



ESG, Climate Change and Net-Zero for the Indian Chemical Sector: Risks and Opportunities

3rd edition of ICC Sustainability Conclave

2-3 December 2021 | Conference Theme : Clean India, Green India



Acknowledgements

ERM would like to thank the Indian Chemical Council (ICC) for collaborating with us and inviting us as a knowledge partner for the 3rd ICC Sustainability Conclave, December 2021.

We are thankful to Dr. Rakesh Kumar, Officer-Sustainability, Environment & Regulatory issues, ICC NR, Mr. P S Singh, Secretary, ICC NR, Mr. Kumaresh C Mishra, IAS (Retd.) Director, ICC and Mr. Kunal Jain, Deputy Secretary, ICC for their constant support and guidance.

Shipra Jain, Swati Lakshmi, Sanjukta Biswas, Aditya Singla, Pranav Sinha, Shubhankar Khare, Dinesh Kanna, Pralabh Bhargava, and Tanvi Katti authored this paper and supported by ERM Design team.

Message from ICC Leadership



RAVI GOENKA

President – Indian Chemical Council

Chairman and Managing Director, Laxmi Organic Industries Ltd.

It is once again my pleasure and privilege to welcome you and introduce the third edition of ICC's flagship event on Sustainability titled "Clean India and Green India" - Strategies, Innovation and Technologies for the Chemical Industry. It has been a momentous year with the recent COP-26 bringing about a host of initiatives and announcements all moving towards addressing Climate change and carbon neutral world with EU announcing 2050 as the targeted year to achieving this goal for Europe and India to achieve this target by 2070.

The chemical industry of the world and India has a significant role in contributing to this task. Companies are seen to have a new and intense focus on ESG with stakeholders demanding that our industry have a clear focus and strategy for Environment, Social and Governance standards. For chemical companies to be considered as successful and valuable, it is no longer enough to show a growing top line and bottom line or even to come out with a great line of products, it is now more and more important to do all this in the most sustainable manner using the cleanest technology with least emissions in the safest manner and keeping in mind the larger good and social responsibilities. Issues like gender balance, GHG emissions, carbon footprint and complete transparency in accounting and disclosure are taking on a new level of desired compliance.

This year's theme is twofold, the main one is to recognize the new order of things, ESG, Climate change and carbon neutrality, sustainable practices in all that we do and a clear recognition of the demand by stakeholders that chemical companies need to adhere to a code of conduct which addresses all the above points. Society today demands this and the chemical sector needs to adopt and find all suitable ways to reach these goals. Technology and digitalization contain answers to many of the question. The conclave attempts to demystify key issues like ESG, Quantification methodology, Digitalization, accounting and measurement as also a session on how to incentivize our industry to achieve higher levels of compliance. All in all our this year's event sessions promises to be very exciting and we are all looking forward to hearing from the experts.

Once again ICC is glad to collaborate with ICCA, UNEP, ACC and CEFIC as also ERM, to bring about this event where we have a long list of illustrious speakers both from Government and industry, India and abroad. We hope you find this a useful and value adding event and our team at ICC will strive to continue to bring you similar events.

We thank you for your participation and solidarity with the cause of sustainable practices and together build a viable and thriving chemical industry in India.

Message from ICC Leadership



VIJAY SANKAR

Immediate Past President - Indian Chemical Council

Deputy Chairman, The Sanmar Group

Economies world over are recovering from the impact of COVID-19 pandemic with industrial activities picking up to the pre-pandemic growth level. Normalcy is returning in all spheres of life. In the backdrop of recently concluded COP-26 in Glasgow, attention is now getting shifted towards the anthropogenic mediated effects of climate change and halting the temperature rise well within 1.50°C. India has set the tone for the climate action with the historic announcement of the “Panchamrit” by Shri Narendra Modi, Hon’ble PM of India in the recently concluded COP26 Summit.

The Indian Chemical industry, which is the third largest producer in Asia, with an estimated size of \$178bn in FY 20 that is expected to reach \$300bn by FY25, employing 4.5mn people, is one of the key contributors to India’s growing sustainability story.

Given the various climate and environmental related challenges the mankind is facing today, the chemical industry is playing a huge role in bringing out solutions to many problems such as shifting to greener sourcing, alternative energy solutions, evolving new circular business models, minimizing waste, reducing carbon footprints, sequestering the already emitted CO₂, and so on. This not only poses many new challenges to chemical industry but also opens up new business opportunities in areas unknown to date. All these are achievable through the use of innovations, cutting edge technologies and appropriate strategies.

I am proud and happy that ICC is at the fore-front in discussing the key issues facing mankind and role of chemical industry in working towards finding solutions to these challenges.

There could not have been a more appropriate time and theme for this 3rd edition of Sustainability Conclave of Indian Chemical Council, taking place on 2-3rd December 2021. I am happy to note that within a short period of time this initiative of ICC has assumed a greater significance with the participation from Ministry of Chemicals & Fertilizers, Ministry of Environment, Forest & Climate Change, UNEP, ICCA, Cefic and ACC.

I wish the conclave a great success!

Message from ICC Leadership



BIMAL L. GOCULDAS

Vice President - Indian Chemical Council

MD & CEO, The Dharamsi Morarji Chemical Company Ltd.



From an environment point of view, the entire world is poised on a cliff edge. It is not a dramatization to say that the decisions taken by countries, companies, and consumers today will alter the future of mankind. Small changes in the climate patterns are already visible: devastating floods, scorching droughts, gigantic storms... the list goes on. In India we saw for the first time in living memory typhoons off the west and east coasts in the same year. The Arabian sea, normally docile, witnessed multiple typhoons this year. The destructive effect of a single species, man, on planet Earth is now undeniable.

As I write this, leaders have gathered in Glasgow to set targets for temperature rise, reduction of emissions, and promotion of renewable energy. There will be progress for sure, but is it enough, or a case of too little too late? Bickering between “developed” nations and “underdeveloped” ones will continue. Developed countries have historically exploited their coal reserves, chopped down their forests to make farmland, and extracted their mineral reserves for consumption in factories. In the process, they became wealthy nations, and now, with the realization of climate change, they are lecturing underdeveloped nations to not do the same.

Elected Governments are in a dilemma. Re-election depends on GDP growth, employment growth, stock market reaching new highs, and so on. The mania for GDP growth by definition needs more consumption. More consumption means more mining of natural resources, more fuel burnt to manufacture and transport goods, more waste generated by the discard of old goods and the packaging material of old goods. Ultimately, this will be a race to the bottom. We, as consumers, need to make decisions that will direct companies and countries towards sustainability. Products and companies that excel in environmental and sustainability performance must be rewarded. The definition of GDP growth needs to be changed to include the past, present, and future protection of the environment. This has to be accepted globally in order to have the desired impact.

The Chemical Industry is a major producer of inputs into all aspects of human life. Consequently, it is also a major consumer of water, minerals, fossil fuels, and energy. Chemists and chemical engineers need to apply their mind to reduce our footprint on all of the above. Can we replace fossil fuels with plant-based sources? Can we move towards renewable energy? Can we recycle the waste water we generate? Can we switch to biodegradable packing? There are many opportunities, and much research is needed. Funding is now available not only from the conventional sources such as banks and financial institutions, but also from dedicated Environment Social and Governance (ESG) funds that will help and reward companies working responsibly.

This year's Sustainability Conclave with the theme “Strategies, Innovation, and Technologies for Chemical Industry” is one small step by ICC to discuss solutions to the environmental issues the world is facing. A lot of work has gone into making this Conclave happen, and I would like to thank all the participants, the speakers, the sponsors, UNEP, ICCA, the Government of India, DCPC and MOEF, and of course the ICC Delhi office and Sustainability team led by Ravi Kapoor. Along with our flagship programs, Responsible Care and Nicer Globe, this conclave has become an industry-leading event in the area of sustainability. We hope this concept will grow and spread to other industries as well such as pharmaceuticals, FMCG, and food, that also have a large impact on the environment.

Message from ICC Leadership



RAVI KAPOOR

Chairman, Sustainability Committee, ICC
MD, Heubach Colour

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About ICC



Indian Chemical Council (ICC) is the apex industry body founded in the year 1938 for promoting the interests of the nascent Chemical Industry. ICC represents all segments of the Chemical Industry such as Organic & Inorganic Chemicals, Fertilizers, Agrochemicals, Pesticides, Paints, Dyes & Dye-intermediates, Drugs & Pharmaceuticals, Fine & Specialty Chemicals, Plastics & Petrochemicals, and Petroleum Refining etc. Over the years, ICC has taken a lead role in developing a robust base for Indian chemical industry. ICC website is: www.indianchemicalcouncil.com which provides details of national and international activities of ICC.

Apart from taking up critical issues faced by the industry, with stakeholders, Government of India, various state governments, ICC also encourages Research & Development, State-of-the-art Technology, Energy Conservation and Quality Consciousness. ICC also monitors and contributes to the framing of industry specific Government Legislation, and to have formal interaction with the concerned Government Ministries regarding policies, tariffs and excise matters. It also helps in monitoring, procuring and disseminating information relating to topical developments on safety, health & environment, to promote Responsible Care Initiative.

One of the key initiatives of ICC is Responsible Care (RC), a global voluntary initiative of chemical industry has been initiated by ICC in India to excel and continually improve health, safety and environmental performance and till date, ICC is the only body recognized for RC. RC is a commitment of the chemical industry for a world-class performance for safe, responsible management of chemicals throughout their entire life. RC addresses community concerns about chemicals and its impact on people and environment during processing, transportation and use. ICC encourages members of the industry for complying with ISO standards, committing for Responsible Care - which is a voluntary initiative of the industry. ICC has a policy for assisting units in SSI sectors for practicing Responsible Care initiative in their units through mentorship program. There are 134 companies who are Signatories of RC till date. Industries are permitted to use RC Logo after the due process of peer audit. At present, there are 48 companies who are RC Logo Holders.

Another pioneer initiative of ICC is the Nicer Globe which is ICC's Responsible Care Initiative for Transport Distribution Safety, Emergency Response and Transport Security. The objective is to foster mutual cooperation and collaboration within the industry for responding to transport emergencies and tracking of movement of dangerous goods from GATE to GATE using Geo Positioning Systems (GPS), GEO spatial information system (GIS) and mobile technology. The project instituted in October 2013.

ICC is very actively involved with Ministry of Chemicals & Fertilizers, Government of India and also all the State Government bodies where chemical industry is concentrated. ICC's representatives are always involved with Ministry of Environment, Forest and Climate Change, Government of India; Central Pollution Control Board; State Pollution Control Boards and voices the concerns of the industry regarding incoming legislation.

Chemical Industry today is in a transition stage. India's opportunities in the sector are still to be exploited fully. The investment, trade facilitation, sustainable manufacturing, perception management of the industry are some of the important areas which need regular interactions with the government and regulatory authorities. In its constant endeavor the service the Chemicals Industry to attain its desired level of growth, ICC is committed to work with all stake holders to attain this objective.

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Chapter 1

Landscape of the Chemical Industry



Landscape of the Chemical Industry

As per a report by the United Nations Environment Programme (UNEP), the global chemical industry production capacity has more than doubled in the past two decades, with a majority of the growth coming from emerging economies, especially China.

Throughout much of the 20th century the industry was based out of Europe, North America and Japan. Since the 1970s, it expanded internationally with investments occurring in Asia and the Middle East. In the 2000s, Chinese and Middle Eastern companies strengthened their positions and companies in India also expanded. The future industry growth is expected to be driven mainly by emerging markets in the Asia-Pacific region, including India; Africa and Middle East are projected to contribute strongest to this growth.

Chemical industry is part of a complex value chain that connects majority of the global system of production and consumption. Chemical products usage starts from extraction of raw materials to the use of industrial and consumer products.

