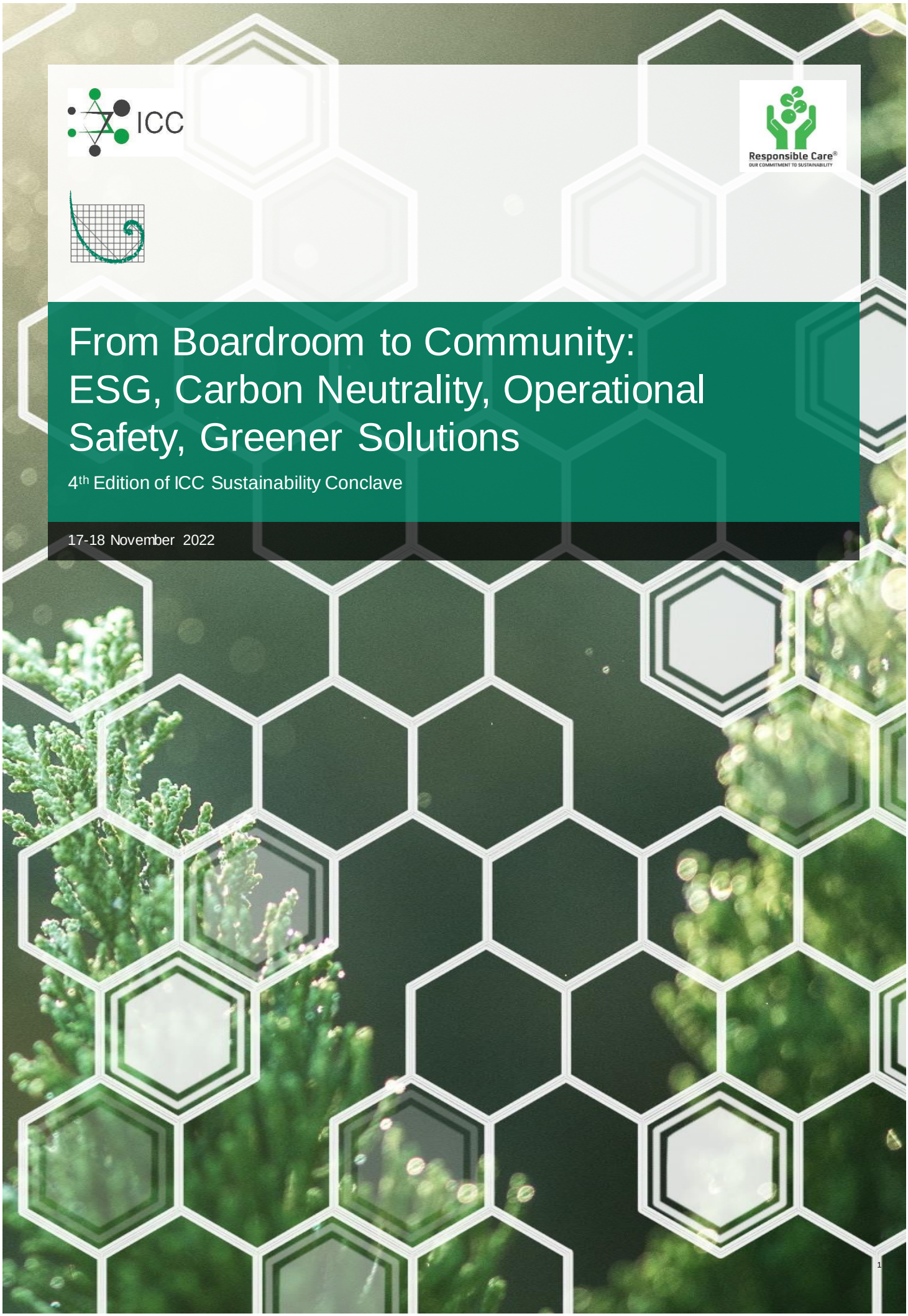

From Boardroom to Community: ESG, Carbon Neutrality, Operational Safety, Greener Solutions

4th Edition of ICC Sustainability Conclave

17-18 November 2022

Acknowledgements

ERM would like to thank the India Chemical Council (ICC) for collaborating with us and inviting us as a knowledge partner for the 4th edition of ICC Sustainability Conclave, November 2022.

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

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Message Of Encouragement

भगवंत खुबा
ಭಗವಂತ ಖೂಬಾ
BHAGWANTH KHUBA

सत्यमेव जयते

Azadi Ka Amrit Mahotsav

रसायन एवं उर्वरक एवं
नवीन एवं नवीकरणीय ऊर्जा राज्य मंत्री
भारत सरकार
Minister of State for
Chemicals & Fertilizers and
New & Renewable Energy
Government of India

MESSAGE

India is gearing up to become the world's economic growth engine. However, this can be achieved only when the growth is sustainable in terms of our surrounding environment, community, etc.

In order to fulfil our Hon'ble PM's vision of making India a $5 trillion dollar economy by 2025 and, Net-Zero by 2070 we need to reimagine our relationship with nature and reprioritize our goals on how we create impact, on the environment and society that we all are a part of.

One of the key contributors to India's growing sustainability story is the Indian Chemical Industry. As the 6th largest in the world and 3rd largest in Asia, this sector is expected to become the economy's 'growth anchor' in the near future. Accounting for 7% of the GDP, 14% in overall index of the industrial production, and employing over 2 million people this sector, it is not only aiming for economic revival but also positioning India to become a resilient, sustainable and stable growth engine for the world.
Sustainability is not a buzz word any more. Organizations across the world are treating their sustainability goals as the new frontiers of innovation and operational excellence. ESG, Carbon Neutrality, Safety, Green Chemistry, etc are topping the charts for chemical industry across the globe. Top companies are realigning their sustainability goals as absolute must-haves in their business plans.

I heartily congratulate the ICC for organizing the Fourth edition of Sustainability Conclave and to have planned such a timely and comprehensive thought leadership forum that highlights how sustainability is an integral value enabler for the Indian chemical industry, now and into the future.

Much as I was looking forward to attending this forum, I am taking forward our nation's message and vision to the international community at COP 27 at Sharm-El Sheikh, Egypt.

I am sure this conclave will come up with further solutions to propel India's drive towards achieving our Hon'ble PM Shri Narendra Modi's global climate commitments and vision of becoming Carbon Neutral.

Let us make the Chemical industry the corner stone of India's Sustainability journey.

Jai Hind!

(Bhagwanth Khuba)

Chemicals & Fertilizers : Room No. 315, 'A'-Wing Shastri Bhawan, New Delhi-110001 Tel : 011- 23382364, 23383686, 23381768
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Message from ICC Leadership

Mr. Bimal Goculdas

President, ICC and MD & CEO, DMCC Speciality Chemicals Ltd.

Dear Industry Colleagues,

Chemicals are an integral part of our daily life touching almost all spheres of human activity. Chemical industry is a major contributor to the economic and social wellbeing of citizens in terms of trade and employment. The chemical industry is often called as industry of industries.

India is poised to play an important role in the newly recalibrated global supply chain. To achieve the Hon'ble Prime Minister's vision of US$5 trillion economy, the chemical industry's role will be crucial. Our compound annual growth rate (CAGR) accounts of 9.3 percent will help to achieve a US$300 billion market by 2025.

In this 4th edition of "ICC Sustainability Conclave" we are trying to anthologize sustainability mantra for chemical industry which I believe will be a flag bearer. With careful thought and our experience with Responsible Care we have designed this year's conclave based on the theme of "From Boardrooms to Community: ESG, Carbon Neutrality, Operational Safety, Greener Solutions".

I am also happy to highlight our focus areas. ICC Sustainability Expert Committee is working on Responsible Care, Environment and Nicer Globe and Carbon Neutrality and helping member industries. ICC Technology and Energy Expert committee guides industry with sustainable and green solution.

I would like to thank our partners including ICCA, UNEP, ACC, CEFIC, and ERM, for helping in the development of the agenda for the 4th edition of ICC Sustainability Conclave 2022'. I must also acknowledge the role of our past President Ravi Kapoor, the Sustainability Expert committee members, and our Delhi Office in making this event a continued success.

Message from ICC Leadership

Mr. Ravi Goenka

Immediate Past President, ICC and, CMD, Laxmi Organic Industries Ltd

India is gearing up to become the world's economic growth engine. This can be pragmatically achieved only by keeping the core focus on sustainable growth. We need to reimagine our relationship with nature and reprioritize our goals on how we create a positive impact, on the environment and society that we live in.

We need to strike the right balance between ecology & economy.

Sustainability is really a mother lode of organizational and technological innovations that yield both top line and bottom line returns. Smart organizations across the world are treating their business-critical sustainability goals as the new frontiers of innovation and operational excellence. Environmental and social governance, efficient and effective resource optimization strategies, sustainable product innovation, transparent and trackable value chain and a robust climate action framework are topping the charts for these organizations as a means to minimize risks and reset growth in the next normal.

One of the key contributors to India's growing sustainability story is the Indian Chemical Industry. As the 6th largest in the world and 3rd largest in Asia, this sector is expected to become the economy's 'growth anchor' in the near future. Accounting for 7% of the GDP, 14% in overall index of the industrial production, and employing over 2 million people this sector, it is not only aiming for economic revival but also positioning India to become a resilient, sustainable and stable growth engine for the world. Top companies are realigning their sustainability goals as absolute must-haves in their business's resilience strategies and rebound plans. By transcending beyond compliance boundaries, these organizations are reprioritizing their sustainability programs to deliver materially better outcomes - mitigating environmental and social risks, integrating the principles of resource efficiency, product stewardship and circularity in their operational excellence goals, developing robust corporate governance mechanisms and instilling digitally agile transformation across the value chains.

I heartily congratulate the ICC for organizing the 4th edition of Sustainability Conclave in physical mode after a gap of two years, to have planned such a timely and comprehensive thought leadership forum that highlights how sustainability is an integral value enabler for the Indian chemical industry, now and into the future.

Let us work together to make India the vanguard of sustainability.

Message from ICC Leadership

Mr. Rajen Mariwala

Vice President, ICC and Managing Director – Eternis Fine Chemicals Ltd.

I am delighted that all of you are participating in the deliberations at The ICC Sustainability Conclave.

Chemical Industry in India is at an inflection point for rapid growth. This will throw up many more challenges in scaling up operations in the areas of safety, environmental compliances, green chemistry carbon neutrality and climate change.

We will have to commit to water and energy conservation, solid waste valorization, green chemistry, carbon neutral operations. Many of these activities will turn out to be highly economical. E.g., Improving safety will help more robust operations, improving yield will reduce environmental costs. So, on so forth.

We have seen many serious safety incidents in the last couple of years as the industry started reopening after COVID.

We need to work on reducing these.

There have been citizens living in areas near Industrial Estates complaining of liquid effluent discharges on Farmland or hazardous wastes being dumped in non-notified areas. We need to make sure these don't happen.

There are solutions to many of these problems. We also have capabilities and knowledge to solve those which currently seem to be difficult. It will require determination and persistence to solve these.

It will be expensive, but we do not have a choice.

I wish all of you have insightful deliberations in the various sessions during the conclave.

Message from ICC Leadership

Mr. Ravi Kapoor

Conclave Chairman; Chairman, Sustainability Committee, ICC and MD, Heubach Colour Pvt. Ltd.

It is my pleasure and privilege to organize the 4th Edition of the ICC Sustainability Conclave on behalf of the Indian Chemical Council (ICC). This conclave has become a flagship gathering of industry captains where they exchange ideas, knowledge, experiences, technologies and most important BEST PRACTICES for moving towards our journey of sustainability NIRVANA.

Sustainability and ESG have now moved from being a lip service topic to a way of life for the chemical industry. No longer is it the fashion of the time, but now more a time to act and implement. Responsible Care principles and practices and ESG philosophy to its core, this is also spread across the globe with more than 3000 major companies signed up for the United Nations' 'Race to Zero' campaign in 2019. These companies have committed to reducing their emissions in India under the leadership of our Hon'ble PM, committed achieving 'Net-Zero' emissions by 2070.

Since the chemical industry acts as an enabler to almost all other sectors, it is extremely important that our industry leads the way to realize India's Climate goals and global commitments, implement Sustainable supply chains, ESG, Greener solutions and Carbon neutrality. Improving efficiency towards reducing carbon emissions with all possible tools like digitalisation, data analytics are the core factors to achieve sustainability and I am happy to report that our industry has started working aggressively in this direction. This conclave could not come at a better time even as negotiations are underway at COP-27 in Sharm El-Sheikh, Egypt where representatives from over 190 countries are brain-storming on the issue of Climate Change. With the inclusion of 'loss and damage' finance in the official agenda of COP-27, India is hoping that a fair negotiation on 'loss and damage' will follow which is only in keeping with the principle of 'FAIR & RIGHT'. The chemical industry has to be the vanguard of sustainability and I would like to urge all of you in joining ICC towards achieving a shared commitments and taking all necessary and pragmatic steps in running our companies in the Cleanest, Safest and Greenest manner for a carbon neutral India and a better tomorrow for all our future generations. This is our obligation and our responsibility and we need to commit fully and completely to this.

Message from ERM Leadership

Mr. Jaydeep Sathaye

Lead Partner, India, ERM India Pvt. Ltd.

As we prepare this Knowledge Paper, the world's leaders have gathered in Egypt for the Conference of the Parties at the UN Climate Change Conference (COP27). COP27 has been billed as the 'implementation' COP, where we see the momentum move from strategy, planning and previous commitments, to action.

Action to help the less developed economies, people and ecosystems mitigate and adapt to higher intensity and more frequent storm events, or to prolonged dry periods, higher temperatures and heat stress, to the threat to public health and physical/social infrastructure caused by biodiversity loss and ecosystem damage, and more. The private sector is a critical part of the solution and actions taken by corporates- industrial, manufacturing financial or others- drive other stakeholders to modify behaviours. One cannot overstate the importance of collaborative and innovative action between corporates, private and public enterprises, the financial sector, policy makers, think tanks, civil society organizations and individuals, to address this unprecedented crisis in human history.

Addressing the crisis requires rapid, revolutionary ways of thinking. The chemical sector represents about 7% of the world's GDP (in 2017), but plays a foundational role in the solutions to climate change mitigation and decarbonization, perhaps disproportionate to this size. Thus, the performance of the sector along Environment, Social and Governance (ESG) factors in its value chain and how it decarbonizes will have impacts far beyond asset boundaries.

'Chemicals' are in everything, and chemistry is everywhere. Present-day materials innovation is a critical part of the technologies and approaches to mitigation of climate change and creation of new business value. For example, the sector is intricately tied to the development of new energies (e.g., electrolysers for hydrogen generation, batteries for EVs or grid-scale storage, wind turbines, solar panels), a digitally-driven agricultural reinvention (e.g., inputs that reduce GHG emissions and enhance soil health), abatement of emissions (e.g., carbon capture, sequestration, re-use), water management, and much, much more.

This edition of the Knowledge Paper is dedicated to exploring some of the key ESG, sustainability technology and decarbonization considerations that are available to the chemical sector with an emphasis on relevance to India. All planning is global, action is local. ERM is a 50-year-old 'glocal' advisory firm, with offices worldwide including in India since 1995, with five in-country offices and 120+ core sustainability subject matter experts. We work with most of the largest chemical companies in the world to help them address their sustainability challenges and uncover opportunities in an era when sustainability and business performance need to be fully integrated.

We are thus very pleased and grateful to the ICC, to produce this paper to contribute to the collaborative and innovative actions urgently required to address the sustainability challenge. Our hope is that this paper spurs further ideas, discussion and innovation on the journey to accelerate towards a sustainable world.

