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India Strategy

Climate Action: Clean your way up

June 2021

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CLIMATE ACTION | #1 Watch Out | 09 June 2021

Clean your way up

- **Climate fears mounting due to global warming, shift in US stance and surge in ESG activism; coal, oil, auto, steel and cement to bear the brunt**
- **Industries have room to pass on compliance costs to end users; sunset for coal though. Climate concerns to impact investment decisions hereon**
- **Renewables, energy efficiency, batteries and hydrogen to dominate fresh capex. Companies leveraged to these technologies have long growth runway**

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Climate concerns at our doorstep: There is now a near universal consensus on the reality and adverse impacts of global warming. The 2015 Paris Agreement that had most major CO_2 emitters committing to specific reduction targets was an important milestone. We are also currently seeing a groundswell of global climate activism. In our view, ESG investing – currently a separate vehicle – will become fully integrated with mainstream investing far sooner than earlier anticipated.

Pressure on emitters: Coal-based IPP (45% of India's CO_2 emissions per our estimates), automobiles (12%), steel (10%) and cement (8%) are among the largest polluters in India. Pressure is intensifying on these sectors the world over. Auto is already seeing exponential growth in electric vehicles, and calls for climate action on other industries will only become more strident as we draw closer to 2030. It will, for instance, become increasingly difficult to sponsor greenfield coal-based power plants. Our analyses show that global carbon emissions in 2030 will likely be lower than 2019 due to these efforts, but could still far exceed the desired 2°C trajectory.

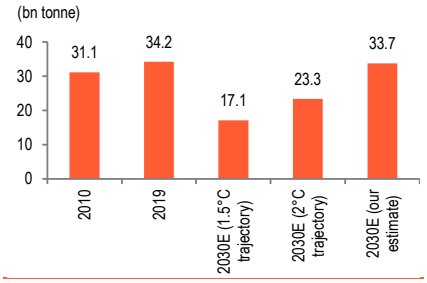
Implementation of green tech no longer costly: Contrary to the general perception that the use of clean technology will render several manufacturers unviable, our analyses show that the end consumer price will likely increase by a mere 1-5% across most products if polluting industries such as steel were to shift to greener manufacturing alternatives. Nuclear energy may partly set off the inevitable cutback in coal for base load power supply.

Winners and losers: We believe a majority of new capex will be directed towards emission reduction initiatives, which include renewable power generation, electric vehicles, batteries, hydrogen, energy-efficient manufacturing, and carbon capture and storage. Global players leveraged to these technologies include Siemens, ABB, Bosch, 3M, Linde, Honeywell, and Schaeffler. For emitters in India, we expect earnings will remain intact much longer than that of global peers, but valuation multiples will likely start to derate sooner than later due to dwindling interest from large global investors and pension funds.

Watch Out

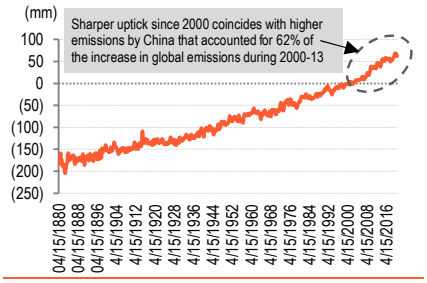
Our new 'Watch Out' series aims to track trends with long-term implications on the Indian economy in general and companies in particular. We focus on environmental concerns in this inaugural edition.

2030 global emission may be double the desired 1.5°C temperature trajectory



Source: BOBCAPS Research, BP Statistical Review 2020, IPCC Special Report

Sea level change vs. 1993-2008 average



Source: NOAA Climate.gov, USA (sea-level data), BP Statistical Review (carbon emission data), BOBCAPS Research (China's estimated contribution to global emissions)

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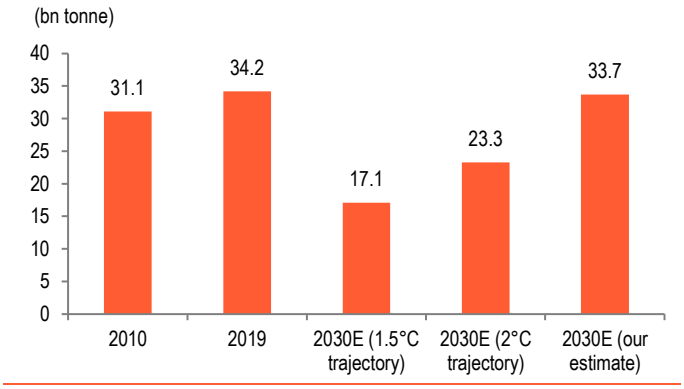

Source: BOBCAPS Research, BP Statistical Review 2020, IPCC Special Report

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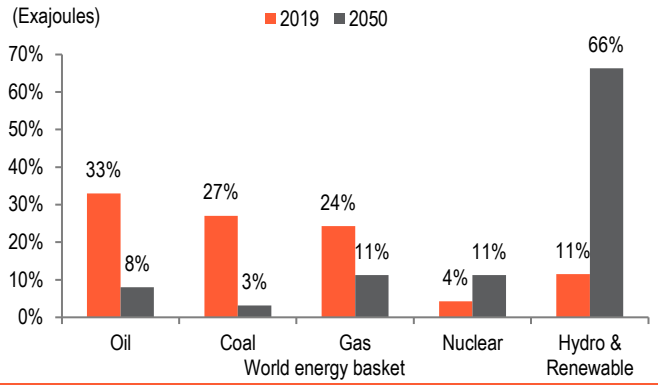

Source: BOBCAPS Research, IEA, BP Statistical Review 2020

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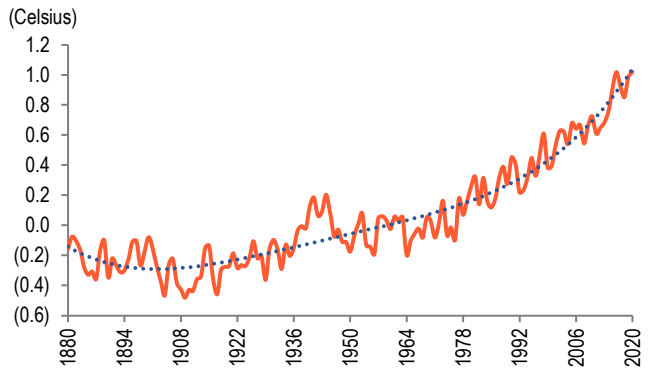

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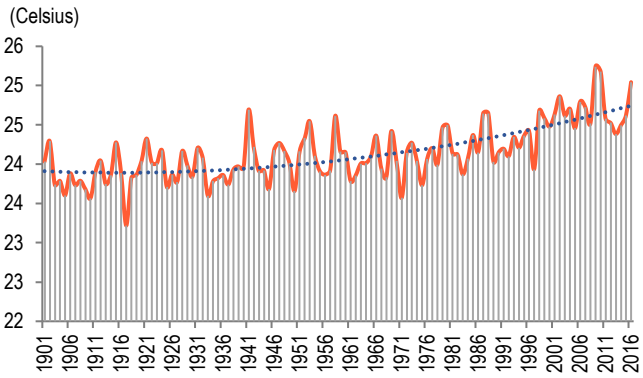

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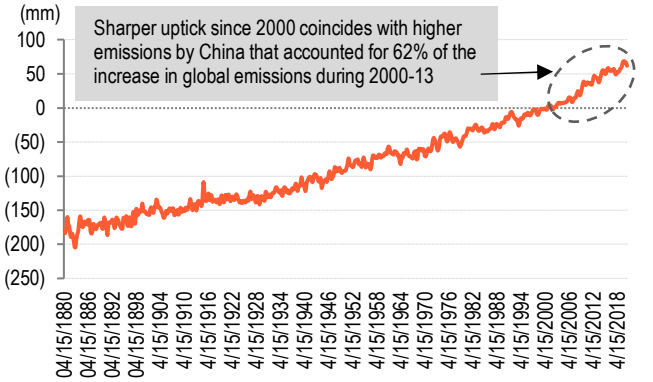

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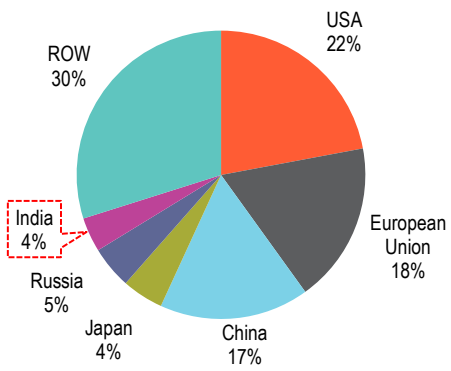

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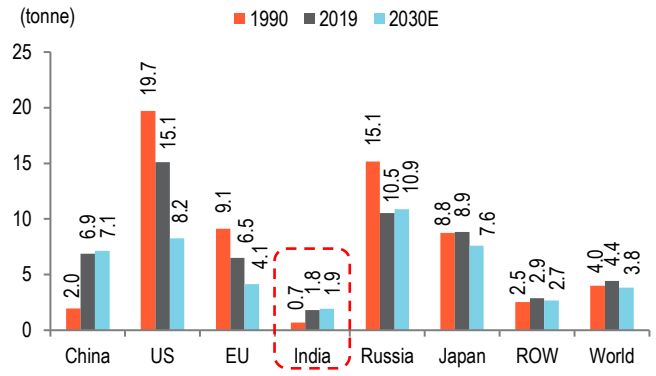

Source: BOBCAPS Research, BP Statistical Review, World Bank

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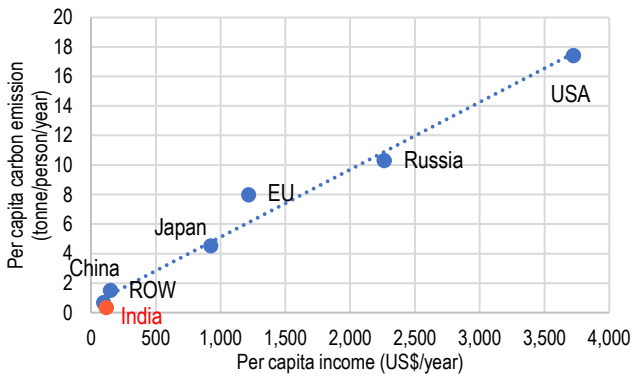

Source: BOBCAPS Research, BP Statistical Review, World Bank

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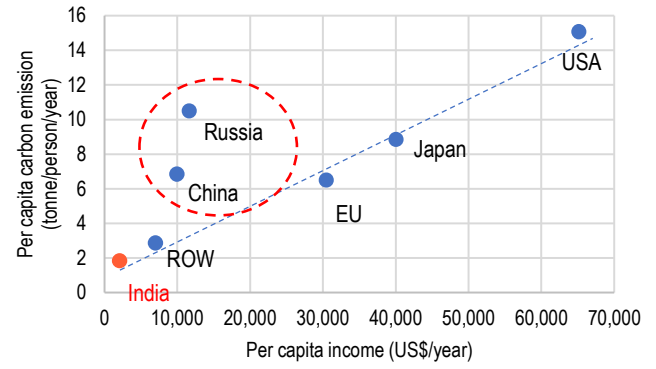

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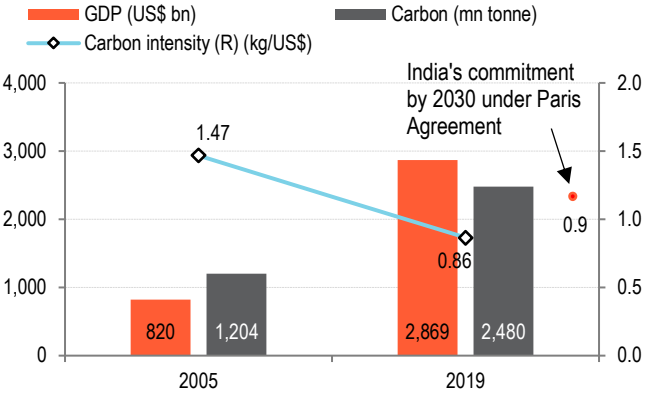

Source: BP Statistical Review, World Bank data, BOBCAPS Research | Note: Carbon intensity is calculated as CO_2/GDP

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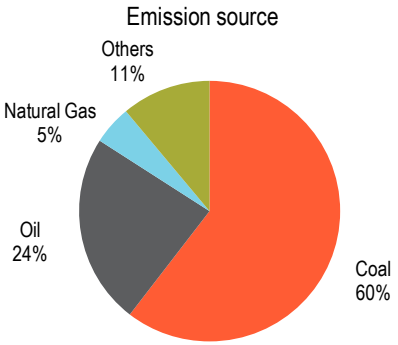

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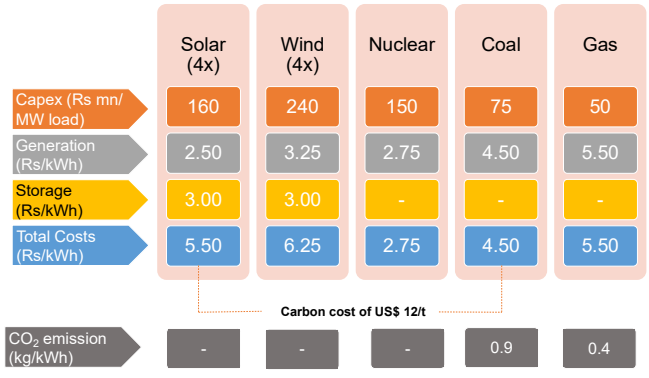


Source: BOBCAPS Research

Executive summary

Mean sea level rising dangerously and it matters

As per data from American scientific agency, National Oceanic and Atmospheric Administration (NOAA Climate.gov), the global mean sea level has risen by over 8 inches since 1880 and if the world continues to follow a high-emission trajectory, a worst-case scenario of a 2.5-metre increase over 2000 levels by 2100 cannot be ruled out.

To put this in context, a major part of Mumbai and Navi Mumbai is just 4 metres above sea level. Even if the world follows a low greenhouse gas trajectory, sea levels will likely rise more than 12 inches above 2000 levels by the turn of the 21st century.

Climate concerns taking political centre stage

Climate concerns are now largely part of consensus opinion. The threats of global warming and rising sea levels are too obvious and overwhelming for us to ignore the underlying drivers. Global response has been inconsistent. The United Nations Framework Convention on Climate Change (UNFCCC) was ratified by 197 countries and entered into on 21 Mar 1994, but the US – a large emitter – kept wavering on various initiatives.

The 21st meeting of the Conference of Parties (COP) at Paris in 2015 was an important milestone as it brought country-specific deliverables to the table, with the main objectives being to hold the increase in global average temperature to "well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels". While different countries committed to specific targets in 2015, recent developments have further reinforced and improved on those commitments, as shown in the exhibit below.

Fig 13 – Recent developments supporting climate commitments

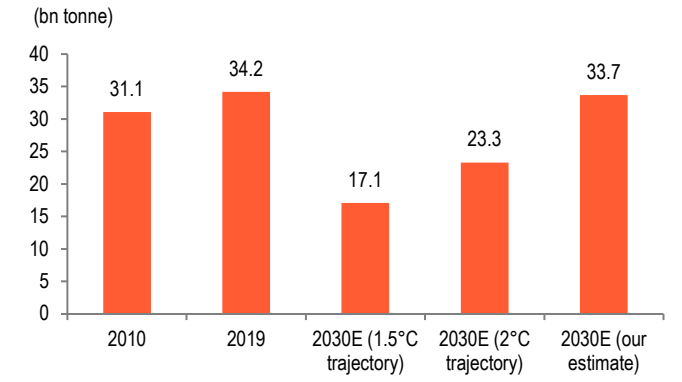
US	UK	Germany	China
• US President Joe Biden's election campaign had a significant emphasis on "green new deal" • US to achieve 100% clean energy economy and net zero emission no later than 2050 • Rally the rest of the world to meet the threat of climate challenge	• Prime Minister Boris Johnson has already promised "urgent action" on climate crisis • UK will stope selling petrol and diesel cars and vans from 2030	• As per latest pre-election poll (as reported by several media outlet), Green Party's Annalena Baerbock is leading over Angela Merkel's successor in the Christian Democratic Union (CDU) party, Armin Laschet • Germany is leading EU's net zero commitment	• China has proposed a net zero emission by 2060 • China is taking series of steps including subsidizing EVs and Hydrogen. • It has also removed export subsidy for steel producers and is attempting to cut throughput. • It has banned imports of 60 solid waste items (for recycling) in five main categories of metal, plastic, paper, textile, and wooden waste.