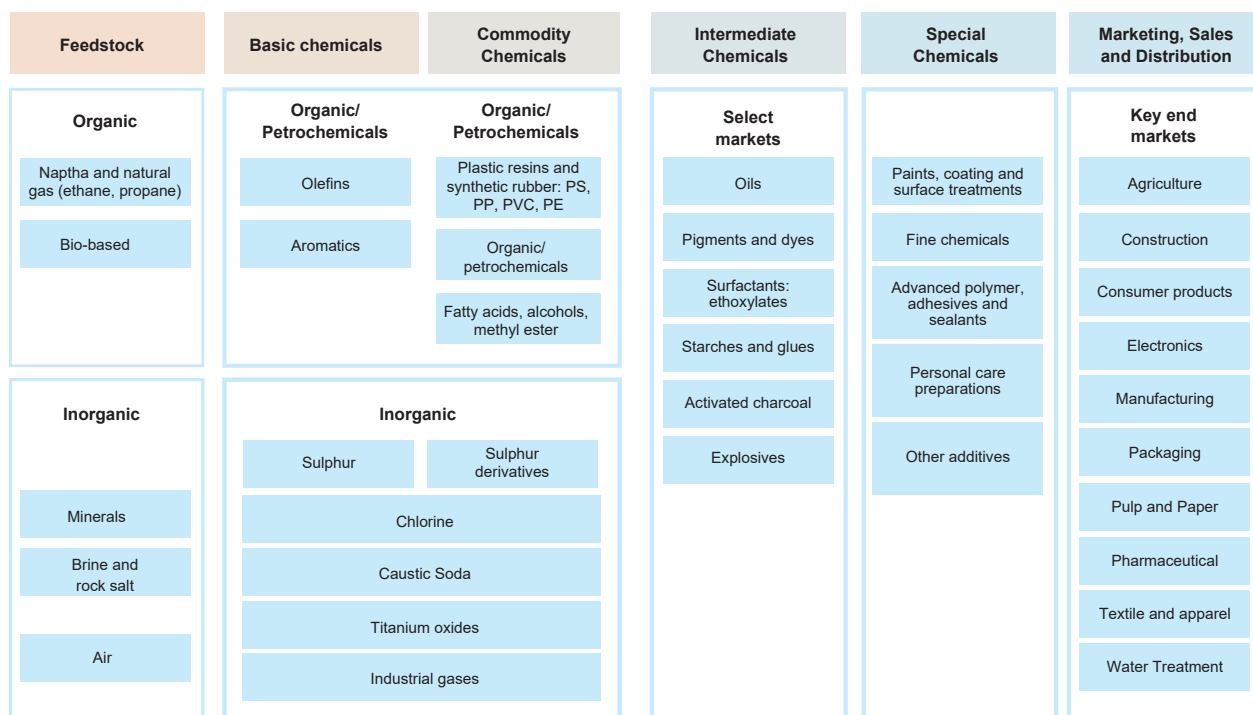


Figure 1: A look at Chemical Industries' value chain adopted from UNEP's Global Chemicals Outlook II

Introduction – India's Chemical Sector

The chemical sector industries in India constitute an important element of the nation's industrial and economic success. Per data released by the Government of India, the market size for chemical sector in India was approximately USD 178 Billion with the total production of major chemicals and petrochemicals in 2021-22 (up to May 2021) was 92.8 Lakh MT. The highly diversified Indian chemical sector, employing more than 2 million people, produces more than 80,000 commercial products (spread across Bulk Chemicals, Specialty Chemicals, Agrochemicals, Petrochemicals, Polymers and Fertilizers), and is the sixth largest producers of chemicals worldwide. India also serves as the third largest market for polymers worldwide, in 2020-2021, per the National Investment Promotion & Facilitation Agency (NIPFA).

Landscape of the Chemical Industry

With a rapidly growing middle class and low penetration of chemical use, the fundamentals for robust growth of the chemical sector are in place in India. The robust demand for ever-greater volumes of chemicals and derivatives in India continues to grow at a fast clip.

The promise of the chemical sector is illustrated by the facts below:

- The overall chemical demand is expected to grow at a CAGR of about 9% between now and 2025;
- Export of Organic and Inorganic Chemicals was valued at \$2230 billion in August 2021 with a positive growth of 36% over exports of \$1643 billion in August 2020;
- The petrochemical demand is expected to grow at 7.5% CAGR from FY 2019-23, with polymer demand growing at 8%;
- The agrochemicals market in India is expected to grow at 8% CAGR reaching \$3.7 billion by FY22 and \$4.7 billion by FY25;
- The specialty chemicals constitute 22% of the total chemicals and petrochemicals market in India. The demand for specialty chemicals is expected to rise at a 12% CAGR in 2019-22.
- Export of Plastic and Linoleum was valued at \$753.30 billion in August 2021 approximately 16.16% higher than exports in this category in August 2020.

The total value of the Indian chemical sector is expected to double to USD 300 Billion by 2025.

Understanding the potential of the industry, Indian government has launched Vision 2034 for the Chemicals and Petrochemicals sector to explore opportunities to improve domestic production, reduce imports and attract investments in the sector. It is considering to launch production-linked incentive scheme to boost domestic manufacturing. India's 'Make in India' policy has also provided support to the industry.

Make in India: evolving manufacturing and value chain framework in India

Self-reliant manufacturing is imperative to any nation's development and history as the Industrial Revolution bears testament. The 'Make in India' initiative was introduced by the Indian government in 2015 with the same intent as a centre-table policy for its manufacturing sector, including the chemical manufacturing sector.

Since the Make in India flagship program came into being, the regulatory environment saw enactment of several reforms that provided a fillip to the chemicals sector. One of the major reforms was the introduction of 100% FDI for the chemical sector. The cumulative FDI equity inflow in the chemicals industry (excluding fertilizers) between the months of April 2000 and June 2021 was USD 18,699.83 million constituting about 3.42% of the total FDI inflow received across all sectors.

The government of India, to empower domestic manufacturers, also introduced de-licensing of manufacture of non-hazardous chemicals and provision of duty protection through anti-dumping duties on substandard imports. The government of India has displayed keen support for skill training, technology, academics and research to promote the Indian chemicals sector through establishment of Centres of Excellence (COE) under National Policy on Petrochemicals, the Chemicals Promotion Development Scheme (CPDS) as well as sector PLI is expected to provide a significant fillip to the related domestic chemical sector.

Landscape of the Chemical Industry

One important proposed reform is a long-awaited overhaul of the Petroleum, Chemicals & Petrochemical Investment Regions (PCPIRs) policy of 2007. The primary rationale for developing PCPIRs was to create an Integrated Chemical Complex wherein several chemical industries could be interlinked through a pipeline corridor to create islands of manufacturing excellence sharing infrastructure such as utilities, ports, railways, etc. Each PCPIR is proposed to have a refinery or petrochemical cracker as an Anchor Unit that would supply petrochemical building blocks (such as Ethylene, Propylene, etc.) through pipelines to downstream industries. Various downstream industries were proposed to be set up around these Anchor Units to make value added products that are essential for India's growth. The policy awaits a genuine review.

The government also provides incentives for setting up plastic park clusters that are specifically dedicated industrial zones devoted to plastics enterprises and allied industries. Plastic Parks in the States of Madhya Pradesh, Odisha, Jharkhand, Assam and Tamil Nadu are being set up under this initiative. Other area-based incentives also include chemical manufacturing units in SEZ/ NIMZ in regions such as North-east, Jammu & Kashmir, Himachal Pradesh and Uttarakhand. Development of chemical parks akin to plastic parks will also be ideal for the overall chemical sector.

Lastly, other than the domestic driven push for manufacturing, certain international factors that are enabling India to become a global player in chemicals apart from China, include global trade tensions, tightening environmental regulations and rising labour costs in China, and a potential overall diversification in global manufacturing.

Key ESG Risks & Opportunities discussed



Climate Change and Decarbonisation



Global Shift to Mandatory Reporting



Supply Chain Disruption



Product Stewardship-focus on GHS



Stakeholder Engagement



Biodiversity and Land Use



Sustainable and Green Financing

Chapter 2

ESG in chemical industry: No longer a theory



ESG in chemical industry: No longer a theory

Action-oriented navigation for businesses

The chemical and petrochemicals industry in India is an important driver for innovation and growth in the Indian economy. However, fulfilling this role in the long term will require significant efforts; like all industries in India, the chemical and petrochemical sector is faced with elementary strategic and structural challenges. Demand for chemical products will grow exponentially in Asia, South America, and Africa in the decades ahead. Since there is an increase in demand for chemical products, coupled with demographic changes, urbanization and shift in consumer preferences towards a healthier lifestyle and environment-friendly products, the whole competitive environment in the chemical industry is in the process of transformation. On the one hand, there is an opportunity to produce more than \$150 Bn worth of chemical products in the home market; on the other, there is a paradigm change in stakeholder preferences and investment methodologies. The stakeholders' expectation from brands to align with their values and growing desire to have a positive impact on society, is pushing companies to embrace ESG. The term E-S-G (Environment Social Governance) which first was used by the United Nations almost 20 years ago, is now being used as a yardstick to measure a company's value and its ability to capture the best opportunities of tomorrow. Creating sustained outcomes that drive value and fuel growth, whilst strengthening our environment and societies is the new go-to-market approach. Only companies that develop strategies to adapt to these changing requirements, and keep ESG at the very heart of operations, will be smarter and will deliver sustainable business advantage.

Even before COVID-19 upended business and society, the ESG movement was gaining steam. Far-reaching challenges such as climate change and economic inclusion concentrated the minds of investors and executives on the importance of long-term priorities and non-financial reporting. The global pandemic heightened awareness of how interconnected we all are, how rapidly external shocks can work through the global economy, and how central trust and transparency are to the economy's operation.

We believe these crosscurrents are coming together to propel the next wave of corporate transformation: the ESG transformation. Like digital, ESG has the potential to revamp how successful organizations' plan, implement and operate. Focus on ESG sectoral issues will gain in importance, board oversight will set the path and, digitalization will lead to extensive changes in all sectors. These three core topics are of central importance to the trends in the chemical sector up to 2030 and beyond. As part of these changes, a new phase of development is beginning in the Indian chemical industry. Following industrialization, increasing globalization and sustainability will play a key role.

Drivers of ESG for the chemical industry

The chemical sector in India is well-positioned to master the challenges of incremental change. On the one hand, these changes offer opportunities in new growth areas for chemical companies. At parallel, they also pose challenges. They have a massive influence on technologies, product portfolios, structures of value creation, and business models in the chemical industry, as well as on its clients and suppliers.

- **Changing Consumer Preferences:** The change in public preferences toward sustainable production and consumption requires the development of products and business models with minimum negative impact on environment & society. The chemical sector can utilize the changing consumer preferences as growth potentials: for example by supporting customers in reaching their sustainability targets or extending their core business with new circular business models, such as chemical leasing.

ESG in chemical industry: No longer a theory

- **Stakeholder Capitalism:** In 2019, a statement signed by 181 CEOs who commit to lead their companies by incorporating the interests of all stakeholders including employees, customers, suppliers, shareholders, and communities, redefined the purpose of a corporation. More recently, the 2020 Davos agenda of the World Economic Forum prompted this shift from shareholder capitalism to stakeholder capitalism in the light of COVID-19, appropriately reflecting the current mood. Stakeholder capitalism entails creating long-term value not only for shareholders but also for stakeholders is here to stay and drive future businesses.
- **Regulations:** The governments across the world have mandating and enforcing several ESG elements which were voluntary earlier. The ESG disclosure have become mandatory for leading markets across the world. In India The Securities and Exchange Board of India (SEBI) introduced new requirements for sustainability reporting by top 1000 listed entities.
- **Reputation risk:** Stakeholders expect the companies to manage and disclose their ESG performance and failure to do so or the companies scoring low are seen as laggards which impacts their reputation. Also companies are accused of green wash if they exaggerate their performance and are not seen doing enough as their peers, several companies have been taken to court by stakeholders and have been asked to take actions to improve their performance.

The Securities and Exchange Board of India (SEBI) on Monday issued a circular notifying new disclosure norms on sustainability related reporting for the top 1,000 listed companies by market cap by FY23.

Key ESG Trends

1 | Climate Change and Decarbonization

Climate Change is still a looming threat across the globe. As of 2021, we are still lagging behind the targets set at COP21 in 2015 and if global policies and business practices were to continue on the current trajectory the planet would still see an increase of 2.1 °C as a best case scenario, while as a worst case scenario the planet would experience a rise of 3.9 °C. The recently released IPCC AR6 report highlighted the urgency of the actions that the world should undertake to avoid climate catastrophe. As per the UNFCCC the report is highlighted as the code red for humanity. As a result, a number of countries have been pledging net zero targets. India, which is the 3rd largest emitter in the world has recently committed a net zero target by 2070, and for India to reach this target and truly become net zero, an unprecedented shift in the energy mix of the nation would need to take place, as fossil fuels still account for a large percentage of energy consumption in the country. One of the biggest challenges in reaching the national target of net zero by 2070 is balancing the economics of business and climate change. For instance, we must achieve decarbonization without damaging business productivity and achieve increased business productivity without increasing overall emissions.

Therefore, to achieve this balance one can expect conversations to shift from simply mitigating the negative effects of climate change, with regards to both physical and transition risks, to a more holistic approach which includes developing adaptation and climate resilience measures for businesses and their supply chains. The development of strong measures that protect an industry against the negative efforts of climate change will go a long way in ensuring business productivity and emission reductions.

