Gigatons at Stake: The Top Five Global Developments to Watch

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At the dawn of 2020, countries are considering policies that will set the course of their emissions over the coming decade. If the world is to stay on track to meet the Paris Agreement goal of limiting warming to well below 2° Celsius, we need to reduce annual greenhouse gas emissions anywhere from 15-32 gigatons of CO_2 equivalent in 2030. That means reducing today's levels by around a third in just a decade. It's clear we're far off track today, but what could tip the scales in the right direction? The answer to five key questions could have a meaningful, multi-gigaton effect on global emissions by 2030:

1. A European Green Deal? Will the EU President-elect succeed in adopting a 2030 target of 55% below 1990 levels and enshrine the 2050 neutrality plan into law?
2. Will Brazil protect its forests? Will President Bolsonaro continue recent efforts to dismantle the country's Forest Code prohibiting illegal logging?
3. Can the US get back on track after the 2020 election? Will US voters choose a president committed to achieving net zero emissions by mid-century?
4. A hard or soft landing for the Chinese economy? A slowdown in economic growth is inevitable, but can critical economic reforms keep the slide to a minimum?
5. Will Indian electricity demand grow like China's? Even if India achieves its ambitious renewable goals, electric demand growth on par with China's could double India's power sector emissions by 2030.

Each of our five big questions considers a turning point facing the world's major economies today and assesses the potential impact of moving in a new direction, whether that's turning toward more energy-intensive growth in India, electing a new President in the US, or taking action to protect Brazil's forests. Each of these decisions will have a gigaton or more impact on emissions by 2030. The ranges presented in Figure 1 (below) show the bounds of potential emissions impact if each economy diverges from their current path. In many cases, emissions outcomes under a country's current path are already uncertain. Where we can measure that uncertainty, we reflect the current path as a range (e.g., current policy outcomes in the US will depend on pending policy decisions and technology costs, and in India it will depend on the level of implementation of Prime Minister Modi's ambitious renewable and non-fossil goals).

If every economy considered here moves away from their current path, the net effect would be a reduction of around 4 to 8 gigatons of CO_2e from currently projected levels for 2030.[1] While a significant contribution to closing the multi-gigaton gap by 2030, as we'll show in the next section, it's nowhere near to where we need to be. In the following section we provide an overview of the scale of emissions reductions needed to keep the world on track to meet the Paris Agreement's climate goals to put the emissions impact of our five big questions in context.

[1] This range is the net total of the sum of all low/high impact estimates. All but India would see a decrease in emissions from their current path, while India would see an increase in emissions from its current path.

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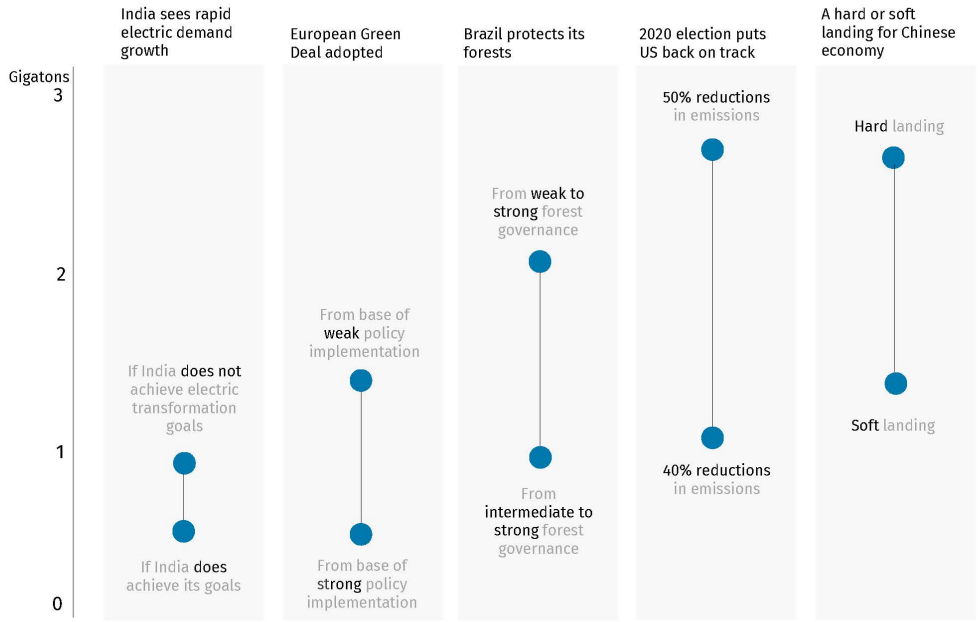
FIGURE 1
Five big questions and the gigatons at stake
Range of potential changes in annual GHG emissions in 2030 (gigatons of CO_2 equivalent)