Source: Media reports (CNBC, Al Jazeera, The Guardian)

We are far off from 2°C trajectory

As per a special report by the Intergovernmental Panel on Climate Change (IPCC), carbon emission by 2030 needs to be roughly 45% lower than 2010 levels in order to limit the rise in world temperature to 1.5°C, or ~25% below for the 2°C rise case. We are, however, far from this goal. Our estimate for carbon emission in 2030 is twice that of its desired trajectory for the 1.5°C scenario. Further, 1.5°C requires net zero emission by 2050 while 2°C requires net zero by 2070.

Fig 14 – Current emissions far off from desired trajectory – 2030 emissions may be double the desired 1.5°C trajectory



Source: BOBCAPS Research, BP Statistical Review 2020, IPCC Special Report

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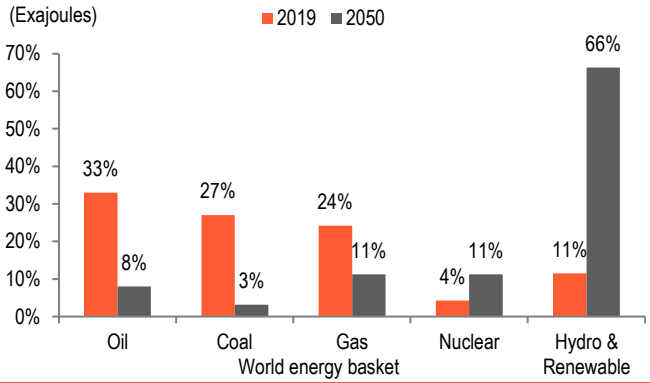


Source: BOBCAPS Research, IEA, BP Statistical Review 2020

ESG inching irreversibly towards mainstream

Sustained lobbying by various interest groups and activists has brought climate concerns to the forefront of public awareness. Parallelly, environmental, social and governance (ESG) concerns, considered niche only a decade ago, are taking centerstage for the industrial and financial sectors. ESG investment vehicles have multiplied both in number and assets under management (AUM). Most large mutual funds globally are now offering such funds to investors, including here in India.

Several large institutions have already started using ESG ratings in their investment decisions. Activist investors are also demanding better compliance from companies across sectors. This is being led and will continue to be led by pension funds worried about the long-term sustainable future of their investment. One example is oil & gas giant Exxon. Only a few years ago, Exxon had the largest market cap in the world. Today, it can't find a place in the S&P Dow Jones Index.

New money into ESG funds in the US that was limited to a few billion dollars per year till a few years ago shot up to US$ 50bn in 2020 and is currently clocking US$ 20bn per quarter. The EU has already enacted Sustainable Financial Disclosure Regulation (SFDR) on 10 Mar 2021 which forms part of the region's 2030 action plan for sustainable finance.

SFDR applies to financial market participants and financial advisors, including asset management firms, banks and insurance companies – it imposes stringent and mandatory sustainability disclosure requirements and contains specific rules for how and what information these entities need to disclose. One of SFDR's aims is to prevent greenwashing (greenwashing refers to creating grand environment plans on paper rather than in practice).

Curious case of Wednesday, the 26th of May 2021

26 May will probably go down in history as one of the most important days in the annals of climate activism.

- On this day, a group of investors backed by some of the largest pension funds unseated two incumbent board members at Exxon and inducted two new green-minded members on board.
- A resolution to cut Scope 3 emissions (arising on account of fuels sold to end consumers) was overwhelmingly passed by 61% of Chevron shareholders on the same day.
- That very day on a different continent, a Dutch court ruled that Shell had to lower its carbon footprint (including carbon emitted by all fuels it sold) by at least 45% by 2030.

A short while later, French oil major Total formalised its new name TotalEnergies as it attempts to pivot away from fossil fuels to renewables. Further, the G7 recently agreed to deliver climate targets in line with the 1.5°C trajectory. These are not just significant but largely irreversible shifts. We expect these climate concerns to permeate into mainstream investing soon. Companies that do not achieve a certain minimum sustainable model will likely get derated, in our view.

The GHG Protocol Corporate Standard classifies a company's greenhouse gas emissions into three scopes:

Scope 1 emissions are a result of direct emissions from owned or controlled sources

Scope 2 refers to indirect emissions from the generation of purchased energy

Scope 3 refers to all indirect emissions (not included in Scope 2) that occur in the reporting company's value chain including upstream & downstream emission

Unfair first-mover advantage for developed world – India to pay for it

Carbon dioxide, the largest contributor to global warming, stays in the atmosphere for thousands of years and some portion could linger for millions of years. Therefore, it is not just annual emissions but the cumulative emissions (carbon dump) by mankind that determine the trajectory of global warming.

The US and EU with a mere 10% of the world's population have contributed more than 40% of the global carbon emission dump during the last 50 years. China accounted for 17% share during 1965-2019. Such indiscriminate emissions have already warmed the earth and unfortunate as it may be, countries like India with a paltry 4% share of the carbon dump will be forced to pay for this historical indulgence of the industrialised world. This means Indian industries will need to migrate to greener processes and products far before Indian living standards match those of the industrialised world.

It is therefore important for incumbents to plan now. The coal sector followed by transport are the two biggest emitters, not only in India but across the world, and will face pressure. Refiners will thus need to pivot away from fossil fuels towards chemicals. We estimate that steel and cement account for roughly 10% and 8% of India's emissions respectively and hence will also feel the heat. Notably, India's cement sector has begun planning well in advance and is already targeting net zero emissions by 2040, even ahead of the EU.

Winners and Losers – renewable, battery and hydrogen-focused players to gain

Those who will be forced into urgent climate action include services with high electricity consumption and most manufacturing setups. While the former can source renewable power to address ESG concerns, some manufacturing sectors will need to completely revamp their business processes to meet progressively stricter green norms as we draw closer to 2030.

In our view, the sectors that will come under the climate action spotlight are refiners, power, automobiles, steel, cement and logistics.

- Electricity generation, transport and steel will likely need to transition to greener manufacturing. This will mean higher usage of renewable resources for power generation, direct reduced iron (DRI) for steel, electric vehicles (EV) for two-wheelers, three-wheelers, metro buses and passenger vehicles, and green hydrogen for fueling long-distance vehicles. Refiners will need to maximise production of chemicals and gradually move away from transportation fuel and furnace oil.

  Hydrogen is currently produced from fossil fuels like natural gas – this is called grey hydrogen, the use of which does not help cut emissions. However, if the carbon produced in the process is captured and stored, the hydrogen is called blue hydrogen. Hydrogen can also be produced through electrolysis of water using renewable energy – this is green hydrogen and does not result in carbon emissions. The use of hydrogen in fuel cells to generate electricity is also a clean process.

- Logistics providers, particularly those associated with MNCs/overseas investors, will need to migrate to EV fleets. We are already seeing early signs of this, with Zomato promising to electrify its entire fleet by 2030.

- We expect much of the incremental demand for power to be met by renewables, particularly solar and offshore wind projects, given the sharp reduction in costs and project longevity. Solar costs have nosedived over the last decade but this resource suffers from inconsistent generation and is only available for a portion of the day. Intermittency can be partly overcome through storage of energy generated during the day, either by using batteries or producing hydrogen.

- Hydrogen technology will thus compete with electric batteries for storage – albeit a much costlier option currently. Hydrogen can also be used as a reducing agent for the steel sector. In our view, metal availability for battery manufacture may not be as big of a concern as it appears currently. Lithium and cobalt have not been adequately explored, with various geological entities now conducting active exploration. Rocks such as pegmatite contain lithium, albeit in low concentration. This rock is abundant in many parts of the world including India.

- Companies involved in energy efficiency, hydrogen, solar energy and EVs will be the biggest gainers. Indian subsidiaries of these companies will also likely be prime beneficiaries.

Fig 16 – Key gainers from the green drive

Energy Efficiency	Hydrogen	EV Ecosystem	Renewables
• Siemens • ABB • Cummins • Honeywell • Thermax • Alstom • Schneider Electric	• Siemens • ABB • Bosch • 3M • Linde • Alstom • Cummins • Schaeffler	• OEMs • Battery makers like Exide, Amara Raja • Auto Ancillaries	• Tata Power & Adani Solar are manufacturing solar panels in India • Developers include Tata Power, Adani Green, Repower, Greenco, Azure Power, JSW Energy

Source: BOBCAPS Research

Green options eminently affordable by end consumer

We believe the incremental costs for greener products in most industries will form only a small part of end-user costs and can be easily absorbed by downstream units. Further, once awareness about green products reaches critical mass, it is likely that consumers will not only pay for the cleaner option but also force companies to adopt the same by rejecting products made by polluting processes.

We are already seeing early signs of such demand patterns emerging in industrialised nations. FMCG companies are now publicly announcing greener options. Unilever has announced a focus on products and processes that will enable it to achieve net zero emissions by 2039. P&G has already introduced recycled paper-based packaging for brands such as Old Spice and Secret.

As per a survey conducted by Accenture (published in Business Standard on 5 Jun 2019), more than half of all respondents were willing to pay more for environmentally friendly products as long as quality was maintained. The results were based on a survey of ~6,000 respondents in 11 countries in North America, Europe and Asia.

Our calculations show that a shift to cleaner manufacturing alternatives by polluting industries such as steel and cement will lead to a price increase of just 1-5% for the end user, which is eminently affordable.

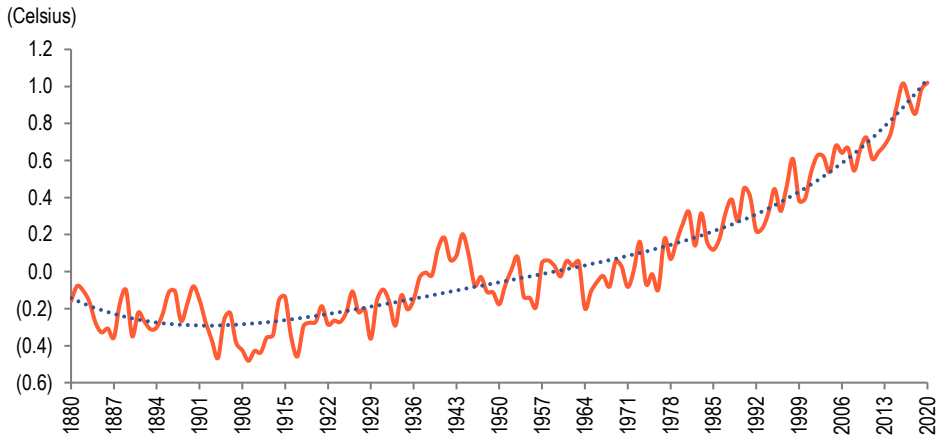
Climate concerns

- Potential 2.5-metre rise in mean sea level by 2100 in the worst-case scenario; 40% chance that the world may temporarily breach 1.5°C warming mark in next five years
- Carbon pollutes the atmosphere for thousands of years, making the cumulative dump (40% from the US and EU) more perilous than annual emissions
- Average Indian will account for just 1.9t of CO_2 emissions in 2030E vs. 7.1t for China and 10.9t for Russia; even so, ESG pressure on Indian companies will intensify

Global warming undeniable

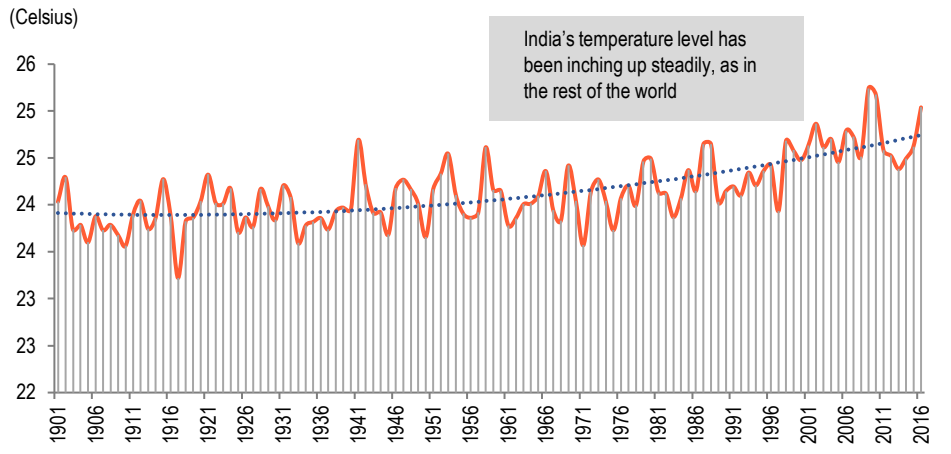
Global warming has long been debated as one of the major threats to the earth's ecosystem. Cynics have denied the extent of warming in the past, but data is increasingly pointing to a steady rise in temperature the world over. As per a new climate update published by the UK Met Office and World Meteorological Organization, there is a more than 40% chance that the annual average global temperature in at least one of the next five years will temporarily reach 1.5ºC above pre-industrial levels.

Fig 17 – Global temperature deviation from mean



Source: BOBCAPS Research, NASA

Fig 18 – Average temperature in India



Source: BOBCAPS Research, World Bank

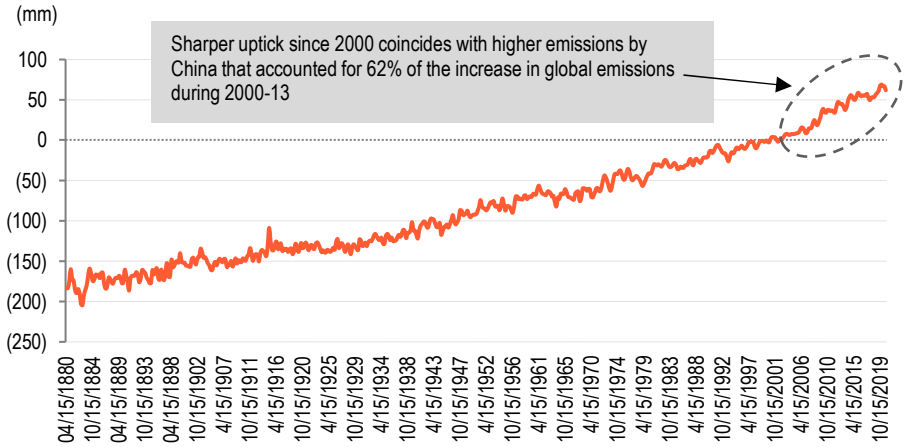
Mean sea level rising dangerously and it matters

As per data from American scientific agency, National Oceanic and Atmospheric Administration (NOAA Climate.gov), the global mean sea level has risen by more than 8 inches since 1880 and if the world continues to follow a high-emission trajectory, a worst-case scenario of a 2.5-metre increase over 2000 levels by 2100 cannot be ruled out.

To put this into context, a major part of Mumbai and Navi Mumbai is just 4 metres above sea level. Even if the world follows a low greenhouse gas trajectory, sea levels will likely rise more than 12 inches above 2000 levels by the turn of the 21st century. As per the UN, 10% of the world's population lives in low-lying coastal areas that are less than 10 metres above sea level, while a staggering 40% lives within 100km of the coast.

The rate of increase in sea level is accelerating and has more than doubled from 1.4 mm (0.06 inch) per year through the last century to 3.6 mm (0.14 inch) per year during 2006-15. In 2019, the mean sea level was 3.4 inches higher than the 1993 average.