ESG in chemical industry: No longer a theory

The changing shift in dialogue and action rings true for the Indian Chemical Industry as well. For instance, there is an increased need for decarbonization as local and regional governments, regulators, investors, and the stakeholders have publically stated need for net zero commitments. Further, a change in the future of energy systems is needed, where the complete removal of fossil fuels and introduction of low carbon energy sources would result in higher prices for basic primary feedstocks. Hence, there is a need in the Indian Chemical Industry to not only decarbonize but also protect assets and business against an evolving regulatory landscape, changing demand patterns, and of course physical climate risk.

This emerging trend of developing adaptation and resilience measures can be achieved through the introduction of new technologies that can support rapid decarbonization while maintaining business performance. The increased prominence of Science Based Targets Initiative (SBTi) and scenario analysis are providing organizations with greater insights into how best these technologies can be implemented as well as which technologies best suit their business needs. For instance, the SBTi Corporate Net-Zero Standard is the world's first framework for corporate net-zero target setting in line with climate science. This gives companies a clear blueprint on how to accurately bring their net zero plans to fruition.

Another important means of achieving decarbonization includes active collaboration within the industry. For instance, the World Economic Forum (WEF) has developed a cross functional initiative known as the LCET initiative to foster alliances and help in the facilitation of joint ventures between companies to help drive LCET innovation and progress. Such initiatives are crucial to enhance the global requirement of decarbonization and climate change mitigation.

2 | A Global Shift to Mandatory Reporting will continue

There has been increasing pressure from stock exchanges and regulatory authorities in the financial system for companies to develop and publish high quality disclosures which provide a 360-degree view into ESG strategy, capabilities, risks, and challenges. Usually disclosures are made on a cyclical basis with organizations making voluntary disclosures on their ESG performance.

However, with the emergence of net zero, decarbonization, and immediate need for climate change mitigation there has been a shift in both what companies disclose and how they disclose it.

More recently, there is a greater shift towards the disclosure of aspects pertaining to climate change with organizations sharing findings on internal studies focused on forward looking climate scenarios as well as the integration of climate risk management into the overall business risk management framework and process. The emergence of both aspects as part of an organizations disclosure structure greatly improves the quality of disclosures and provides stakeholders, both internal and external, with the necessary information to not only adapt to the emergence of climate change but also avoid any unnecessary risk.

Likewise, organizations are now moving from voluntary reporting to mandatory reporting, as there is a shift in stakeholder expectations and demands. The move to mandatory reporting is supplemented by the emergence of a number of disclosure platforms that provide organizations with essential tools to disclose effectively and accurately. For instance, the emergence of the Business Responsibility and Sustainability Reporting (BRSR) has helped the Securities and Exchange Board of India (SEBI) to develop comprehensive methodologies for reporting on climate change and provides Indian organizations with the required frameworks to ensure data consistency and validity. Similarly, the Taskforce on Climate-related Financial Disclosures (TCFD), Carbon Disclosure Project (CDP), Sustainability Accounting Standards Board (SASB), are long established platforms that are increasing in prominence in India and allows Indian organizations to benchmark and compete on a global scale.

ESG in chemical industry: No longer a theory

Mandatory reporting will also ensure that organizations no longer report on a cyclical basis but rather report more dynamically resulting in more fluid information transfers between stakeholders. This would further enhance the advantages of reporting and guarantee that those that become leaders in ESG and more specifically climate change reporting will be viewed as less volatile investments with most ESG leaders showcasing higher business performance as well as higher dividend yields for investors. Furthermore, ESG leaders are also shown to garner greater returns with lower interest rates due to improved credibility and trust amongst stakeholders and financiers. It is becoming increasingly clear that strong ESG metrics and strategy go hand in hand with strong financial performance. In order to effectively establish and disclose ESG strategies and performance, regularly tracking key metrics is crucial. One of the challenges of this has been that there is no definitive universal set of ESG metrics. As investor demand for disclosure has grown alongside a shifting political climate, a future with standardized ESG metrics is becoming increasingly likely. One model put forward by the UN is the Value Driver Model, which helps companies assess and communicate the impact of sustainability-advantaged products, initiatives and, risk exposure and integrate them with performance metrics.

What metrics a company should be tracking largely depend upon the sector, request of the stakeholders and the impact that company creates. No matter where the driver is- the metrics must consider each aspect of Environment, Social and Governance. Some of the key metrics are:

Environmental Metrics: Carbon Footprint, GHG Emissions, Water, Waste Trends, Material Sourcing

Social Metrics: Health & Wellbeing, Stakeholder Engagement, Community Impact

Governance Metrics: Cybersecurity, Executive Compensation, Pay Gap

The growing trend of ESG metrics is undeniable and is affecting investments decisions of today and tomorrow. Many financial institutions and rating companies use ESG metrics to evaluate companies by assessing risks and opportunities, see the larger picture when making capital allocation decisions and transition their investments as the world begins to move to a low carbon economy. Some of the highly influential ESG Assessments are done by organisations such as:

S&P Global Ratings: It is a one of a kind assessment of a company's ESG strategy and ability to prepare for potential future risks and opportunities. The methodology is founded on analysts' sector and company expertise, relying upon in-depth engagement with company management to assess material ESG impacts on the company, past, present and future. S&P Global ESG Scores capture the nuances and differences of policies and programs and in-depth ESG information. The CSA turns intangible corporate ESG performance into tangible S&P Global ESG scores. The scores at total, dimension (ESG) and industry specific criteria level are made available to the global investment community on the S&P Global Market Intelligence Xpressfeed™ platform and the S&P Dow Jones Indices SPICE platform. In addition, S&P Global publishes percentile rankings at the criterion, dimension and total score levels - on the Bloomberg Professional platform.

MSCI- MSCI ESG Ratings aim to measure a company's resilience to long-term, financially relevant ESG risks. We leverage artificial intelligence (AI) and alternative data to deliver dynamic investment-relevant insights to power your investment decisions. Developed based on 40 years of experience collecting, standardizing and modeling ESG metrics, the data is used as inputs for in-house analytical models or to develop proprietary investment strategies by investors to screen companies in their portfolios. MSCI ESG Metrics is a tool designed to give institutional investors a broad set of standardized ESG data and simple flagged metrics that are comparable across a broad universe of 8,500 companies in the MSCI ACWI Investable Market Index (IMI) coverage universe.

SustainAnalytics: Sustainalytics' ESG Risk Ratings measure a company's exposure to industry-specific material ESG risks and how well a company is managing those risks. This multi-dimensional way of

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measuring ESG risk combines the concepts of management and exposure to arrive at an absolute assessment of ESG risk. The company identifies five categories of ESG risk severity that could impact a company's enterprise value. These risk scores are made available to the world's leading investors who use score for evaluating the company's absolute ESG risk, while using the scores for best-in-class analysis of their portfolios.

3 | Supply chain disruption - its impact on the chemical industry

Supply chain management had been an essential fundamental element in handling of the entire production flow of a good or service to maximize quality, delivery, customer experience and profitability. With COVID-19 interruption, the chemical industry realized that not only an effective supply chain management is required but also an intelligent supply chain management is need of the hour. Secondly, COVID-19 interruption has made countries to be no longer be dependent on a single source or supplier and find optimal ways for international collaboration. Thirdly, increasing consumer awareness, rising environmental concerns and stakeholder's interventions has forces the industries to procure raw material from sustainable sources. The extreme climate events can have a significant impact on the supply chain and hence the business should evaluate the potential risks due to climate change and take necessary actions to make it resilient, On the other hand increasing focus on decarbonisation will drive the companies to seek raw materials with low embedded carbon.

India's position due to supply chain interruption

The Indian chemical industry is divided into large, medium and small companies manufacturing major petrochemicals, alkali chemicals, inorganic chemicals, organic chemicals, pesticides, dyes and pigments and other chemicals. The Indian chemicals industry stood at US\$ 178 billion in 2019 and is expected to reach US\$ 304 billion by 2025 registering a CAGR of 9.3%.

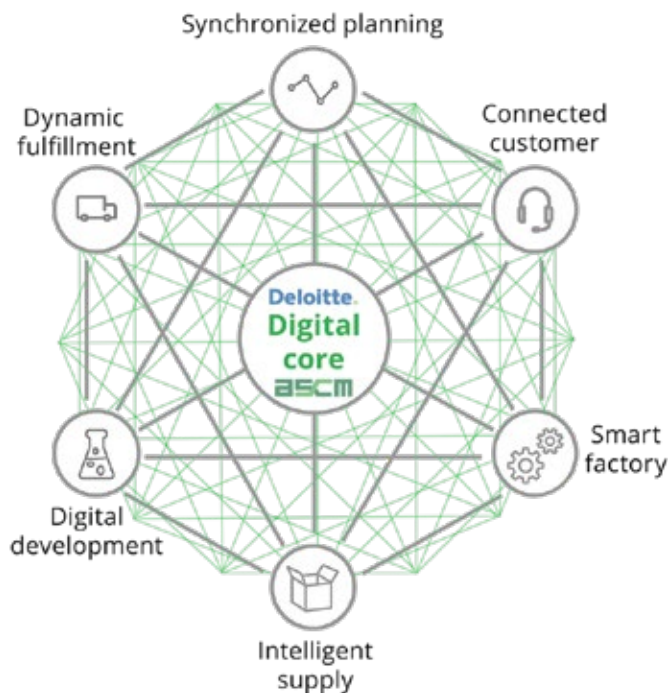
The global supply chain industry has strongly relied on China; and this dependency had led to major losses incurred by the chemical industries during COVID-19 pandemic. Globally, the chemical supply chain market recorded a sharp decline in outputs leading to shortage of most raw materials and finished products. This trend is changing. The shift in production and consumption towards Asian and Southeast Asian countries is leading to increasing demand for Chemicals and Petrochemicals. To sustain the growth, the supply chain in the chemical sector needs to be planned carefully.

Future of Supply Chain

Supply chains are constantly evolving; technology along with diversification of skill sets is playing a key part in this development. To further accelerate resilience, the companies, manufacturers and players within supply and value chains need to adopt to the usage of right technologies.

To leverage on supply chain visibility, a digital element leading the wave on visibility across the industry is digital supply networks (DSN). DSNs are integrated digital platforms/networks which accumulate and analyze data as well as events from the physical world and other digital platforms using advanced analytics, sensors, artificial intelligence allowing end-to-end agility, optimization, flexibility, visibility, and collaboration along the supply chain network. With continuous flow of information, DSNs enables companies to connect to their total supply network across the globe with complete access to readily available data/information such as customer demand, product quality and production capacity.

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Consumer preferences for sustainable products is also driving the industry. The heightened awareness of the close relationship between human health and the health of the planet, is leading to a continued consumer-driven push for sustainable products. Additionally, the societal concern for environmental issues has forced chemicals executives to identify consumer support for reducing carbon emissions as one of the top drivers behind the industry's transition toward a sustainable, low-carbon future.

- Finally, Industry 4.0 in the chemicals industry needs to be discussed from a market perspective, not just a technical point of view.

- Transparent, structured and lean supply chain essential to stay competitive

- Enabling M&A activities with means of standard SCM processes, with a focus on strengthening the global footprint

- To cope with market uncertainties, supply chain resilience and integrated business planning become key for success

- Differentiation from competitors through supply chain services crucial to avoid competing only on the price level

- Adapt service levels accordingly, i.e. premium service for 'A' customers

- Not meeting customer's supply chain service expectations increasingly puts the relationship at risk

- Thoughtful developed digitalization strategy and implementation roadmap

- Further individualization of chemical product offerings (formulations) based on insights as a service

- Decreasing costs and performance-based pricing instead of price-per-kg or price-per-container needed.

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4 | Product Stewardship – Driving growth and Opportunities

According to the Product Stewardship Society, Product Stewardship (PS) is defined as, to responsibly manage the health, safety, and environmental aspects of raw materials, intermediate, and consumer products throughout their life cycle and across the value chain in order to prevent or minimize negative impacts and maximize value. Product stewardship is the core of an organization's value generation and is not only limited to minimize business risks but also generates bounteous opportunities. The diagram illustrates the risks and opportunities related to Product Stewardship:

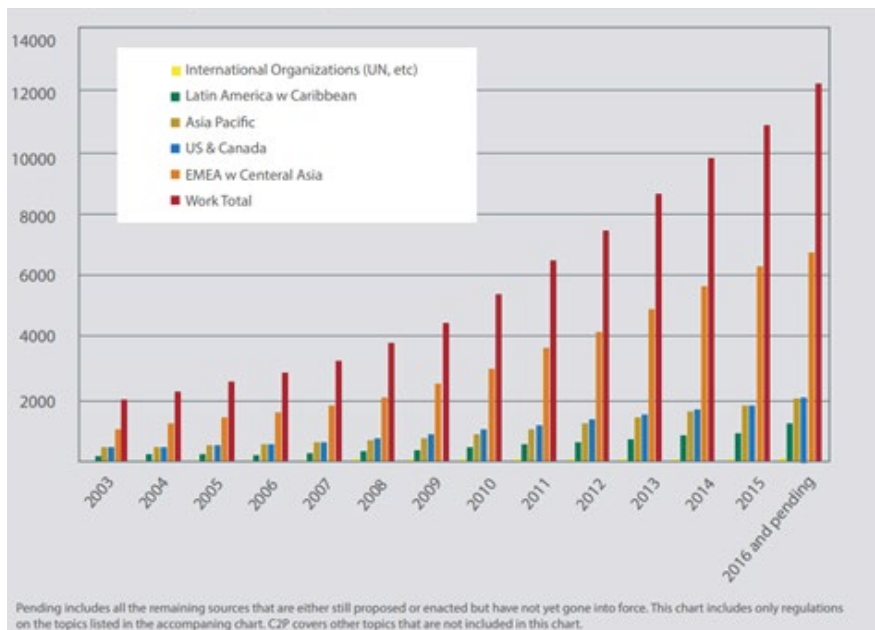


Making the case for Product Stewardship

According to a 2015 survey of some 1200 corporate executives in 63 countries, the top five business risks included regulatory compliance and corporate reputation. Two of the top business opportunities were improvements in corporate reputation and penetration of emerging markets.