The Gigaton Gap

As part of the 2015 Paris Agreement, countries agreed to hold global temperature increases to "well below" 2°C above pre-industrial levels and to "pursue efforts" to limit temperature increases to 1.5°C. In 2018, the Intergovernmental Panel on Climate Change (IPCC) released a much-anticipated report detailing what kind of global action would be required to achieve that 1.5°C goal. They found that it is still technically possible but will require slashing global carbon emissions to net zero by around 2050.

As we approach 2020, countries are considering policies that will set the course of emissions through 2030 and inform their Nationally Determined Contributions under the Paris Agreement. As they do so, the IPCC Special Report on 1.5°C provides a helpful benchmark for the scale of global emission reductions necessary to stay on track to limit warming to 1.5-2°C. To keep warming below 2°C, the IPCC estimates that global greenhouse gas (GHG) emissions should be limited to about 40 to 45 gigatons of CO_2 equivalent (CO_2e).[2] Limiting warming to 1.5°C means bringing emissions down even further, in the range of 28 to 40 gigatons CO_2e.

To put those figures in perspective, Rhodium Group estimates that in 2017 global net GHG emissions reached 51 gigatons CO_2e. In its recent Emissions Gap Report, UNEP projects that under current policy, global emissions will reach 60 gigatons CO_2e per year by 2030. If the world is serious about meeting the Paris climate goals, we'll need to reduce annual emissions anywhere from 20 to 38 gigatons of CO_2e below expected levels in 2030.[3] That's the equivalent of zeroing out today's emissions from China and the US on the low end, or the top 20 emitting countries on the high end, all within a decade.

Meeting this challenge will require a concerted global effort to decarbonize every aspect of our economy, across all regions of the world. At the same time, we know that the world's largest economies will play an outsized role in determining the fate of global emissions. Many of these countries face decisions in the coming years that will have a multi-gigaton impact on their emissions by 2030. In the sections below, we highlight five big questions facing the world's largest economies and assess which will have the greatest impact on global emissions in 2030.

[2] In this report we use 100-year Global Warming Potential Values from the IPCC's 4th Assessment Report.

[3] Based on UNEP Emission Gap Report (2019) current policy scenario and IPCC AR5 (2014) 2030 emission levels consistent with 2 and 1.5C scenarios.

A European Green Deal?

The President-elect of the European Commission, Ursula von der Leyen, who will take office in December 2019, has stated that passing a European "Green Deal" is at the very top of her list of priorities. The Deal, which she plans to outline in her first 100 days, would establish a target of climate neutrality by 2050, and would accelerate the pace of a suite of climate policies like the Emissions Trading System (ETS). Her success will depend in large part on the willingness of European member states to accept the Deal and their ability to effectively implement its provisions.

The President-elect is stepping in after a period of very active climate policy-making by the European Commission. 2018 and 2019 saw the adoption of a swath of new EU-wide policies, which if implemented, will put the EU on track to meet its Paris Agreement target of 40% emissions reductions from 1990 levels by 2030. In 2018, EU ETS reforms were finalized, which have already resulted in higher emissions allowance prices and are expected to increase the share of proceeds that go toward additional climate measures. This year the final pieces of the "Clean Energy for all Europeans" package were adopted. This package includes updated renewable energy targets (REDII), energy performance requirements for buildings and other energy efficiency measures, as well as a new mandate for member states to submit 10-year national energy and climate plans. Finally, earlier this year the Parliament and Council adopted enhanced CO_2 standards for cars and heavy trucks.

The extent to which these new policies help the EU achieve its Paris Agreement target will depend to a great extent on how member states implement their provisions. In a recent analysis by the European Environmental Agency based on member states' own reporting, the EU bloc as a whole is expected to achieve 30% reductions based on existing measures adopted to date by member states.