CONTENTS

Setting The Context

In the words of the Department of Chemicals & Petrochemicals (DCPC), Ministry of Chemicals and Fertilizers, India, "The chemical industry is a knowledge intensive as well as capital intensive industry. It is an integral constituent of the growing Indian industry. It includes basic chemicals and its products, petrochemicals, fertilizers, etc. The diversification within the chemical industry is large and covers more than eighty thousand commercial products. This sector occupies a pivotal position in meeting basic needs and improving quality of life. It is also the main stay of industrial and agricultural development of the country and provides building blocks for several downstream segments such as textiles, papers, paints, varnishes, soaps, detergents, pharmaceuticals."

The above introduction to the Indian chemical industry by the DCPC clearly highlights the importance of the sector to the economy. However, it also therefore reflects the reality that geopolitical issues, economic downturns, trade or other barriers and environmental performance of the industry, to name a few variables, could impact the industry.

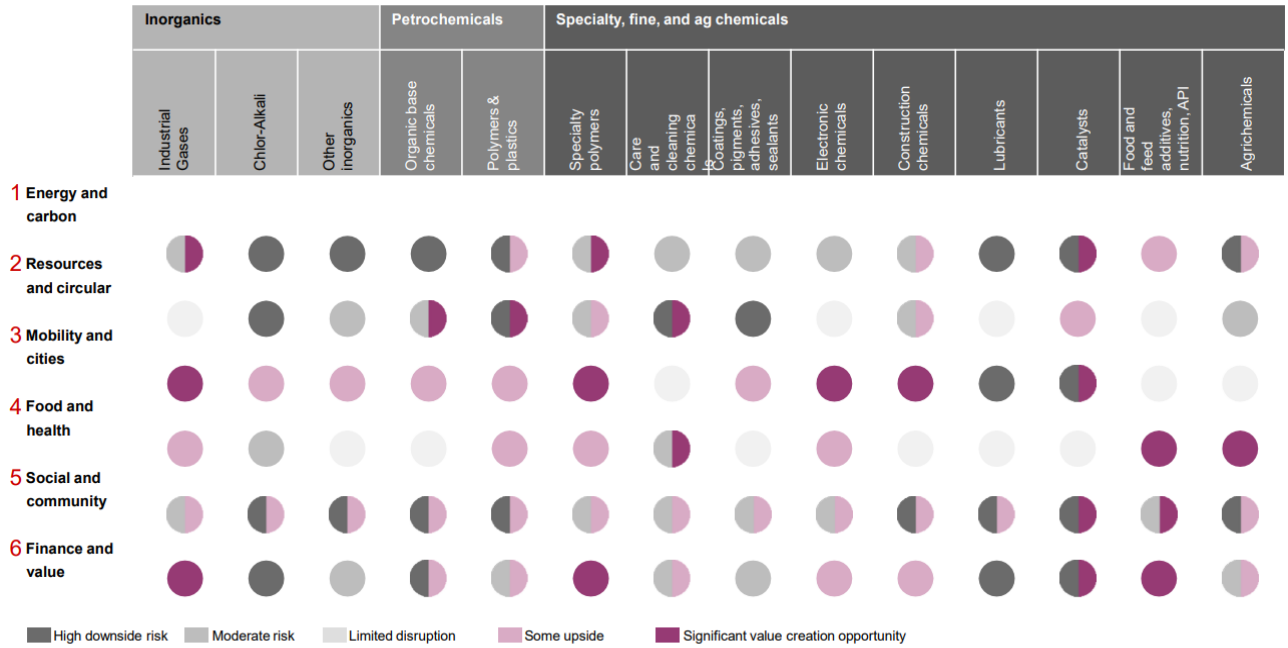
The COVID-19 pandemic led to a reduction in the chemical industry output in 2020 and early 2021. The post-pandemic economic recovery provided strong growth to the industry. However, global chemical industry in 2022 was marred by volatility driven by the central-Asian geopolitical tensions which disrupted the supply chain of key fuels and raw materials for the chemical industry. The European economy negatively impacted by high energy costs, the US economy dampened by high inflation and rising interest rates, and China's zero-Covid policies all have led to a weaker economic environment globally, resulting in weakening in several Asian markets too, faced by softening export demand and rising prices for energy imports.

Chemicals and materials are ubiquitous in the modern-day lifestyle, and for chemical producers to operate in this evolving global landscape, there will be a strong need to make fundamental changes, either proactively or reactively. The Covid disruption followed by the geopolitical conflicts have already led to transformation in some parts of the industry and has made companies brace for potential headwinds. There are also ever-changing stakeholder's expectations, including changing investor requirements and customer preferences, which are increasing pressure on companies to evolve continuously. These factors are in turn resulting in setting a new trajectory for the industry with a greater than ever focus on sustainability (both, environmental and corporate) in the chemical industry.

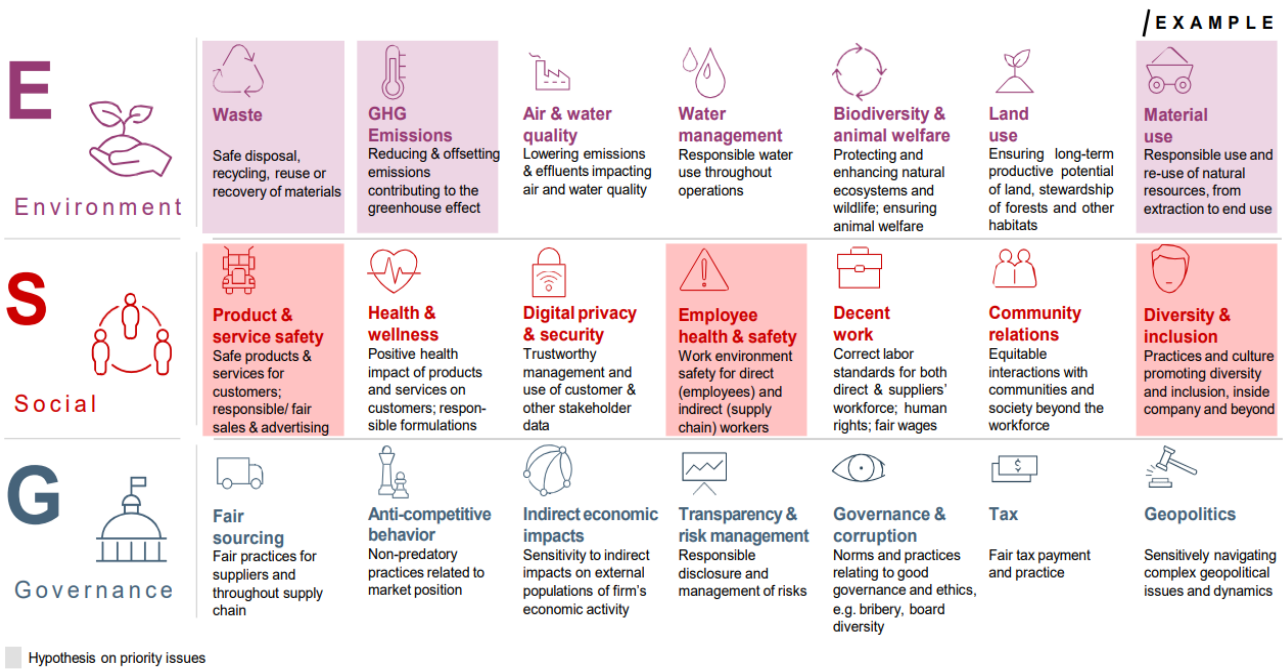
Beyond other factors, ESG-related factors are also driving a transition in the global economy. There is an increasing focus on not only how company is impacting the ecosystem around it but also how the ecosystem is changing the dynamics for the company. These 'double materiality' aspects are covered in this knowledge paper to provide a cohesive view to the industry.

These double materiality impacts, as contextualized for the chemical sector, are summarized in a presentation by Heubach India . This summary shows how potentially ESG driven transition in energy and carbon, resources and circularity, mobility and cities, food, and health, social and community, and finance and value can impact various segments of the chemical industry in India.

Setting The Context



The above infographic from Heubach India presentation show how the various chemical sub-sectors fit into these transitioning elements. It summarizes the view on how the different companies would have to address these elements and whether they would provide an opportunity to create value for the business or it would be a risk that needs to be addressed to defend the value of the business. Further, the image below shows the steps needed to mitigate such risks and seize some of the opportunities associated with the transition driven by ESG.



Chapter 1

VALUE CREATION WITH ESG

Value Creation with ESG

The Indian Chemical industry, which makes up 3.4% of the global chemicals industry , has a significant role to play in making India a US $5 trillion economy by 2025. The industry will contribute ~US $300 billion to GDP by 2025 as stated by the India Brand Equity Foundation (IBEF) . The industry is growing with compounded annual growth rate of 9.3% and is expected to attract investments of ~USD 100Bn by 2025. It is currently ranked sixth in the world and fourth in Asia in terms of global revenues from chemicals.

Considering the fundamental role the chemical industry plays in the growth of Indian economy, there needs to be a competitive as well as sustainable landscape for the chemical industry. Sustainability performance of the chemical sector is driven by export markets (the US and the EU for example) as well as investors and government goals, ambitions, and policies. In the current scenario, approaching sustainability just as a compliance exercise is unlikely to help transform into a sustainable economy and way of life. Companies that act on ESG and give it due consideration will stand out as leaders whilst the others would likely be considered laggards.

7.1 Key growth drivers

India has inherent growth drivers such as increasing local demand base, significant exports with room to expand, and significant imports with scope for domestic substitution. There is an ever-increasing demand for personal care, agrochemicals, food, paints, and coatings, owing to the increasing urbanisation and rise in middle class population. In addition, post Covid-19, we are witnessing an increased demand for disinfectants resulting in the growth of chloro-alkali, ethanol, personal care, and surfactant industry. These growth drivers are coupled with the policy support from Government such as 100% FDI allowance in the chemical sector under automatic route with exception to few hazardous chemicals. The Production Linked Incentive (PLI) scheme in key end-use sectors such as pharmaceuticals, telecommunication & networking equipment, automobiles, electronics, textiles, etc., is also driving growth in the chemicals and petrochemicals sector. This growth in demand is coupled with the huge potential for investment attraction due to the emerging manufacturing hubs under the Petroleum, Chemicals and Petrochemicals Investment Regions (PCPIR) policy.

7.2 ESG Trends in Chemical Sector

The chemical sector is increasingly being driven by ESG considerations. The following are some of the key trends:

- Diversification of product portfolios for future-proofing the business

  Several companies have already undertaken an ESG-driven innovation approach to unlock new industries as well as customers and are coming up with sustainable solutions that add value for the customers, as well as deliver economic value to all parties across the value chain. The solutions developed focus on issues such as water, environmental impact, raw materials, safety over lifecycle and energy use.

  The market for chemical products that enable sustainability-aligned end markets is very large, for example, electric vehicles (EVs), circular packaging, and natural ingredients. Companies should therefore focus on enabling the green economy by selling existing materials and solutions to end markets that are accelerating the sustainability trends. This would imply focusing on end-markets such as those related to EVs (battery catalysts and battery material separators), hydrogen generation via electrolysis (membranes), or energy efficiency (such as specialty insulation)

Value Creation with ESG

Many companies are using Portfolio Sustainability Assessments (PSAs) developed by World Business Council for Sustainable Development (WBCSD) to analyse different market signals in the end-markets of their business.

Considering the commitments that were made by India at COP 26 such as 500 GW renewables by 2030, higher EV penetration (around 10% by 2025), 20% ethanol blending for petrol, improvement in energy efficiencies and improvement in carbon capture and use of digital technologies, chemical companies have a massive role to play, being part of the fundamentals of several sectors. Thus, the sector can help in enabling other parts of the economy become more sustainable, by supplying products that have an impact on:

a) Climate change mitigation and low-carbon economy transition (LCET): This aspect brings both challenges and opportunities. It could mean providing products that enable lesser energy consumption or coming up with materials with low-embedded carbon. There is a significant role for the chemical sector in unlocking climate strategies across the industrial manufacturing value chain and thereby help in low-carbon economy transition.

b) Circularity: This includes using renewable and reused materials and developing more durable product offerings to extend the life of products downstream, avoiding need for modification; reducing waste and using embedded energy in new applications.

c) Health & Safety: This refers to actions such as reducing the use of chemical substances of concern and carrying out periodic risk assessments.

- Sustainable finance

  ESG considerations and decarbonization are becoming key reasons for decisions related to investments and divestments. Investors are increasingly seeking to match their portfolio strategies with ESG and sustainability targets. As per an analysis by Bloomberg, ESG assets increased to a record USD 37.8 trillion by the end of 2021 and are expected to grow to USD 53 trillion by 2025, which accounts for a third of all the global assets under management .

- Increasing reporting requirements

  Sustainability reporting requirements are evolving constantly with changes based on markets, technologies, and regulations. Ensuring compliance and reporting to appropriate regulatory agencies helps companies manufacture and/or sell products in regulated markets like EU, U.S.A., Canada, or Japan. This requires extensive and continuous monitoring of regulatory changes such as enforcement of new rules/regulations such as EU REACH, listing/delisting of substances from chemical inventories, etc.

  The legal framework governing ESG compliance in India is still in its infancy, with only the top 1000 listed companies (based on market cap) required to mandatorily report through Business Responsibility and Sustainability Report (BRSR), modelled on the principles prescribed by the National Guidelines on Responsible Business Conduct promulgated by the Ministry of Corporate Affairs (MCA) in 2019. To keep up with global companies with extensive reporting practices, Indian chemical companies that are not mandatorily required to comply with the reporting requirements under the SEBI (Listing and Disclosure Requirements) Regulations, 2015 may voluntarily adopt a suitable ESG compliance framework, by relying on internationally accepted standards/frameworks such as the Global Reporting Initiative or the Sustainability Accounting Standards Board.

Value Creation with ESG

- Changing consumer preferences

  Businesses need to realign their strategy to suit the changing consumer mindset and even a willingness to pay more for products designed with sustainability in mind. Also, today there is an increased awareness among the consumers regarding the risks related to usage of chemicals. These factors are pushing chemical companies all over the world to explore decarbonization technologies, review their product portfolio and tap into the potential of the circular economy, even diversify away from hydrocarbons in their value chain.

- Product stewardship

  Product stewardship refers to an approach undertaken by a company to ensure product safety and sustainability into the value chain. There is an increased scrutiny on companies with respect to health and safety of workers, consumers, and other stakeholders in the entire value chain. In case of global chemical companies, product stewardship approach often goes above and beyond the statutory requirements such as European Chemicals Regulation REACH as well as the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). This includes commitments to voluntary initiatives by the global chemical industry such as Responsible Care of the Global Charter of International Council of Chemical Associations (ICCA). Usage of life cycle assessment studies are also becoming common these days, to come up with product and/or process-oriented improvements to reduce the carbon footprint, reduce water usage, etc. These are conducted in accordance with ISO 14040/14044 standards and help companies to identify the environmental impacts resulting from production of their products (Cradle to Gate) as well as during customer usage and disposal (Cradle to Grave). In addition, companies are increasingly conducting epidemiological and toxicological evaluations for their existing and new raw materials to assess the safety of their products.

- Sustainable supply chains

  Globally, an increasing proportion of companies are recognizing that chemical supply chain management is a collaborative process which would require external partnerships to strengthen the evaluation and audit programs for suppliers with potential ESG risks. We see companies increasingly partnering with Together for Sustainability (TfS) or Responsible Care (RC) – initiatives set up by European chemical industry, and the United States respectively, to improve sustainability in the supply chain. Similarly, the US has Responsible Care initiative. This is aimed at standardizing and simplifying supplier audits and evaluations globally for responsible procurement and supply of goods and services. The audits are conducted by EcoVadis, a ratings agency, partner of TfS, specialized in sustainability analyses. These engagements help companies to embed sustainability into procurement decisions and continuously monitor and improve upon supply chain related environmental and social impacts.