True Product Stewardship is about taking total control of products and their chemical components throughout their life cycles. This challenge of doing so has never been more important and hence, the new global economy that we operate in, requires organizations that do business in multiple nations to comply with increasingly stringent regulations. Over the years we have been a witness to the escalation in the rules and regulation pertaining to Product Stewardship, the diagram represented below illustrates the growth of the applicable regulations for Products crossing international borders.

C2P Global Regulations by Region: Cumulative Totals

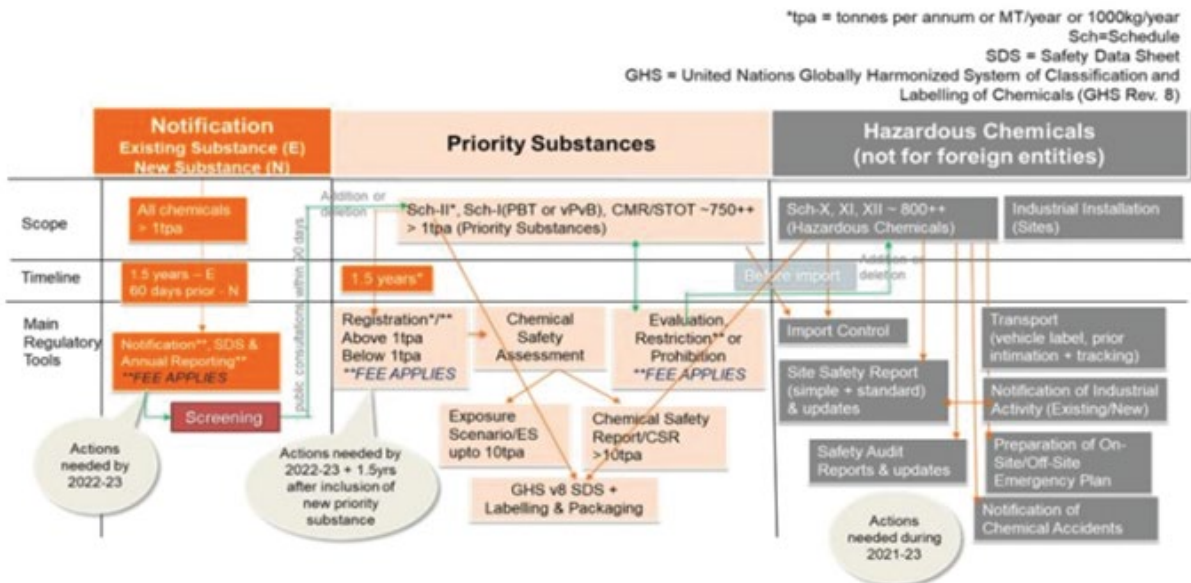


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India 'REACH'

India has circulated 5th Draft in August 2020: Chemical (Management and Safety) Rules, 20xx, ("India REACH", ICMS Rules or CMS Rules) which will replace existing Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules 1989 and Chemical Accidents (Emergency Planning, Preparedness and Response) (CAEPPR) Rules 1996. The regulatory requirements shall come into force on the date of their publication in the Official Gazette, expected during 2022.

The REACH regulation aims to ensure a high level of protection to human health and the environment. Once, it enters into force, this regulations are applicable to Indian Manufacturers, Indian Importers and Authorized Representative/AR – located in India appointed by Foreign Manufacturers. Similar to EU REACH regulation, Non-Indian companies can as well appoint an Authorized Representative in India to prepare and submit their notifications and registrations to the Indian Authority. The below diagram explains the requirements of the Indian REACH regulation.



Focus on GHS and Digitalization will support Product Stewardship

Globally Harmonized System of Classification and Labelling of Chemicals (GHS), was endorsed in the Year 2003 by United Nations (UN) Economic and Social Council, which is one of the six principal organs of United Nations. The Council of UN ECOSOC oversees this Expert body called the "Committee of Experts on the Transport of Dangerous Goods and the Globally Harmonized System of Classification and Labelling of Chemicals".

GHS acts as a complement to the UN Numbered system of regulated hazardous material transport. Implementation is managed through the UN Secretariat. This system does not replace transportation labels and terminology but does replace various versions of other hazard communication systems and symbols.



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It is a logical and comprehensive approach to:

- Defining health, physical and environmental hazards of chemicals.
- Creating classification processes that use available data on chemicals for comparison with the defined hazard criteria;
- Communicating hazard information, as well as protective measures, on labels and Safety Data Sheets (SDS)

Digitization to Digital Transformation

When we name Product stewardship and Regulatory Affairs within the business, it delves into the integrated elements of the related business functions, which eventually require digital transformation to effectively manage (as shown in Figure 3)

With all the development and implementation in GHS and its myriad regulatory changes, companies will be facing various challenges in managing / integrating these functions within their businesses. To do so, we are seeing companies move forward from Digitization to Digital Transformation with more aggressive, nimble business models to be smart, safe, efficient, inclusive, and responsible.

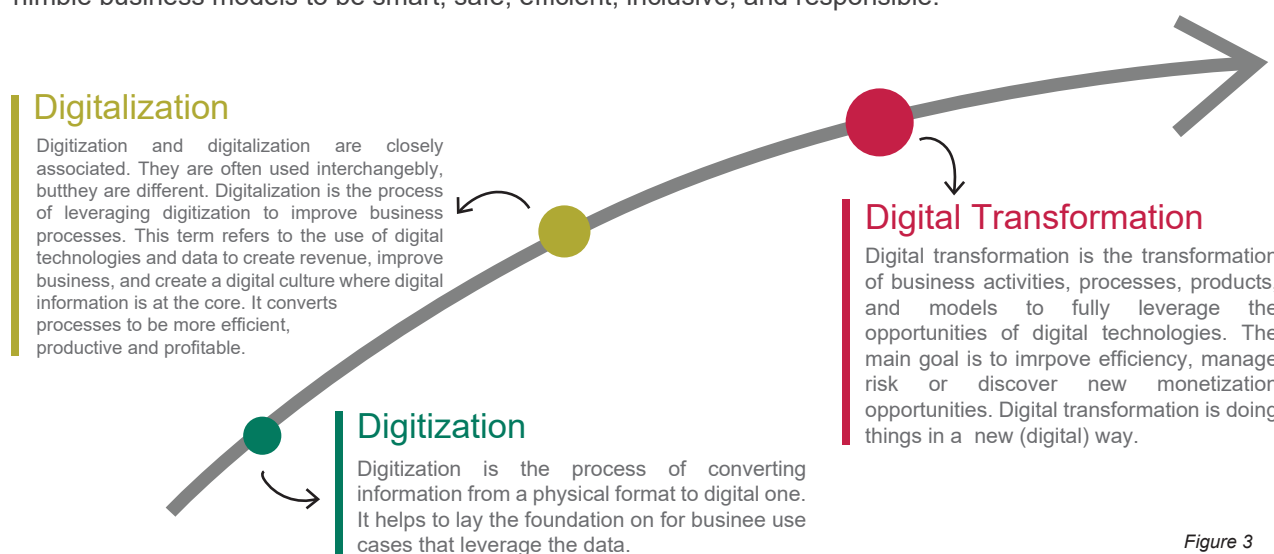


Figure 3

Need for Digital Transformation / Solutions

1. Compliance Issues

- Regulatory Strategy & Intelligence on supplying alerts on regulatory processes & its amendments
- Classification, Labelling & Packaging of Substance, Mixtures & Articles
- Monitoring & Communication towards SVHC (Substance & Mixtures) and SCIP (Articles)
- SDS, eSDS & IMDS authoring & support
- Risk Assessment on current Technical & Regulatory gaps / issues including reporting & Integration
- Support towards Registration, communication, preparation of required regulatory documents



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2. Process & Team Issues

- Expert support on reducing cost incurred for In-house SDS authoring team which is expensive and could be providing higher value contributions
- Quality product stewardship expertise with affordable service cost
- Translation of Regulatory & Technical documents
- Regulatory SMEs lifts the bandwidth issue faced with the internal PS team in fulfilling the SDS requirements
- Guidance towards understanding the country specific product compliance
- Streamlining the process of SDS generation in SAP or related ERP system with integrating different global regulations.



2. Organizational Issues

- Providing with high value ERP system with reduced issues & errors
- Expert advice on ERP system content and its MoC strains resources
- Stewardship support in reducing carbon footprint from product life cycle and its process.
- End to End Project Management, Data Management & legal compliance management
- Providing expert service on the submission of SCIP database, Black & Grey list to track the usage & reduction of Hazardous chemicals from supply chain.
- End to End integration of Technical & Regulatory data to track Inbound & Outbound Chemicals / parts.



Some / Most of these will be issues / challenges that any organization can relate based on their business model. On the Interim, with all these challenges, manufacturing products is fraught with EHS&S complexity. Creating the right environment, processes, and culture to deliver safe, compliant, sustainable, and high-quality products will be an industries top priority. Thus this Digital Platform will enable any organization on:

- Keeping up to date with the complexity of ever-expanding global regulations, implementing them seamlessly into your workflows, automating tasks, and improving operational efficiency throughout the product lifecycle is critical to your success.
- Product compliance disruption in your product's value chain can have a significant impact on your operations, your right to trade, your brand, and your profitability.
- The technological enablement of product stewardship is essential in helping you to manage your accelerating data demands and necessary core business systems integrations
- Designing and implementing a robust product stewardship programme is imperative for business continuity and long-term success.

It can also help in understanding and creating an uninterrupted Life cycle management within the process manufacturing starting from R & D / Formulation / Product development, Product Safety & Compliance, Sourcing, Manufacturing, Sales & Distribution, till End of Life.

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5 | Going beyond the Social License to Operate will improve business performance

While stakeholder engagement and management are imperative for maintaining a conducive environment for manufacturing, it is also a tool for improving business performance. This is very well applicable for the Chemical sector, as the chemical industry is expected to contribute US\$ 304 billion to India's GDP by 2025.

In the case of the chemical sector, some major stakeholder engagement and management issues that require attention include:

Employee health and safety: Occupational Health and Safety (e.g., exposure to hazardous chemicals (e.g., carcinogens such as organic solvents, metals, asbestos) including short and long-term risks to health, dust and noise; unguarded machinery; fire and explosion risks; ergonomics issues, accidents at work with potentially severe consequences (e.g., risk of explosion of volatile materials), insufficient information and training for workers on health and safety issues and information not provided in languages used by the workforce.

Employment and poor labor standards: Exposure to chemicals can be particularly hazardous for young workers, children working long hours and missing out on educational opportunities, are some the major concerns that need to be addressed.

Community health and safety: The local population may be exposed to risks such as wastes and resultant impacts, noise, vibration, dust, traffic, emissions and air quality. The aspects that pose a potential threat to the community also include, the storage and transport of hazardous materials, which may pose risks for local communities if inadequate standards are applied, leading to damage to health or the local environment; natural resources may be contaminated by waste disposal and pollution and this may further lead to damage to people's health through contamination of the food chain or water supplies.

Communicable diseases: Spread of diseases by workforce to local populations, the COVID-19 pandemic is an example of how a disease can affect the community.

Land acquisition: Establishing units and displacing populations may lead to loss of livelihood, resources or assets. If full consultations and compensation arrangements are inadequate, this can lead to tensions, protest and severe community backlash.