That puts the EU just short of its 40% target, but that doesn't take into account the full suite of recent EU-wide policies mentioned above. If all member states effectively implement those provisions, the EU Commission estimates that emissions reductions would reach 48% (if LULUCF is accounted for), far surpassing the existing target for 2030.

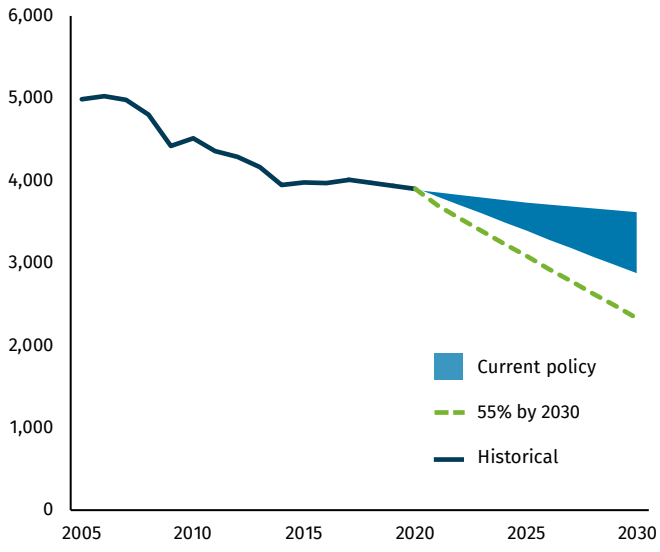
President-elect von der Leyen has plans to push the EU even farther. In addition to enshrining the 2050 climate neutrality goal into law, her agenda laid out in her political guidelines calls for a more ambitious 2030 target of at least 50% emissions reductions and commits to put forward a comprehensive plan to reach 55% by 2021.

Soon after the new college of Commissioners is in place, the Commission is expected to release a Communication outlining in more detail the elements of the European Green Deal. Von der Leyen has indicated she plans to expand the EU ETS to cover transportation and construction, and tighten restrictions for airlines, which currently get most pollution permits for free. The Deal may also put pressure on the EU's trading partners, introducing a Carbon Border Tax that would start small but expand its coverage over time.

Adopting the European Green Deal will be no small feat. While a vast majority of member states support the 2050 climate neutrality goal, a much smaller number have endorsed the plan to move to 55% and the tightening of EU laws that would be required to achieve that target. To some extent, this will depend on the array of enticements for the holdouts, in particular states with significant heavy industry, like Poland. To sweeten the deal, the President-elect has proposed a Just Transition Fund that is expected to provide billions of euros in support for industrial decarbonization.

So, what would the successful adoption of Europe's Green Deal mean for EU emissions in 2030? If all conditions are met and the EU adopts a new target of 55% reductions below 1990 levels, the EU would avoid an additional 1.5 gigatons of CO_2e in 2030 if member states do little between now and then to implement the bloc's current measures. If member states are on track to implement all current policy measures, the enhanced target would only achieve an additional 0.5 gigatons in 2030 (Figure 2).

FIGURE 2
EU emissions
Net emissions and removals including LULUCF (million metric tons, CO_2e)



Source: EEA Trends and Projections (2019), EC Long-term Strategic Vision (2018), Rhodium Group analysis.

Will Brazil Protect its Forests?

Over the past summer, Brazilian President Jair Bolsonaro was the target of an international and media uproar over an alarming spike in the number of wildfires across the Brazilian Amazon. While searing images of a rainforest in flames have captured the attention of the international community, the fires themselves are not the only risk to the Amazon's standing forests and the vast amounts of carbon they contain. Much of the condemnation of Bolsonaro is for his failure to enforce Brazilian laws prohibiting illegal forest clearing.

Implementation of Brazil's ambitious Forest Code has been credited with the precipitous drop in deforestation between 2004 and 2012 (by 76%), resulting in a 60% decrease in land-based greenhouse gas emissions over that period. The Forest Code required landowners to protect forests on portions of their land (up to 80% for properties held in the Amazon) and designated environmentally sensitive areas for permanent preservation.

By 2012, however, pressure from industry led to the relaxation of the Forest Code, reducing protected or restored forest area by 60% and providing amnesty to more than half of illegal logging before 2008. As a result, deforestation has more than doubled over the past six years according to Brazil's National Institute for Space Research (INPE).

