered by the Effort Sharing Regulation account for almost 60% of total domestic EU emissions. EU Member States now have emission reduction targets ranging from 10 to 50% compared to 2005 levels.

NDC Commitments and Net Zero Targets

Brazil



Carbon Neutral: 2050

NDC Commitments

Brazil has set a target of reducing net GHG emissions by 37% below 2005 (897 Mt CO₂ eq.) levels by 2025 and 50% below by 2030 (448 Mt CO₂ eq.).

Current Status & Action Plans

- Committed 30% reduction in methane emission from 2005 level Govt. launching 'Zero Methane' Program in Mar 2022
- To reduce deforestation in Brazil in years to come with a target to stop deforestation by 2030
- As per Brazil's 10-year energy plan, Renewables are expected to make up 48% Primary energy and 84% of electricity generation
- Since 2009, Brazil has implemented reverse auctions to contract new clean energy generation capacity to supply the regulated utility market.
- Net metering has also been a widely utilized clean energy policy. Retail electricity customers may install up to 5 MW self-generation facilities, connect to the grid, deliver surplus generation and obtain compensation in the form of a subsequent billing credit.

NDC Commitments and Net Zero Targets



Mexico



Net Zero: No firm Target

NDC Commitments

- Reduce GHG Emissions by 35% & 40% under BAU condition in unconditional and conditional scenarios by 2030.
- Reduce Black Carbon Emissions by 51% & 70% under BAU condition in unconditional and conditional scenarios by 2030.

Current Status and Action Plans

- Mexico has put in place the architecture for carbon pricing, through both a carbon tax and a pilot emissions trading system (ETS)
- In an objective to reduce GHG emission under a Special Program on Climate Change (PECC) emphasis was laid on incorporation of clean energy, increase energy efficiency and sustainability for generation and promotion of energy transition
- IMF staff projections suggest a carbon price of around US\$75 per ton by 2030 is in line with Mexico's conditional mitigation target for 2030, in the absence of other mitigation measures
- Under the \$75 carbon price, 57, 28,14, and 2 percent of the reduction in fossil fuel CO2 emissions come from the power, industry, transportation, and building sectors respectively

NDC Commitments and Net Zero Targets



Canada



Net Zero Year: 2050

NDC Commitments

Committed to reduce GHG emissions by 40-45% from 2005 (693 Mt CO2 eq.) level by 2030 (382-416 Mt CO2 eq.).

Current Status & Action Plans

- Mandatory carbon pricing has been in effect across Canada since 2019 that helps in legislating the pricing policy for carbon
- Canada co-founded the Powering Past Coal Alliance in 2017 to phase-out of unabated coal-fired electricity by 2030
- Canada adopted EV sales targets in 2019 and strengthened it to have 100 % sales of vehicle by 2035 from Evs
- In June 2021, the Canadian government moved up its previous goal to require 100% of new light-duty cars and trucks to be zero-emitting by 2035. Canada aims for at least 20% of new passenger vehicles sold in Canada to be zero-emissions by 2026 and at least 60% by 2030. (Source _BNEF)
- Committed to reducing methane emissions from the sector by 40–45% from 2012 levels by 2025 and at least 75% by 2030
- Canada is part of the 'Net Zero Producers Forum', along with other oil and gas majors: Norway, Qatar, Saudi Arabia, the UAE and the US with an aim to aim is to develop 'pragmatic net zero emission strategies'

NDC Commitments and Net Zero Targets

Saudi Arabia



Net Zero Year: 2060

NDC Commitments

Aims at reducing GHG emissions by 278 Mt CO₂e by 2030, with respect to GHG emission of 720 Mt CO₂ eq. in the year 2019.

Current Status & Action Plans

- Renewable Energy target for 2030 is aimed at 50% of the total energy mix.
- The government has announced it aims to plant 450 million trees by 2030 and 10 billion trees over the coming decades as part of the Saudi Green Initiative
- The implementation of Saudi Arabia's NDC Targets is not contingent on receiving International Financial Support
- The Circular Carbon Economy (CCE) approach consist of the "4Rs" model of reduce, reuse, recycle, and remove to manage GHG emissions
- Saudi Arabia plans to shift public transport operating upon oil to Metro and Electric Rail System.

NDC Commitments and Net Zero Targets

Argentina



GHG Neutral: 2050

NDC Commitments

To not exceed net GHG Emissions above 285 Mt CO₂ eq. in 2030, which is 19% reduction from 2007 (352Mt CO₂ eq.) Level (year of peak).