Fig 19 – Sea level change vs. 1993-2008 average



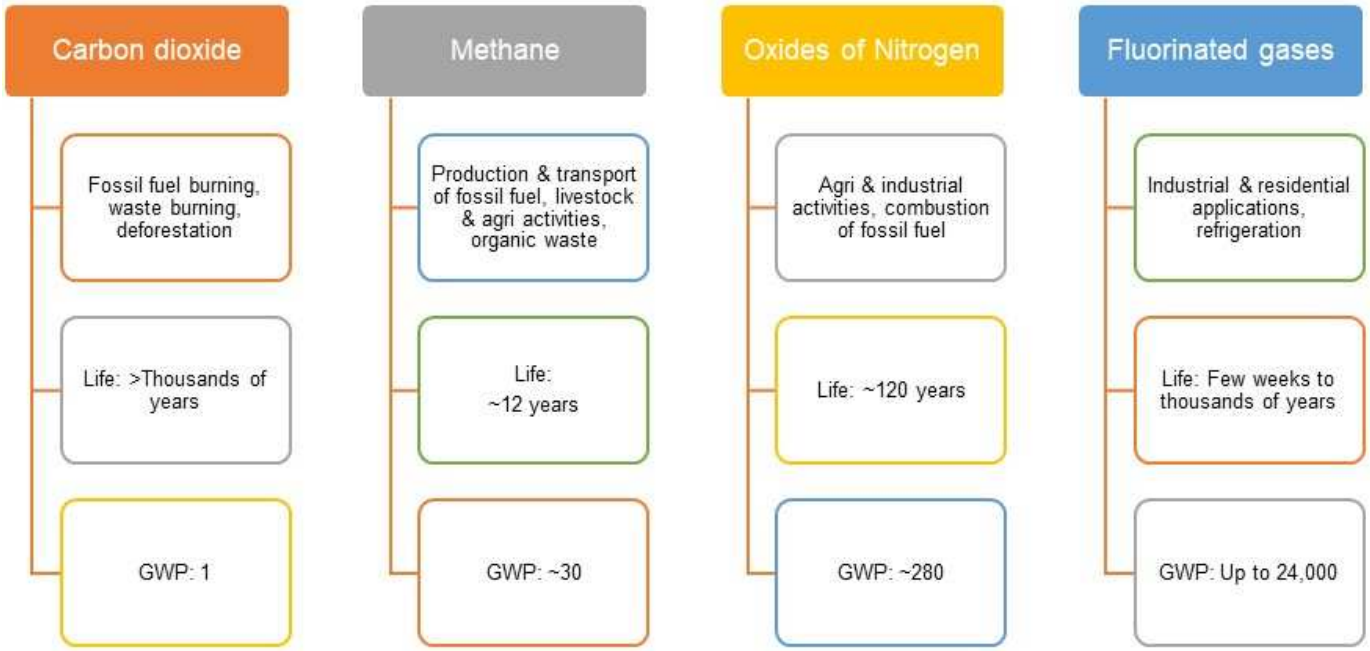
Source: NOAA Climate.gov, USA (sea-level data), BP Statistical Review (carbon emission data), BOBCAPS Research (China's estimated contribution to global emissions)

Global warming is the main reason behind the rise in mean sea level as (i) glaciers and ice sheets are melting and adding water to the ocean, and (ii) the volume of the ocean expands as water temperature rises (see Annexure-II). Another smaller contributor is a decline in the quantum of water in land aquifers, lakes, reservoirs, rivers and soil. This shift of water from land to ocean is mainly on account of groundwater depletion by pumping.

Not all greenhouse gases are equal

Greenhouse gases responsible for global warming include carbon dioxide, methane, nitrous oxide, and fluorinated gases. While methane lasts about 12 years in the atmosphere, nitrous oxide lasts about a century. Fluorinated gases are judged the most damaging and can linger for a few weeks to a thousand years while carbon dioxide remains in the atmosphere for thousands of years with only some portion being absorbed by the ocean. The global warming potential (GWP) of these gases can be estimated with respect to carbon dioxide which has been assigned a GWP of 1.

Fig 20 – Global warming potential (GWP) of different greenhouse gases



Source: EPA, USA

Note that unlike all other greenhouse gases, fluorinated gases (F-Gases) aren't generated naturally but are a product of industrial activities, largely generated from refrigerants. There are four main types of F-Gases, viz. hydrofluorocarbons (HFC), perfluorocarbons (PFC), sulfur hexafluoride (SF6), and nitrogen trifluoride (NF3). Several fluorine compounds are also used in a variety of agrochemicals and medicines. There aren't enough studies in place to understand the specific impacts of these gases on climate change.

Fig 21 – Fluorinated gases – Impact summary

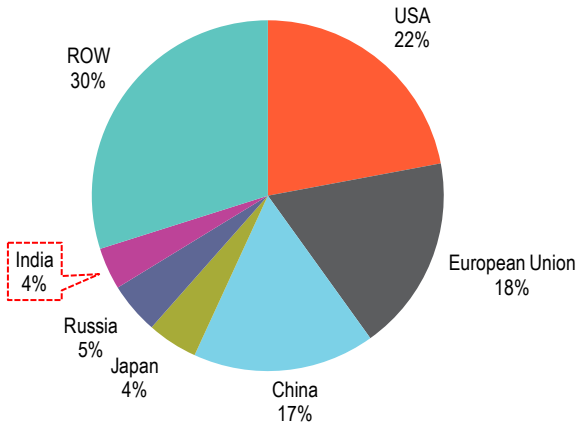
F-Gas	HFC	PFC	NF3	SF6
Lifetime in atmosphere (years)	270	2,600-50,000	740	3,200
GWP	14,800	12,200	17,200	22,800

Source: EPA, USA

Cumulative dump more dangerous than annual emissions – 40% from US & EU

While it is important to address future carbon emissions, the amount of carbon already dumped into the atmosphere over the last several decades will still be around for thousands more years warming up the planet. The US, EU and China are responsible for more than half of the carbon dioxide in the atmosphere. The US and EU, with just 10% of the world's population, account for 40% of global carbon emitted during the last 50 years. As per IPCC, the cumulative carbon dump since the industrial age is close to 2,200bn tonnes, 56% of which has been deposited since 1965.

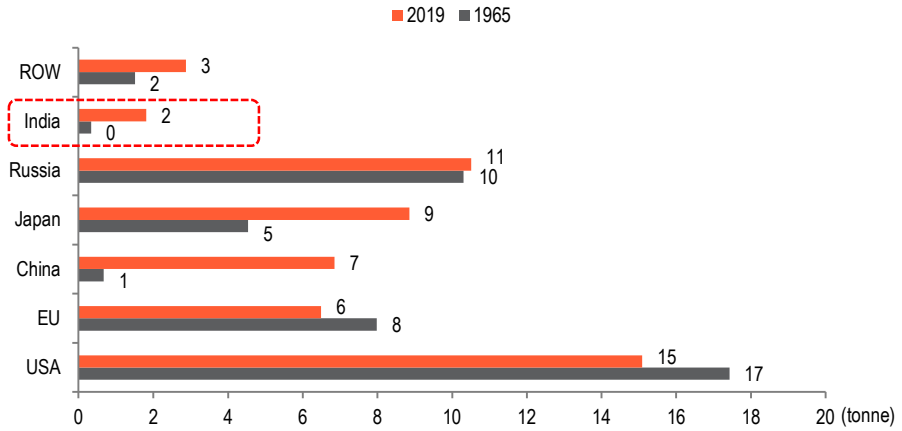
Fig 22 – Global carbon dump during 1965-2019



Source: BP Statistical Review, BOBCAPS Research

It is important that the culprit countries do more than just focus on current emissions. For instance, an increase in tree cover is crucial to address the historical dump. Targeting populous countries such as India on climate change is, therefore, unfair to some extent. Even on a per capita basis, industrialised countries continue to have a significantly higher carbon footprint compared to developing nations.

Fig 23 – Per capita carbon emission (2019 vs. 1965)

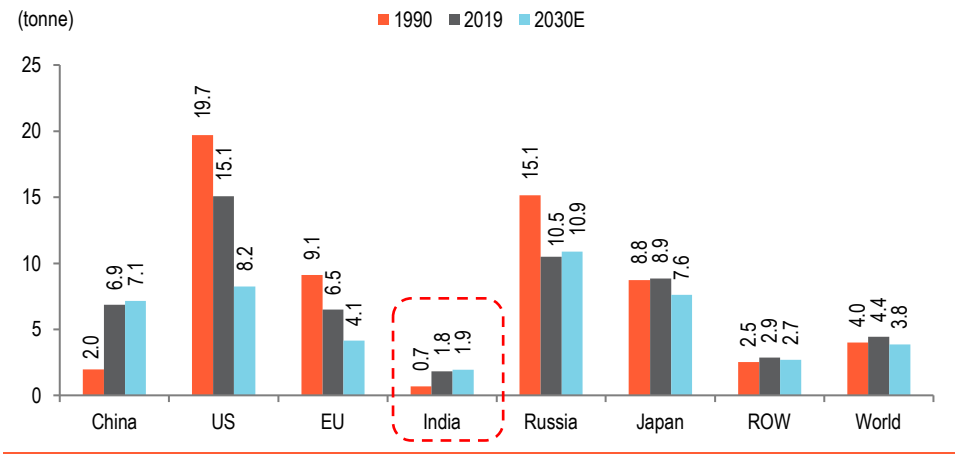


Source: BP Statistical Review, BOBCAPS Research

Despite significant efforts being made by the EU to shrink its carbon footprint, we estimate that the cumulative dump for the region and for most industrialised countries will remain high through to 2030, both in absolute and per capita terms. We have assumed that all countries will either meet their 2015 climate change commitments or exceed them based on their current trajectory.

Per our calculations, an average resident of India will still account for a mere 1.9tonnes of carbon emissions in 2030 compared to 7.1t for China, 10.9t for Russia, 4.1t for the EU and 3.8t for the rest of the world.

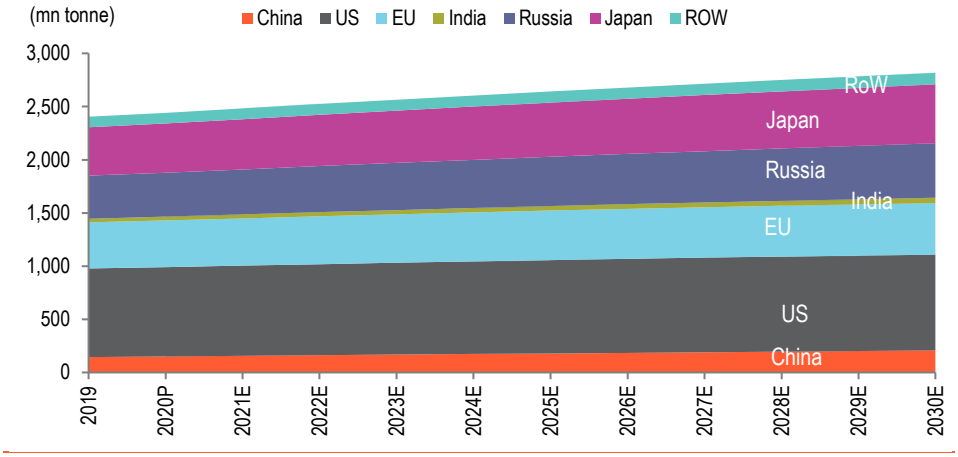
Fig 24 – Per capita carbon emission



Source: BOBCAPS Research, BP Statistical Review, World Bank

On a cumulative basis too, we estimate that the average Indian resident would have added only a fraction of carbon to the atmosphere during 1965-2030 compared to other nations.

Fig 25 – Cumulative per capita carbon dump over 1965-2030

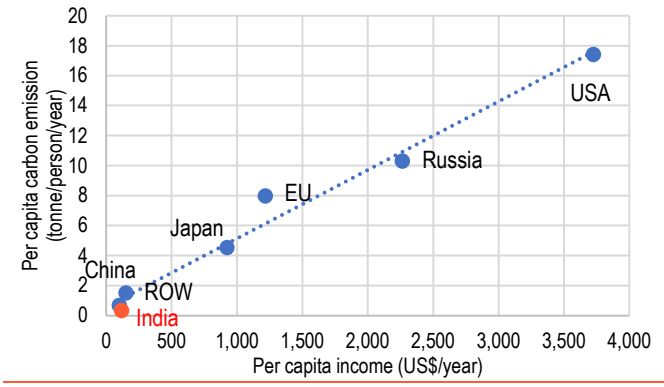


Source: BOBCAPS Research, BP Statistical Review, World Bank

Developing countries cross-subsidising industrialised world's carbon dump

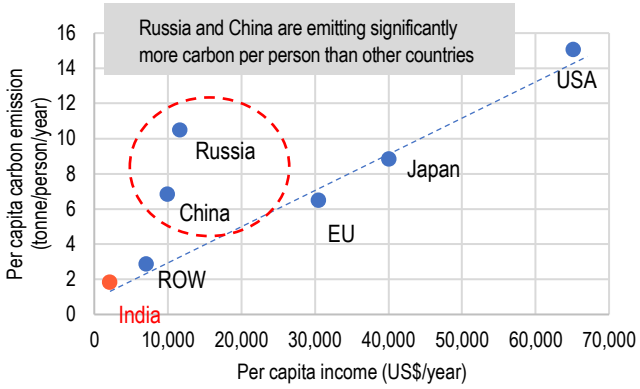
Developed countries have already raised the standard of living of their populace through rapid industrialisation and attendant emissions. Any economic hardship that emanates from tighter carbon emission norms for countries like India, which significantly lag the developed world on per capita income, can only accentuate global inequality.

Fig 26 – Country ranking on yearly per capita carbon emission: 1965



Source: BOBCAPS Research, BP Statistical Review, World Bank

Fig 27 – Country ranking on yearly per capita carbon emission: 2019



Source: BOBCAPS Research, BP Statistical Review, World Bank

Global response to climate change – historical background

Climate concerns gave way to the first UNFCCC that was ratified by 197 countries and entered into in Mar'94. The main objective of this international environmental treaty was to prevent dangerous human interference with the climate system.

Conference of Parties (COP)

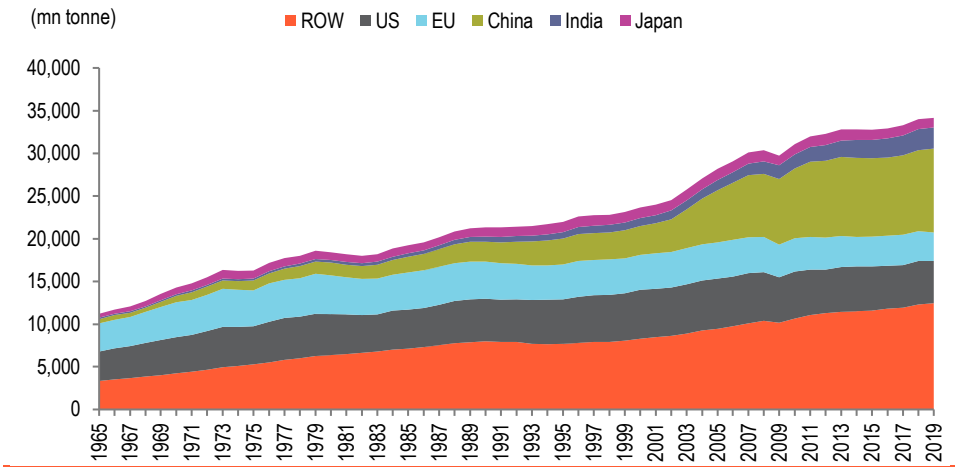
As a follow-up under UNFCCC, a decision-making body for global climate action called the Conference of Parties (COP) was created and mandated to meet every year. All members of the UNFCCC are part of the COP, which first met in Germany in 1995. This body reviews the implementation of UNFCCC decisions by studying the national communications and emission inventories submitted by members. A total of 25 COP meetings have taken place since UNFCCC.

What are the latest commitments under COP?

During COP 21 held in Paris in Dec'15, parties to the UNFCCC reached a comprehensive deal intended to limit global temperature rise this century to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5°C. Each country was asked to decide their emission reduction targets for 2030 by committing to a nationally determined contribution (NDC).

The US skipped ratifying Paris Agreements, though the current US administration has formally announced that it is rejoining the Paris Agreement and has also indicated its new commitment to a 50% cut in carbon emission from 2005 levels by 2030.