Since President Bolsonaro came to power earlier this year, his actions have accelerated the dismantling of the country's forest laws, weakened environmental institutions, undercut indigenous rights and limited participation of civil society. The impact on Brazil's forests have been stark and immediate. INPE reported this month that deforestation over the past year increased 30% from the previous year. That's the highest deforestation rate experienced in the Amazon in over a decade.

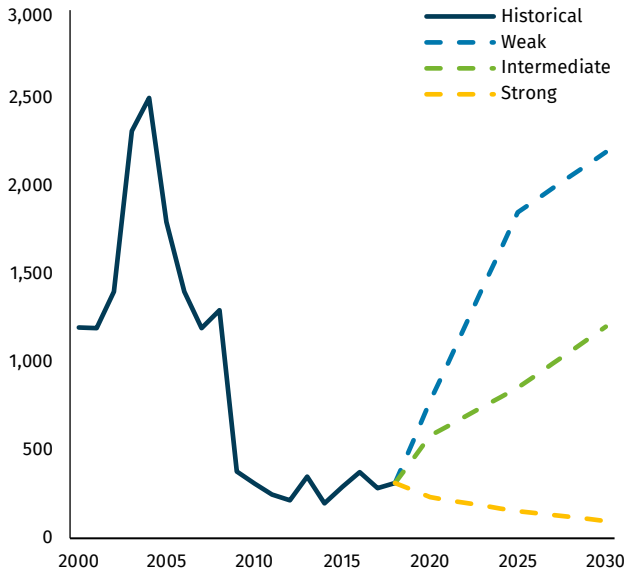
How the country proceeds with its forest policy in the coming years will have a significant impact on the health of the Amazon, as well as the nation's GHG emissions. Emissions from land use change and forestry made up more than half of the nation's total emissions over the past three decades. Here we assess the emissions impact of three potential forest governance scenarios described by leading Brazilian academics and published in Nature (Rochedo et. al., 2018):

1. **Weak**: complete abandonment of current deforestation policies, as well as strong political support for industry and agriculture to push into forested areas.
2. **Intermediate**: current deforestation control policies are maintained (e.g., lax enforcement of the Forest Code, reduction in the number and size of protected areas), with growing political and legal support for agricultural expansion and land-grabbing practices.
3. **Strong**: expansion of current deforestation policies, including full implementation of the Forest Code and economic incentives for forest conservation.

To calculate the net emissions impact from each of these scenarios, we used projected gross CO_2 emissions for each of these scenarios from Rochedo 2018 and assumed a constant rate of removal based on Observatório do Clima's SEEG estimates for 2016-2018.

We find that an acceleration of weak environmental governance displayed under the Bolsonaro administration to date could lead to a return of emissions to levels nearly as high as their peak in 2004, reaching 2.2 gigatons by 2030 (Figure 3). A move toward intermediate environmental governance (on par with efforts under the last administration), would drop 2030 emissions by about 1 gigaton. But if Brazil were to get back on track with its success from the previous decade, strong environmental governance would put emissions on a declining path, avoiding more than 2 gigatons of emissions in 2030.

FIGURE 3
Brazilian forest and land use emissions
Net emissions and removals of CO_2 (million metric tons) from Land Use, Land Use Change and Forestry (LULUCF) under 3 environmental governance scenarios



Source: Brazil's 3rd Biennial Update Report, Observatório do Brasil/SEEG, Rochedo 2018, Rhodium Group analysis

US Back on Track After 2020 Election

Almost exactly 10 years ago, the US submitted a letter signing on to the Copenhagen Accord and formalizing its 2020 target of emission reductions in the range of 17% below 2005 levels. This letter also contained the Obama Administration's intention of putting the US on track to reduce emissions 42% below 2005 levels by 2030, and 83% by 2050.

In the years that followed, the US upheld its 2020 target, despite the failure of comprehensive climate legislation on which it was based. President Obama released his Climate Action Plan in 2013, which relied on the Administration's existing authorities to tackle emissions sector by sector. In 2015, the US submitted its new target of 26-28% by 2030 under the Paris Agreement.

Fast forward to today—the US is nearing the range of 17% reductions in 2020 but is far off track from its 2025 commitment. Making good on his campaign commitment, the Trump Administration submitted a new letter notifying the UNFCCC of its intention to withdraw from the Paris Agreement.