  For increased supply chain visibility and in ensuring an effective supply chain management, companies are exploring the potential of digitalization and data analytics. This helps to make the supply chain reliable and agile, even if faced with disruptive events.

7.3 ESG Evolution of Indian Chemical Industry

The Indian chemical industry is preparing to face current and upcoming ESG norms and regulations and align with the requirement of transparent disclosure from stakeholders (government, investors, shareholders, consumers). SEBI has mandated filing of Business Responsibility and Sustainability Report (BRSR) for top 1000 listed companies (by market capitalisation) from the current financial year (FY 23).

The BRSR aims to increase the transparency and standardize disclosure on ESG parameters and risks/opportunities. With the changing ESG reporting/policies, chemical companies should adapt an innovation-fuelled strategy across the value chain.

Indian corporates like Tata Chemicals, UPL Limited, Gujarat Fluorochemicals Limited, Godrej Industries, and others have taken significant steps forward to incorporate sustainability and be climate conscious by design. Aligned with the Paris Agreement, Indian companies are preparing themselves for transition to decarbonisation by setting Science Based Targets (as per SBTi) approved emission reduction targets. As this sector is energy intensive, reduction and management of GHG emission is crucial. Majority of the GHG emission comes from Scope 3, i.e., emissions from upstream and downstream value chain segments. To achieve net zero in the next 30 years, chemical companies must leverage sustainable energy consumption for reducing Scope 2 emissions and source sustainable raw materials and provide sustainable products using sustainable means to reduce the upstream emission (Scope 3).

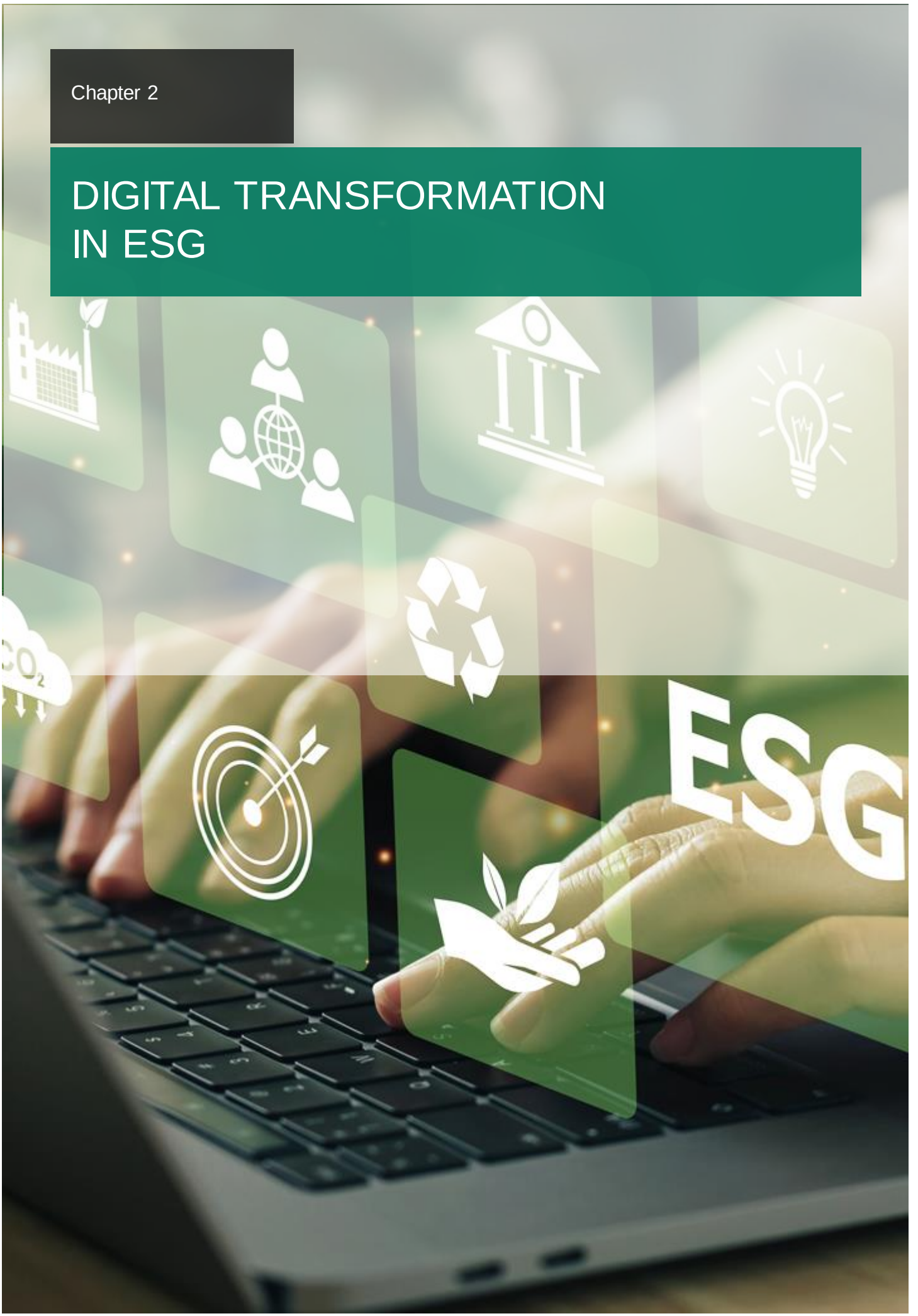
Indian chemical companies ESG focused areas

GHG Emissions | **Energy Consumption** | **Climate Change** | **Working Conditions**

Indian chemical companies are investing and implementing emission-reduction and climate-related initiatives like plastics reuse, recycling, energy-efficient technologies, and more. Whilst these are significant steps towards environmental and climate change consciousness, this sector including the MSMEs still require adapting a holistic and systems driven ESG approach to combat climate change related risks. For example, water, which is a critical resource used by the sector is typically not assessed from a stewardship approach, which creates a win-win context for industry and all stakeholders. The same is true of safety; over the past 2-3 years, we have witnessed frequent accidents resulting from insufficiently trained and motivated workers. In many cases, the accidents have resulted in fatalities as well as environmental and property damage.

Chapter 2

DIGITAL TRANSFORMATION IN ESG



Digital Transformation in ESG

8.1 Global perspective: how digital transformation and ESG are moving hand in hand

The global pandemic has played a major role in accelerating a shift towards adoption of digital means of conducting business. Ideas and perceptions are changing, including those of investors, customers, and employees. They are more 'aware' of the world around them. They are more suitably placed to challenge the established norms in their world and are not afraid to do so – whether it is about investing in or establishing new businesses, creating employment opportunities for themselves, or showcasing increased sensitivity to how their employment impacts their world and themselves.

It is no surprise then, that as businesses look to survive and thrive in the acute conditions of growing ESG uncertainty, they turn to digital mechanisms to de-risk themselves and secure a future. Technologies are allowing us to record and track data in a highly detailed manner (Big Data), discover dependencies between seemingly unrelated activities and outcomes (Artificial Intelligence and Machine Learning) and disseminate information in a highly connected ecosystem (Internet of Things).

8.2 India context

ESG assumes relevance in India given its dependence on traditional, fossil-fuel based energy sources, demographic endowments, and prevalent economic conditions. Development and implementation of an equitable and just energy transition will ensure that India continues to perform and attract sufficient investment to support its 1.4+ billion people through myriad climatic, ecological, economic, and socio-political changes.

A plethora of laws addressing ESG-related matters apply to operations of corporate entities. These laws aim to address environmental safeguards, employee benefits and corporate governance. The Indian government has recently formulated four consolidated labour codes. SEBI has introduced the BRSR framework from May 2021, applicable to top 1,000 listed companies (by market cap) for mandatory reporting from FY 2022-23 . However, some of these laws and frameworks may yet need an overhaul to meet India's targets under international agreements.

Economic behaviour is changing too. India is moving from a savings-oriented approach to life, to an assets-based approach. While on the one-hand we have seen our own so-called Silicon Valley in Bengaluru come to life in the past several years, we have also seen a remarkable increase in the number of retail investors. India has the potential to mobilize USD 1 trillion in retail sustainable investing towards ESG priorities by 2030 . Similarly, consumption via e-commerce has seen a phenomenal rise across the country.

Unsurprisingly again, digital enablement has been key.

8.3 ESG and Digital transformation in the Chemical Sector

The Indian chemical sector is riding the digital wave of 'Industry 4.0' with a growing sensitivity towards ESG. Further, over one hundred companies from the chemical sector are in the top 1000 listed companies, which will be required to follow BRSR from FY 2022-23. This presents a great opportunity for the sector to implement interlinked strategies on ESG and digital transformation.

8.3.1 Environment

In a 2022 report, McKinsey provides a framework for CXOs to design their ESG strategy . Apart from being a sustainability enabler, digital technology can play a wide role in measurement and tracking of climate focused actions (e.g., carbon credits, de-carbonization of supply chain, etc.). It will enable measurement and simulation of physical and transition risks and compare opportunities.

8.3.2 Social

Adoption of digital technologies in the Indian chemical sector has only increased in the last three years. Key trends of digital transformation are across production optimization, remote operations, waste reduction, supply chain streamlining and safety and compliance. In July this year, the ICC signed an MoU with Intel for improving the safety (Advanced Driver Assistance System - ADAS) and operational efficiency of chemical transport fleets. Accenture's research shows that the industry's digital maturity index in 2020 stood at 42.2% (where 100% implies full digital tech adoption) . Clearly, a good start has been made, but there is significant room for improvement.

8.3.3 Governance

Overall digital transformation will also include company re-organization, change management and process flows to ensure companies are gearing up for a 180-degree shift in their core operations, marketing communication and public outreach and community contributions.

8.3.4 Immediate challenges

The Indian chemical sector faces challenges from several perspectives, including natural and man-made resources, impacts, energy use. The sector must actively address these issues related to

- Water: Already a scarce resource, its supply has not been a subject of sustained or planned effort (i.e., a stewardship approach)
- Environment: Pollution levels (in air and in soil and groundwater) have reached alarming levels in several parts of India and led to large scale damage to the environment. Aside from the damage to the environment and social infrastructure, this issue has become a reputational bane for the industry.
- Energy: While a major consumer of energy, most of the industry continues to be from inefficient and polluting fossil fuels.

On the digital front, there are several factors which are causing chemical plants to move slowly. Notwithstanding that most companies are MSMEs, recruitment, leadership support and scaling-up efforts play a big role . For example, in the US, 50% manufacturers report struggling to find the right digital talent while the Gulf Petrochemicals and Chemicals Association (GCPA) say that only 15% of companies have an effective recruitment process.

Digital Transformation in ESG

8.4 Emerging trends

India seems to have undergone a “Rachet Effect” in terms of its digital driven retail investors. This is set to continue with more millennials and Gen-Z joining the financial markets. Some experts predict that online trading could reach a value of USD 14.3 billion by 2025 .

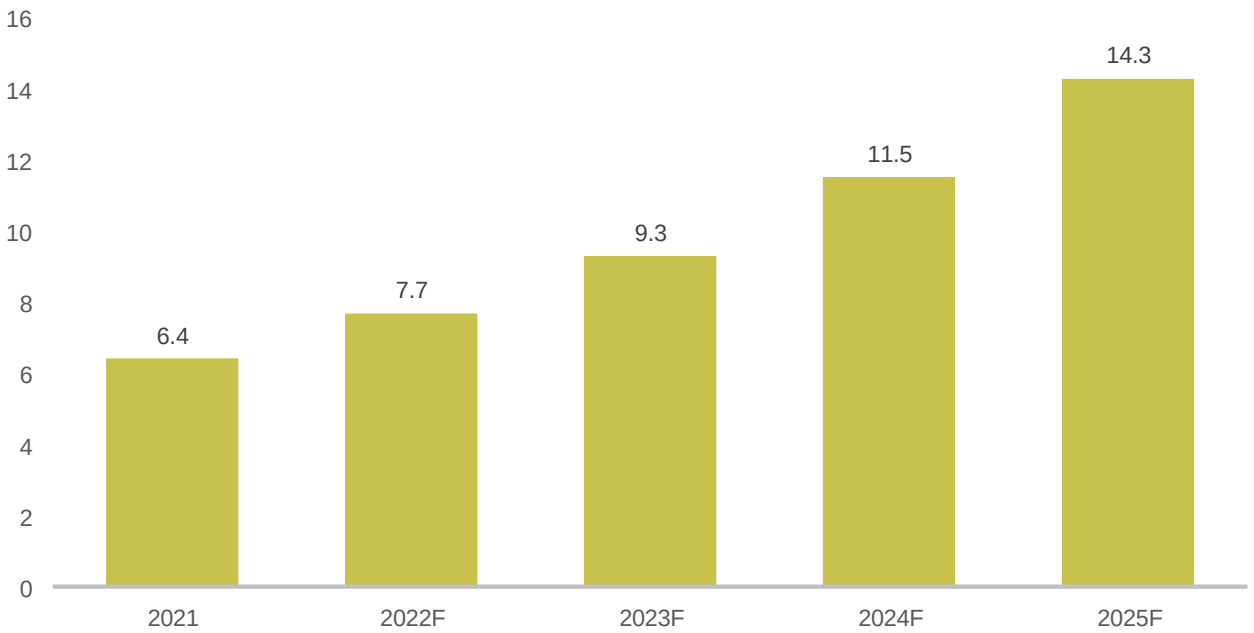


Figure 1: Online trading value, India

Assets under management (AUM) for ESG themed funds rose to USD 650 million in FY21 from USD 275 million in FY20, a 2.5x increase .

The government is also taking concrete steps through its 25-year roadmap (Amrit Kaal), focusing on inclusive development, productivity enhancement, energy transition, climate action and investment financing amongst other areas.

This highlights that ESG awareness and action is a permanent reality. And companies need to find the most efficient ways to ensure that they not only garner favour with their investors but also appeal to customers, community, and regulators alike.

Chapter 3

CLIMATE CHANGE & LOW-CARBON ECONOMY TRANSITION (LCET)

Climate Change & Low-carbon Economy Transition (LCET)

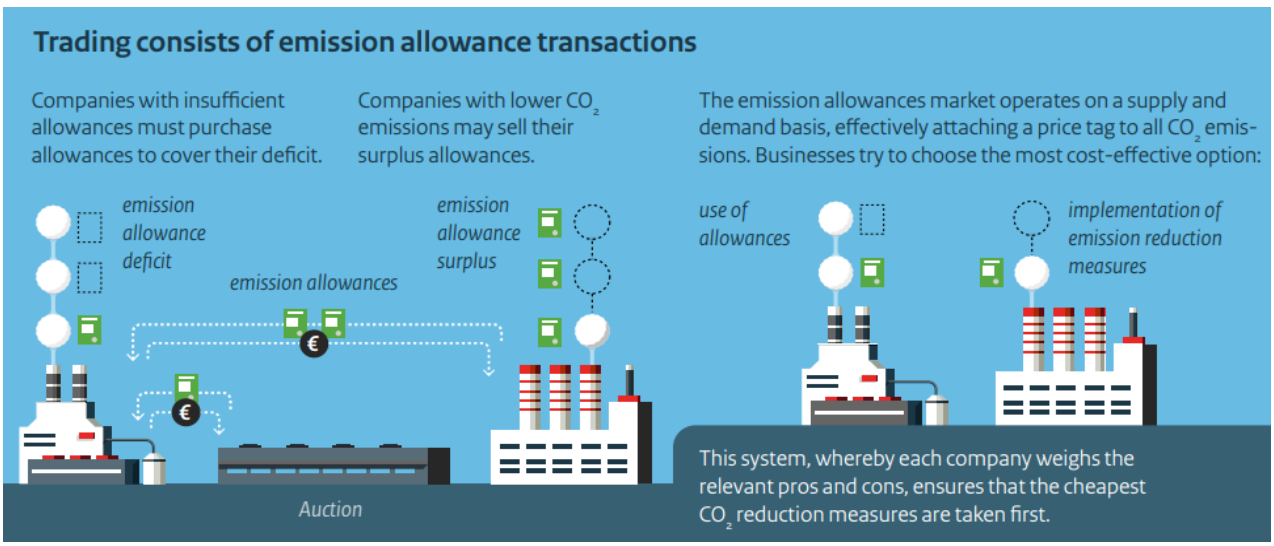
The path toward low carbon transition is riddled with both risks and opportunities. The Indian chemical industry is no exception. In anticipation of transition risks and opportunities, the readiness to deal with such change has become a priority for various stakeholders. Preparing for and thereafter addressing/capturing risks and opportunities is essential to not only maintain business relevance but also to ensure that compliance with rapidly evolving rules and regulations is achieved.