The Government of India is in the process of finalizing its National Action Plan on Business and Human Rights to ensure that businesses are sustainable and responsible towards the rights of communities that are being impacted by them. The draft is articulated on principles as three pillars – state duty to protect (human rights), the corporate responsibility to respect (human rights) and access to remedy (for business-related human right abuses that stems from the country's endorsement of the United Nations Guiding Principles (UNGPs) on Business and Human Rights adopted in the UN Human Rights Council (UNHRC) in 2011. The zero draft of NAP, which has been public for over one year, is now under the final stages of extensive consultations with stakeholders led by the Union Ministry of Corporate Affairs (MCA).

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6 | Biodiversity & Land Use is becoming centrestage of discussions

With advent of industrialization, massive changes in economies and livelihoods, a large part of natural ecosystems have been compromised and threatened. Over the decades, human activities have constantly altered natural ecosystems with full tilt that has benefitted the societies and economies but only at the cost of diminishing biodiversity and degrading ecosystems. Biodiversity is an upcoming challenge for businesses. Business risks and opportunities associated with biodiversity and ecosystem services are growing in manifolds. Ecosystem degradation is pertinent to business as the companies both impact and also depend on ecosystems directly and indirectly therefore has implications in the short and long term as well. India being recognized as one of the megadiverse countries of the world, it is important for businesses to consider biodiversity as a vital aspect of their existence and development.

As much as any other industrial sector, the chemical industry has impacts on biodiversity and ecology. In a broad-spectrum, these impacts are relatively limited in the manufacturing phase but can also be significant in other phases of the value chain as well. However, if proper opportunities to avoid, mitigate or offset adverse impacts on biodiversity are taken then the overall effect can hugely be minimized. For the chemical sector, right from the supply chain phase to manufacturing phase and consumption and waste phase, it is extremely important to consider the various risks/impacts and dependencies that the phase can trigger. Like for the Supply Chain phase, some dependencies can be noted as, provisioning of raw material, Genetic diversity (essential for the development of new enzymes and micro-organisms, which are extensively applied by chemical companies) and Pollination: Pollination is essential for at least one third of the world's crop production.

Similarly, the impacts the manufacturing phase of chemicals pose can be detailed as, air pollution, GHG emissions, water pollutions, Soil pollution, Over-harvesting and over-exploitation, Light and Noise pollution (dependent on location of the site, this impact can be relevant (e.g. site located nearby important foraging area for bats or a nearby protected bird area). Case in example, In Belgium, OmniChem (current Ajinomoto OmniChem) collaborated with the Flemish nature conservation NGO Natuurpunt to set up a winter refuge for bats. Hence, there are many chemical industry examples of biodiversity conservation or restoration measures at site level.

7 | Influx of Sustainable and Green Financing shows investor interest

2020 was a record year for ESG inflows, with global assets in sustainable funds ending the year at approximately US \$1.7 trillion, up about 67 percent from nearly US \$1.0 trillion at the end of 2019. According to Morningstar's 2020 Annual Report, net inflows to sustainable funds increased rapidly sequentially in 2020, with the fourth quarter of 2020 net inflows recording an increase of 150 percent against the fourth quarter of 2019. Europe leads in terms of growth in sustainable assets, followed by the US. However, it will not be long before India, too, follows in the footsteps of Europe and the US on ESG disclosures.

On a less conspicuous but wider scale, the relationship between chemical companies and investors is being shaped by ESG investing: investors' consideration of environmental, social, and governance factors alongside financial ones when they make investment decisions.

The practice of responsible investing began in the 1960s when investors excluded stocks or entire industries—such as tobacco or businesses involved in South Africa's apartheid regime—from their portfolios.

Since then, the money flowing into funds that invest in companies with certain values and businesses has skyrocketed, fueled by rising awareness of the climate crisis and consumers' interest in putting their

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money in firms they perceive as doing good. But while it's tempting to see this trend as a vehicle for positive change, some experts question whether ESG investing has the power to truly influence a company's financial worth. The environmental component of ESG has been the dominant driver of outperformance in the US, while governance is the driver in Europe, which is further ahead in developing an ESG regulatory framework, Jefferies surveyed more than 2,100 individual investors in the US, UK, Germany, and China for its report. It found that most prefer to invest in companies focused on sustainability and that this demand "appears to be increasingly motivating money managers to incorporate ESG into their investment process, with climate change the leading issue." An estimated \$35 trillion is now invested in funds with sustainability considerations of some kind.

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To chemical companies, this is an incentive to let sustainability motivate decision-making. The world's largest fund manager, BlackRock, made headlines earlier this year when it doubled the number of sustainability-focused exchange-traded funds it offers to 150 and removed from its actively managed portfolios companies that derive a quarter or more of their revenues from thermal coal.

8 | Future ready companies will need ESG Oversight

A company's ESG strategy spans a wide swath of the organization, requiring multiple functions to work together towards common goals and reporting that tie deeply and directly to the overall business strategy. Many companies are just beginning to pull the pieces together and close oversight from the board is essential in crafting a compelling ESG story and bringing it to life.

Management is responsible for developing and executing the company's strategy under the board's oversight. ESG risk and opportunity considerations should be embedded in the strategy. If the company is already providing ESG metrics in a variety of places (such as on its corporate website, or through social responsibility reports), you may be well served to step back and consider whether the messaging is clear and consistent across channels. Is it tied to the company's purpose, and aligned with the business strategy? Does it focus on stakeholder needs and address material risks? In this section, we take you through the important considerations.

Now that you know what the board is overseeing when it comes to management's development and execution of an ESG strategy, how exactly does the board go about overseeing these efforts? The board will have to consider a number of different topics/issues. Where responsibility lies: Because ESG strategy should align with business strategy and focus on material risks and business drivers, the full board will want to understand the ESG messaging and how those risks are being mitigated. If this is a new area of focus for the board and the company, directors may need to assign detailed oversight to specific committees to help the ESG strategy launch smoothly. Ultimately, ESG issues will be relevant to all committees. For example, the nominating and governance committee will be interested in the shareholder engagement element, while the compensation committee will be interested in accountability through compensation. The audit committee will be interested in the disclosure, messaging, and metrics.

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Here are some considerations for the full board and its committees on how to address ESG oversight:



Full Board



Audit Committee



Nominating and Governance Committee



Compensation Committee

Chapter 3

In Focus: Risk and opportunity of climate change to the chemical sector



In Focus: Risk and opportunity of climate change to the chemical sector

As per the Intergovernmental Panel on Climate Change Sixth Assessment report (AR6), climate change is already causing many weather and climate extremes in every region across the globe. The scale of recent changes across the climate system as a whole are unprecedented over many centuries to many thousands of years.

Global surface temperature will continue to increase until at least the mid-century under all emissions scenarios considered. Global warming of 1.5°C and 2.0°C will be exceeded during the 21st century unless deep reductions in carbon dioxide (CO₂) and other greenhouse gas emissions occur in the coming decades. Many changes in the climate system become larger in direct relation to increasing global warming. They include increases in the frequency and intensity of hot extremes, marine heatwaves, and heavy precipitation, agricultural and ecological droughts in some regions, and proportion of intense tropical cyclones, as well as reductions in Arctic sea ice, snow cover and permafrost. Continued global warming is projected to further intensify the global water cycle, including its variability, global monsoon precipitation and the severity of wet and dry events.

From a physical science perspective, limiting human-induced global warming to a specific level requires limiting cumulative CO₂ emissions, reaching at least net zero CO₂ emissions, along with strong reductions in other greenhouse gas emissions. Strong, rapid and sustained reductions in CH₄ emissions would also limit the warming effect resulting from declining aerosol pollution and would improve air quality.

With this AR6 report as background, all the nations gathered at CoP26 UN Climate Change conference in Glasgow this year to up the ante on reducing global emissions. As part of the conference, India also announced several targets:

- India will get its non-fossil energy capacity to 500 gigawatt (GW) by 2030
- India will meet 50 per cent of its energy requirements from renewable energy by 2030
- India will reduce the total projected carbon emissions by one billion tonnes from now onwards until 2030
- By 2030, India will reduce the carbon intensity of its economy by 45 per cent
- By 2070, India will achieve the target of Net Zero

This net zero 2070 ambition means that companies in India have to align their future course of action in line with the transition to a low carbon economy. Some of India's biggest companies have declared net-zero targets, including Reliance Industries (RIL), Tata Consultancy Services (TCS), HDFC Bank, Wipro, Infosys, Mahindra & Mahindra, JSW Energy, ITC, Adani, Dalmia Cement, and Indian Railways and we see more and more companies taking up such ambitions.

Chemical sector and Climate Change

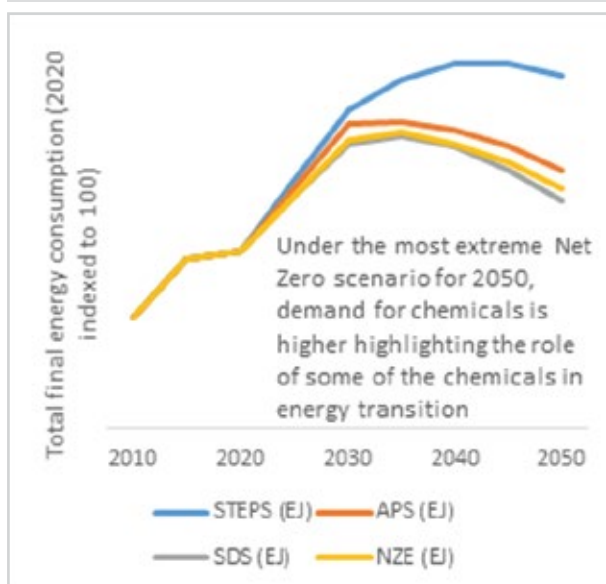
The chemical sector, through its role in the entire value chain, is linked to almost all the industries and plays an important role in our daily lives. Hence, in line with the expectation of increase in global population and increase in standard of living, global chemicals production is expected to grow at a rapid pace as well.

Global economy depends on chemicals and this reliance is only expected to increase, especially in the transitioning world, where chemical industry play a critical role in the low carbon energy transition.

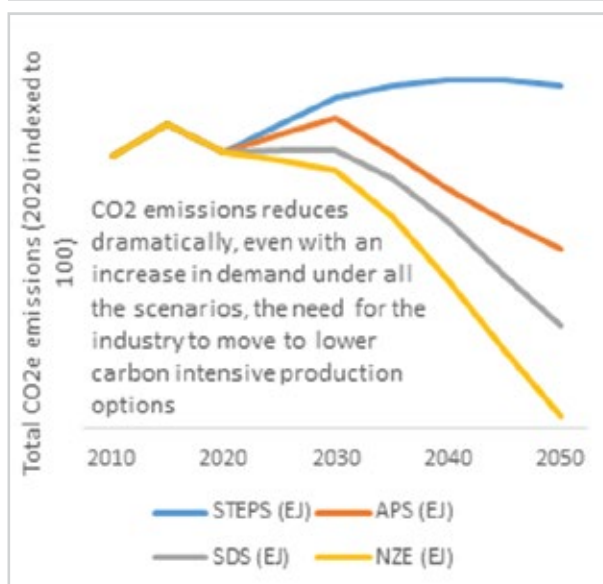
In Focus: Risk and opportunity of climate change to the chemical sector

Even under a transitioning world, moving toward low carbon future, chemicals are expected to play an important role. Many low-carbon technologies rely on chemical innovation to become efficient, cost effective and scalable. Chemical sector provides material for solar PV systems and wind turbines. Some of the other chemical products help in bringing efficiencies in the building, industry and transport sectors. For instance, lighter weight automotive parts can help bring fuel efficiencies in both internal combustion as well as electric vehicles reducing the need for traditional fuels as well as electricity.

Chemicals demand well supported under all the transition scenarios...



however, adoption rates of low carbon technologies intensifies proportionately



Source: IEA (2021), World Energy Outlook 2021, IEA, Paris <https://www.iea.org/reports/world-energy-outlook-2021>

On the flip side, chemical sector is also a carbon intensive sector which makes it prone to climate-change related risks. As the world is transitioning toward a lower carbon trajectory, it would mean that chemical companies would have to change the way they have been operating traditionally. Companies would have to look to adopt greener technologies and invest in research and development of such technologies, incurring additional capital and operating costs compared to a business-as-usual case.

There could potentially be carbon prices/ carbon trading mechanisms in place in the future impacting the profitability of the business in the future. Increasingly, more end users, whether a business or an individual consumer, will seek products which have a lower carbon footprint, which could impact the revenues of the company.

In addition to these impacts on the financial metric of the businesses, there are now increasing requirements on the companies globally to disclose the climate-related risks and opportunities relevant to their company and how it is managing them. Stakeholders, including investors, are keenly looking at the governance structure of the companies, risk management framework, strategies on mitigating risks and capturing opportunities, and the disclosure practices pertaining to such climate-related risks and opportunities.