The Trump Administration has systematically rolled back much of the Obama era climate policies, resulting in excess cumulative emissions of 1.9 to 3.1 gigatons CO_2e through 2035 (Biggest Rollback Yet? (2018) and Come and Take It: Revoking the California Waiver (2019)). And although states, cities and businesses are working to pick up the slack, the US is currently on track to reach 12-19% emissions reductions from 2005 levels by 2025 (Taking Stock (2019)).

So what is the outlook for 2030? As we've seen in the past, a lot can happen in a decade. Next November, Americans will decide whether to give the Trump Administration another four years or elect someone new. While there is much at stake in this election, the decision of American voters will have drastic consequences for the direction of US climate policy and greenhouse gas emissions over the coming decade.

To understand the gigatons of GHG emissions at stake in the 2020 US presidential election, we compare emissions under President Trump's current policies with the goals set out by the leading Democratic contenders. Despite their differences, nearly all of the 2020 Presidential challengers have presented themselves as the antithesis of Trump when it comes to climate policy. Nearly all have vowed to immediately rejoin the Paris Agreement and re-engage in international climate efforts.

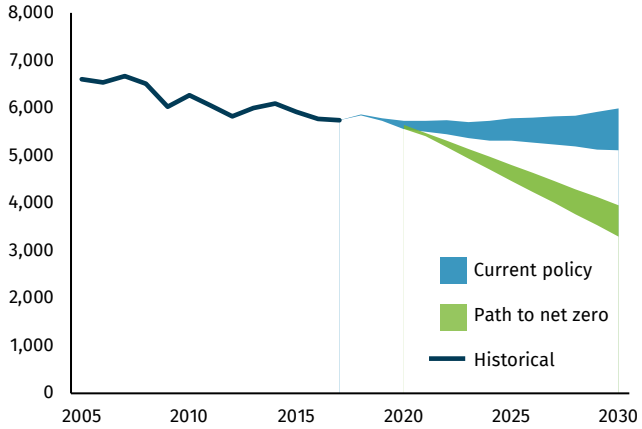
But what might a Democratic presidential win mean for domestic efforts to curb US greenhouse emissions over the coming decade? The details of candidates' climate plans are still emerging, so there is little detail yet on expectations for 2030. Where candidates have been very forthcoming is in their vision for achieving a net zero future in line with the goals of the Green New Deal.

Of the top 10 Democratic candidates, nine have called for the goal of economy-wide net zero emissions between 2045 and 2050. Rather than parse the limited details of each candidate's plan, we work backward from their common mid-century goals to assess where US emissions would need to be in 2030 to remain on track for net zero.

We estimate that to be on track for net zero by 2045-2050, US emissions in 2030 would need to reach 40-50% reductions from 2005 levels (Figure 4). Achieving that range of reductions would reduce US GHG emissions from levels expected under today's policies by 1.2 to 2.7 gigatons of CO_2e emissions in 2030.

Electing a presidential candidate that has vowed to put the US on track to net zero by mid-century will be a critical step for American and global efforts to fight climate change. But that alone will not guarantee success. Few of the candidates have provided information on how they plan to implement their climate plans, much of which will likely require congressional approval. Staying on a straight-line path to net zero by mid-century will require emission reductions on the order of 4-5% every year from 2021 to 2030. The US has no track record of sustained annual reductions since it began instituting climate policies earlier this century. In fact, since 2005 annual emission reductions have averaged around 1.1% (ranging widely from -7.4% during the Great Recession to +4.1% the following year as the economy picked back up).

FIGURE 4
US greenhouse gas emissions
Net emissions and removals of all 6 GHGs (million metric tons, CO_2e)



Source: US EPA, Rhodium Group Taking Stock 2019, Rhodium Group analysis

Hard or Soft Landing for China's Economy?

Looking back over the past two decades, it's hard to miss the single biggest factor affecting global greenhouse gas emissions: the rise of China. Rapid, energy-intensive economic growth fueled by domestic construction and industrial expansion delivered double digit annual Chinese emissions growth in the early 2000s and high single-digit growth for the rest of the decade. By 2004, China had displaced the US as the world's largest emitter. By 2017, China's annual emissions had nearly tripled from levels at the start of the century. As a result, China contributed nearly two-thirds of the global growth in emissions over that period.