It is here, where a framework called Task Force on Climate-related Financial Disclosures (TCFD) comes into play. Introduced by the G-20 Financial Stability Board in 2015, the TCFD framework provides a structured framework on risks and opportunities related to the transition to a lower-carbon economy. The framework today is widely and increasing accepting, becoming almost the de-facto framework to understand climate related risks and opportunities for any business.

The assessment of transition risks and opportunities encompasses dimensions such as – Market, Technology, Policy, and Legal as well as Reputation. These dimensions help organizations ascertain the multifarious nature of impacts associated with each dimension.

The impacts of these dimensions are reiterated time and again in new updates and policy briefs. While some unchanging trends like continued growth of opportunity in petrochemicals, especially specialty chemicals remain relevant from the market perspective; the policy and legal domain related to chemicals is witnessing rapid changes.

Since 2021, several developments have occurred which will bolster the growth of Indian chemical companies that wholeheartedly embrace and integrate sustainability with business operations. The Indian government has proposed a domestic carbon market. Taking European model of the Emissions Trading System of the European Union (EU ETS) as an inspiration, India's Bureau of Energy Efficiency (BEE) has recently presented a draft pitch for the gradual introduction of a voluntary domestic Cap-and-Trade system in India. Secondly, the lower house of Parliament has adopted an amendment bill to the 2001 Energy Conservation Act which provides the legal basis for the establishment of a voluntary carbon credit trading scheme. The infographic below shows the working of the EU ETS trading scheme, to provide a view on potentially what could be launched in India.



Source: Dutch Emission Authority (Nederlandse Emissieautoriteit – NEa)

BEE's draft has proposed a three-phased adoption plan for a carbon market. With the EU ETS as inspiration, the first phase focuses on voluntary demand creation for carbon credits in India. The demand should be driven mainly by voluntary buyers, state-designated agencies, power distribution companies, and airlines, with the scope of inclusion of other sectors.

The second phase aims to increase the supply of carbon credits through the development, registration, and validation of emission reduction projects, post which projects will then issue emission reduction units. In the third phase, the voluntary market should ultimately advance to a mandatory cap-and-trade system, in which earmarked sectors and companies are nominated to generate only a certain volume of emissions (i.e., a cap).

Shortly after BEE's draft was published, the lower house of Parliament recently published an amendment bill introducing a framework for a voluntary carbon credit trading scheme. Section 14 of the bill grants the power to the central government or any authorized agency to issue "carbon credit certificates" for the reduction of carbon emissions to registered entities. The amendment bill will become an act if the Upper House of Parliament adopts it in December 2022.

However, key details such as: the timeline for implementation, the nature of the registered entities, how the credits will be generated and certified, and agencies involved, are yet to be worked out. Currently, a strategy paper with further details is being prepared and undergoing a stakeholder consultation.

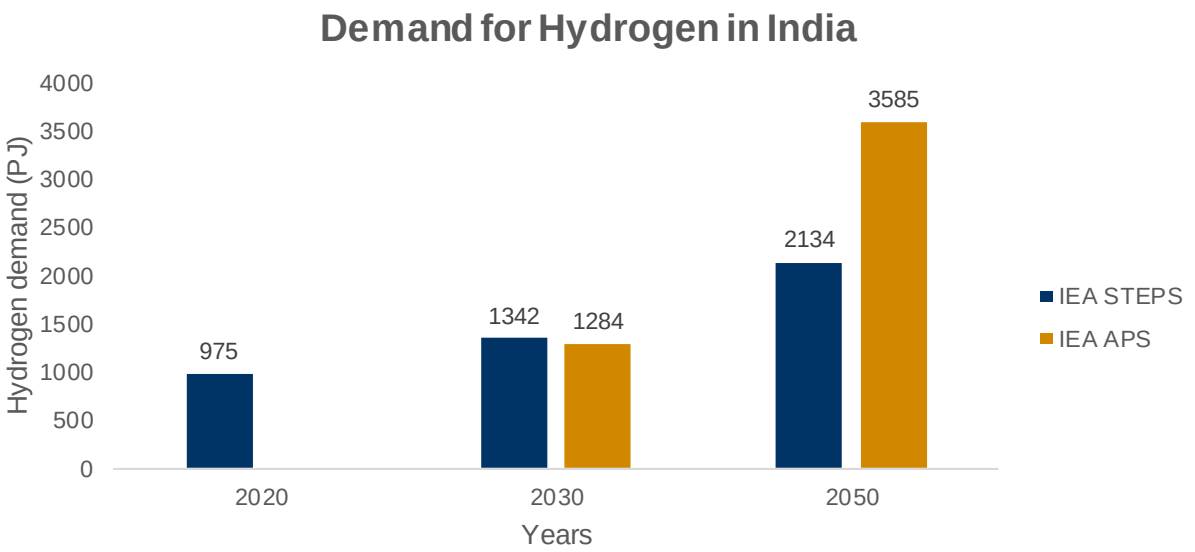
The implications of a carbon market are well known. Generally, a carbon tax would increase the cost of burning fossil fuels, thus increasing the cost of producing goods and services that rely on those inputs, particularly for carbon-intensive sectors which include the chemical industries as well. The push for such an amendment bill, comes after Gujarat government's intent project to implement a subnational cap-and-trade market in May of this year . Such measures become imperative in view of India's target of becoming carbon neutral by 2070.

Green hydrogen policy announced earlier this year was introduced with the aim of facilitating green hydrogen production in the country. The phase one of the policy focuses primarily on renewable energy procurement, hydrogen production, storage, and distribution with the aim to meet the production targets of 5 million tonne per year of green hydrogen along with associated renewable capacity additions by 2030. A major offering under the first phase is the waiver of inter-state transmission charges for 25 years for projects commissioned until June 30, 2025, and grid transmission connectivity on a priority basis.

Another component is that the companies are allowed to generate electricity from renewable sources in the country, by themselves or through a developer. The generated electricity will then be allowed to be wheeled, free of cost, through open access of the transmission grid, to the plant where hydrogen is to be produced along with the provision of banking/storing excess green hydrogen produced by any company for up to 30 days, applicable to capacities which are set up before 2025. These measures would enable kick-starting the establishment of an ecosystem for hydrogen in the country which in turn can boost the chemical industries.

The upcoming release of the details regarding the second phase in December 2022 will most likely mandate industries– like refineries, and fertilizer, among others–to use green hydrogen and ammonia . An implementation of this mandate can result in over and above expenditure for chemical industries as setting up an ecosystem for hydrogen will be a gradual process.

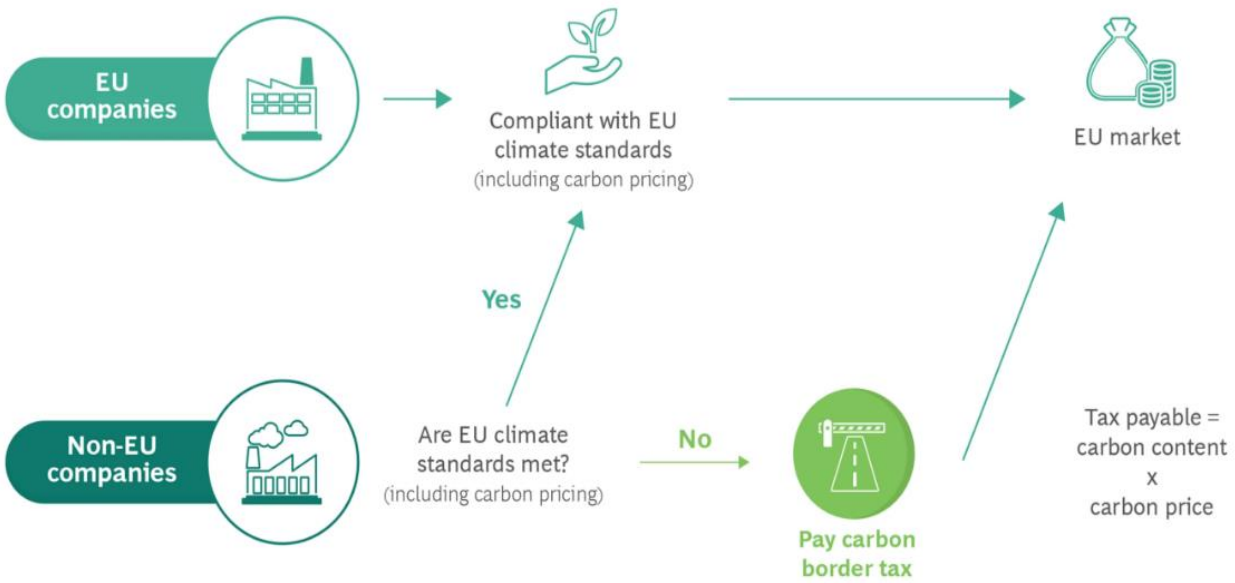
The numbers on demand for hydrogen in India from IEA WEO 2022, as shown below, also attest to this fact. Under the Stated Policies Scenario (STEPS), which considers the policies already in the system, the hydrogen use will increase significantly. However, the increase is much larger in the Announced Pledges Scenario (APS), which considers India Net Zero commitment by 2070.



Source: World Energy Outlook, 2022

Apart from these forthcoming changes, Carbon Border Adjustment Mechanism (CBAM) is another such impending reform under the EU Green Deal, that can impact the chemical industries . CBAM will introduce a carbon price on certain products imported into the EU. The vision behind a climate measure such as CBAM is to prevent the risk of carbon leakage, incentivize the uptake of cleaner technologies abroad and provide a level playing field between local and foreign producers. Under the CBAM regime, additional charges on imports centered on the emission intensity of production processes would affect the export competitiveness of Industries in the Asia-Pacific region. Originally, scheduled for June 2022, CBAM has now been deferred, due to the refutation of the revision of the EU Emissions Trading System (ETS), with which the CBAM is closely linked. However, since CBAM is still in line for adoption, businesses would need to continue preparing. To prepare for CBAM, companies would have to measure their current emissions as well as carbon tax exposure across their entire supply chains and product lines, and accordingly, develop a robust carbon strategy, as well as identify opportunities to convert the challenges into a source of competitive advantage.

The diagram below shows that European importers will be required to buy carbon import permits for each metric ton of CO2 imported into the EU through goods and materials. The tax liability would be contingent on both the carbon intensity of the import and the tax rate per metric ton—which will match the domestic carbon price paid by EU producers.



Source: BCG, 2021

It is worth noting that regulations related to climate change are highly dynamic in nature and therefore, it is necessary for business to keep themselves abreast with this dynamism to avoid any reputational risk or additional costs that business might face in case of non-compliance.

Chapter 4

‘NET ZERO CHEMICALS”: ROLE OF CIRCULAR ECONOMY AND COST OPTIMAL PATHWAYS

‘Net Zero Chemicals”: Role Of Circular Economy And Cost Optimal Pathways

In a typical chemical value chain, about 15 to 30 percent of the total GHG emissions come from production operations that are classified as Scope 1 and 2 emissions. However, majority of the GHG emissions are Scope 3, which is much more puzzling to determine. In India, only a few companies from top Indian chemical companies have committed to GHG reduction targets until 2030, and very few have declared a target year to achieve net-zero emissions.

Businesses have begun to realize sustainability challenges and are addressing emerging customer demand and technology shifts. Companies are also looking at overhauling existing products with a focus on sustainability (e.g., using bio-based inputs) for aligning with climate conscious end-markets. Sustainable raw materials are slowly becoming a norm as the industry is increasingly shifting from fossil fuels to renewable feedstock in the production of speciality chemicals. For instance, carbohydrate and triglyceride, which can be derived from corn/sugar beet and oil seed producing plants respectively, can be used to make plastics. These plant-generated plastics not only use feedstock as a raw material but as they are recyclable and/or biodegradable, they have the potential to significantly reduce the carbon generated from traditional plastics. Shifting from a linear model of economy to a circular one entails building green products. A linear model is essentially focused on the principals of Procure—Utilize—Dispose; the circular model on the other hand, aims at Procure—Utilize—Recycle—re-utilize.

Some Indian Chemical companies are making a shift towards circular economy. Tata Chemicals is implementing a circular solution at their Mithapur plant , where all waste is turned into cement. Aditya Birla Chemicals, currently in customer trial stage, is working with a patented technology, called Recyclamine that enables epoxy thermosets which are traditionally non-recyclable, to now be recovered, reused, and repurposed. Through this technology, Aditya Birla Chemicals is facilitating end-of-life recycling and zero waste manufacturing thus moving closer towards a circular economy. PI industries is also moving towards circularity. It manufactures complex chemical compounds using hazardous raw materials such as cyanides, acids, etc. The process routes have been designed to isolate basic compounds as gas or salts which are then restructured to form other compounds. For e.g., Hydrogen from Cyanide is used in Ammonia; Hydrogen from ring formation is used in HCL acid. These are then further utilized in the process, post quality checks, which promotes circular economy by reducing the number of intermediates required in manufacturing.

Business Model Innovation can drive a more circular economy. The upcoming role of certain business models such as chemical leasing , in which the vendor is paid for a service, motivates organisations to innovate to achieve the same effect with lesser chemicals. Pioneered by UNIDO, chemical leasing means that profits are not generated from volumes of chemicals, but rather through a value-added approach.

Innovation of business models goes hand in hand with creating an ecosystem that serves as an enabler to a set of companies seeking transition. ‘Industrial Symbiosis’ is an ecosystem whereby independent companies exist in symbiotic format and drive each other’s success. Such an ecosystem allows one to turn a waste product of one industry into a resource for one or more industries. This enabling virtuous cycle will require the government and other stakeholders to create a regulatory environment that drives these changes. Denmark’s Kalundborg Symbiosis – a partnership between nine public and private companies. The partnership rests on the concept that the residue from one company becomes a resource for another.