In Focus: Risk and opportunity of climate change to the chemical sector

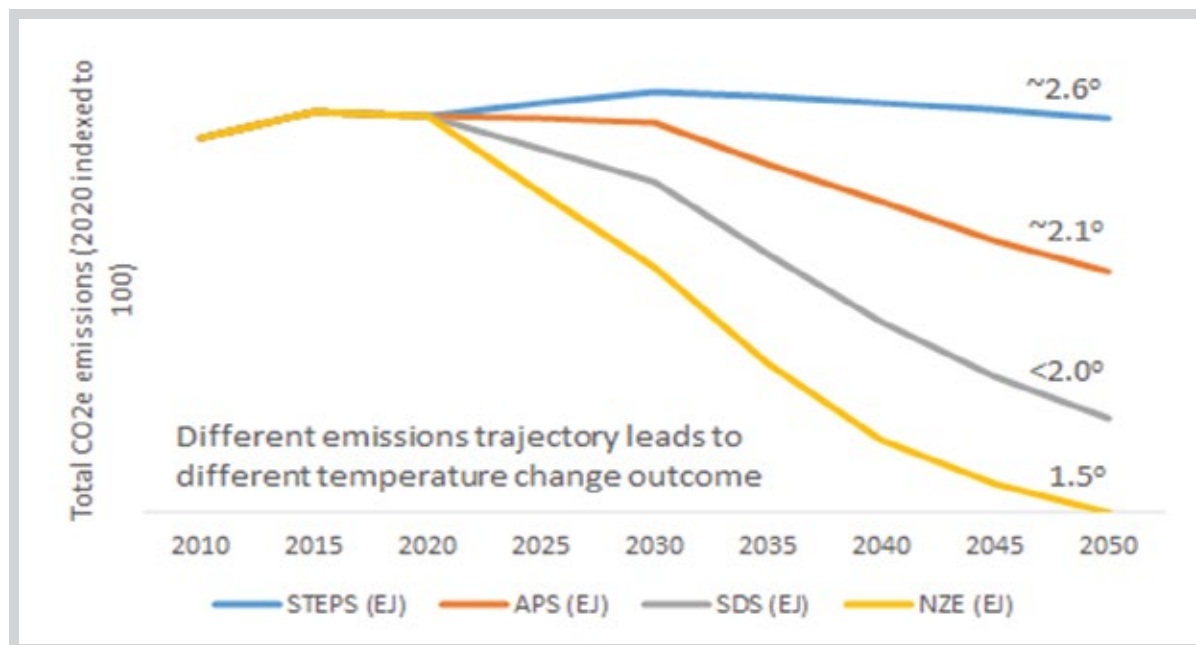
Different IEA scenarios, their emissions trajectory and temperature change impact.

STEPS: Stated Policy Scenario depicts the impact of government measures actually put in place, as well as policy initiatives under development. IEA estimates that these policies will lead to an average global temperature increase of 2.6° C from pre-industrial levels by 2100.

APS: Announced Pledges Scenario takes into account impact of more than 50 countries, as well as EU, that have pledged to meet net zero emissions. This scenario leads to an average global temperature increase of about 2.1° C from pre-industrial levels by 2100.

SDS: Sustainable Development Scenario provides a view on the energy transition required across the global to reach net zero by 2070 and limit temperature increase to below 2.0° C from pre-industrial levels by 2100. It is considered a Paris-compliant scenario.

NZE: Net Zero Emissions 2050 charts a roadmap to restrict temperature increase to 1.5° C from pre-industrial levels by 2100. The global temperatures have already risen by 1.1° C and to achieve this roadmap, energy transition needs to happen now.



Source: IEA (2021), World Energy Outlook 2021, IEA, Paris <https://www.iea.org/reports/world-energy-outlook-2021>

Physical Risks of Climate Change

From a climate-related physical and transition risks and opportunities perspective, the G-20 Financial Stability Board, that monitors and makes recommendations about the global financial system, has recommended the implementation of guidelines prescribed by the Task Force on Climate-related Financial Disclosure (TCFD). TCFD defines the Physical Risks as risks associated with physical impacts from climate change that could affect the assets and operating companies. These impacts may include acute physical damage from variations in weather pattern (such as storm, flood, and drought) or chronic impacts such as sea level rise and desertification (TCFD, 2017).

In Focus: Risk and opportunity of climate change to the chemical sector

Extreme weather events have been identified by the TCFD as top risk in terms of likelihood since 2017 to 2021; it has also been ranked within top five risks between the same period by the World Economic Forum ((WEF). It is also evident from the increasing trend in number of extreme weather events reported globally. Extreme weather events indicated approximately five-fold increase in decadal occurrences, with 711 events reported in 1970-1979 to 3165 events reported in 2010-2019. Similarly, the economic losses indicated an increase from USD 175.4 Billion in the decade of 1970-1979 to USD 1381 Billion in the decade of 2010-2019 (WMO, 2021).

India also presented similar trend in occurrences of extreme weather events. Decadal trend since 1960 indicated an increase in occurrences of extreme weather events, with 21 events in the decade of 1951-1960 to 96 events in the decade of 2011-2020. Decade of 2001-2010 indicated most number of events (123) during the period of 1951-2020.

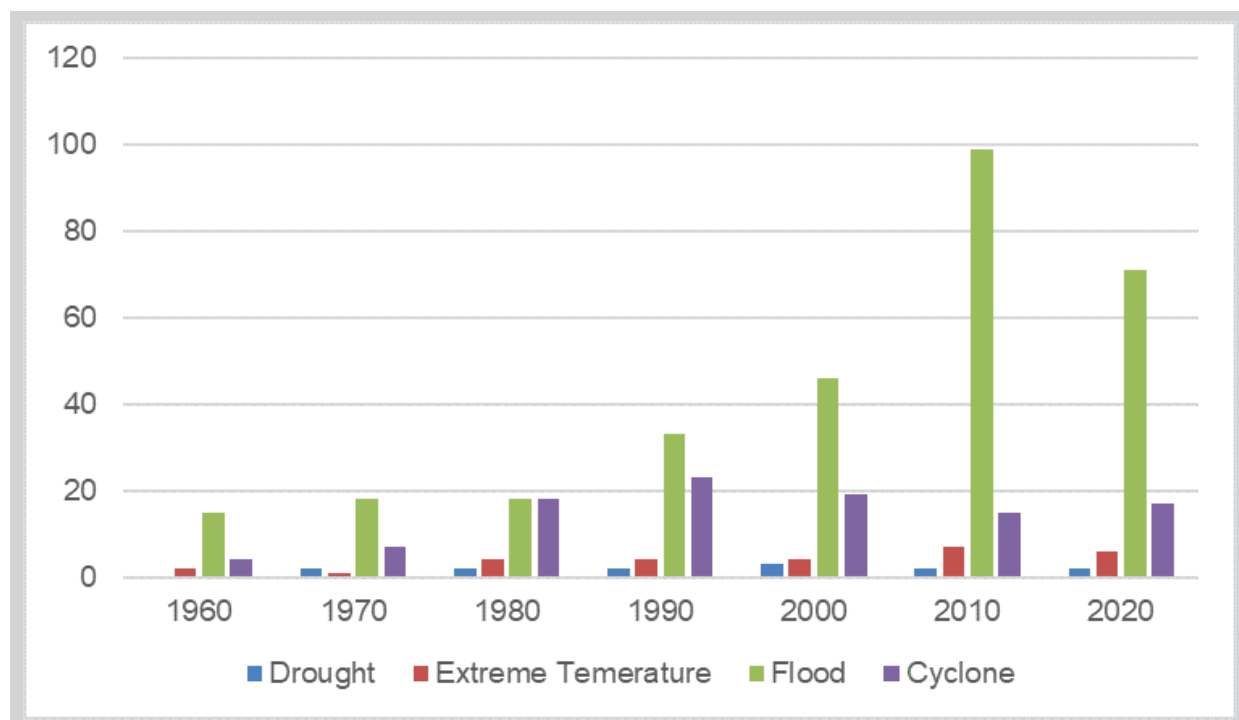


Figure 4: Decadal Trend in Extreme Weather Events during 1951-2020 (Source: EM-DAT)
Year indicates the last year of decade. For example, 1960 corresponds to decade of 1951-1960

India is also reported to be the 5th most affected country in 2019 by climate related disasters. However, India reported highest fatalities and financial losses among the top ten most affected countries in the same year. The financial losses reported to be USD 68812.12 Million (PPP), resulting in ~0.72% loss of GDP (Eckstein, 2021).

Some of the change in extreme event occurrences are reported to be attributed to anthropogenic influences, including increase in concentration of atmospheric greenhouse gases. One of the reason for long-term increase in losses economic losses is reported to be increased exposure to population and economic assets. The trend in economic losses adjusted for population and economic increase are not attributed to climate change, but the role of climate change is not excluded (IPCC, 2012). Climate change projections in general, indicate likely increase in frequency and intensity of some of the extreme weather events including extreme temperature, floods, and cyclones.

In Focus: Risk and opportunity of climate change to the chemical sector

Potential Implications on Chemical Sector

Changes in Temperature and Extreme Heat Conditions

A recent publication by Indian Institute of Tropical Meteorology (IITM) evaluating the climate change projection for Indian region indicated a projected increase of 1.92°C by mid-century and 2.34°C by end-century in average annual temperature under RCP 4.5 scenario. The increase in average annual temperature under RCP 8.5 scenario is projected to be 2.66°C by mid-century and 4.31°C by end-century. The temperature change is projected to be more prominent in northern parts of India as compared to peninsular India. The increasing temperature is also likely to result in increased frequency and duration of heat waves. Heat wave frequency is projected to increase throughout the peninsular India under RCP 8.5 scenario in mid (1-4 heatwaves/ season). Increase in temperature and extreme heat events may result reduced working efficiency of employees. Moreover, heat stress may pose significant health risk and could be fatal in extreme cases. Higher ambient temperature would also result in increased cooling demand resulting in higher expenditure on power supplies. Moreover, existing cooling system may not be able to provide optimum performance, requiring the systems to be replaced resulting in additional costs. Ambient temperatures may be particularly critical to chemical sector as extreme temperatures can affect the temperature sensitive processes and transport of volatile chemicals.

Changes in Rainfall Pattern and Water Availability

Climate change projections for annual rainfall also indicated an increasing trend with increase of 10-20% under RCP 4.5 and 10-30% under RCO 8.5 scenario by mid-century. Increase in annual rainfall by end century is projected to be in the range of 10-30% under RCP 4.5 and 45% under RCP 8.5 scenario. It should be note that this increase in rainfall is likely to be received as number of short duration high intensity rainfall as indicated by projected increase in consecutive 5-day rainfall and number of consecutive dry days⁷. Therefore, the increased rainfall may not result in increased availability of water in the absence of sufficient storage capacity and water management policies in place. Moreover, the increased intensity of rainfall may result in increase in flood events. The water availability may further be exacerbated by increasing demand from multiple stakeholders including domestic, agriculture, and industrial. Reduced availability of water in future may not only lead to direct impact the production capacity, but also lead to conflicts among the stakeholders depending on the common water source, stringent regulations on abstraction of water and recycle for industrial purposes.

Changes in Extreme Precipitation and Flooding

Projections for extreme precipitation indices such as contribution very wet day precipitation to total precipitation and consecutive five-day precipitation indicated a general increasing trend throughout the India under all climate change scenarios. The contribution of very wet day precipitation to total precipitation indicated higher increase along western coast and parts of Ganga basin under all climate change scenarios. This contribution is further projected to increase with higher warming (time and radiative forcing). The western coast has indicated an increase of up to 25% by end century under RCP 8.5 scenario. Whereas, rest of the India indicated 15-20% contribution from very wet day precipitation to total precipitation. Projections for five-day consecutive precipitation also indicated increasing trend. Western and Southern parts of India indicated higher increase in five-day rainfall as compared to rest of the India. Highest increase of ~40% is projected in parts of Rajasthan, Gujarat, Maharashtra, Goa, Kerala, Karnataka, Tamil Nadu, and Andhra Pradesh (Pai, et. al., eds, 2020)⁸. Furthermore, the increase in flood events is projected to be higher in the south-eastern and eastern parts (especially near coastal areas) of India.

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Such increase in flood events may result in increased number of operational disruption in coming years. Some of such disruptions have already been reported in recent times by the chemical companies in western India, resulting in disruption of operations for up to 7 days. Such business disruptions could result in loss of production and revenue. Apart from damages to physical assets and disruption of operations, chemical sector in particular may be exposed to liability risks due to presence of large quantities of hazardous chemicals and substances, which may be released to environment during flood events (Chemical Industries Association, 2015). Such chemical releases can be difficult to contain and result in significant damage to environment and ecology and pose risk to human life.