This was not expected. At the turn of the century most international organizations anticipated Chinese economic growth would slow considerably from the 10% average over the previous two decades. In its 2002 World Energy Outlook, for example, the International Energy Agency (IEA) projected 5.7% average annual growth between 2000 and 2010. Instead, China grew at 10.6%.

This upside surprise in both headline growth and the energy-intensity of the Chinese economy resulted in an upside surprise in global emissions. The IEA projected 5.4 gigatons of energy-related Chinese CO_2 emissions by 2020. China emitted 9.3 gigatons in 2017 and could come close to doubling the IEA projection in 2020. Put another way, the growth in Chinese emissions due to unexpected economic developments over the past two decades is almost as large as total US CO_2 emissions today.

Looking ahead to 2030, experts are no longer debating how much faster China will grow, but instead, how quickly it will slow. This also has significant implications for global emissions, but in the opposite direction.

The twin engines of industrialization and urbanization that have driven recent Chinse growth are running out of steam. According to official statistics, Chinese growth slowed to 6.6% in 2018. The IEA and World Bank now both project 5.1% average annual Chinese growth between 2020 and 2030. This is optimistic, and will require the adoption of a series of difficult economic reforms, many of which China is lagging behind on.

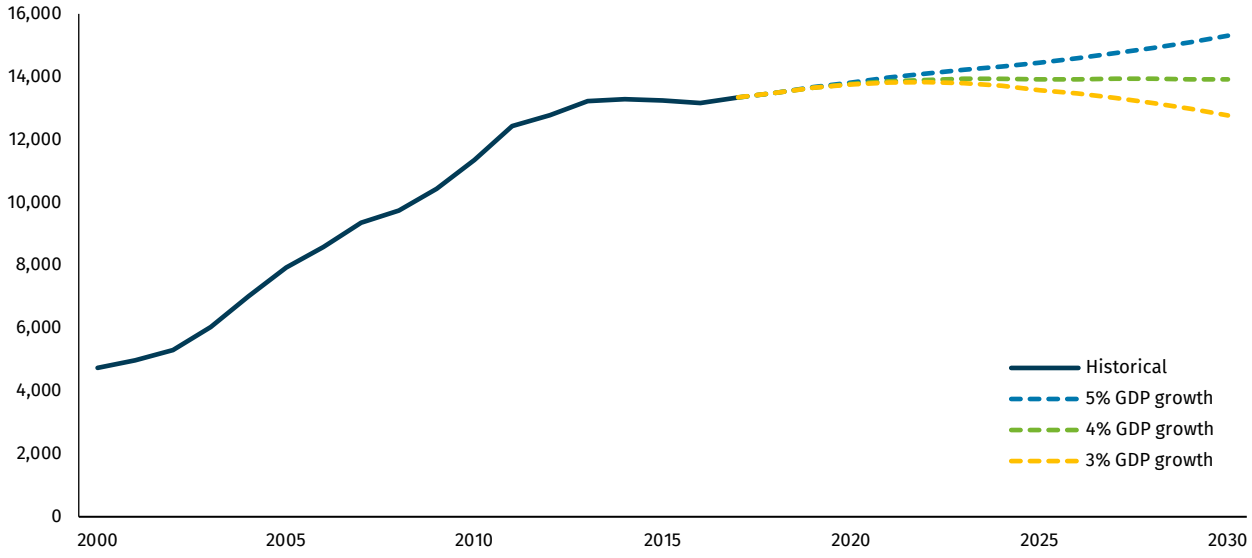
If growth comes in just 1 percentage point lower on average between 2020 and 2030, Chinese GHG emissions in 2030 could be 1.4 gigatons lower than in a 5% GDP growth future (Figure 5). That's on par with total current emissions from the UK and Germany combined. An additional 1 percentage point drop would shave emissions by another 1.1 gigatons. Under these lower growth scenarios total Chinese emissions would flatten out by 2022 (with 4% average annual growth) or even peak and start to decline (with 3% average annual growth).

Chinese economic growth uncertainty doesn't just impact global emissions directly, it will determine whether existing and potential Chinese climate policy commitments (like emissions peaking) are binding or business-as-usual.

FIGURE 5

China's greenhouse gas emissions under a range of potential economic growth scenarios

Net GHG emissions (million metric tons, CO_2e) under 3 potential GDP growth scenarios (annual average 2021-2030)



Source: Rhodium Group analysis

Will India' Electric Demand Grow Like China's?