Fig 28 – Emission trajectory



Source: BP Statistical Review, BOBCAPS Research

Fig 29 – NDC or latest commitment if stricter than NDC – China, US & EU have all set stricter targets

Country	Share of 2019 global emission (%)	Targets (NDC)
China	29	▪ Peak emissions before 2030 ▪ 60-65% reduction in carbon intensity of GDP (i.e. CO_2/GDP) from 2005 level by 2030 ▪ Carbon neutrality before 2060
USA	15	▪ 50% reduction in greenhouse gas emission from 2005 level by 2030 ▪ Carbon neutrality by 2050
EU	10	▪ 40-55% reduction in net greenhouse gas emission from 1990 level by 2030 ▪ Carbon neutrality by 2050
India	7	▪ 30-33% reduction in carbon intensity of GDP from 2005 level by 2030 ▪ Increase tree cover to create additional sink for 2.5bn-3bn tonnes of carbon; 175 GW of renewable capacity by 2022
Russia	4	▪ 25-30% reduction in greenhouse gas emission from 1990 level by 2030
Japan	3	▪ 26% reduction in greenhouse gas emission from 2013 level by 2030
Iran	2	▪ 4% cut in emission by 2030 relative to business as usual
South Korea	2	▪ 37% reduction in business-as-usual emissions by 2030
Indonesia	2	▪ 29-41% reduction in business-as-usual emissions by 2030
Saudi Arabia	2	▪ Saving of 130mn tonnes of carbon equivalent by 2030
Canada	2	▪ 30% reduction in greenhouse gas emission from 2005 level by 2030
Mexico	1	▪ Peak net emissions by 2026 ▪ ~40% reduction in carbon intensity of GDP from 2013 level by 2030
Brazil	1	▪ 37% reduction in emissions from 2005 level by 2025

Source: UNFCCC, BOBCAPS Research

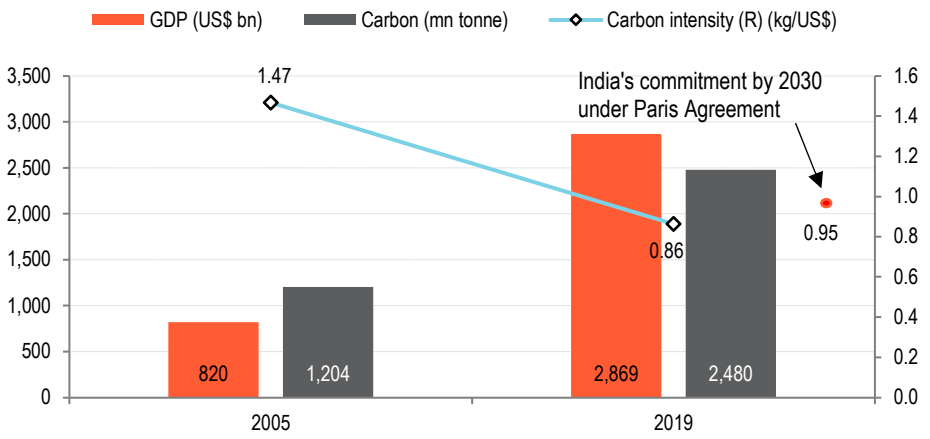
Implications for countries like India

Despite not being among the countries responsible for a bulk of the global carbon dump, the pressure on India in general and Indian companies in particular will likely intensify given global ESG concerns among large institutional investors. The recent announcement by the World Meteorological Organization and Britain's Met Office that the world may temporarily breach the 1.5°C warming mark within the next five years will only ratchet up the pressure.

Current global commitments are a tough ask and will require all countries to pitch in. This also means that developing countries such as India will likely be compelled to change over to greener options, even if significantly costlier than conventional alternatives, particularly in identified polluting industries. This may take Indian industries by surprise, which would create near-term headwinds.

Note that India is already ahead of its 2015 Paris commitment on emission intensity thanks to efforts made since then. Nevertheless, we expect stronger measures from industrialised countries targeting polluting industries through tariff and nontariff barriers, necessitating rapid structural changes in the way these businesses operate. Also, as investors start demanding stricter adherence to ESG norms, companies will be forced to opt for greener technology.

Fig 30 – India's carbon intensity

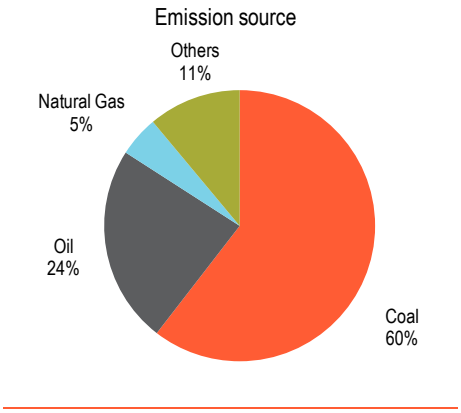


Source: BP Statistical Review, World Bank data, BOBCAPS Research | Note: Carbon intensity is calculated as CO_2/GDP

Unfair to blame carbon for India's sustained pollution

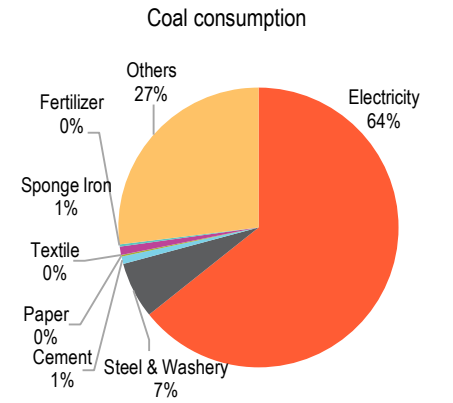
It is important to understand that pollution in many cities in India does not seem driven as much by carbon as by dust. Road transport accounts for a mere 12% of the country's total carbon emissions, as per our estimate. The steel and cement sectors together account for higher emissions compared to the road transport sector.

Fig 31 – India's carbon emission dominated by coal



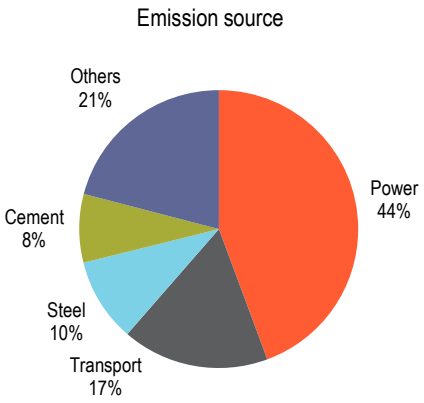
Source: BOBCAPS Research, US EPA

Fig 32 – Coal predominantly used for power generation



Source: Ministry of Coal – India, BOBCAPS Research

Fig 33 – Coal-based power & transport sectors dominate emissions



Source: BOBCAPS Research

Select sectors to bear brunt of ESG activism

We expect pressure to lower emissions on sectors such as transport, power, cement, steel, and oil refineries. Once more automobile OEMs shift to EVs, the focus is likely to turn to suppliers such as steel manufacturers for greener steel.

Any new restrictions are unlikely to be regulatory in nature for the next few years at least as India is already ahead of its Paris NDC commitment. However, given the sharp uptick in ESG activism further accentuated by social media, we believe both investors and consumers will start enforcing better environmental compliance from these industries.

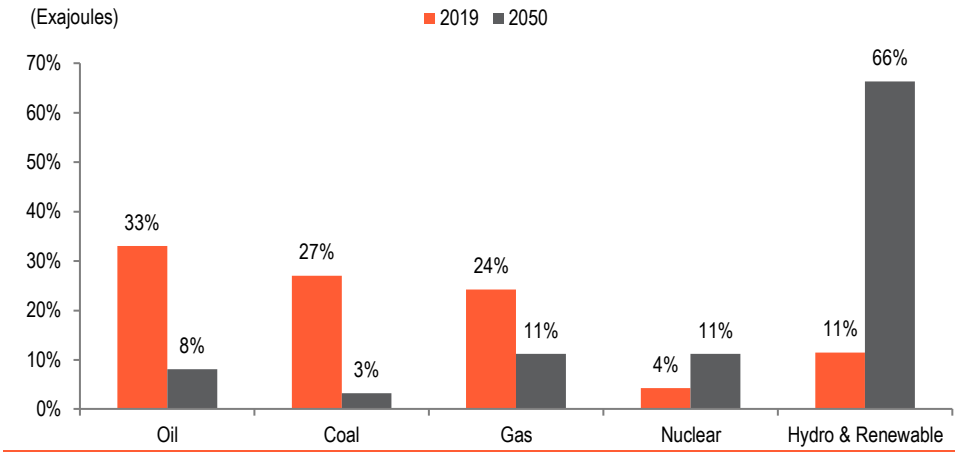
Sectors in India: Potential impact and response

- Current blended solar tariffs of Rs 2/unit to sound death knell for new coal-based power generation
- Refineries may not need more capacity after 2028 if EVs take off meaningfully; refiners shifting to O2C model to capture petchem market will require first-mover edge
- Transport sector estimated to cut emissions just 12% even taking the full green route – instead, any hybrid technology that doubles vehicle mileage the best solution
- At US$ 150/t of added cost, green steel would warrant only a low 1-5% hike in end-user prices. For cement, US$ 25/t of carbon cost would form 1.5% of construction cost

Net zero by 2050 will effectively shutter coal and refineries

We show below the requisite change in global energy basket in 2050 compared to 2019 as per IEA's 1.5°C scenario. Note that total energy consumption not only needs to fall by ~9% in 2050 over 2019 levels, but the share of fossil fuel (coal, oil & gas) will also need to drastically contract from the existing 85% to 22%.

Fig 34 – Energy basket in 2050 vs. 2019 – fossil fuels must make way for renewables and total energy basket must shrink ~9%



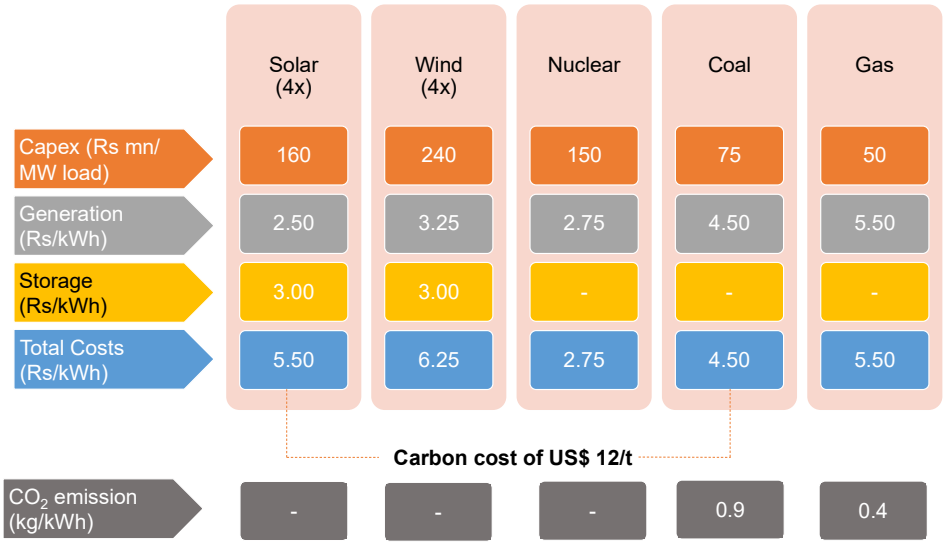
Source: BOBCAPS Research, IEA, BP Statistical Review 2020

While the world may not be able to achieve such a dramatic shift towards renewables by 2050, the direction is set and we expect a steep fall in consumption of fossil fuels, in particular coal and oil. This will mean significant pressure on coal-based power generation, refiners and the internal combustion engine-based automotive ecosystem.

Electricity Generation – renewable options are now cheaper and growing

We estimate that the coal-based generation contributes close to 45% of India's carbon emissions. With coal falling out of favour, renewable and nuclear sources are the only way forward for power generators. Note that the upfront cost of installing renewable energy capacity is significantly higher due to lower plant load factor, but the unit cost is comparable per our calculations in the exhibit below. We have assumed solar and wind PLF at 25%. This means that a company would need four times the installed capacity of its electric load requirement for both solar and wind installation.

Fig 35 – Renewable power with storage is competitive now



Source: BOBCAPS Research

Please see BOBCAPS Analyst Tarun Bhatnagar's report **Power: Cleaning up its act** dated 18 May 2021. Tarun believes the estimated 5%+ growth in India's annual electricity demand will be met largely by renewable resources as the cost differential to coal continues to narrow in favour of green energy. The following section is excerpted from Tarun's captioned publication.

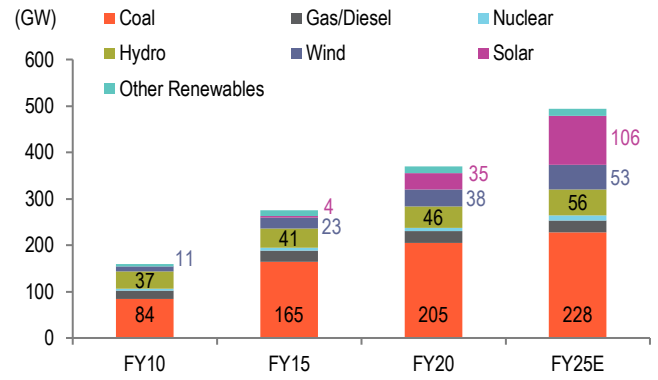
Solar leading the way

India had ~380GW of installed power capacity as of FY21 – the third largest globally after China (~2,200GW) and the US (~1,100GW). Thermal power has a ~55% share but we believe incremental capacity additions will be dominated by renewable energy for the following reasons:

- a steady fall in prices of solar equipment due to continued scientific innovation and research whereas costs for coal and gas power plants have barely moved;
- strong competition from domestic and international private equity (driven by sustained growth in green funds), energy companies (to improve their ESG ratings) and utility companies; and

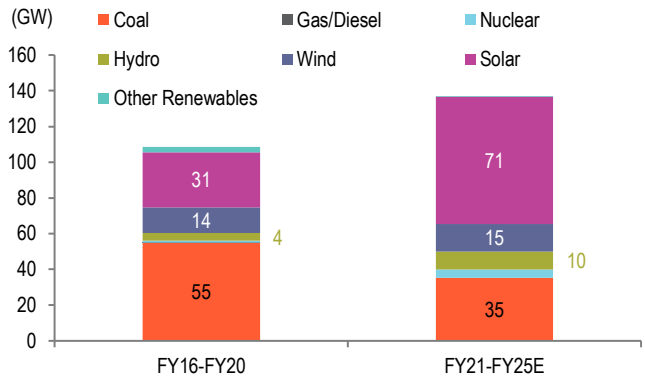
- considerable appeal for international investors as Indian renewable energy offers power purchase agreements (PPA) spanning 25 years with predictable cash flows, which is attractive in a low interest rate environment.

Fig 36 – India's installed capacity – shift to renewables has already begun



Source: CEA, BOBCAPS Research

Fig 37 – Gross capacity additions

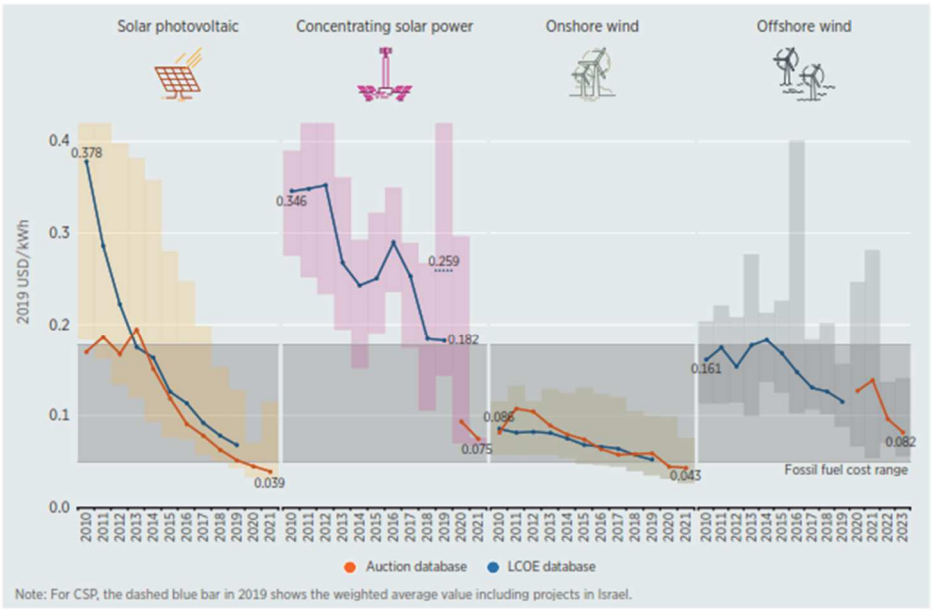


Source: CEA, BOBCAPS Research

Renewable costs fast reducing

While solar generation costs have reduced 90% in the last decade, prices of conventional thermal energy have barely shifted at all. Many global power technology suppliers such as GE and Siemens have moved away from coal generation, which has stalled efficiency gains. Also, the focus on climate change has shifted research dollars towards renewables.