‘Net Zero Chemicals”: Role Of Circular Economy And Cost Optimal Pathways

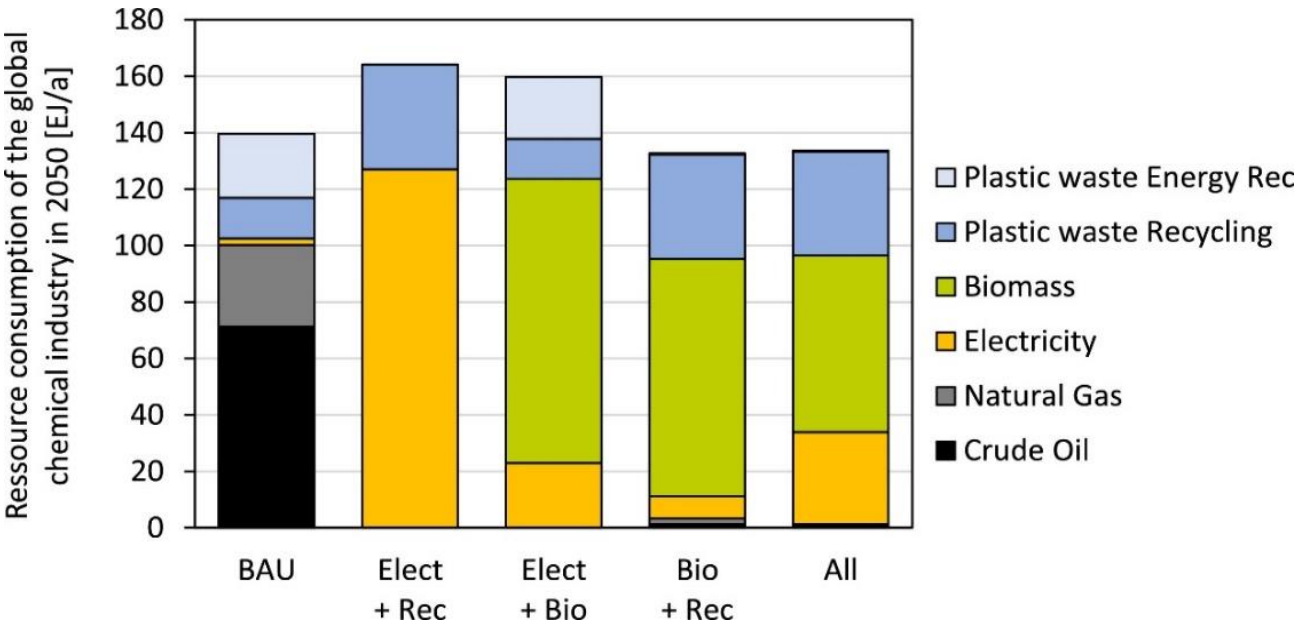
Decarbonisation of the chemical industry is imperative now. It can be achieved through mitigating GHG emissions in the fossil-based energy supply along with deployment of low-emission technologies. There are certain Low-emission technologies that can substitute fossil carbon-feedstock using either biomass, CO2, or plastic waste. While these low-emission technologies already exist at high technology readiness levels, they still require significant investment and entail operating costs. Therefore, to compensate, government intervention through carbon pricing can encourage low-carbon investments as the chemical industry will also need substantial investments to start a pathway towards net-zero chemicals and plastics.

A literature review of major studies that have tried to ascertain cost optimal pathways for circularity for chemical industries, reveal that a study called, Cost-optimal pathways towards net-zero chemicals and plastics based on a circular carbon economy is relevant to the topic in discussion as it has provided a comprehensive investment pathway for the global chemical industry while also considering carbon pricing. It has calculated transition pathways, that are based on cost-optimal investment decisions, from 2020’s production levels using fossil fuel-based technologies towards net-zero GHG emissions by 2050. As a part of the study, a total of six scenarios, which differ with respect to resources prices and footprints, carbon prices, and available technologies, are considered. They are a Business-as-Usual scenario (BAU), a Sustainable Development Scenario (SDS), and four scenarios where the chemical industry reaches net-zero GHG emissions by 2050, so-called net-zero pathways.

The four scenarios where the chemical industry reaches net-zero GHG emissions by 2050 are based on different permutations and combinations of available technologies to analyse the influence of technology and resource availability. It has analysed a cost-optimal combination of technologies based on (1) electrification, including carbon capture and utilization, and recycling (Elect + Rec), (2) electrification and biomass (Elect + Bio), (3) biomass and recycling (Bio + Rec), and (4) a combination of biomass, electrification, and recycling (All). A limitation of the study is that Carbon capture and storage (CCS) was not included in any pathway since the focus is on circular carbon technologies.

The results of the study show that carbon prices between 190 and 370 USD/tCO2-eq can incentivize the chemical industry to accomplish net-zero GHG emissions by 2050.To ensure this, investments would need to increase by 37-51 % compared to a fossil-based Business-as-Usual Scenario and for a cost-optimal combination of technologies, the chemical industry would need to build on 62 EJ of biomass, 32 EJ of renewable electricity, and 37 EJ of plastic waste. Increased recycling rates are essential to reducing resource demands and avoiding price sensitivity for renewable electricity and biomass. The figure below shows resource consumption of chemical industry in 2050 across different scenarios represented in Exajoules (EJ) of energy. While BAU is a fossil-based reference, the other four bars are representative of greener form of energy, which result in net-zero GHG emissions: A cost-optimal combination of technologies that is based on (1) electrification, including carbon capture and utilization, and recycling (Elect + Rec), (2) electrification and biomass (Elect + Bio), (3) biomass and recycling (Bio + Rec), and (4) a combination of biomass, electrification, and recycling (All).

‘Net Zero Chemicals”: Role Of Circular Economy And Cost Optimal Pathways



Source: Cost-optimal pathways towards net-zero chemicals and plastics based on a circular carbon economy, 2022

All net-zero pathways still emit greenhouse gasses in 2050. The chemical industry may reach net-zero for annual GHG, but it may not necessarily reach net zero over the whole product life cycle. While either kind of net zero goal may be desirable, it is essential that government address the differences to adjust policies and carbon accounting. To reach net-zero over the whole product life cycle or in other words, produce net zero chemicals, all residual GHG emissions, which cannot be mitigated or captured, would have to ultimately be offset by net-negative technologies (e.g., direct air capture and carbon storage.

Chapter 5

SUPPLY CHAIN MANAGEMENT IN CHEMICAL INDUSTRY - LOOKING BEYOND REGULATORY REQUIREMENTS

Supply Chain Management In Chemical Industry - Looking Beyond Regulatory Requirements

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Supply Chain Management In Chemical Industry - Looking Beyond Regulatory Requirements

11.1 Importance of Supply Chain in the Transforming Chemical Industry

As the world is trying to get back to a firm footing following the disruption caused by the COVID-19 over the last two years, a foreseeable change in business dynamics is round the corner especially for the chemical industry. With the growing pressure of the industry trends such as international competition, heightened customer expectation on the chemical industry, this operational transformation will be led by the industry focus and commitment on circularity, decarbonization and sustainability. Amid the looming challenges around energy price volatility, economic uncertainty, evolving regulatory landscape and geopolitical tension, supply chain excellence can prove to be a potential "game changer" in the performance of the chemical companies. Supply chain performance has achieved new importance, and companies are getting future ready to become more secure, agile, resilient, and efficient.

11.2 Supply Chain Management

11.2.1 Key Challenges and Risks

Managing of supply chain is a key challenge for many chemical companies considering its complexity, evolving regulations lack of integration of sustainability framework and monitoring. Some of the key risks/challenges are as follows:

Evolving regulations: In most case the supply chain in is spread across multiple geographies and jurisdiction. With the ever-evolving regulatory landscape, there is a long list of requirements that need to be complied and monitored to avoid supply chain disruption, legal scrutiny, and reputational risk. In other words, chemical companies must comply or face costly fines/closure.

Supply chain complexity & monitoring: For chemical companies, the product manufactured is likely to have multiple material suppliers across the value chain, which adds to the layer of complexity. Monitoring of such complex supply chain therefore poses a major hurdle especially when it comes to keeping track of sustainability measures being adopted and implemented.

Integrating and demonstrating environmental and social responsibility: Consumer expectations on integrating and demonstrating compliance to environmental and ethical standards by the suppliers have grown in recent years, with global issues like climate change, environmental degradation etc. taking centre stage. This is also being complemented by pressure being put on by regulators to source in a sustainable manner. This is a major challenge experienced by the smaller suppliers and or those based out of developing countries, where regulatory enforcement lacks clear mandate and execution.

11.2.2 Need to Look Beyond Regulatory Requirements

Focus on sustainable supply chain is an essential prerequisite for the future proofing of companies. For the supply chain, this means that in addition to economic criteria, environmental, health and social criteria must also be met by all players along the entire supply chain. This includes not only the origin and production of products, but also their use and disposal.

Considering the risks/challenges associated with the supply chain in the chemical sector the need for a robust and effective management system is the call of the hour. This is of particular importance when the supplier sustainability goals need to be synchronized with the customer goals towards responsible sourcing.

Supply Chain Management In Chemical Industry - Looking Beyond Regulatory Requirements

To achieve this, a step change is required in the in the risk management approach of chemical sector companies by large. One of them being to look beyond regulatory compliance as the “one stop solution” to address all its supply chain risks.

Adopting Industry Initiatives: To effectively address the wide-ranging challenges of a sustainable supply chain and to leverage synergies, one can look at the following industry initiatives:

- Together for Sustainability (TfS): It is a joint initiative and global network of 30 chemical companies, delivers the de facto global standard for environmental, social and governance performance of chemical supply chains. The TfS program is based on the UN Global Compact and Responsible Care® principles.
- Pharmaceutical Supply Chain Initiative (PSCI): It is a group of pharmaceutical and healthcare companies who share a vision of better social, health, safety, and environmental outcomes in the communities where we buy. All PSCI members are expected to support and incorporate the organization’s core principles that encompass five areas of responsible business practices namely, ethics, labour, health and safety, environment, and management systems, into their supply agreements.

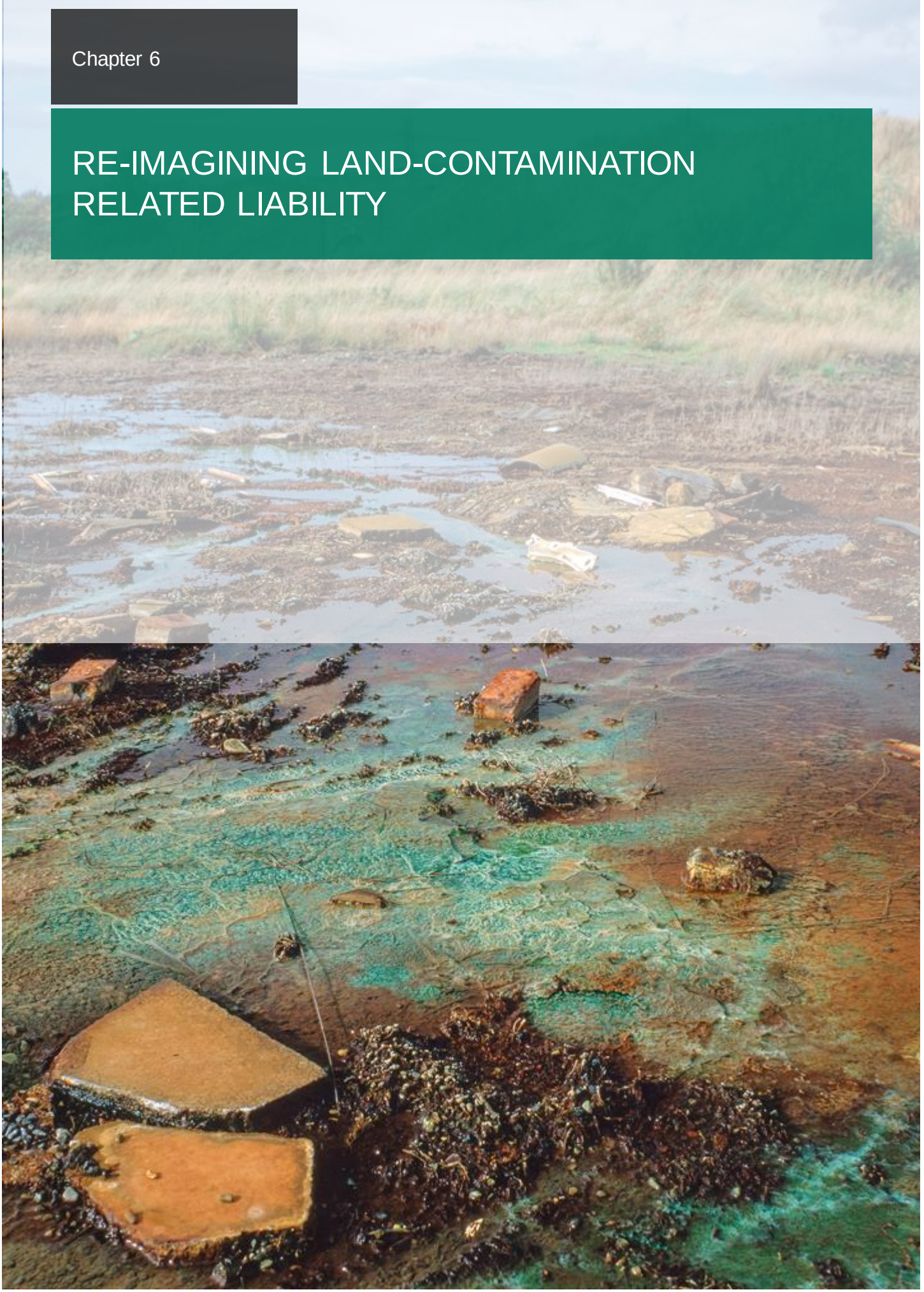
These initiatives are not typical regulatory compliance assessment and investigates sustainability performance of the supplier, where audit results of suppliers are exchanged. Sharing information with multiple customers reduces the need for multiple assessment and significantly reduces time spent, resources used and overall costs. This enables both sourcing and supplying organizations to allocate resources more efficiently and to mutually improve sustainability standards in the global supply chains of the respective industries. Both initiatives focus not only on conducting audits or assessments, but also on capability building for suppliers. This supports suppliers in operating consistently with industry expectations and best practices on sustainability and goes hand in hand with consumers responsible sourcing goals.

Based on ERM experience, use of such industry initiatives is picking pace with more and more companies adopting these to have a better visibility and control on their supply chain risks.

Digitalizing Chemical Supply Chain: Apart from industry initiatives, chemical companies are also relying on digital solutions to perform supplier assessment on Environmental, Social & Governance (ESG) aspects for their onboarding and periodic performance evaluation. The tool is based on supplier self-assessment on ESG metrics, where an overall risk rating is provided to them based on responses to ESG performance queries. This allow companies to get a real time view of the performance and risk rating of multiple suppliers at a glance including necessary corrective action that need to be adopted.

Chapter 6

RE-IMAGINING LAND-CONTAMINATION RELATED LIABILITY



Re-imagining Land-contamination Related Liability

12.1 Background

In March 2020, the Central Pollution Control Board (CPCB) published a comprehensive list of 324 "contaminated" or "potentially contaminated" sites in need of further action (preliminary/detailed assessment and/or remediation) throughout the country. This is more than double the number of contaminated sites listed by the State Pollution Control Boards (SPCBs)/Pollution Control Committees (PCCs) in 2005 (141 sites).

With increasing scrutiny of contaminated sites by the CPCB and SPCBs/PCCs, and expectations of time-bound risk-based investigation and remediation at these sites, it has become imperative for owners, operators, plant managers and EHS professionals of "contaminated" or "potentially contaminated" sites to be aware of India's legal stance on contaminated sites and associated liabilities.

In the absence of country-specific risk-based standards for soil and groundwater, contamination in India is identified and evaluated subjectively based on actual impact, potential impact, or risk to natural resources (soil quality and productivity, surface water, groundwater, etc.) and human health. Contaminated sites may include (but are not limited to): active facilities, production areas, orphaned sites, landfills, dumps, waste storage and treatment facilities, mine tailings, spill sites and chemical waste handling units. These sites may be in residential, commercial, agricultural, recreational, industrial, rural, and urban or wilderness areas.

Disclosure in the event of known or suspected contamination is a regulatory requirement in India. Section 31 of the Water Act, 1974 and Section 12 of the Environment (Protection) Rules, 1986 state that "forthwith information" is to be provided to the CPCB/SPCB/PCC in cases of discharge (or apprehension of discharge) of any poisonous, noxious, or polluting matter into a stream or a well or sewer or on land. The duty to disclose is on the person in charge of the industry. Further, the industry is bound, if called upon, to render any assistance in response to this event.

If disclosure is not voluntary, Indian courts have held that the "onus of proof" to show that any action is/ was environmentally benign is on the actor or the developer/industrialist. In a 2015 order, the National Green Tribunal (NGT) stated that the appellant (a citizen/ a regulator) only has primary burden of proof with respect to environmental harm/ violations, while the substantive burden of proof rests with the industry/developer.