Changes in Cyclone

Frequency of tropical cyclones in North Indian Ocean indicated a decreasing trend during 1961-2018. However, number of very severe cyclonic storms indicated increasing trend during 2000-2018 with +1 cyclone every decade (Krishnan et. al., 2020). Climate change projection for tropical cyclones in North Indian Ocean also indicated similar trends under 2°C scenario by end of the century. Overall frequency of tropical cyclones is projected to decrease by ~5%. However, frequency of category 4-5 (very severe to extremely severe cyclones) is projected to increase by ~5%. Moreover, the intensity of sustained wind speeds is projected to increase by ~5% and rainfall during the cyclones is projected to increase by ~17% (Knuston et. al., 2020)¹². More extreme changes in changes in cyclonic occurrences may be experienced under higher warming scenario. Cyclonic events have two major impacts: damages to due to high wind speeds, and damages due to floods as a result of high intensity rainfall. Damages to some of the chemical companies in Western India are already been reported during recent cyclonic events, resulting in damages to structures requiring temporary shutdown (partial). Such damages result in loss of revenue due to shut down and additional expenditure for repair/ replacement works. Moreover, cyclones can disrupt utilities such as power supply to the companies affecting the production capacity for few days to weeks depending on the extent of damage to the electricity grid. With increase in intensity and frequency of very severe to extremely sever cyclones such damages/losses may become more frequent and more severe. As per annual survey of industries in 2017-18, states of Gujarat, Maharashtra, Tamil Nadu, Himachal Pradesh, Uttar Pradesh, Uttarakhand, and West Bengal contributed to around 71.9% of gross added value (Department of Chemicals and Petrochemicals, 2021). Whereas, states of Gujarat, Maharashtra, Uttar Pradesh, Tamil Nadu, West Bengal, Rajasthan, and Andhra Pradesh contributed to ~73% of the output.

Most of these states are exposed to high risk from hazards such as water scarcity, riverine and urban floods, extreme heat, cyclones, and coastal floods (Figure 5). These risks are likely to exacerbate in terms of intensity and frequency with further warming as indicated by various studies.

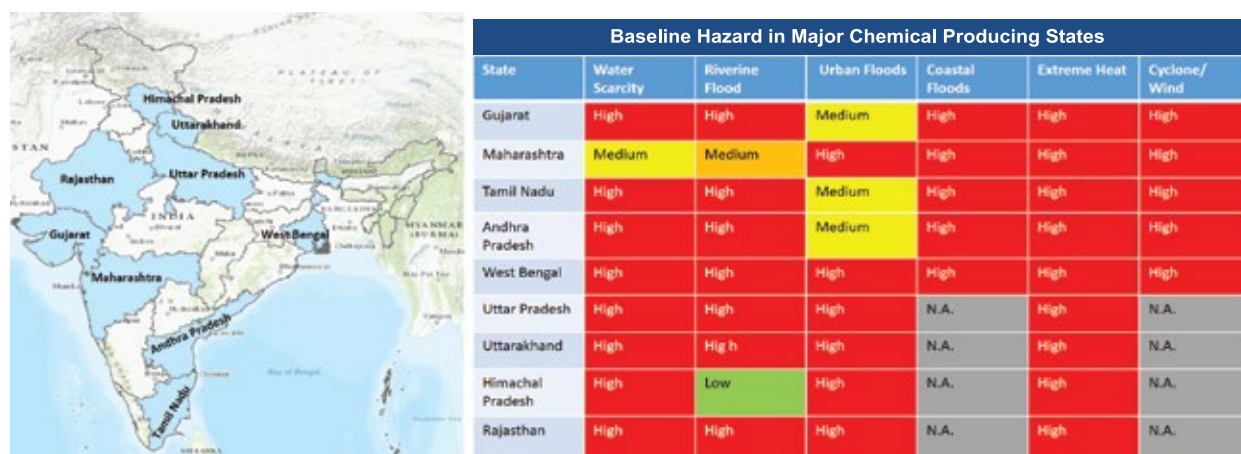


Figure 5: Major Chemical Producing States in India

In Focus: Risk and opportunity of climate change to the chemical sector

Physical Risk Outlook in Chemical Sector

As discussed above, climate related physical risk may impact the chemical sector in the form of direct damages to assets/structures, disruption of operations, weather sensitive processes, health and safety of employees, and liability risks resulting from chemical spills and releases. However, as indicated by TCFD Chemical Sector Preparer Forum, most of the businesses from this sector find transition risk more material in the short and medium term as compared to physical risks. Physical risks were reported to be more relevant in the long term, with companies having limited understanding at present (WBCSD, 2019).

The studies indicate that the physical risks are likely to be materialized after mid-century. However, sectors with less movable and capital-intensive infrastructure are likely to bear the brunt of these risks (FSB, 2020). Indian chemical industry is expected to reach to USD 304 billion by 2025 from USD 178 billion in 2019. This expected increase in the value of the chemical sector will result in expansion or establishment of new assets in the coming years. Long lifetimes of such assets increase their exposure to long term changes in extreme weather events (climate related physical risk).

Incorporation of multi-hazard approach in the planning stage are reported to be increasingly recognized internationally as one of the disaster management and adaptation strategies (IPCC, 2012)⁵. Moreover, financial institutions and lenders are increasingly demanding the climate related risk to be disclosed as a pre-requisite for financing. Therefore, it becomes imperative that the chemical sector recognize these risks and prepare at the earliest.

Climate change-related transition risks and opportunities

Under the TCFD guidelines, for assessing transition risks, a company need to assess them under the following categories: policy and legal, market and technology and reputational risks.



Policy and Legal

Transition Risk

Increased pricing of GHG emissions and enhanced reporting obligations

Mandates on, and regulation of, existing products and services

Chemicals Business Implications

Restrictive cap and trade policy

Carbon pricing

Carbon Border Adjustment Mechanism to be implemented in EU

US looking to adopt policies on similar lines and other countries may follow suit



Market

Transition Risk

Changing customer behavior

Uncertainty in market signals

Increased cost of raw materials

Chemicals Business Implications

Increase in demand for recycled products

Shift in demand from internal combustion vehicles to electric vehicles

Improved application efficiency in the end use sectors,

Could offset some of the growth for ammonia and urea over the long term

In Focus: Risk and opportunity of climate change to the chemical sector



Technology

Transition Risk

Substitution of existing products and services with lower emissions options

Development and maturity of new technologies

Chemicals Business Implications

Products from less carbon intensive sources will be preferred

Biofuels, bio-feedstock, and Synthetic fuels

Carbon capture, utilization and storage (CCUS),

Green hydrogen, electrification

Patented technology that is not readily available



Reputation

Transition Risk

Increased stakeholder concern/negative feedback

Shift in consumer preferences/ Stigmatization of sector

Chemicals Business Implications

Reputational risks can degrade the intangible value of the company and goodwill

Increase in cost of capital, both debt and equity

Along with risks, climate-change also provides many opportunities to the chemical industry. World Business Council for Sustainable Development (WBCSD) paper on TCFD guidelines for the chemical sector details the opportunities shared below for the sector across different categories.

Resources Efficiency

- Use of more efficient modes of transport
- Use of more efficient production and distribution processes
- Use of recycling
- Move to more efficient buildings
- Reduced water usage and consumption

Energy Source

- Use of lower emission sources of energy
- Use of supportive policy incentives
- Use of new technologies
- Participation in carbon markets
- Shift toward decentralized energy generation

Products and Services

- Development and/or expansion of low emission goods and services
- Development of climate adaptation and Insurance risk solutions
- Development of new products or services through R&D and innovation
- Ability to diversify business activities
- Shift in consumer preferences

Markets

- Access to new markets
- Use of public sector incentives
- Access to new assets and locations needing Insurance coverage

Resilience

- Participation in renewable programs and adoption of energy efficiency n.
- Resources substitutes/diversification

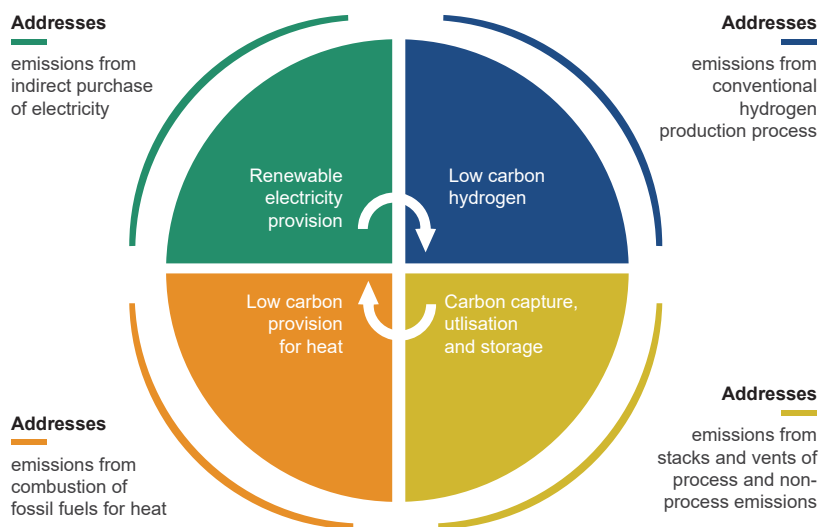
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Emissions sources, mitigation options and how chemical sector would need to transition

As per IEA, “The chemical sector is the largest industrial consumer of both oil and gas. Yet despite being the largest industrial energy consumer, it is the third industry subsector in terms of direct CO₂ emissions – behind iron and steel, and cement. This is largely because around half of the sector’s energy input is consumed as feedstock, the emissions of which are released downstream in other sectors.”

Chemicals sector is considered one of the hard-to-abate sectors as besides non-process emissions, there are several sources of process emissions as conversion of some of the feedstock lead to emissions. The conversion process of hydrocarbons require high degree of heat which is sourced from combustion of fossil fuels leading to high intensity of non-process emissions too.

Hence to reduce the carbon footprint and to mitigate the transition risks and capture the opportunities, companies’ would have to adopt greener technological options. For adopting such greener options, companies need to first assess the material sources of emissions, which would vary across products, location, size, type of feedstock, production process, technology etc. However, addressing some of the key sources of emissions generally applicable to chemicals and petrochemicals production process, we can refer to the infographic below.



There are host of options available to address key sources of emissions across the four quadrants highlighted above. Some of the technologies are at an early stage of development, or colloquially called early stage of technology readiness level, and are quite expensive. However, some of the low-hanging fruits in terms of energy efficiency measures, process improvements, replacement of old inefficient equipment etc. can be incremental in nature with technology easily available and at low costs.

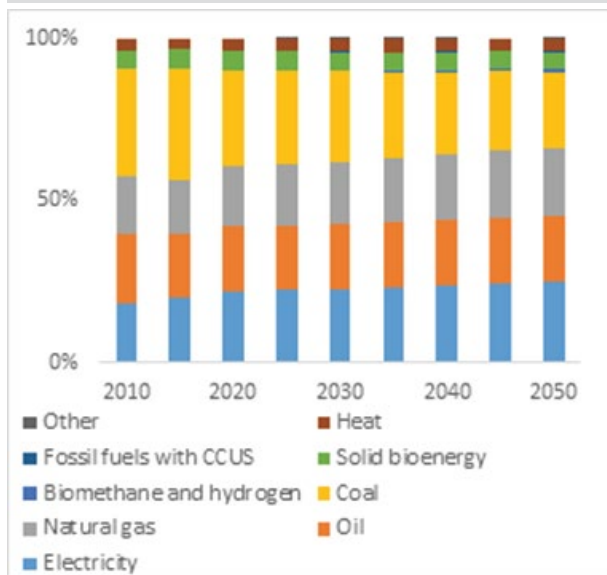
Renewable energy options to address emissions largely from purchased electricity is a viable option in a country like India, where there is a lot of potential for renewable energy deployment. For converting some of the captive electricity to renewables, alternative use for the recovered waste fuels and gases needs to be taken into account, if they are getting utilized for generating electricity. However, if there are no alternative uses, then the company might still have to rely on the existing method of generating electricity and instead use other technologies to capture CO₂ emissions.