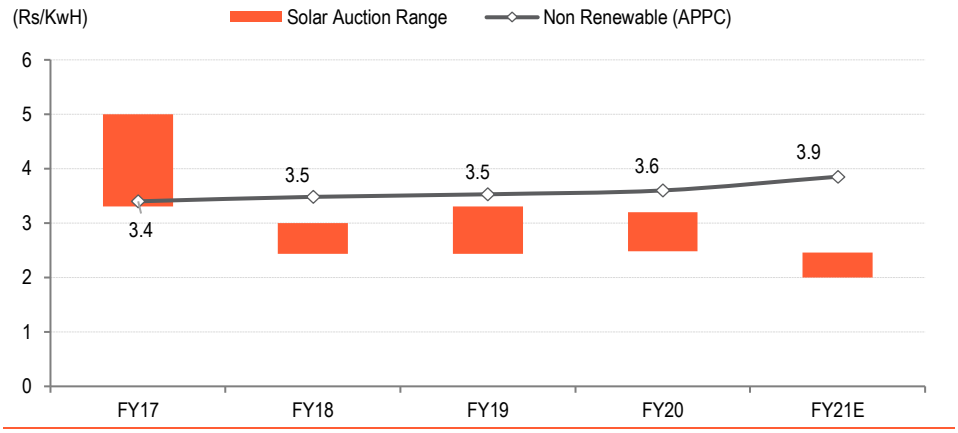
Fig 38 – Solar costs have fallen by 90% in the last decade



Note: The thick lines are the global weighted average LCOE, or auction values, by year. The grey bands that vary by year are cost/price range for the 5th and 95th percentiles of projects.. For the LCOE data, the real WACC is 7.5% for OECD countries and China, and 10% for the rest of the world. The band that crosses the entire chart represents the fossil fuel-fired power generation cost range.

Source: IRENA

Fig 39 – Power sale price by generator

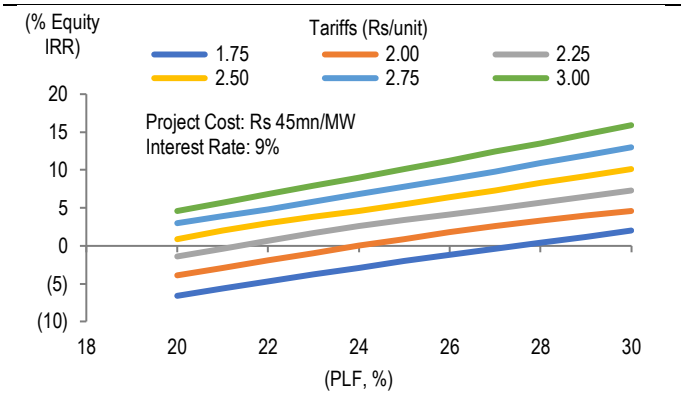


Source: CERC, BOBCAPS Research

Falling bid prices – room only for technically or financially savvy

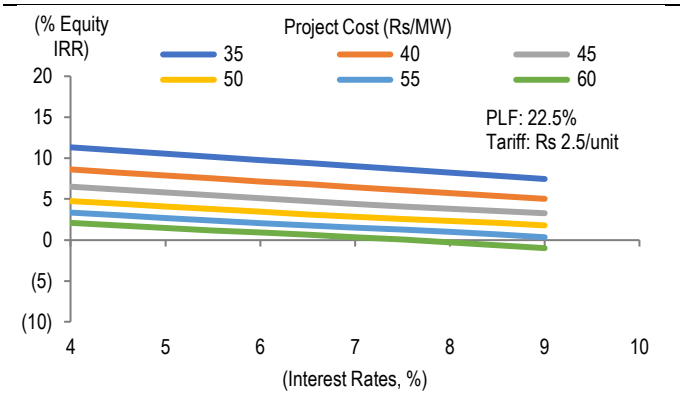
Returns on solar projects are a function of tariff, project cost, plant load factor (PLF) and interest expense, besides operation and maintenance cost. An investor must have either the financial strength to ensure lower financing costs and/or bargaining power with suppliers/EPC players to reduce project costs. Alternatively, a technically strong developer with scale can also generate superior returns. This, in turn, means that a subscale player who has neither the technical skills nor the financial muscle could fail to generate returns.

Fig 40 – Return sensitivity to PLF & tariffs…



Source: BOBCAPS Research

Fig 41 – …and to project costs & rates



Source: BOBCAPS Research

Thermal/hydro pipeline can help balance grid till batteries turn feasible

The power sector's thermal and hydro pipeline will add an estimated 9% to generation capacity over FY22-FY25, net of plant retirements. Renewable power generation is volatile as solar units cannot generate energy during the night and wind power is difficult to predict. Therefore, controllable sources of power such as coal, nuclear and gas will continue to be in demand to provide reliable base load supply.

India's peak load power demand currently totals ~190GW versus base load capacity of 300GW. Assuming annual growth of 5%, demand will still be below this capacity till FY25, by when 33GW of additional base load capacity under NTPC and state utilities is largely scheduled for completion (net of plant closures; equal to ~9% of FY21 installed capacity).

Renewable energy may also cross 15% of total power generation by FY25 and will require more robust grid management through (1) better forecasts of renewable energy generation so that grid managers can design appropriate generation schedules, (2) availability of batteries for storage of power when demand is low, and (3) a large spot market which can be used to buy power in order to balance demand if needed.

Gas plants that can be quickly turned on/off can also be used to manage the grid, but this may require government support as gas-based plants have remained historically underutilised or shut due to volatile gas prices and import dependence.

Nuclear, battery and hydrogen routes may be solution to future grid management

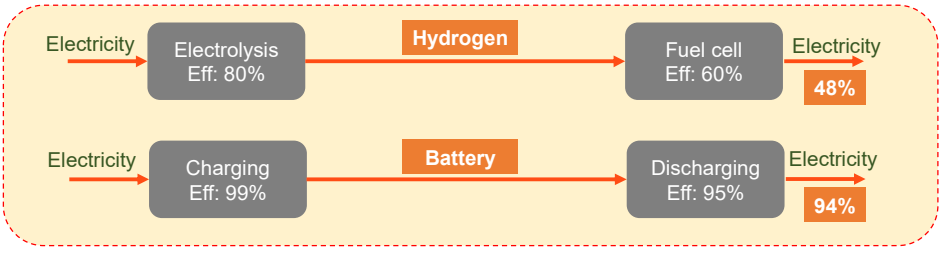
Both solar and wind power suffer from irregular generation, making it difficult to meet user requirements. Coal-based power has traditionally provided the base load supply, with the variable load coming from natural gas and renewable-based generation.

With coal unlikely to find favour in a green world, nuclear power may be required to meet base load needs till we have a viable option to store renewable power so as to resolve intermittency issues and enable solar and wind energy to be seamlessly plugged into the grid. Modern nuclear plants can operate at fluctuating loads and probably offer the only secure counterbalance to inconsistent generation by renewables.

Current storage battery costs of US$ 100/kWh can provide a viable alternative, in our view. Further, we believe the availability of metals such as lithium will not be a bottleneck for battery manufacturing even if demand increases materially. These metals have simply not been explored adequately. Also, pegmatite, a rock widely present globally including in India, does contain a small quantity of lithium that can be commercially extracted with proper mineral beneficiation technology.

Hydrogen is gaining traction as an alternative to store renewable energy on a large scale. This entails producing ‘green’ hydrogen by the electrolysis of water using electricity generated during peak solar/wind generation. Hydrogen operates as a media to hold and distribute energy that can be used to bridge supply gaps due to renewable intermittency. However, such an application will entail significant loss in conversion and reconversion. While a battery can return close to 95% of electricity, the hydrogen route can provide just about 50% of input energy, though this number can increase with rising efficiency of fuel cell technology.

Fig 42 – Electric battery vs. hydrogen fuel cell



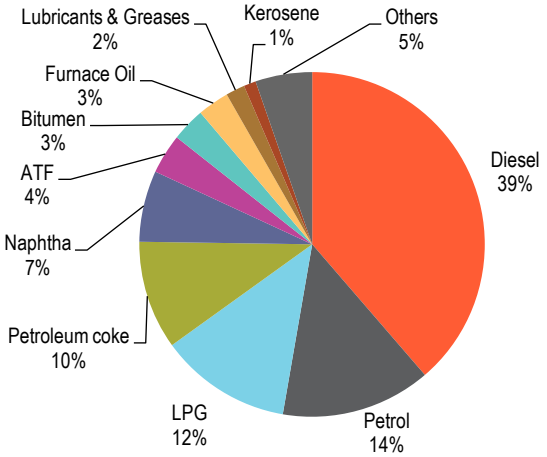
Source: BOBCAPS Research

Stationary fuel cells (as opposed to those that are part of a moving vehicle) can offer as high as 70% efficiency in lab conditions but the same is yet to be tested in practical applications. Even at 70%, hydrogen storage falls far short of battery energy efficiency.

Refining – shift to chemicals inevitable but transition slow

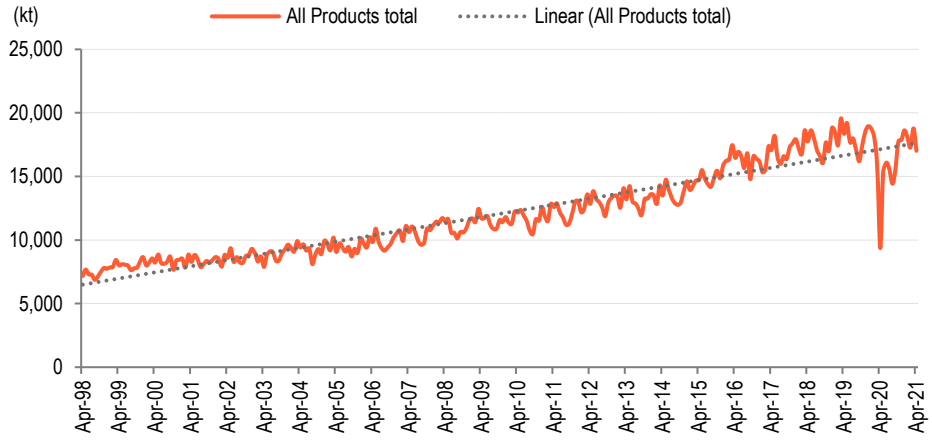
India's refining product demand totals 220mtpa, as shown in the chart below. Transport fuels account for ~50% of all consumption and are at risk of replacement along with furnace oil (3% share), another polluting fuel. The country's long-term annual growth rate of petroleum product consumption is ~4%.

Fig 43 – Petroleum product consumption (220mtpa)



Source: BOBCAPS Research, PPAC

Fig 44 – Monthly petroleum product consumption trend



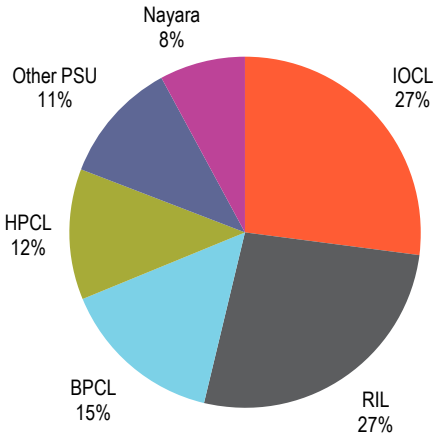
Source: PPA, BOBCAPS Research

As against 220mtpa of demand, India has 265mtpa of crude oil refining capacity spread across the private and public sectors. Another 20mn tonnes (mt) of new capacity/ expansion is under various stages of implementation. Note that the long-term growth rate of India's oil consumption is also ~4%.

Rise of EVs to curtail capacity adds

Given ongoing expansion, we believe domestic refining capacity will be able to fully meet India's demand till 2028. If EVs take off in a meaningful way, India may not need additional refining capacity beyond 2028 as the reduction in demand for diesel and petrol may offset the growth in energy demand.

Fig 45 – Refining capacity (265mtpa)



Source: BOBCAPS Research, PPAC

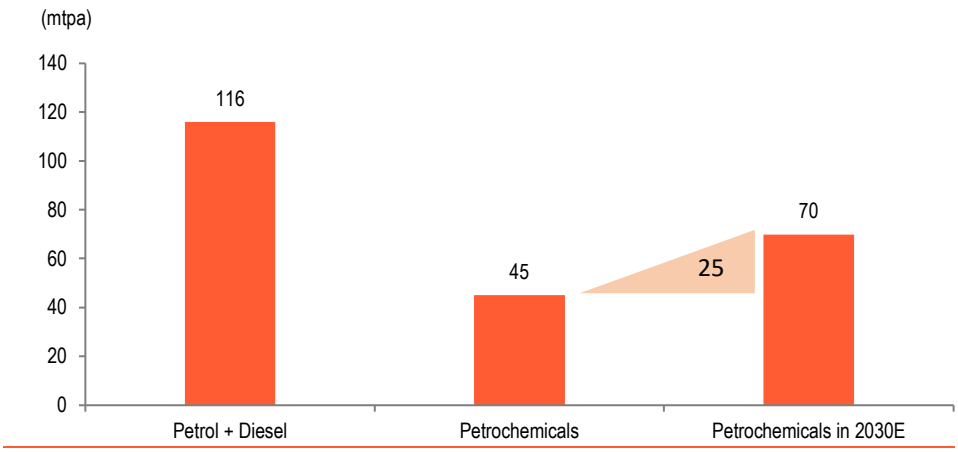
O2C to benefit only a few refiners and not all

As the EV population increases, demand for transport fuel will decrease. This would result in a reduction in refining margins, which will compel refiners to look beyond transport fuels and focus on alternative uses for refining capacity. We believe the only viable alternative is petrochemicals but even that shift may not be enough.

Our estimates indicate that ~13.5% of world oil consumption is currently used as feedstock for petrochemicals. Even assuming that the annual growth rate of 3-4% (average 3.5%) is fully met by refiners shifting to an O2C (oil to chemical) model, this will mean annual conversion of just ~0.5% of global refining capacity.

We estimate India's petrochemical demand at ~45mtpa growing at ~5%, which is hardly a meaningful opportunity for Indian refiners carrying 265mtpa of capacity. However, this does present a substantial market for the first mover if other competitors don't follow suit. In our view, petrochemical demand could grow by ~25mtpa to 70mtpa by 2030 (against existing petrol and diesel consumption of ~116mtpa).

Fig 46 – India's annual transport fuel and petchem consumption



Source: BOBCAPS Research, PPAC

We do expect several global refiners to gradually increase production of petrochemicals. This may mean a steady reduction in global petrochemical margins too. However, petrochemical capacities based on cheaper natural gas will continue to earn above-average margins.

Transport sector – disproportionate attention

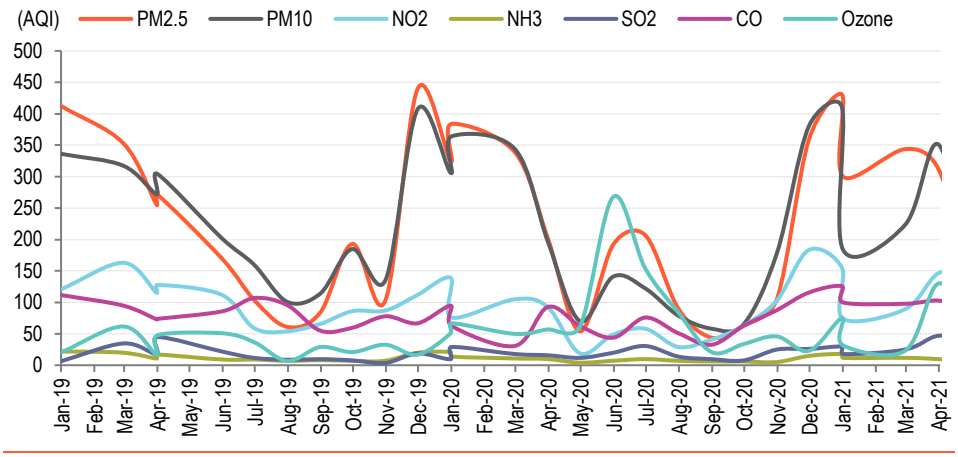
The climate change spotlight is largely trained on the transportation sector with battery-operated vehicles gaining the largest mindshare. However, this sector accounts for just 12% of India's emissions, per our estimates. The attention has resulted in a slew of EV-led initiatives by several state governments besides a battery scheme by the Centre carrying mega incentives of Rs 180bn to encourage the setup of battery gigafactories.