The current legal frameworks that address contaminated sites are as below:

- The Water (Prevention and Control of Pollution) Act, 1974.
- The Air (Prevention and Control of Pollution) Act, 1981.
- The Environment (Protection) Act,1986.
- Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.
- Development of Methodologies for National Programme for Rehabilitation of Polluted Sites in India, published by the Ministry of Environment and Forests and Climate Change, September 2012.
- Development of National Programme for Rehabilitation of Polluted Sites, CPCB, January 2013.
- Guidelines on Implementing Liabilities for Environmental Damages, CPCB, January 2016.

The above legislations and guidelines stipulate that a facility shall be liable for all damages caused to the environment due to improper management through the payment of financial penalties. According to the Guidelines on Implementing Liabilities for Environmental Damages, violators, individuals who have operational control and executive powers of assets (including boards of directors, directors, and other senior officials) will be held liable for: immediate response, assessment of contamination and remediation of contaminated sites. They will also be held liable for damages to natural resources and compensation to the third parties for personal injury, property damage, and economic loss. The document apportions monetary values to liabilities and specifies imprisonment terms.

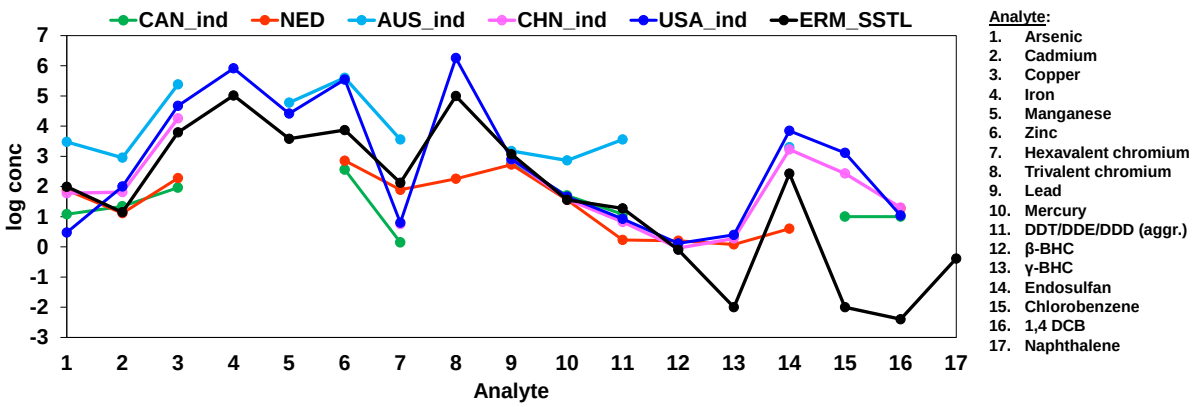
In summary, the above frameworks clearly define environmental liability in India. In recent years, particularly since the establishment of the NGT in 2010, these legislations and associated guidelines have received strong judicial backing in their implementation. As such, it is crucial for owners and operators of "contaminated" or "potentially contaminated" sites to understand the nature and extent of contamination, if present, and develop and implement effective action plans for remediation, especially in the context of India's liability frameworks. There are many sustainable remediation techniques that evaluate financial, environmental and social factors to arrive at an optimal solution.

12.2 Screening and Response Levels

The "Guidance document for assessment and remediation of contaminated sites in India" defines two levels of concentrations of hazardous substances: the screening level and the response level. The screening level is a concentration at which potential risk to the ecology and humans is the least, but further investigation needs to be carried out to assess the contamination level of the land. The response level is a concentration which is harmful to human and ecology health and requires a response or an intervention. At present, the Canadian Soil Quality Guidelines (SQGs) are used as screening levels. The SQGs have been derived for four kinds of land use patterns viz., agricultural, residential/parkland, commercial and industrial. As response levels, the Dutch Intervention Levels (DIVs) have been adopted. The protocol for derivation of these reference levels (screening or intervention) is a very detailed one and needs assessment of individual contaminants for their effect on human and ecological health. The critical parts of the evaluation are:

- Defining the land use pattern, this determines the sensitivity of humans and ecological receptors and the degree of protection needed. The degree of protection is higher for agricultural and residential land uses than commercial and industrial land uses.
- Classification of the chemical into classes, e.g., organic/inorganic, dissociating/non-dissociating, volatile/non-volatile, soluble/insoluble, and biomagnifying/non-biomagnifying. These chemical characteristics determine the fate and transport phenomenon of chemicals (or contaminants) in soil.
- Understanding of the soil texture which also determines fate and transport of chemicals in it
- A detailed review of toxicological studies performed on relevant receptors (plant and organism species), evaluation of soil ingestion, bioconcentration and dose-response assessment. Each contact and migration procedure of the chemical to the receptor is evaluated. For ecological protection a nutrient and energy cycling checks are also performed that determines the critical concentration of the contaminant that can impair physiological activities in the soil.
- Determining the background soil concentration

After the reference values of ecological and human health protection are derived, the most conservative value is chosen to maximum protection of the environment. The same approach is used by different countries to define their own standards, with changes in the parameters used or scenarios considered. Figure 1 shows a comparison of Canadian SQGs, DIVs, Australian, USEPA and Chinese industrial soil reference values for seventeen analytes (or contaminants). There are countries like Netherlands that do not state a land use for application of the reference values. Also, there are guidelines like that of Australia, USEPA and China that only consider human health protection. ERM has used its own Human Health Risk Assessment (HHRA) tool to derive site specific target levels (SSTLs). When broadly compared against the reference values of the five abovementioned guidelines, the SSTLs are among the more conservative (or more protective) group.



Comparison of reference values for industrial land use from Canadian, Dutch, Australian, Chinese, USEPA guidelines and SSTLs derived by ERM for 17 analytes.

12.3 An alternate approach

The current MoEFCC guidelines state two different concentrations: the screening and the response levels which make it difficult for implementation. An alternate approach would be to state just the screening levels for reference; if the measured concentrations exceed the screening levels, they are compared against site-specific target levels. An important question would be to whether develop screening levels specifically for India. The two key components of these risk-based reference values are: toxicological studies and exposure pathways. It must be considered that the derived guidelines are results of almost three decades of research and it may be largely time-intensive to develop India-specific screening levels based on regional toxicity data. Adopting the best suited guideline (based on factors like relevant exposure pathways considered, background concentrations, depth of applicability, etc.) as screening level might be the short-term appropriate solution.

Re-imagining Land-contamination Related Liability

To delineate the process of classifying a land as contaminated, the following future scope of works might be useful:

- Predefine a list of contaminants to be analysed in a soil investigation, based on past experiences and kind of industries prevalent in India
- Standardize the methods of analyses for such contaminants
- Define a screening level for every analyte on the list by collating available established guidelines appropriately
- A long-term objective would be to develop India-specific toxicological database by thorough literature review and lab-scale studies where applicable.

Chapter 7

BREATHING LIFE INTO ESTABLISHED SAFETY PROGRAMS

Breathing Life Into Established Safety Programs

It is well understood fact that every organization invests immense efforts and resources in designing, establishing safety management system to attain desired safety performance and safer work environment. This involves investment of numerous hours in training the workforce, day-to-day use and putting number of safety management processes into use, filling in permits, reviews, checklists, etc. This results into investment of hundreds of hours from personnel at various levels within the organization to attain a safe performance in line with organizational objectives.

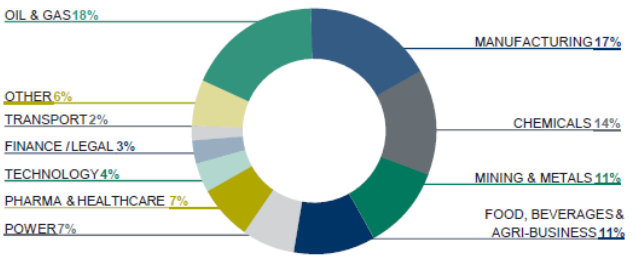
Despite spending these vast amounts of resources on safety management, organizations continue to experience serious incidents and fall short of deriving value from investments. Here we describe some of the key building blocks as considerations for safety transformation programs and practical approaches put into use by many organizations (commensurate to their need and scale of challenges being faced) for achieving sustainable safety performance.

13.1 Insights and discussions from ERM Global Health and Safety Survey:

To build the context, focusing on some relevant insights from the ERM Global Health and Safety Survey 2020 (ERM GHSS 2020) would be fruitful. This executive summary sets out findings from engagements with 273 senior health and safety Function Leaders from corporations with combined revenues of US $6.6 trillion, equivalent to 7.5% of world GDP in 2019, and which collectively employ 12.2 million people. 79% of the participants in the study had global responsibilities for H&S in their organizations with operations in 143 countries across a broad range of industry sectors.

Breakdown of interviewees by role title

Breakdown of interviewees by sector



Breathing Life Into Established Safety Programs

Some of the relevant insights from the ERM GHSS 2020 are as following:

- **Evolved approaches deliver results, putting the 'why' back into health and safety:**

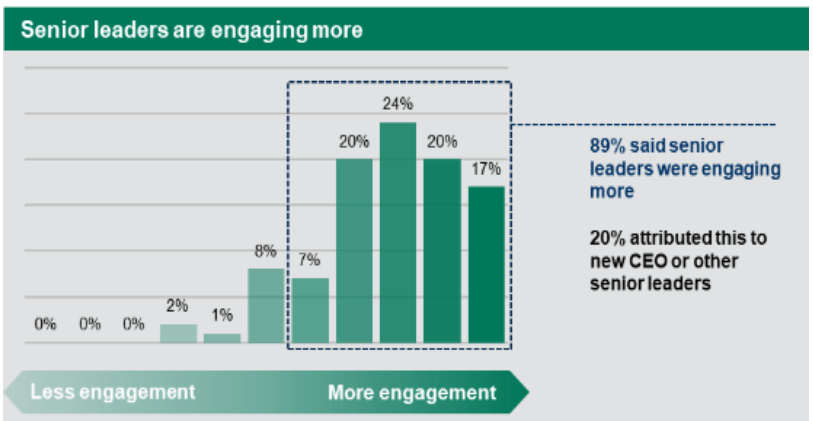
  Over three-quarters of ERM Survey participants identified deficiencies with their established health and safety processes. Ten percent expressed significant concerns about the value derived from them, either due to processes not being fit-for-purpose, or due to poorly implemented systems. Survey respondents cited nine evolved approaches (see Figure) that they believe capable of delivering extensive benefits because of how they support more people-centered approaches. The Survey analysis suggests that the way forward lies not in any one of the nine alone, but in ensuring they are all delivered with a singular focus on purpose.

- **Value from established processes but issues with design and execution:**
  - The survey data points to persistent systemic deficiencies. The survey participants were broadly positive on the value they are deriving from their established H&S processes: However, over 76% participants identified deficiencies with their established processes, and 10% expressed 'significant concerns' on the value derived from them.
  - The deficiencies with their processes identified by the participants fall under two main headings.
  - First, the processes are not fit-for-purpose (overlapping and duplicative, overly bureaucratic, obsolete, lack consideration of the human element). Cited by 35%.
  - Second, 24% shared the view that they had "sound systems but they are poorly implemented" and are therefore failing to deliver the value they should. A further 12% expressed specific concerns about tick-box approaches to execution of the processes.
  - Several the Function Leaders reported they had recently completed substantive overhauls of their established systems and 10% are currently engaged in re-engineering their processes at this time. Streamlining and better integrating the human element in core health and safety processes is one of the key innovations identified by the participants.

Breathing Life Into Established Safety Programs

Some of the relevant insights from the ERM GHSS 2020 are as following:

- **Leadership engagement is the most effective means of delivering improvement in H&S performance**:
    - 89% participants reported that their senior leaders are engaging more on H&S, with 17% rating the maximum 'greatly increased' engagement on the scale.
    - 20% of those who reported increased leadership engagement attributed this to the recent appointment of a new CEO or other senior leaders. Insights from the participants indicate that a new generation of business leaders see a clear link between H&S and business performance and a thriving workforce.



- That said, the survey data clearly indicated that **the increased senior leadership engagement isn't sufficiently translating into impact on the frontline**:
    - 79% of the Function Leaders believe there is a material difference in risk tolerance between senior leaders, middle managers, frontline leaders, frontline workers, and contractors in their organizations.
    - Only 8% of the participants rated senior leaders as highly proficient in terms of their ability to translate commitment and engagement on health and safety into meaningful impact on culture, behaviours, and performance.
    - Only 5% rated their middle management and their frontline leaders as highly proficient.

These all points towards a need for:

- better metrics to access leadership engagement on health and safety; and
- a need to focus on enhancing the quality of leaders' engagements.

Concerns about leadership, culture and behavioural aspects were identified as the number one issue in safety for the Function Leaders and a top three investment priority for them.

The above relevant data calls for a refreshed approach to leadership development in health and safety, one that builds on the very real advances in safety leadership in the past few years and the step-change in the extent and quality of leaders' engagements on safety. These approaches need to go to the heart of the underlying cultural challenges, need to equip leaders with the practical skills they require to allow them to translate their very good intentions (and the investment of their time) into great outcomes.

The remaining document shares some of the proven approaches that can be put into use to address these challenges/shortcomings in building and sustaining the safety performance and culture as per organization's vision.

13.2 Building a Case for Change

Establishing real need /trigger: There are various triggers for thinking about bringing safety transformation within the organization. The basis for triggering safety transformation may vary from organization to organization. Some are triggered by unfortunate serious incidents/high potential near misses whereas some safety transformation programs are triggered by inner drive of the management to go beyond the status quo and challenge the existing processes, personnel to identify improvement opportunities. The design and treatment for every safety transformation may vary from this perspective, however, the core approaches evolved over the decades of practical experience, principles still form the core of such transformation programs.

Pre-requisites: To change the status quo and embrace the change positively, it is imperative that leadership is committed to evaluate its safety performance and culture, transparently without any hesitations, biases. The real need for safety transformation needs to be understood by the organization-level leadership, they need to be brought on the same page so that they can shape the desired transformation in the safety performance and culture. It is the foundational requirement for any such program and this message needs to be cascaded across the organization to get required support and openness in the conversations.

Diagnostic Assessment and Leadership Alignment: The diagnostic approach considers whatever the safety performance outcome is, either good or not so good, it should be seen as the reflection on the personnel at various levels and ultimately the leadership. If the performance is perceived to be good, then it is because of the leadership and vice a versa is also true. This process of case for change makes the leaders at all levels understand the root causes and leads to a feeling a deep sense of unease about the status quo. Make them understand that the outcomes derived from the diagnostic assessment are reflection on their leadership.

Create case for change from an assessment of actual conditions and behaviours on the frontline. While doing this, focus shall be on finding examples of poor risk control, non-compliance, and unacceptable ongoing impacts on people. Establish the data-driven and evidence-based breakdowns in leadership behaviours, culture and processes which are giving rise to these issues, using in-situ root cause analysis techniques. It is critical for the facility operational leaders to participate together in some or all these sessions. These sessions serve to validate the seriousness and breadth of concerns about safety in the field and help build a deepening sense of the real need for a transformation in how safety is addressed across the operation.

13.3 Breathing Life into Established Safety Programs

Breathing life into established safety programs requires leaders at all levels understanding the purpose of the established safety programs and processes and using those effectively during their engagements with their personnel. As highlighted in the survey, processes are not fit-for-purpose, poor implementation prevents organizations from deriving value from these investments. Hence, leaders at various levels through effective engagements can really breathe life into existing processes. This requires them to walk the talk and demonstrate that through every decision they make, there are clear communications and actions.