Current Status & Action Plans

- Argentina is one of the 95 countries to have signed a methane pledge for reducing its methane emissions
- Sales of Hybrid Vehicles with Electric Fuel component are increasing (5800 vehicles sold in 2021) and expected to increase further when EV costs become competitive
- In order to reduce Deforestation, Argentina signed the forestry pledge at COP26 in 2022.
- Announced in COP 26, the Australian firm Fortescue will invest USD 8.4bn in the Argentinian province of Rio Negro to develop green hydrogen

NDC Commitments and Net Zero Targets



Australia



Net Zero Target Year : 2050

NDC Commitments

Australia is increasing the ambition of its 2030 target, committing to reduce greenhouse gas emissions 43% below 2005 (571 Mt CO₂ eq.) levels by 2030 (325 Mt CO₂ eq.).

Current Status & Action Plans

Generation

- Consumes around 5% power from solar and wind whereas oil, gas & coal form around 87% of consumption (2021)
- By 2030, the Govt. aims for 82% of renewable penetration in Australia's grid, driven by policy support.
- Coal's share in the power mix is declining as assets are ageing or are pulled out of the market by cheaper renewable energy projects.

Investments

- A \$20 billion investment to unlock greater penetration of renewable energy and accelerate decarbonization.
- A Powering the Regions Fund to support the development of new clean energy industries and the decarbonization policy

NDC Commitments and Net Zero Targets

South Africa



Net Zero Target Year : 2050 (Commitment)

NDC Commitments

- South Africa's annual GHG emissions will be in a range from 398-510 Mt CO₂-eq. by 2025
- South Africa's annual GHG emissions will be in a range from 350-420 Mt CO₂-eq. by 2030

Current Status & Action Plans

Generation

- Out of 54 GW of thermal installations as on Dec 2022, 39.8 GW comes from coal, which is ~74 % of generation mix and Wind & Solar comprise of 3.4 GW and 2.3 GW, which is ~11 % of capacity mix
- Integrated Resource Plan (IRP)- Set capacity allocations for at least 20 GW of new wind and solar by 2030, alongside additional thermal generating capacity and storage.
- The Just Transition Framework refers to reaching “net-zero greenhouse gas emissions by 2050”

Investments

- Implementation of National Climate Change Adaptation Strategy (NCCAS) for adaptation interventions for the period 2021 to 2030 with investment of USD 3-4 billion

NDC Commitments and Net Zero Targets



Russia



Carbon Neutral Target Year : 2060

NDC Commitments

Limiting GHG emissions to up to 70% compared to 1990 levels (2969 Mt CO2 eq.) by 2030 (2078 Mt CO2 eq.).

Current Status & Action Plans

Generation

- Russia has Installed Capacity of 163.5 GW of thermal power, 50.1 GW of Gas power, 29.5 GW of Nuclear, 2.3 GW of wind power and 2.1 GW PV Solar
- Aims to increase the share of renewable energy power generation from under 1% currently to 2.5% by 2024.
- Approved a unique "capacity payment mechanism" for new renewable energy capacity in solar, wind and small hydro projects (< 25MW) has been approved, with an assured 12% return on investment.
- The country supports solar, wind and small hydro through a series of auctions, which award developers capacity payments on a competitive basis for a 15-year period

NDC Commitments and Net Zero Targets

Germany



Carbon Neutral Target Year : 2045

NDC Commitments

- Green House Gas emission reduction by at least 65% by 2030 (395 Mt CO₂ eq.) compared to level of net GHG emission in 1990 (1129 Mt CO₂ eq.).
- Green House Gas emission reduction by at least 88% by 2040 (135 Mt CO₂ eq.) compared to level of net GHG emission in 1990 (1129 Mt CO₂ eq.).

Current Status & Action Plans

- Germany's installed capacity stands at 228 GW, with 28% of wind (64 GW), 26% of solar (58 GW), 17% of gas (39 GW) and 16% of coal (37 GW) at the end of year 2021
- The power sector target was updated in July 2022, and aims for 80% renewable energy by 2030. Plans to transform its power sector to 100% renewable energy and committed to phasing out internal combustion engine cars by 2035.
- In July 2020, the German government adopted a coal exit law that stipulates the last coal-fired power plant will be closed by 2038 at the latest

NDC Commitments and Net Zero Targets

South Korea



Carbon Neutrality Year: 2050

NDC Commitments

Target is to reduce total national GHG emissions by 40% from the 2018 level (727.6 Mt CO₂ eq.) by 2030 (436 Mt CO₂ eq.).