As we saw with China, uncertainty in the growth path of major emerging economies can lead to widely divergent outcomes for emissions. India's emissions have grown rapidly over the past decade, increasing 70% since 2007, but are currently only about a quarter of China's. While India's population is expected to surpass China's in the next few years, India's per capita GDP looks more like China's did 10 years ago.

As India's economy develops over the course of the next decade, the evolution of the country's electric power system will play a key role. With steady population and economic growth, India is on track to be the fastest-growing market for electric power of any of the world's major economies. Power generation—the single largest source of emissions in India—contributes a third of the country's total. Two key factors will ultimately determine the magnitude of emissions growth in the decade ahead: the pace of growth in energy demand and the share of renewables and other non-fossil sources in the country's power mix.

Since 2000, India's power demand has doubled as over half a billion people gained access to electricity, almost doubling the country's electrification rate. India's per capita power consumption has risen almost 10% in the past four years since Prime Minister Modi began rolling out his ambitious agenda to provide universal electricity access and improve supply. India is on track for universal electrification in the next year or two, putting it only a few years behind China, which reached full electrification in 2015. Over the coming decade, India still has room to grow considerably. India's per capita electricity consumption is still just one-third of the global average.

Coal generation—which has also doubled since 2000—powered three quarters of all electricity access achieved over the past two decades in India. This kind of coal-led growth won't be consistent with Paris climate goals. Instead, a growing share of the country's electric load will need to be met by renewables and other non-fossil sources.

Transforming the country's electricity sector, including a significant diversification away from coal-fired power, is a key priority for Prime Minister Modi. In 2015, Modi set an ambitious goal for India to generate 175 gigawatts (GW) of renewable energy by 2022. In 2018 India released its National Electricity Plan, at its core a target of reaching 275 GW of renewables by 2027, which would put India well on its way to achieve its target of achieving non-fossil shares of electric generating capacity of 40% by 2030.

To assess the potential gigaton impact of faster growth in electricity demand for India, we consider two different electricity demand growth scenarios, one that follows IEA expectations of 5.8% annual growth, and one that follows a higher demand growth pathway with annual growth of around 7%—levels on par with those seen in China at similar stages of its economic growth.

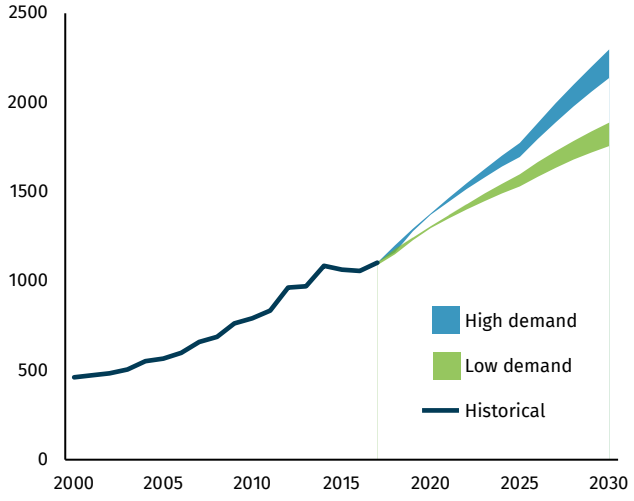
For both scenarios we include a range of potential outcomes based on implementation of India's broad power sector transformation goals for 2030. First we assume today's policies extend through 2030, providing a high-end estimate of emissions under both demand scenarios. At the low end, we assume that India meets all its ambitious goals to expand renewables and non-fossil generation and limit the expansion of coal and other fossil sources.[4]

Under current policy and demand assumptions, Indian power sector emissions are expected to rise 70% from 2017 levels. If the country meets its non-fossil goals, growth is limited to about 60%. If India sees high electric demand, however, emissions will double (rising 108% under current policy and 94% if the country's non-fossil goals are met). That puts the potential emissions impact of the pace and composition of India's electric power system in 2030 at about 0.5 to 0.8 gigatons of CO_2.

FIGURE 6

India's GHG emissions from electric power generation

Ranges based on high/low implementation of India's non-fossil goals (million metric tons, CO_2)



Source: IEA WEO 209 and Rhodium Group analysis

4 India's electric power sector policies are consistent with IEA's WEO 2019 "Current Policies Scenario" and "Stated Policies Scenario."

Disclosure Appendix

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