Transport sector unfairly singled out as the biggest culprit

The transport sector accounts for less than 1/7th of total carbon emissions in India but captures the highest mindshare thanks to constant media chatter on battery technology and EVs. Such discussions especially gather momentum in winter when pollution in cities such as Delhi increases substantially. We produce data from Delhi and Mumbai, among the country's most polluted cities, in the exhibits below to further underscore this point (see Annexure-I for additional details).

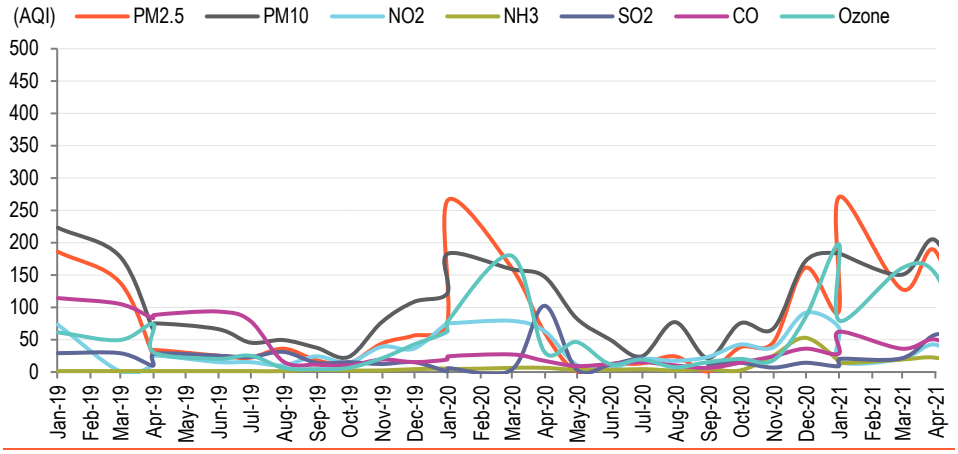
Despite high vehicle concentration in both Delhi and Mumbai, the latter doesn't face as much PM2.5 and PM10 pollution as the national capital. Even in Delhi, despite high particulate matter concentration, the other pollutants associated with vehicular emission (SOX, NOX) aren't as high.

Fig 47 – Air pollution in Delhi



Source: BOBCAPS Research, Centre Pollution Control Board, Ministry of Environment, Forests and Climate Change, India

Fig 48 – Air pollution in Mumbai



Source: BOBCAPS Research, Centre Pollution Control Board, Ministry of Environment, Forests and Climate Change, India

Focus on electric vehicles

Several states have announced incentives for EVs and a few already have electric buses in use for public transport. Mumbai has started what is likely the largest battery-operated public commute in India, with a battery-operated bus running between Cuffe Parade and Belapur in Navi Mumbai (pre-Covid), a 50km ride in peak evening traffic.

The government has also announced incentives for battery programmes. Please see BOBCAPS Analyst Mayur Milak's report **Transforming India into a global cell manufacturing hub** dated 24 May 2021. As per Mayur, government think tank NITI Aayog has set up a National Programme on Advanced Chemistry Cell (ACC) battery manufacturing, aka India's battery "gigafactory" scheme. The programme is designed to incentivise companies that intend to set up gigafactories in India. There is no end use restriction but electric mobility, energy storage for renewables and communication towers will likely be the main end users.

A total of Rs 180bn in incentives are on offer for 5GWh-20GWh of cell manufacturing capacity in India. Incentives are based on the extent of indigenisation and can be as high as 20% of sale value in case of full localisation. For battery companies globally that work at single-digit margins, such benefits offer a substantial profit. We expect the two-wheeler, energy storage and communication tower businesses to be early users of these batteries.

EVs vs. Hydrogen (FCEVs)

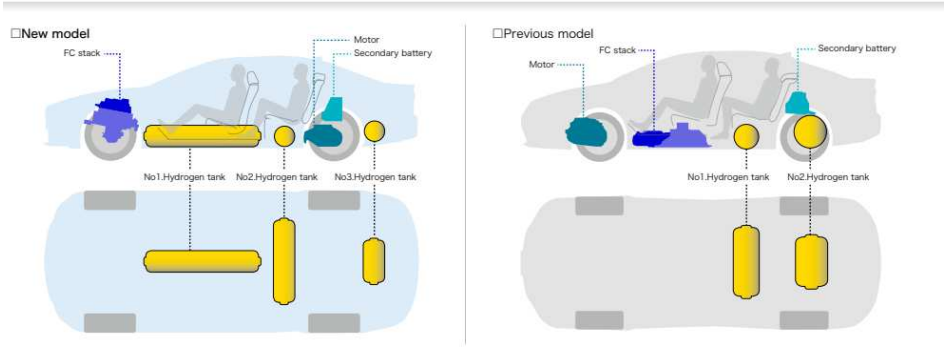
Apart from EVs, hydrogen-based fuel cell vehicles (FCEV) offer another green transport option. Such vehicles use hydrogen to generate electricity in a fuel cell and have an electric power train (similar to an EV) to run the vehicle. This is supposed to address the most important bottleneck for EVs – range.

Tesla currently provides the best range among competing EVs, offering as much as 660km on a single charge. However, battery weight increases disproportionately for a higher range or for vehicles carrying high loads. Therefore, batteries may not be an optimum solution for long-distance heavy vehicles and instead hydrogen can provide a zero-emission solution.

Toyota has launched its hydrogen car 'Mirai' (upgraded version rolled out in 2020) with a 5.6kg hydrogen tank and a 750-850km range vs. Tesla's 'Model S' EV that has a range of 660km. Both vehicles, however, have almost similar curb weights of ~2,000kg (1,930kg for Mirai vs. 2,140kg for Tesla).

Hydrogen is required to be stored either at very higher pressure or in liquid form (-253^{0}C). Toyota stores hydrogen in three high-pressure tanks in its Mirai model, each at nominal working pressure of 713kg/cm^2, which is almost three times higher than CNG tanks that store natural gas at 200-250kg/cm^2.

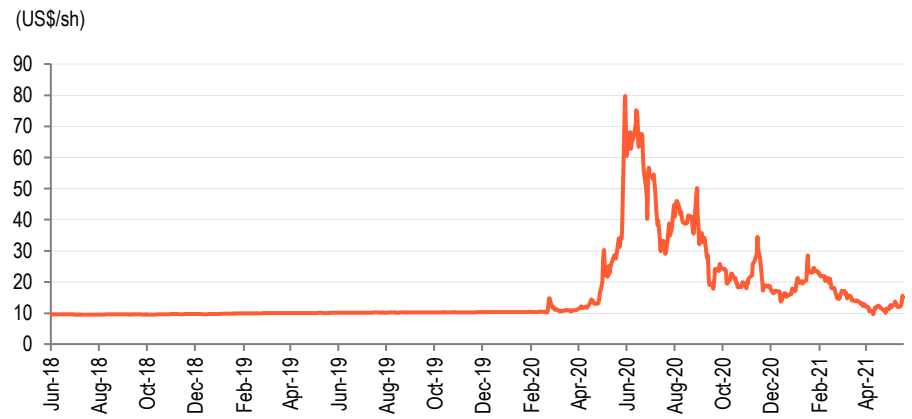
Fig 49 – Toyota Mirai: Placement of hydrogen tanks and fuel cells



Source: Toyota Mirai Brochure

Nikola, a US-based startup, is developing hydrogen-fueled trucks for long-distance commutes. However, Nikola ran into corporate governance issues in early 2020 that saw its market cap fall steeply from US$ 32bn to just ~US$ 4bn in 2020. There are still lingering doubts about whether Nikola can deliver the promised trucks by 2021-end though the company seemed confident as per its last analyst call.

Fig 50 – Nikola share price



Source: Nasdaq

Nikola intends to use grid-based electricity to generate hydrogen locally at filling centres during non-peak hours via electrolysis. This will also provide succour to generation companies during non-peak periods when base load generation plants are otherwise used sub-optimally. The model seems attractive in theory but practical demonstration is awaited. Note that electrolysis is a very costly mode of green hydrogen production but is the only commercial scale option available at present.

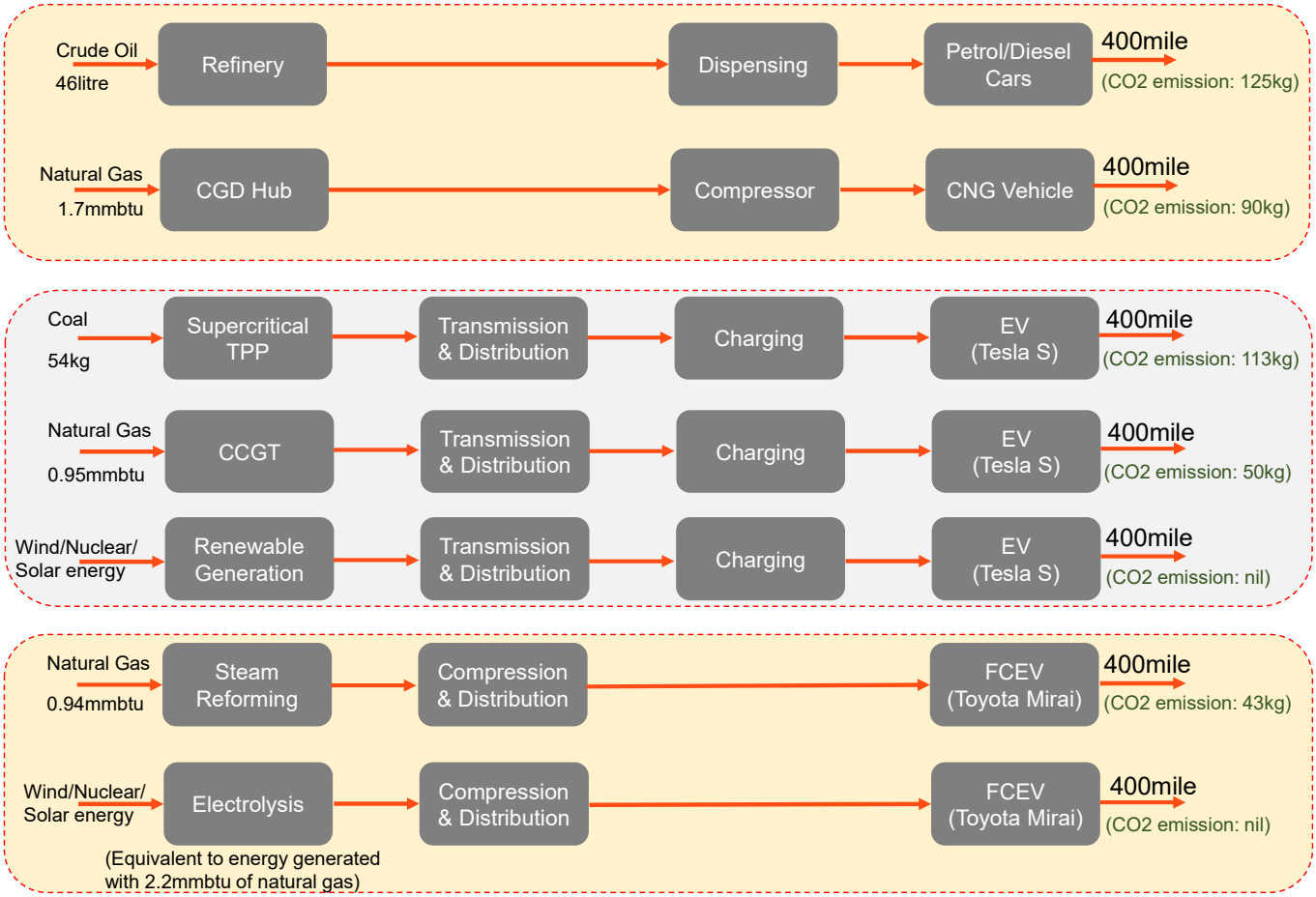
Hydrogen is already used by process plants the world over, including in refineries and fertiliser plants. However, it is typically produced using natural gas (grey hydrogen) and is not carbon-free.

Green route can cut India's emissions only 12%; hybrid best near-term option

A comparison of various fuel options for Indian conditions shows that unless we use green hydrogen or renewable-based electricity to power EVs, we do not save meaningfully on carbon emissions. In fact, our study indicates that an EV running on coal-based power generation is more polluting than a CNG vehicle. Even with the full green route, i.e. all vehicles at zero emission levels (EV, PHEV, FCEV), we only reduce India's emissions by a mere 12% from current levels.

Thus, we believe the heavy capex required to change over to an EV ecosystem can best be utilised elsewhere, and any hybrid technology that doubles the mileage of conventional vehicles is the most optimal solution for India. This will mean per vehicle carbon emissions of a mere 60kg per our estimates, which compares with 50kg for an EV that uses natural gas-based power and 113kg for one that runs on coal-based power for a 400mile range.

Fig 51 – Comparison of various fuel options for Indian conditions – coal power-charged EV worse than CNG cars



Source: BOBCAPS Research, Company data

EVs racing ahead globally

Given the proposed phaseout of conventional engines in several countries, all major OEMs have announced EV roadmaps. Toyota's luxury brand Lexus is planning to introduce 20 new or redesigned vehicles globally by 2025, at least half of which are likely to be all-electric or electrified hybrid models. Volvo cars will be fully electric by 2030.

Fig 52 – EV roadmaps of major global OEMs

OEM	EV target
General Motors	All EV by 2035
Nissan	All EV by 2030
Volvo	All EV by 2030
JLR	All EV by 2030
Diamler	25% sales from EVs by 2025, 50% sales from PHVs (plug-in hybrid vehicles) & EVs by 3030
Ford	All EV in Europe by 2030

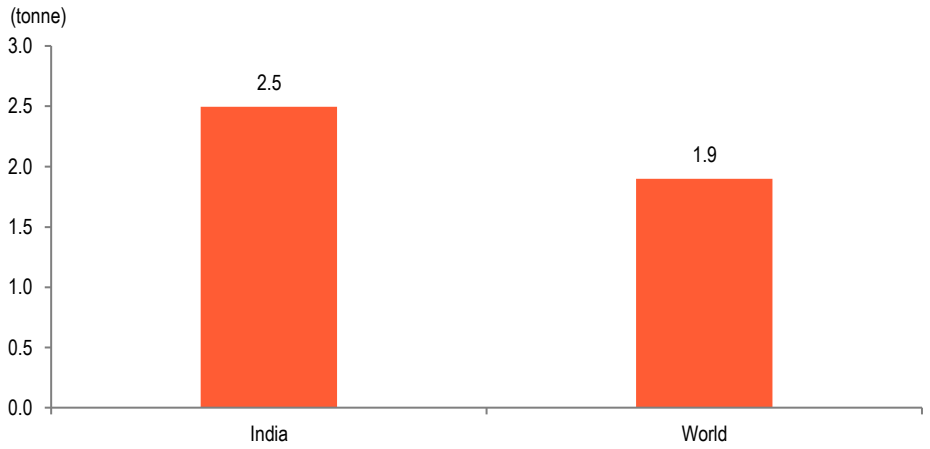
Source: BOBCAPS Research, Company

The UK government has recently come out with an EV policy under which it will ban the sale of new petrol and diesel cars by 2030 (from 2035) as part of its 10-point 'road to zero' plan to meet its target of net zero greenhouse gas emissions by 2050.

Steel sector – lagging behind

We estimate that the steel sector accounts for ~10% of India's carbon emissions against ~8% for the world. Global average carbon emission is ~1.9t per tonne of crude steel against 2.5t in India.