Current Status & Action Plans

RE Generation

- The annual renewable target increases by 0.5% each year until 2018 and then by 1% from 2019 to 2024, reaching 10% by 2024. In 2016, the Korean government revised the 2018 target from 4.5% to 5%, increasing all subsequent targets by 1%.
- In Sep 2021, South Korea enacted the Framework Act on Carbon Neutrality and Green Growth for Climate Crisis Response
- South Korea is focusing on driving a low-carbon transition in emission-intensive sectors, i.e., steelmaking, petrochemicals, and cement industries

NDC Commitments and Net Zero Targets

Indonesia



Net Zero Target Year : 2060 or earlier

NDC Commitments

32 % & 43% reduction in emission by 2030 from BAU situation unconditionally (without external financial support) and conditionally (external financial support) respectively

Current Status & Action Plans

Generation

- Indonesia plan for Capacity New Tech. & RE: 23% in 2025 and 31% in 2050, Oil: 25% in 2025 and 20% in 2050, Coal: 30% in 2025 and 25% in 2050, Gas: 22% in 2025 and 24% in 2050
- Indonesia has also established the development of clean energy sources as a national policy directive.

Emission Reduction

- Through the long-term strategy – low carbon and climate resilience scenario (LTS-LCCR 2050) – Indonesia will increase ambition on GHG reduction by achieving the peaking of national GHG emissions in 2030 with a net sink of forest and land-use sector, reaching 540 MtCO₂e by 2050

NDC Commitments and Net Zero Targets

United Kingdom



Net Zero Year: 2050

NDC Commitments

Committed to reduce GHG Emissions by 68% from 1990 level (749 Mt CO₂ eq.) by 2030 (239 Mt CO₂ eq.) .

Current Status & Action Plans

Generation

- As on Dec 2021: Installed Capacity mix of 112 GW is a mix of 47 GW RE, 37 GW Natural Gas, Nuclear 8 GW, Coal 6 GW, Oil 1 GW, Interconnectors 5 GW and Storage 4GW
- Target to reach 50 gigawatts (GW) of offshore wind capacity installed by 2030 and 70GW of solar capacity by 2035, and to fully decarbonize power generation by 2035.

Emission Reduction

- Framed sectoral decarbonization plans for transport, buildings, industry and hydrogen, as well as commitments on tree planting, peatland restoration and others

NDC Commitments and Net Zero Targets

Japan



Net Zero Year : 2050

NDC Commitments

To reduce its net GHG emissions by 46% in fiscal year 2030 (730.08 Mt CO₂ eq.) from its fiscal year 2013 levels (1352 Mt CO₂ eq.)

Current Status & Action Plans

RE Generation

The government aims for 38% of the 2030 power supply to come from renewables

Investments

- The country has established a 2 trillion yen (\$14 billion) Green Innovation Fund for research and development in 14 key sectors including clean energy, hydrogen/ammonia, energy storage, shipping, aviation, and buildings.
- The government is encouraging the retirement of inefficient coal plants by 2030 by setting a higher coal fleet efficiency standard for each power generator

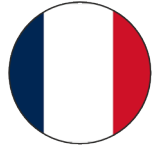
Carbon Pricing

- Speed-up the roll-out of an effective carbon pricing scheme based on mandatory participation

NDC Commitments and Net Zero Targets



France



Net Zero: 2050 (EU Target)

NDC Commitments

Target is to reduce total national GHG emissions by 37% from 2005 (509 Mt CO₂ eq.) level by 2030 (371 Mt CO₂ eq.)

Current Status & Action Plans

RE Generation

- Renewable electricity target for 2030 is 40% of energy production and 33% of final energy consumption, according to the national energy and climate plans published in 2019
- Aims to Increase the share of renewables in energy consumption to 32% by 2030, split into 40% renewables in electricity, 38% in heat, 15% in transport fuel and 10% in gas
- The Multiannual Energy Program (PPE) covers two five-year periods, 2019-2023 and 2024-2028, with a key target to attain 50% of final energy consumption from renewable sources by 2035.

Low Carbon Targets

- Reduce emissions to 40% below 1990 levels by 2030, and achieve net-zero carbon emissions by 2050
- Cut final energy consumption to 20% below 2012 levels by 2030 and 50% by 2050.

NDC Commitments and Net Zero Targets

Italy



Net Zero: 2050 (EU Target)

NDC Commitments

Target is to reduce total national GHG emissions by 33% from 2005 (556 Mt CO₂ eq.) level by 2030 (372 Mt CO₂ eq.).

Current Status & Action Plans

RE Generation

- 30% renewable energy in final energy consumption by 2030
- 26% renewable energy in electricity generation by 2020
- 55% renewable energy in electricity generation by 2030

Low Carbon Targets

- Target to phase out all coal plants by 2025 as part of its National Energy Strategy
- Build 5GW of electrolyzer capacity by 2030



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