To make this happen leaders at every level need to be equipped with effective engagements and observation skills. Once equipped, they should be recognizing moments (whether in meetings, corridor walk, site walk, etc.) for engaging with personnel using any recent events (whether having positive or not so positive outcomes with respect to safety).

Engaging the frontline in continuous improvement: None of us would feel comfortable agreeing to a recommendation for surgery before a full diagnosis is made. When hearing about problems in their organisation, managers often move quickly to make changes without undertaking a rigorous diagnosis of the root causes or involving the affected employees. Why? Time pressures often prevent reflection and the carrying out of an in-depth diagnosis. The solution is to engage frontline employees and ask them questions such as 'How can we make things safer, easier, and better for you?' The key is for the manager to engage frontline employees not only in identifying the problem but also in coming up with solutions.

The fundamentals of continuous improvement build on the lean principle of going on the 'Gemba walk' (meaning to go and see the problem on site) and empowering frontline employees to identify and resolve problems themselves rather than relying on a top-down approach. The purpose of these Gemba walks should be to engage in some safety conversations with frontline employees about how the work is really done or work as-done (WAD) by the people exposed to hazards. In contrast, work-as-imagined (WAI) refers to how the organisation believes safe work is performed and how it's then prescribed and documented through the various elements of the safety management systems . The gap between work as done (WAD) and work as imagined reflects (WAI) the changing and dynamic nature of work and how it takes place in an environment that is often not as imagined, with multiple shifting goals, variable and unpredictable demands, and variable resources within a system of constraints and incentives, which can all have unintended consequences.

Often, leaders must be trained and coached on how to effectively engage in Gemba walks or safety conversations. ERM has developed a popular and effective programme to equip leaders with the skills to observe differently and engage for impact and bring about positive shift in people's thinking. Engaging differently helps leaders understand how to engage with their teams on work plans, permits, job hazard analyses and management of change processes. When leaders spend time understanding with their teams, especially in the context of observed at-risk conditions and behaviours, they breathe life into these programs. This is the opportunity wherein leaders express to their personnel that they care about their safety and frontline personnel are expected to engage in conscious thought and real dialogue about the hazards, and the risks with other personnel in the work environment.

Breathing Life Into Established Safety Programs

The value of using engaging differently techniques is not limited to safety related performance improvement aspects, however, based on feedback received from numerous leaders, it does help them in deriving excellent outcomes in their operational matters as well. The leaders can turn toolbox talks from low value routines into high impact engagements.

Sharing successes and creating viral content: It isn't enough for leadership to communicate and articulate the need for a safety transformation. They must engage employees in the safety transformation process in a meaningful way. There are too many times when leaders fail to get employees on board, despite a clear and compelling rationale for change. Communication is about creating momentum for change. The most effective way to build momentum is by setting small, visible goals, helping people achieve them, and publicly celebrating their successes.

It's not about doing more on safety, it's about getting more from what you do already.

Chapter 8

CHEMICAL PRODUCT STEWARDSHIP

Chemical Product Stewardship

14.1 Product Stewardship Audits: Origins and Traditional Focus

Product stewardship is the science and practice of responsibly managing the health, safety and environmental aspects of raw materials, intermediates, and consumer products throughout their lifecycles, across their value chain, to prevent or minimize adverse impacts and maximize value. Product stewardship has two key pillars:

- product compliance and regulatory affairs; and
- product sustainability (e.g., green chemistry and sustainable product design).

As with most other fields that require active management and oversight, Product Stewardship has seen the evolving role and significance of audits over the past two decades.

At the turn of the century, Product Stewardship Audits ('PS Audits') emerged as a subset of traditional environment, health, and safety (EHS) audits. To begin with, they were focused on mitigation of business risks arising from use, handling, storage, and sale of hazardous substances. They also incorporated an assessment of management systems and product compliance. The advent of product stewardship regulations in key markets of the world (EU RoHS, EU REACh, RoHS regulations in multiple US states), during the last 20 years, together with the ever-tightening embrace of global supply chains enhanced the need for PS Audits further. In the early part of their evolution, the rationale for conducting PS Audits included routine checks and verification of compliance and management systems; assurance when expanding into newer uses for a product, and/ or into newer manufacturing locations or market geographies; and support in mitigating regulatory risks when launching new/ revised products.

14.2 Changing Landscape, Evolving Value of PS Audits

14.2.1 Recent Changes Propelling PS Audits

In the last 5 – 7 years, several factors have converged to bring greater focus on product compliance, emerging regulatory risks, as well as product sustainability. These are:

- Spread of Product Compliance Regulations: Starting with three product regulations of the 2000s [EU RoHS Directive; EU REACh; and waste electrical and electronic equipment (WEEE) Directive], there are now multiple regulations governing product compliance and post-consumer wastes in different jurisdictions worldwide.
- Product Sustainability Emerging as a Differentiator: In a crowded and extremely competitive marketplace, product sustainability and product compliance have emerged as the new ground for contestation and competition.
- Product Stewardship in Boardrooms: As product stewardship becomes more central to commercial success and business continuity, this topic is gaining progressively greater attention in corporate boardrooms. US Corporation 3M's decision in 2000 to voluntarily steer away from PFOS is one well-known early example of a significant business decision that stemmed from product stewardship concerns. Over the last two decades, there have been several other key business decisions that can be attributed to, or that accounted for, product stewardship. Increasingly, there is also a recognition of liabilities associated with product stewardship; these are being considered as part of valuations during mergers and acquisitions.

The factors listed above have also enhanced the role and value of PS audits, making them more central to both, risk management programs and to corporate decision making.

14.2.2 Value Added by PS Audits

Listed below are some areas in which PS Audits now aid business decisions, and add value:

- **Assuring Compliance, Improving Performance**: The complex web of product stewardship regulations that corporations must contend with today include the REACh-like regulations (enacted by Korea, Turkey, Taiwan, and UK; and proposed by India); the State-specific RoHS regulations in USA; regulations on PFAS/ PFOA; and the host of regulations requiring the move towards circularity on post-consumer wastes (end-of-life vehicles, waste electrical and electronic equipment (WEEE); and plastics). This mushrooming of regulations that are similar in intent but vary in their details, when combined with the complex global supply chains and distribution networks, presents a challenge to corporations around the world. The chemical sector finds itself in the crosshairs of such regulations both, as a producer and seller of raw materials, and as a manufacturer of consumer products.

  Second- and third-party audits can be effective tools in evaluating and verifying status of compliance with existing and emerging product compliance regulations. Apart from assuring compliance, these can also identify significant risks, systemic weaknesses, and areas where investments are required to bolster performance. Robust audit programs take on greater significance given the rapid changes in regulatory regimes and the complicated interactions between regulations of different jurisdictions.

- **Supply Chains and Sustainability Disclosures**: The choice of supplier has traditionally considered ability to provide necessary chemicals/ components; costs; quality; reliability; and timing. However, global regulatory compliance obligations and sustainability metrics are resulting in corporations re-assessing their supply chains to mitigate regulatory obligations, environmental impact, and carbon footprint. With many corporations having signed up to time-bound sustainability-related goals, driving sustainability in their supply chains also plays a crucial role in meeting those goals. With Sustainability Disclosures now the norm, corporations are faced with the opportunity (as well as the expectation from their stakeholders) to present information about the processes they employ to drive sustainable practices in their extended supply chains.

  PS Audits can help verify practices and identify areas for improvement in the supply chains. Therefore, PS Audits now increasingly guide corporations' decisions relating to the choice of geographies/ vendors to include/ avoid in their supply chain. They can also be useful in informing corporations of compliance burden associated with new markets that they may want to enter. Finally, PS Audits also play a crucial role in providing the assurance required before corporations publish data about their performance on this crucial aspect.

  With the Indian chemical sector being a key contributor to global supply chains for multiple products, this element is especially significant for businesses in India.

- **Competitive Edge & Customer Requirements**: While countries and trading blocs have tended to use product compliance regulations as non-tariff barriers, consumers and businesses are increasingly taking sustainability of products (whether in design, in origin of materials used, or in prospects for end-of-life recovery), into consideration while making purchases.

Sustainability Disclosures are causing an ever-greater greater visibility of product sustainability measures than there has been in the past. Industry-leading performance on product stewardship thus transcends the bounds of compliance and risk mitigation, transforming into a key weapon in the armory of Indian businesses looking to compete in the global marketplace.

PS Audits underpin this element by providing an impartial, independent verification of practices and processes. PS Audits also validate and testify to the effectiveness of a supplier's systems and practices in minimizing adverse impacts of their products and in complying with regulatory requirements of the place of origin, as well as the markets for which the products are destined.

In cases where customers have additional chemical/ product restrictions that go beyond regulatory obligations, PS Audits can help assure compliance with contractual obligations and may be useful to demonstrate the robustness of systems and processes implemented to allow for consistent conformance with the customer's requirements. This in turn, can allow for a long-term collaboration between the supplier and customer.

- Mergers and Acquisition Valuations: As corporations recognize the material risks posed by product stewardship to long term commercial success of businesses, a PS audit is starting to become of interest as part of the due diligence conducted when companies consolidate or move to divest an operation/ business unit. A PS audit in the due diligence context can:
    - Inform the decision to divest.
    - Support the desired sale price point; and
    - Identify:
        - Shortcomings in available systems, processes, or tools that make assessing compliance obligations a challenge.
        - Violations of applicable regulations/ contract conditions; and
        - Risks from emerging issues.

  The proposed price for the acquisition may be reduced to account for costs to remedy identified shortcomings in systems and processes, to address identified regulatory and other violations or the potential loss of market access due to violation of regulatory/ contractual requirements.

  Ideally, the PS assessment/ audit must be performed in conjunction with the broader M&A due diligence prior to an acquisition. If a PS audit is not conducted during M&A, or is conducted after the deal is closed, the buyer may be faced with unpleasant surprises such as:

    - Insufficient processes and tools to determine compliance obligations.
    - A fundamental difference in risk management strategies.
    - Regulatory violations.
    - Obligations not uncovered in a traditional M&A audit that could have a significant negative impact.

14.2.3 Challenges to growth of PS audits

Despite the range of risks that PS Audits can identify and the value they provide, their popularity and use remained limited, belying expectations of professionals in this area. Unlike their close cousins, the multiple types of EHS audits – PS Audits are yet to become the norm in most corporations, despite having an equally broad reach in theory.

Some challenges to the growth of PS Audits, despite their obvious utility include:

- Business Buy-In: Not all corporations are convinced of the value of PS Audits, often due to misperceptions and a lack of understanding of the principles of product stewardship and the regulations.
- Protocol Availability: Robust protocols for use in PS Audits are generally not available off the shelf. While some protocols may be available with consultancy firms/ as part of traditional EHS audits, the need for PS Audit protocols to be customized in view of the audit objectives and the regulatory jurisdictions being covered means that time and effort is required to prepare an audit protocol that can underpin an effective and useful audit.
- Availability of Qualified Auditors: While it would be ideal to have suitably qualified and experienced local auditors who bring the correct combination of subject-matter expertise, industry-specific knowledge, an understanding of business implications of the matter being assessed, and an understanding of local context and culture, finding such auditors outside the US or EU is unlikely. In most geographies, non-PS auditors must be used to conduct the audits, with support from PS specialists.

14.3 Key Takeaways

It is clear from the discussion above that while challenges exist, PS audits have grown into a specialized field of work that delivers significant value to businesses. The key takeaways for corporations are listed below.

- Significance of PS Audits Will Likely Grow: PS Audits have evolved to deliver value beyond what was originally envisaged. Their significance to business decisions has grown recently and will likely continue to grow as focus on product sustainability and regulatory matters intensifies in the years ahead.
- PS Audits Can Add to Bottom Lines: With performance on PS becoming material to financial success, growth, and expansion of businesses in a fast-evolving operational landscape, PS Audits can play a significant role in adding to, and sustaining, the profitability of corporations. This they can do by improving PS performance across the supply chains, as well as by identifying and flagging key risks before they result in business interruption/ other penalties.
- Now is the time to start your PS Audit Program: As the chemical sector in India prepares for the launch of CMSR, India's REACh-like regulation, this is an opportune moment for chemical industries in India to consider developing and implementing a PS Audit program. A well-designed PS Audit program that is tailored to the business context of the company and addresses both risks and opportunities for value creation, will allow organizations to harness presently dormant value for their success.

Chapter 9

WATER STEWARDSHIP – PATH TO WATER SUSTAINABLE CHEMICAL INDUSTRY

Water Stewardship – Path To Water Sustainable Chemical Industry

15.1 Background

Water is an essential part of the manufacturing, delivery and use of products and services. Uncertainties and dilemmas associated with water consumption affect almost every company. Without improvements in water management and use, the world could face a 40% supply gap by 2030. Businesses need to assess their water risk exposure to implement sound water stewardship strategies. This includes addressing shared water risks at the watershed level.

Chemicals sector is water intensive with varying water footprints across various segments. Industrial organic chemicals manufacture is the most water-intensive chemicals sector, whereas agrochemicals is the least water-intensive. Significant number of industries in India are producing water pollution above National Standard by several times. These industries are inter-dependent which arises from the fact that the output of an industry is generally required as an input by another industry. A pollution control scheme influences the output and prices of different industries which acts as a deterrent. However, it must be noted that, as per a Carbon Disclosure Project (CDP) study, companies reported maximum financial impacts of water risks at US$301 billion – five times higher than the cost for addressing them.

Water-related business risks are set to multiply in the coming decade, with increased flood and drought conditions projected for much of the world. Chemical producers are acutely exposed to physical and reputational risks emerging in the vicinity of production sites. They also need to find efficient ways to manage manifold regulatory requirements relating to water (for example, substance monitoring and reporting under the Water Framework Directive and REACH Directive).

15.2 Water stewardship

Many chemical producers have made investments towards ensuring the sustainability of their operations but lack the means to communicate these achievements to employees, authorities, and consumers. Water Stewardship allows chemical producers to derive value from existing water management activities– and continue to improve.

Water stress and associated water risks necessitate stewardship that involves collective action and community engagement among government, public and private sectors, NGOs, and communities. Corporate Water Stewardship emerges as a strategic approach for companies to mitigate water risks, and many global corporations are publicly disclosing their water risk and responses through initiatives such as the CDP's Investor Water Program, Alliance for Water Stewardship, CEO Water Mandate and Global Reporting Initiative amongst others. These initiatives prescribe a 'beyond the fence' approach to water stewardship including identify areas for improvement: in factories/facilities, in local watersheds, across the supply chain and in providing access to water in communities located in the vicinity of the facilities and source water.

Water stewardship refers to a use of water that is socially equitable, environmentally sustainable, and economically beneficial. Of special concern is to ensure that large water-consuming industries care about and collectively take responsibility for the way they use and manage water in their production, including the quality of their water discharge and the use of fresh cooling water. And it aligns well with the concept of Corporate Social Responsibility, as many large water-consuming industries have begun to accept and act upon the fact that they are part of a local community as well as a global world of water scarcity.

Water stewards hence "understand their own water use, catchment context and shared risk in terms of water governance, water balance, water quality and important water-related areas; and then use this to engage in meaningful individual and collective actions that benefit people and nature." (Alliance for Water Stewardship)

Water Stewardship – Path To Water Sustainable Chemical Industry

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15.3 Water uses in Chemical Industry

Water is mainly used as a media in chemical manufacturing processes. Most of water used by the chemical industry is for return-flow applications which results in large quantity of effluent generation. Effluent becomes a major concern for chemical industries. The effluents produced by this sector often contain organic and inorganic matters in varying concentration. Many materials in the chemical industry are toxic, mutagenic, and carcinogenic or non-biodegradable. Surfactant, emulsifiers, and petroleum hydrocarbons that are being used in chemical industry reduce performance efficiency of many treatment operations. The best strategy for treatment of toxic industrial wastewater is to segregate the waste chemicals/ solvents at the source and by applying onsite treatment within the production lines with recycling of treated effluent.