Fig 53 – Carbon emission per tonne of crude steel

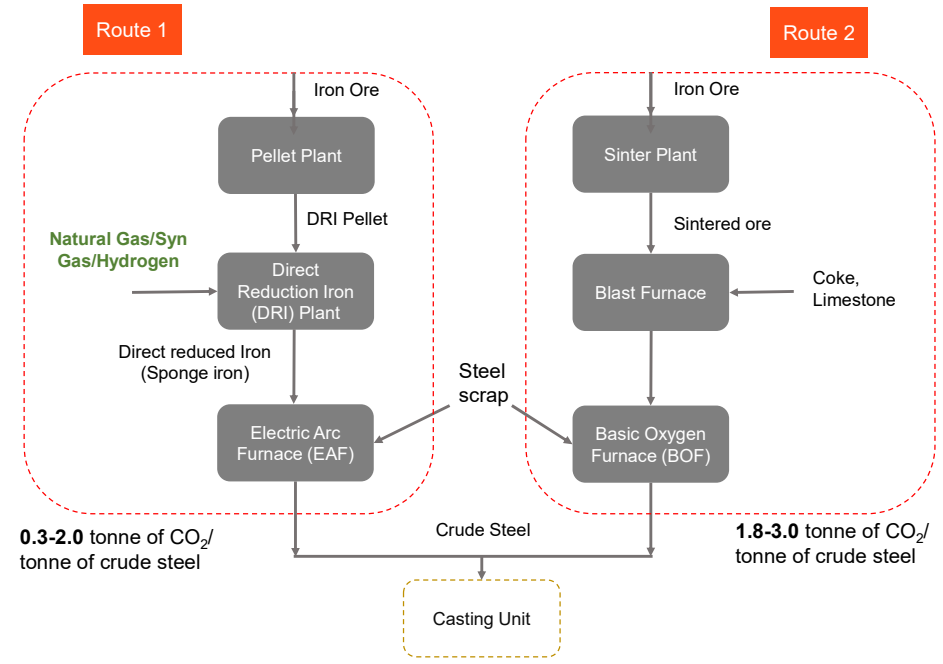


Source: Ministry of Steel Annual Report, FY19

Green option could entail added steel costs of US$ 50-150/t

There are two main ways to make crude steel. The BF/BOF route uses a coke-fuelled blast furnace to reduce iron ore while the other route uses natural gas/syn gas to reduce the ore through a direct reduction iron (DRI) plant. In the BF/BOF route, the downstream unit is another furnace called a basic oxygen furnace (BOF) while the downstream unit for a DRI plant is an electric arc furnace (EAF). Both BOF and EAF can use steel scrap. These two processes are explained below.

Fig 54 – Crude steelmaking process – Route 1 is the greener option

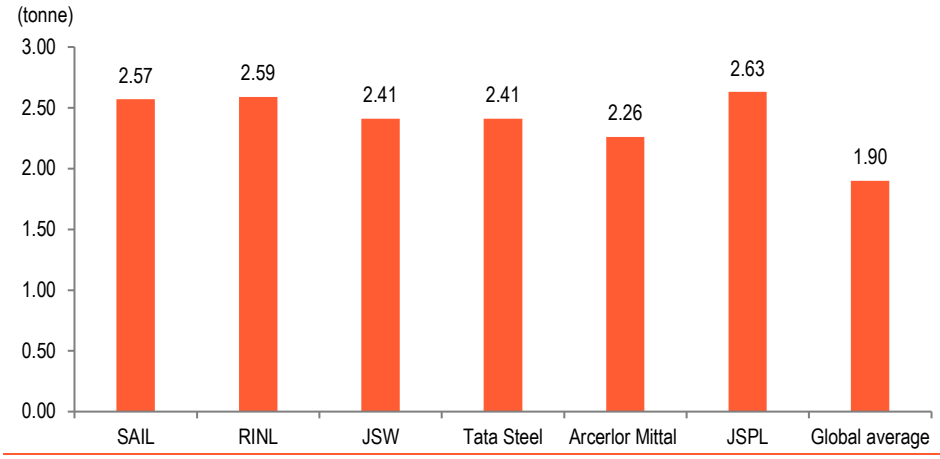


Source: BOBCAPS Research

A gas-based DRI plant coupled with a downstream EAF unit (Route 1) usually generates carbon emissions of 1.5-2t per tonne of crude steel compared to 2-3t of carbon emission by the blast furnace route (Route 2). The use of hydrogen and renewable power can significantly reduce carbon emission in Route 1. Hydrogen can be used as a reducing agent in Route 2 but the technology is not yet commercially available.

Note that most Indian plants use the second route for steelmaking. Many DRI units are also coal-based, with only a handful being gas-based. We believe the green option for Indian steelmakers will entail additional blended steel costs of US$ 50-150/t. This incremental cost may appear high given slim long-term average steel margins but can be comfortably passed through to end consumers, in our view.

Fig 55 – Carbon emission of Indian steel companies (per tonne of crude steel)

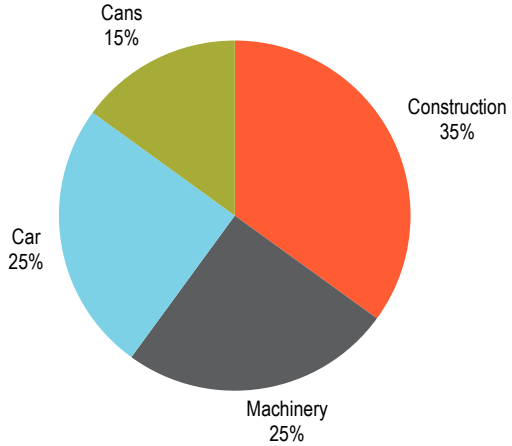


Source: Ministry of Steel Annual Report, FY19

Green steel cost can easily be passed through

We believe the incremental costs for green steel will form only a small part of end-user costs (except in the low-to-medium-end capital goods sector) and can easily be absorbed by downstream units. Further, once awareness about green products reaches critical mass, it is likely that consumers will not only pay for the cleaner option but also force companies to adopt the same by rejecting products made by polluting processes.

Fig 56 – End uses of steel



Source: BOBCAPS Research

We have analysed the hike in prices required in each of the steel end-use sectors assuming a substantial US$ 150/t increase in green steel costs. Overall, the machinery sector (low-to-mid-end capital goods) will probably find the higher cost least affordable among various categories of consumers.

For the auto sector, we have considered Delhi prices for cars made by Maruti, arguably the cheapest carmaker in India. Our estimates suggest that the use of green steel will require a less than 2% increase in end-user car prices (see Annexure-III for details). Similarly, in real estate, we peg the increase in construction cost at ~1.8%. In the machinery sector, margins on several machines, particularly low-end engineering machines, are quite low and hence adoption of green steel will entail a substantial hike in end-user product prices, ranging from an estimated 5% to 15% of product cost.

Fig 57 – Price hike needed in Maruti cars to offset US$ 150/t of added green steel cost

Source: BOBCAPS Research

Cement sector – net zero will need carbon capture & storage

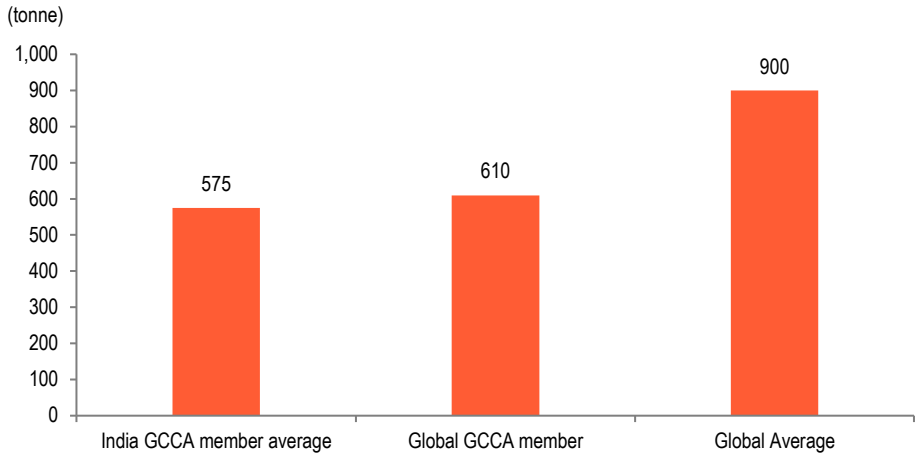
The cement sector accounts for an estimated ~8% of India's carbon emissions. Cement manufacturing is a unique process where carbon is released both directly (by the heating of limestone) and indirectly (by the burning of fuel to heat the kiln).

India outpacing global cement peers on climate action

We believe the Indian cement sector can and has been reducing its carbon intensity by a combination of energy-efficient processes and higher use of greener inputs. In fact, Indian companies are some of the lowest Scope 1 emitters of carbon among cement plants globally thanks to the use of slag and fly ash, which are byproducts from steel plants and coal-based power plants respectively.

Dalmia Bharat, Ambuja, ACC and Shree Cement lead the list of India's least emitting cement companies, with Scope 1 carbon intensity of 515-550t of carbon per tonne of cement. On the whole, Indian players are better placed than global peers, as shown in the chart below.

Fig 58 – Carbon emission of cement plants (per tonne of cement)



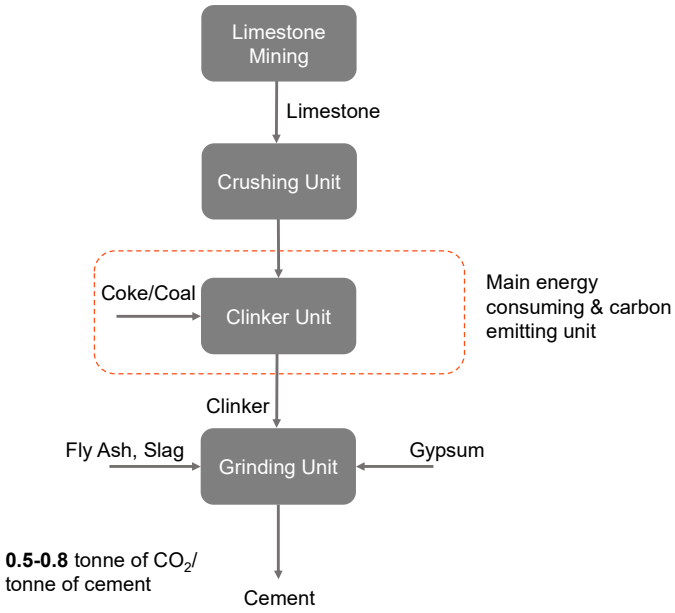
Source: Dalmia Bharat, BOBCAPS Research

Indian companies lead in energy intensity too and the list of most efficient energy users includes Ultratech, ACC, Ambuja, Shree Cement, and Dalmia Bharat. Dalmia Bharat has pledged to work towards 100% power from renewables and is exploring setting a large CCS plant.

Prime candidate for CCS

The use of fly ash and slag does run the risk of higher carbon costs in future. Unlike the steel sector, cement does not have the option to change the manufacturing process materially. Therefore, the sector is a prime candidate for carbon capture and storage (CCS) to achieve net zero emissions.

Fig 59 – Cement manufacturing process



Source: BOBCAPS Research

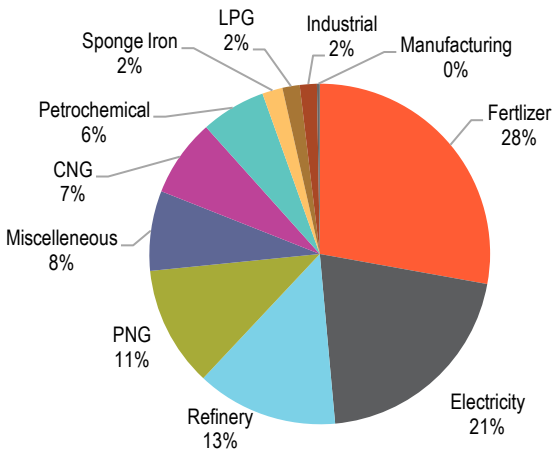
Net zero pledge by 2040

Indian cement companies have pledged to reach net zero emissions by 2040. We estimate that even if they have to incur carbon costs of US$ 25/t, this will constitute only ~1.5% of final construction costs.

Fertiliser sector likely to remain unscathed

India consumes ~34mt of urea and produces ~25mt with the balance met by imports. Most urea plants use natural gas (29 out of 32 plants) and the fertiliser sector is the largest consumer of natural gas in India.

Fig 60 – Natural gas consumption



Source: NITI Aayog, BOBCAPS Research

Indian urea producers are less polluting (0.7t of CO_2 per tonne of urea) than their global peers. We believe the manufacturing of urea contributes only a small portion of overall emissions despite India being one of the world's largest consumers of this fertiliser. Moreover, given food security sensitivity in India where over two-third of the population is dependent on agriculture and urea is the most widely used fertiliser, we do not expect the sector to be subjected to a costly greening up.

Note that the use of blue hydrogen (where carbon produced is sequestered) could increase the cost of urea by ~US$ 50/t which is 20% of the international urea price.

Global emission forecast – 2030 levels to be lower than today

- Our analysis suggests that global CO_2 emissions could fall ~1% to 33.7bn tonnes by 2030 from 34.2bn tonnes in 2019
- US, China and EU will remain largest contributors to the historical carbon dump

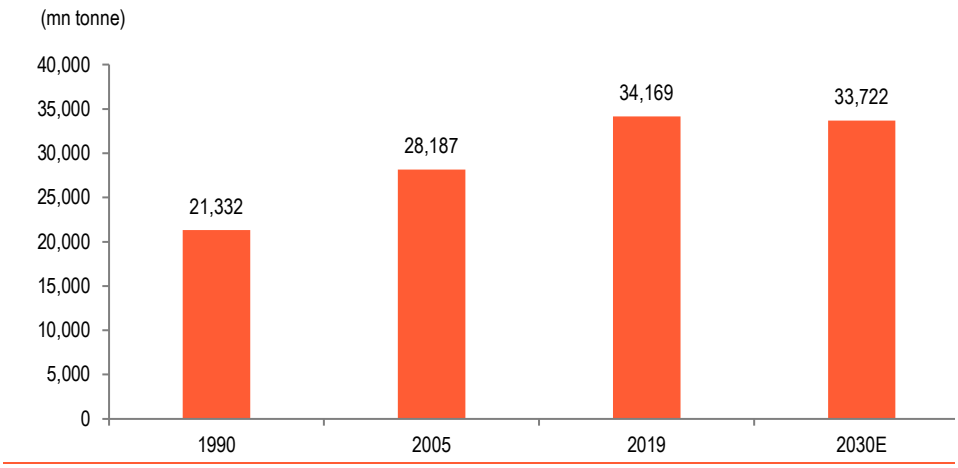
Global carbon emission will likely peak this decade

We believe that most countries will follow up on their climate action commitments, in particular the US and EU, and that other large emitters such as China and India will likely maintain their current efforts. We thus expect global carbon emissions to peak this decade and start to decline moderately by 2030.

Our assumption is based on the 2015 Paris targets set by various countries or their respective trajectories of the previous decade (2000-10), whichever yields lower emissions. Even this will require sustained effort with countries either fully meeting or exceeding their NDCs and also ensuring that the current pace of emission cuts is maintained.

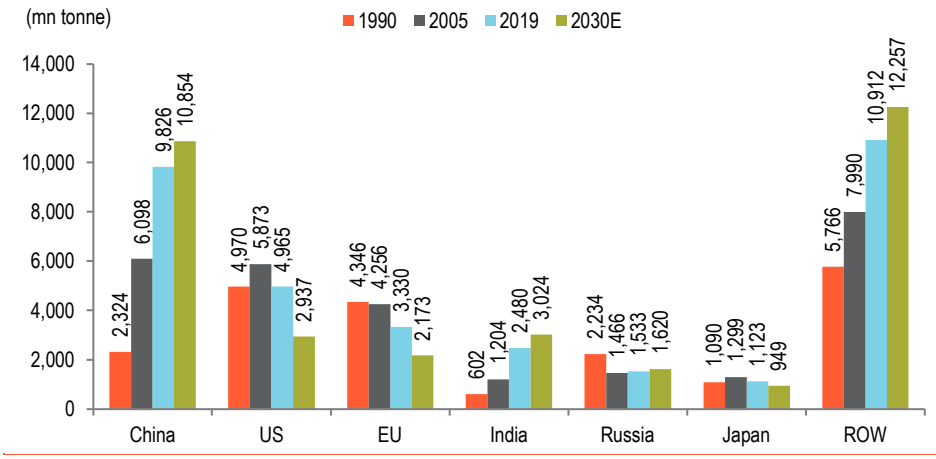
Note that the above calculation does not factor in any deep cuts by large emitters such as China who may need to effect sharper reductions given that the current global emission trend is still well away from the intended 2°C trajectory.