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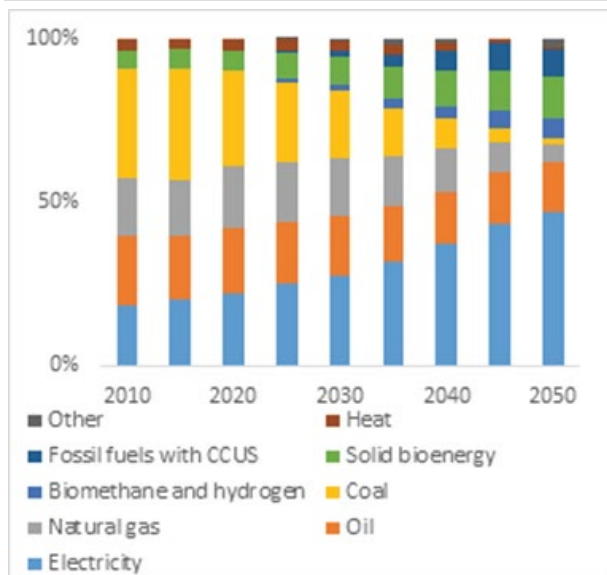
Carbon capture, utilization and storage (CCUS) is considered one of the most important for some of the hard-to-abate sectors including chemicals sector. However, India is at an early stage of energy transition, and as such infrastructure, policy and regulatory framework is lacking for deployment of such a technology at a large scale. The carbon capture technology is readily available now but is still quite expensive, and companies would still have to chalk out plans to utilize and/ or transport and store the captured carbon.

Further, on the low carbon provision for heat, one of the most important technology being looked at currently is electrification of heat as well as processes. From furnaces to boilers, to crackers and reformers, there is research and development happening across the globe to move toward electrification and utilize renewable electricity to power equipment. A very early stage technology and even the costs estimates are at a high degree of uncertainty. Hence, this technology option is something more for a long term and alternatives may need to be deployed before in the short-to-medium term to reduce emissions.

Energy sources for industries globally under STEPS scenario



Energy sources under NZE 2050 transitions away from fossil fuels to electricity and biomass



Source: IEA (2021), World Energy Outlook 2021, IEA, Paris <https://www.iea.org/reports/world-energy-outlook-2021>

One of the options which can have an impact across these four quadrants is substitution of fossil fuels and feedstock with biomass and synthetic fuels. This option also takes into account circular options like waste plastics to naphtha, which helps reduce carbon footprint. Again, some of the technological options for biomass and synthetic fuels are at an early stage of development and are expensive. However, there are several that are largely getting deployed around the world as the global economy transitions and Indian companies would have to start looking at them seriously.

Summary

Way Forward



Way forward

Sustainability will be an important driver for the economic growth of the Indian Chemical Sector and the companies should go beyond regulatory compliance. The recent IPCC AR6 report has highlighted the urgency of climate actions the government and the companies should take to keep the temperature rise below 1.5°C. India has openly acknowledged the urgency to act and has committed to be Net Zero by 2070. As per another report by Accenture, 81 % of consumers plan to buy more eco-friendly products over the next five years. By being agile on ever evolving regulations and by capturing a share of rapidly expanding market for reusable, renewable and recyclable products, chemical companies can turn these changes to their advantage and drive growth while helping to shape a greener, cleaner, more sustainable future.

Chemical Companies may have many reasons to focus on ESG issues- They may want to stay ahead of stringent regulations or satisfy their customers, who are increasingly choosing brands with strong ESG credentials, even if the prices are higher. Others react to pressure from banks and investors, want to improve employee engagement, or feel a need to better attract and retain talent. For most organizations, the answer will be a combination of these factors, which together add up to a need to understand and manage impact through every part of the business value chain.

ESG leadership begins with own operations, but it can't stay there. The sustainability agenda of the company should go beyond their operations and should cover the supply chain from resource acquisition, through consumption and to the disposal of products. The Indian companies should not only align their ESG strategy with the local regulation but also with the commitment and expectation of value chain partners. Digitalization plays an important role in tracking and monitoring the ESG performance and helps the management in reviewing and taking timely decision. Some of the key elements that play an important role in the success of the ESG programs are:

Leadership, strategy and culture

Rise in ESG conversations is intensifying and most of the corporates are looking to move up on the sustainability maturity curve. Real progress is only made if the entire organisation buys into the value of sustainability. Also, senior leadership embracing a vision helps instil a culture of sustainability throughout the organisation. Such a vision also helps direct all the business functions, including sustainability, finance, operations, marketing and communications, to work towards the same business-driven goals that reward investors, employees and society at large.

Better data equals greater knowledge, insights, and reporting capabilities

Digitalisation is playing an increasingly central role in many organizations' ESG programs. The data challenges posed by a need for robust ESG reporting may seem daunting, but there is a range of solutions available to make sense of various ESG initiatives. Better data-gathering technology not only allow investors to examine companies in a much more granular way than they could in the past but also allows different functions to understand the business opportunity in a way that is relevant to their roles. Massive amounts of information can be harvested and used to drive objective, quantitative decisions.

For instance, an organization with a complete picture of the business implications of issues like climate-related risks and opportunities of new products and services can take the necessary actions like investing in technology and buying and selling assets.

An ESG data management solution can help coordinate the moving parts, report on progress and stay ahead of activists, investors and competitors.

Way forward

Choosing the right solution is vital, and organizations should prioritize five key criteria and areas of functionality when shortlisting options:

- Flexibility
- Data collection
- Monitoring and reporting
- Specialized functionality in climate/sustainability and executive compensation
- Service and support

With ESG only anticipated to grow in importance among consumers, legislators, regulatory bodies and investors, companies need to get ahead of the game when it comes to ESG data collection, benchmarking and reporting. And the solution a company choose needs to be flexible and scalable, so it evolves with changing ESG priorities and external drivers.

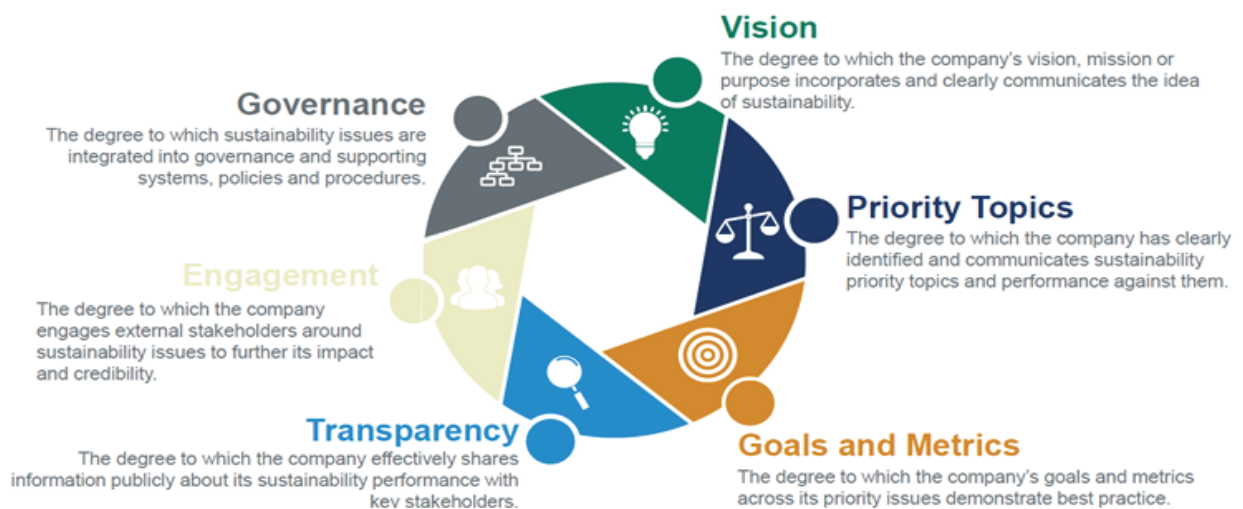
So what does it mean for a company's future?

Understand where the company is on their Sustainability performance, using verifiable data, rather than opinions. Define where it 'want to be' and assess the gap. This gap can impact everything from customer and employee attractiveness and retention, to longer term brand issues.

Once identified, these gaps can be addressed through mitigation strategies but it is important to make sure that the material risks become part of the risk management practices. Conversely, such an understanding could also help in identifying potential benefits and help an organisation in seizing opportunities. These mitigation steps and seized opportunities can help the organisation move up the curve particularly in terms of operational excellence, business integrity, and access to market and capital and support the future state that it want to reach.

As more parts of the organization start to embrace the importance of sustainability as a driver of growth, building the foundation of the company on six key attributes will prove instrumental in creating value for the organisation in the long-term.

Sustainability Leadership: Key Attributes



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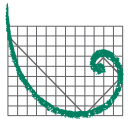
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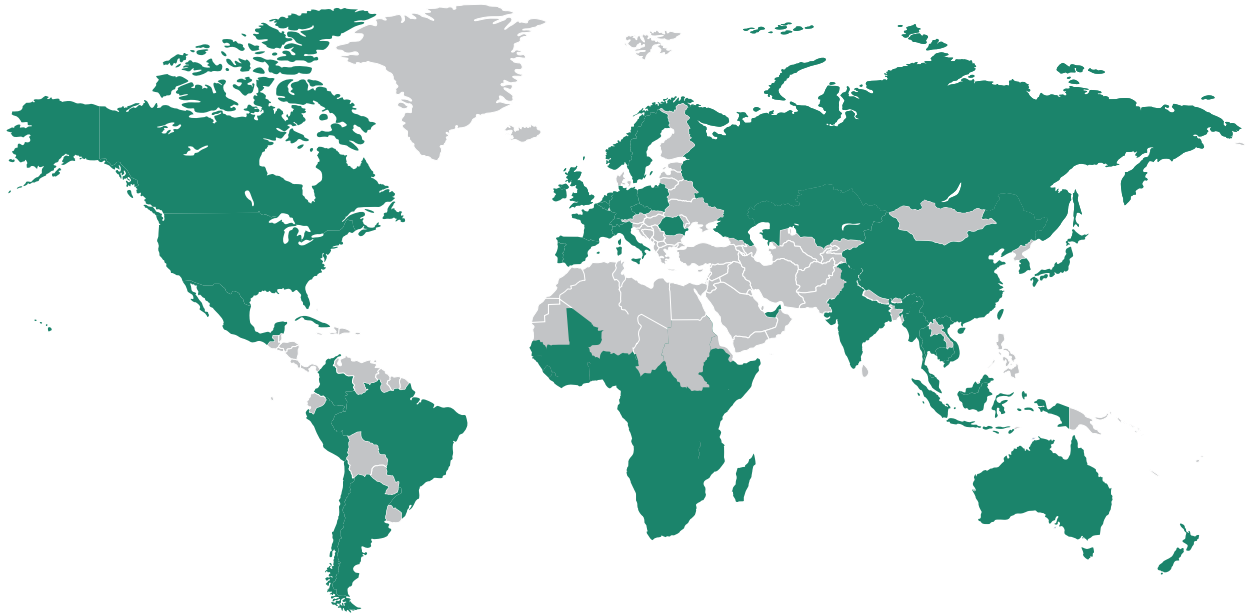
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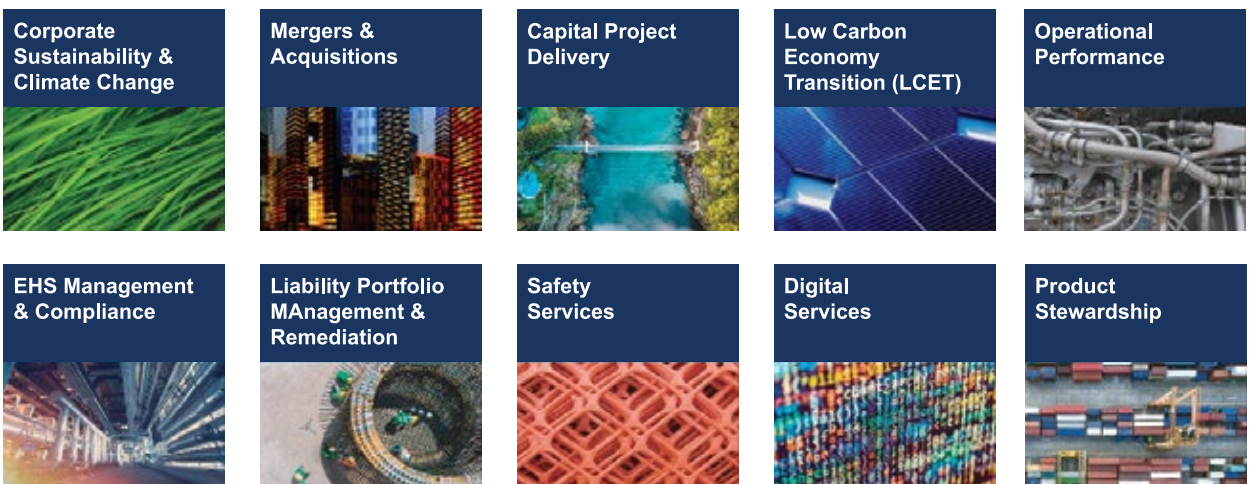
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Contact us



.....
Shivananda Shetty

Partner
Asia Pacific

Shivananda.Shetty@erm.com



.....
Jaydeep Sathaye

Partner
Asia Pacific

Jaydeep.Sathaye@erm.com

The business of sustainability