Fig 61 – Global CO2 emission



Source: BOBCAPS Research, BP Statistical Review

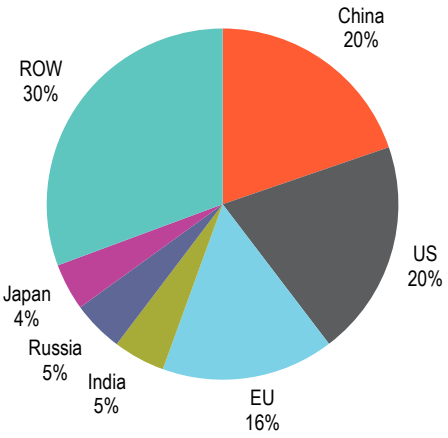
Fig 62 – Carbon emission trend and 2030 commitment



Source: BP Statistical Review, BOBCAPS Research

If we evaluate our emission estimates in the context of the cumulative carbon dump, we find that the US, China and the EU will continue to account for more than half of the global dump for the 1965-2030 period.

Fig 63 – Cumulative carbon dump during 1965-2030E



Source: BOBCAPS Research, BP Statistical Review 2020 | *Actual till 2019 and estimate for 2020-30

ESG ratings – Useful for monitoring but not for investment decisions

- Wide divergence in ESG evaluation parameters implies rated investments could still carry high carbon risk
- Standard global rating norms the need of the hour – varied socio-political structures could require higher weightage for environment goals over social/governance aspects

Vastly divergent ratings need to be rationalised

There are seven major ESG rating agencies, viz. KLD, Sustainalytics, Vigeo, RobecoSAM, Refinitiv, MSCI and S&P. However, their ratings vary significantly (see Annexure-IV).

A Sep'20 paper by Florian Berg, Julian F Koelbel and Roberto Rigobon from MIT Sloan concluded that the correlation among ratings of various agencies ranges from 0.38 to 0.71 with an average of 0.54, implying high divergence. This divergence means current investments are fraught with the risk of a high carbon footprint even if they may have an acceptable ESG rating. Thus, the investor community will have to create its own sustainability matrix to shortlist investment candidates and use agency ratings only for monitoring purposes and not for investment decisions.

Rating agencies use a mindboggling 700 odd parameters to rate companies on ESG. Regulators are struggling to find a minimum acceptable taxonomy to replace the current 'one size fits all' approach that is flawed due to significant local variations. Common ground can be found on environmental aspects but using similar parameters and weights across geographies for social and governance aspects runs the risk of creating an artificial score with no practical use. As an example, racial discrimination in multiracial countries may need to be treated with different weights compared to other countries with a largely homogeneous population.

Thus, when global bodies do finally agree on a uniform global taxonomy, we believe it will be weighted largely towards environmental aspects as opposed to social and governance aspects.

Winners and losers

- Refiners and coal-based power stand to lose; steel and cement will need to incur significant capex
- Companies leveraged to energy efficiency, hydrogen, renewables and the battery ecosystem will benefit

Coal & Refiners – Valuation multiples may derate sooner than expected

We believe coal-based plants will find it increasingly difficult to survive and may be mothballed as carbon cost inches up, unless they find viable CCS methods. Cement will also need to depend on CCS. Refiners may see a permanent impairment of demand and will face trouble due to Scope 3 emissions, as in the recent Dutch judgement against Shell.

While the earnings momentum for Indian refiners may sustain beyond that of global peers as the country will take far longer to transition to a full EV landscape, we expect their valuation multiples will likely start moderating much sooner, given decreasing interest from global investors, particularly long-only funds. Refiners who make the early transition to O2C and capture chemical demand will likely limit derating of multiples. We believe Reliance Industries is working on this strategy while PSU refiners have lagged thus far.

Steel & Cement – Costs can be passed on but derating possible

We believe steel companies have ample scope to pass along the cost of climate actions to end consumers. Cement companies are already experimenting with CCS. Success on this front will likely preserve their valuation multiples. But if CCS efforts are unsuccessful, cement players may find earnings intact but valuation multiples deteriorating. Dalmia Bharat is implementing a large CCS unit and its success will likely result in a sector rerating.

Automobile sector – Visible green path

The automobile sector, particularly large OEMs, can transition to HV/EVs almost fully as demand picks up. Such an ecosystem is already established globally and can be replicated in India in line with demand. Therefore, this sector will likely retain its valuation multiple. Auto ancillaries that transition to the EV ecosystem also stand to gain.

Best placed companies

In our view, companies geared to energy efficiency, hydrogen, renewables and the battery ecosystem will be the biggest gainers of the global migration to cleaner alternatives (Fig 64).

Fig 64 – Key gainers from the green drive

Energy Efficiency	Hydrogen	EV Ecosystem	Renewables
• Siemens • ABB • Cummins • Honeywell • Thermax • Alstom • Schneider Electric	• Siemens • ABB • Bosch • 3M • Linde • Alstom • Cummins • Schaeffler	• OEMs • Battery makers like Exide, Amara Raja • Auto Ancillaries	• Tata Power & Adani Solar are manufacturing solar panels in India • Developers include Tata Power, Adani Green, Repower, Greenco, Azure Power, JSW Energy

Source: BOBCAPS Research

Annexures

Annexure I: Raw pollution data from Centre Pollution Control Board, Ministry of Environment, Forests and Climate Change, India

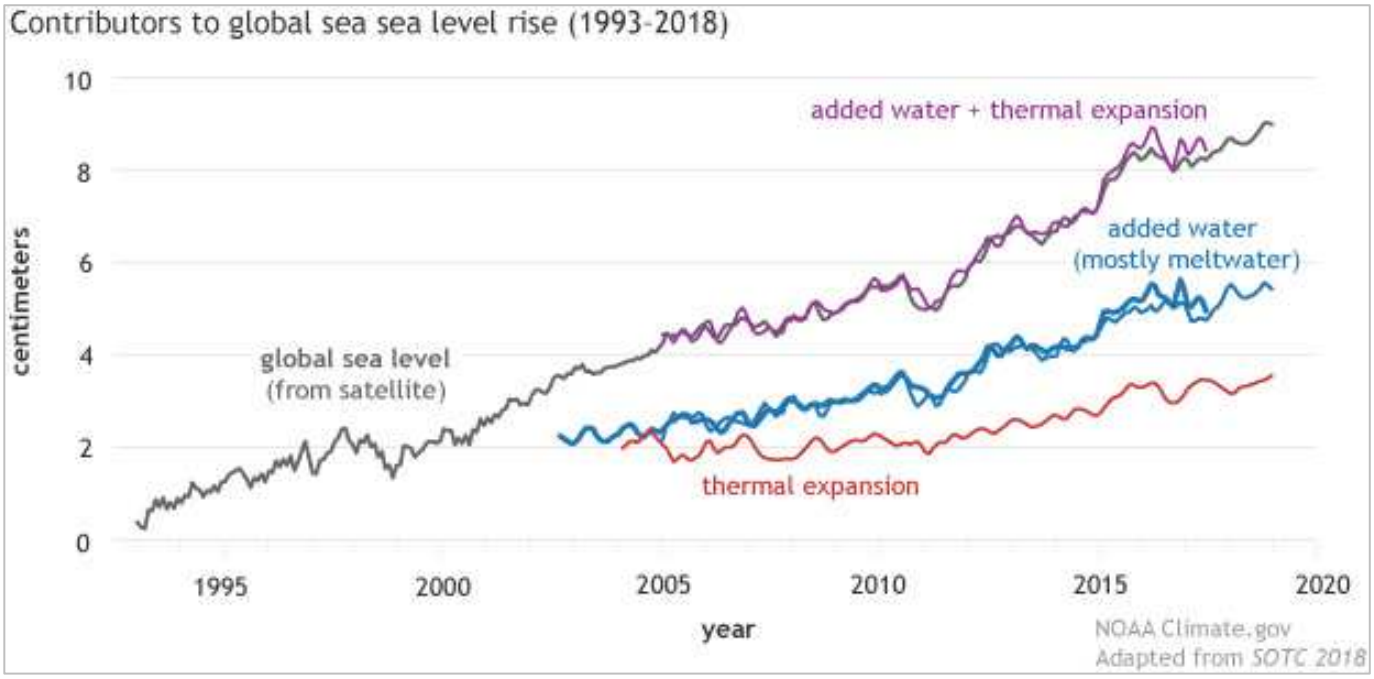
Good | Satisfactory | Moderate | Poor | Very Poor | Severe

Delhi	PM2.5	PM10	NO2	NH3	SO2	CO	Ozone
Jan-19	412	336	121	22	7	112	21
Feb-19	353	317	163	20	35	95	62
Mar-19	255	272	115	11	18	73	17
Apr-19	271	304	128	17	45	74	48
May-19	170	202	112	9	22	86	51
Jun-19	104	160	59	9	12	107	37
Jul-19	61	101	54	7	9	96	7
Aug-19	84	114	66	8	10	55	29
Sep-19	193	185	86	7	8	60	21
Oct-19	103	135	87	7	4	78	33
Nov-19	440	407	112	20	19	67	17
Dec-19	325	306	139	21	10	95	51
Jan-20	384	364	76	14	29	63	67
Feb-20	339	344	105	11	18	31	50
Mar-20	201	196	92	10	16	93	57
Apr-20	54	70	19	4	12	63	62
May-20	192	141	49	7	20	44	268
Jun-20	207	122	58	10	31	76	154
Jul-20	90	79	29	7	14	51	84
Aug-20	44	58	41	6	10	33	21
Sep-20	63	65	63	6	8	63	34
Oct-20	105	178	103	5	25	88	46
Nov-20	359	380	183	15	26	116	23
Dec-20	431	410	155	18	30	126	75
Jan-21	300	183	74	12	18	100	32
Feb-21	344	223	89	12	25	98	23
Mar-21	313	351	146	10	47	103	130
Apr-21	145	151	143	6	36	90	59

Mumbai	PM2.5	PM10	NO2	NH3	SO2	CO	Ozone
Jan-19	186	223	73	1	29	114	61
Feb-19	139	179	1	1	29	105	49
Mar-19	27	66	10	1	10	83	74
Apr-19	34	75	25	1	28	88	30
May-19	25	66	15	1	25	93	20
Jun-19	22	45	15	1	23	79	25
Jul-19	36	49	10	1	31	16	6
Aug-19	18	37	24	3	14	11	4
Sep-19	13	23	14	2	15	10	6
Oct-19	44	77	39	2	12	19	21
Nov-19	56	108	36	4	15	15	42
Dec-19	75	121	76	5	1	19	62
Jan-20	266	183	75	4	6	24	79
Feb-20	162	159	79	6	3	27	180
Mar-20	61	147	63	6	102	17	31
Apr-20	1	83	11	3	4	9	46
May-20	12	50	5	3	11	12	12
Jun-20	13	24	20	4	23	15	19
Jul-20	24	77	17	2		10	7
Aug-20	1	21	23	4	11	6	15
Sep-20	38	75	42	2	14	14	20
Oct-20	46	67	38	25	7	24	18
Nov-20	161	171	91	53	14	36	84
Dec-20	93	184	69	17	9	28	198
Jan-21	271	183	16	13	20	62	79
Feb-21	128	150	20	19	21	36	160
Mar-21	188	204	42	22	57	50	153
Apr-21	29	95	6	8	54	22	36

Source: Central Pollution Control Board, BOBCAPS Research

Annexure II: Contribution of global warming to rise in sea level



Source: NOAA, USA

Annexure III: Details of price hike required for Maruti cars to use green steel (higher cost of US$ 150/t)

Maruti Cars	Kerb weight (kg)	Hike required (Rs/car)	Monthly sales (units)	Ex Showroom Delhi (Rs/car)	Ex-tax (Rs/car)	Price hike needed (%)*	Engine capacity (cc)
Vitara Brezza	1,110	9,990	11,274	7,51,500	5,73,664	1.7	1500
Dzire	915	8,235	11,434	5,98,000	4,63,566	1.8	1200
Swift	905	8,145	21,714	5,73,000	4,44,186	1.8	1200
Alto	730	6,570	17,401	2,99,800	2,32,403	2.8	800
Baleno	935	8,415	21,217	5,98,000	4,63,566	1.8	1200
Ciaz	1,016	9,144	1,628	8,52,000	6,50,382	1.4	1500
XL6	1,190	10,710	3,062	9,94,689	7,59,305	1.4	1500
WagonR	845	7,605	18,757	4,80,500	3,72,481	2.0	1000
Eeco	928	8,352	11,547	4,08,800	3,16,899	2.6	1200
Celerio	785	7,065	4,720	4,65,700	3,61,008	2.0	1000
Ignis	840	7,560	4,359	4,95,320	3,83,969	2.0	1200
S Cross	1,130	10,170	2,535	8,39,000	6,40,458	1.6	1500
Ertiga	1,135	10,215	9,303	7,81,500	5,96,565	1.7	1500
S-Presso	726	6,534	7,252	3,78,000	2,93,023	2.2	1000
Weighted average	**910**	**8,193**	**-**	**5,49,361**	**4,24,056**	**1.9**	**-**

Source: BOBCAPS Research, Company data on on-road price and specification | *Percentage of pretax prices

Annexure IV: Divergence of ratings among ESG rating agencies (sample not exhaustive)

Negl. Risk - 0-10	0 to 25 - POOR	CCC -LAGGARD	Low Score
Low Risk - 10-20	> 25 to 50 - satisfactory	B - LAGGARD	
Med. Risk - 20-30	> 50 to 75 - good	BB - Average	
High Risk - 30-40	> 75 to 100 - excellent	BBB - Average	
Severe Risk - 40+		A - Average	
		AA - Leader	
		AAA - Leader	High Score

Sr No	Company	Industries	Sustainalytics	Refinitiv	MSCI	S&P
1	Ford Motor	Automobile	31	83	B	27
2	general Motor	Automobile	31	79	B	79
3	Tesla	Automobile	31	57	A	15
5	TATA Motors	Automobile	29	85	B	56
7	BMW	Automobile	28	85	A	80
8	TOYOTA MOTOR	Automobile	30	80	BBB	49
9	Hyundai Motor	Automobile	36	74	B	70
10	Maruti Suzuki India	Automobile	27	58	BB	49
12	Tata steel	Steel	39	64	B	64
13	JSW Steel	Steel	37	59	CCC	61
14	Nucor Corp	Steel	37	49	BBB	11
15	Nippon Steel Corporation	Steel	37	58	BBB	22
16	ArcelorMittal	Steel	38	58	BB	49
17	HPCL	Oil & Gas	39	64	BB	
21	HUL	FMCG	26	68	A	
22	Colgate-Palmolive Co	FMCG	22	85	AA	81
23	Reckitt Benckiser Group PLC	FMCG	21	84	AA	77
24	Procter & Gamble Co.	FMCG	24	74	A	60
25	ITC Ltd	FMCG	27	71	AA	59
26	LG Household & Health Care Ltd.	FMCG	23	77	A	80
27	Godrej Consumer Products Ltd.	FMCG	27	74	BB	71
28	Dabur India Ltd.	FMCG	29	62	AA	
29	JPMorgan Chase & Co.	BFSI	28	82	BBB	37
30	Bank of America	BFSI	26	81	BBB	76
31	HDFC Bank	BFSI	28	74	A	56
33	SBI	BFSI	30	46	A	50
34	Goldman Sachs Group	BFSI	28	85	BBB	38
35	Industrial & Commercial Bank of China Ltd.	BFSI	36	66	BB	26
43	3M Co	Industrial Conglomerates	35	88	AAA	67
44	Siemens AG	Industrial Conglomerates	28	87	BBB	81
45	General Electric Co	Industrial Conglomerates	43	80	BB	25
47	Cipla	Pharma	38	74	BB	55
48	Netflix	Media	17	28	BB	9
49	Amazon	Retail	27	89	BBB	21
50	L&T	Construction	34	70	BB	
51	China Railway	Construction	45	27	BB	
53	Caterpillar Inc	Machinery	39	68	A	78

Source: ESG Rating Agencies

Disclaimer

Recommendation scale: Recommendations and Absolute returns (%) over 12 months

BUY – Expected return >+15%

ADD – Expected return from >+5% to +15%

REDUCE – Expected return from -5% to +5%

SELL – Expected return <-5%

Note: Recommendation structure changed with effect from 1 January 2018 (Hold rating discontinued and replaced by Add / Reduce)

Our recommendation scale does not factor in short-term stock price volatility related to market fluctuations. Thus, our recommendations may not always be strictly in line with the recommendation scale as shown above.

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