There are key unique factors which shape the way water is managed within chemical production that have implications for Water Stewardship:

- 'Cocktail effects', where substance interactions in effluent may generate unforeseen impacts.
- Historical pollution issues may represent an ongoing reputational risk to production sites.
- Complexity of supply chains presents a challenge for comprehensive risk assessment.
- Public perceptions of environmental impact may not reflect efforts undertaken to improve performance.

The AWS Standard is built around five steps. Site owners implementing the Standard:

- Gather and understand water-related data
- Commit to water stewardship and create a water stewardship plan
- Implement their plan
- Evaluate their performance
- Communicate and disclose progress with stakeholders

15.4 Benefits of Water Stewardship in Chemical Sector

Implementation of Water Stewardship allows sites to:

- Ensure Operational Efficiency and Operational Sustainability
- Improved water governance
- Good water quality
- Access to water, sanitation, and hygiene (WASH) for all
- Identify and respond to local water risks
- Encourage Source Diversification
- Develop & implement a water management framework
- Promote Eco-system Health
- Anticipate changes in water regulations (state & national)
- Build trust with authorities and local suppliers
- Communicate their performance to consumers

Water Stewardship – Path To Water Sustainable Chemical Industry

By taking the steps towards Water Stewardship implementation, a site will mitigate all foreseeable risks relating to water. Integrating risk management regarding water quality can yield significant savings by reducing effluent treatment costs. Outreach to authorities and external water users is often a highly effective means of achieving this- a key element of the Water Stewardship concept.

Table 1: How water stewardship can help address water-related risks

Risks	Areas of Exposure to Risk	How does Water Stewardship address this?
Physical risks	■ Increasing competition for water resources ■ Increased incidence of extreme events, e.g., flooding and drought	■ Precise understanding of water balance, linking water use/discharge with fluctuations in availability ■ Comprehensive water management strategy, addressing all foreseeable risks and contingencies
Regulatory risks	■ Regulatory changes ■ Associated increases in water pricing	■ Water Stewardship helps build monitoring capacity for priority substances (e.g., within risk assessment) ■ Substance control capacity can help drive down effluent treatment costs
Reputational risks	■ Reputational risk from activities of other water users as a highly 'visible' sector ■ Public perception of sector as a 'polluter'	■ Demonstrates a commitment to transparency and legitimacy in water resource management ■ Outreach to other water users helps sites understand shared risks- and take steps to mitigate or protect against these risks

15.5 The Way Forward

Ensuring a prosperous and sustainable future for people and planet requires responsible and inclusive stewardship of water – a critical and limited resource. It sets out how we will ignite and nurture water stewardship in value chain hubs, accelerating impact for communities, ecosystems, and economies.

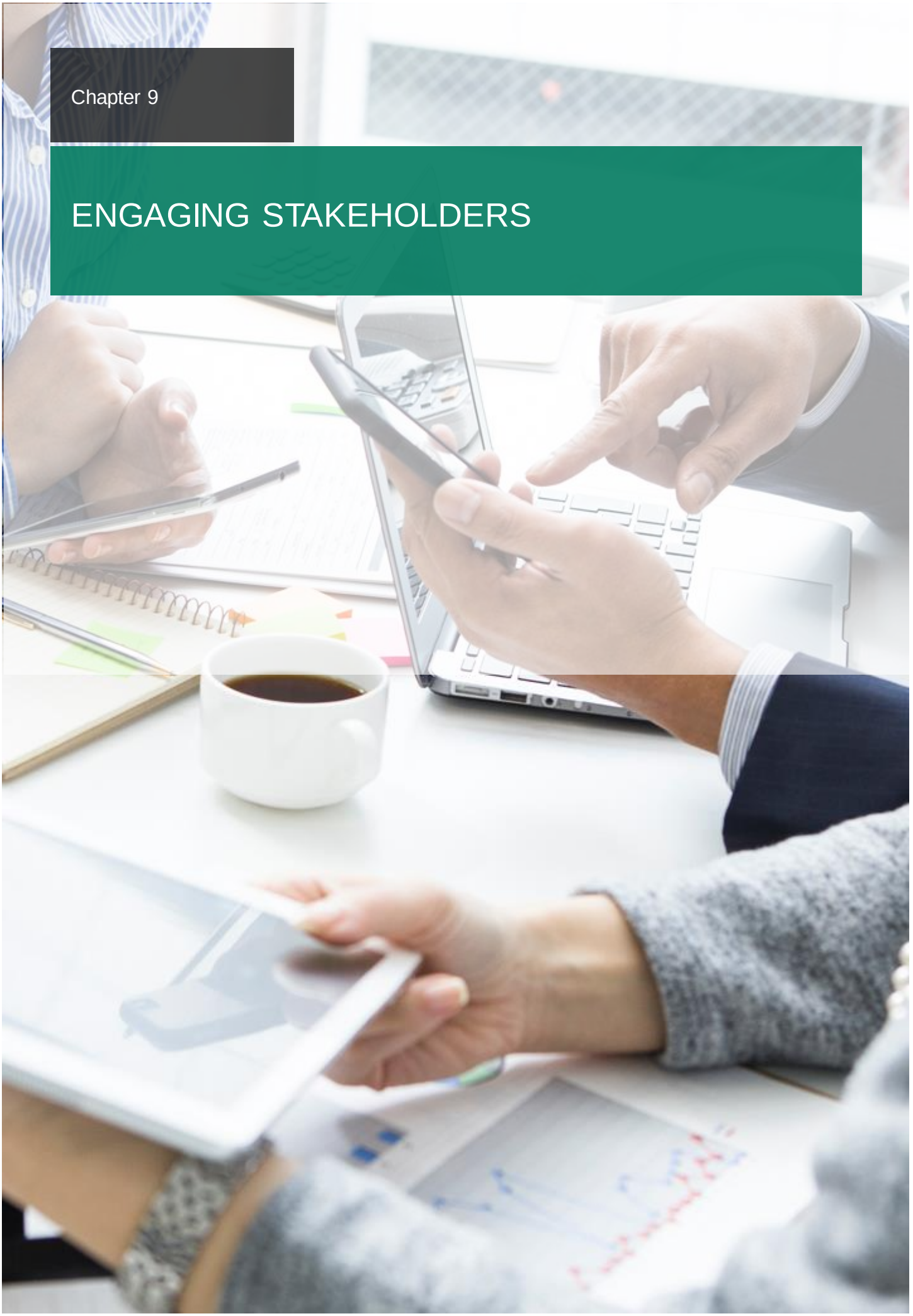
With an increase in water costs, water related conflicts, water scarcities and other extreme events around the globe, companies are coming to the realization that water risks can directly impact their operations and their credibility with investors and local communities. Investors are pushing companies to improve their reporting and understanding of the likelihood of water risks which could potentially affect business robustness.

Responding to these risks, efficiency improvements combined with partnerships with local communities, businesses, and government actors to protect the water in the river basin is the one certain way to protect the interests of all water users. Water Stewardship is an emerging paradigm which allows companies to respond to these growing challenges to protect corporate and brand reputability.

Where the resources and capacities of local governments fall short of meeting demands, Water Stewardship plays a role in stimulating improvements to river basin management by guiding the appropriate actions needed to effect real change. Water Stewardship emphasizes actions at local level prioritizing the need to understand and engage in the broader catchment, since water users share risks and opportunities related to water resource management.

Chapter 9

ENGAGING STAKEHOLDERS



Engaging Stakeholders

Stakeholder engagement lies at the centre of emerging trends and changing landscape in the chemical sector, globally and in India. Trends such as changing consumer preferences, product stewardship, product diversification and downstream business growth, digitalisation, circular economy, increasing ESG reporting, sustainability, net zero and decarbonisation - all point to the ever more increasing need to keep interests of all relevant stakeholders such as employees, workers, customers, local communities, suppliers, governments, and not just shareholders at the centre of future development. There has been gradual departure from Maximising Shareholder Value (MSV) that governed business practices from the time Milton Freidman wrote a New York Times article in 1970. Friedman opined that any business executives who pursued a goal other than making money were "unwitting puppets of the intellectual forces that have been undermining the basis of a free society these past decades" . However, after almost five decades of commitment to MSV, which in 2009, Jack Welch called "the dumbest idea in the world"— big business now admits that MSV has failed and claims to be embracing a new goal: stakeholder capitalism.

World Economic Forum (WEF) Davos Agenda 2021 was focused on emerging needs to move away from shareholder and state capitalism towards stakeholder capitalism (which Klaus Schwab, Executive Chairman, WEF, calls a better global system). Both shareholder and state capitalism systems have led to tremendous economic progress over the past few decades. But each has equally brought about major social, economic, and environmental downsides. They led to rising inequalities of income, wealth, and opportunity; increased tensions between the haves and the have-nots; and above all, a mass degradation of the environment.

Schwab states that in the system of stakeholder capitalism, the interests of all stakeholders in the economy and society are taken on board, companies optimize for more than just short-term profits, and governments are the guardians of equality of opportunity, a level-playing field in competition, and a fair contribution of and distribution to all stakeholders with regards to the sustainability and inclusivity of the system.

Given the intertwined nature of chemical sector at a global level, the importance of keeping interests of stakeholders is of immense importance to India as well. Recently, the policy formulation from government has stressed the need for engaging with industry stakeholders.

Engaging Stakeholders

The Government is planning to redraft Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) policy guidelines wherein the government has requested the industry to share their viewpoints so that the same can be fine-tuned further. At the 12th edition of India Chem in September 2022, Union Minister of State for Chemicals & Fertilizers and New and Renewable Energy, Bhagwanth Khuba stated that the government wants to institutionalize the process to conduct regular meetings by involving all the stakeholders to address the major issues of the chemical industry. Enabling frameworks, providing proper infrastructure and trade related issues are among the major focus points of the Department .

However, much is still left to achieve, especially regarding local communities, employees, and workers (permanent and contracted), and customers. With growing concerns of human rights linked to forced labour in China , there is also a growing focus of customers to ensure that the supply chains (of which India aims to be an integral part of) are benchmarked to international standards and best practices and are not just compliance driven.

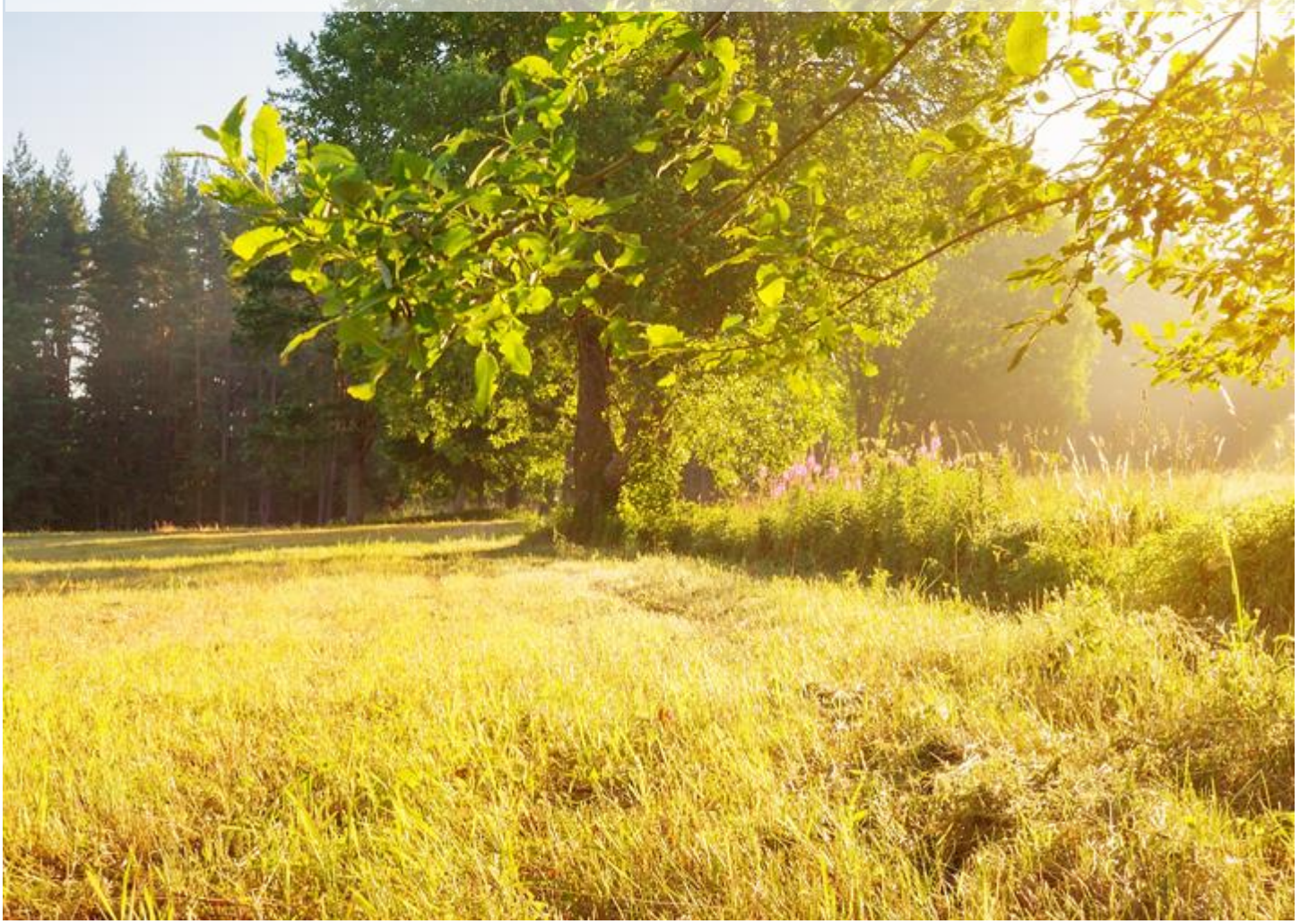
While public hearing is a mandatory step in the regulatory EIA process, the engagement levels with communities gradually boils down and moves from community concerns and impacts to CSR driven engagement. Local communities and civil society have been at the forefront to demand for bans of harmful chemicals and demanding actions to address legacy and ongoing pollution and contamination in industrial areas . A cursory look at the number of cases in National Green Tribunal (NGT) on pollution and contamination by chemical industries does not leave much to imagination and reiterates the gulf between ambitions and current situation.

To conclude, India's chemical sector must transition away from MSV and towards consistent and meaningful stakeholder engagement through the entire lifecycle of projects, and across the complex supply chain with multiples nodes and relevant stakeholders. Companies should play an active role in engaging with government stakeholders to ensure that the policy formulation has an eye on global trends and demands. Long term ESG vision – cultivated through international benchmarks and reporting requirements should drive companies' actions in managing the sector risks and opportunities.

Engaging with stakeholders should not be seen as a PR stunt but as a process to incorporate the outcomes in decision making.

WAY FORWARD

SUMMARY



Summary

The transition towards sustainability and circular economy is driven by an increased focus on sustainable actions demanded by end consumers, brand owners, investors and regulators alike, and accelerated by the rapid pace of technology development. Sustainable and circular business models are the foundation of a sustainable transition for the chemical industry, and a crucial element in achieving the targets that the companies may set in line with the ambitions at the national level.

These upgraded business models can turn inefficiencies and waste streams in traditional linear value chains into business opportunities. This would mean maximizing the time materials and products are kept in use by continuously feeding them back through the value chain for reuse and utilizing other inefficiencies like waste energy in the value chain.

The chemical industry plays a key part in enabling more wide-scale sustainability and across industries, as it is heavily interlinked with other industries. Chemical companies are well equipped to develop materials and methods that enable and speed the adoption of sustainable and circular business models, allowing them to be powerful partners to manufacturers, suppliers and retailers, besides developing their own operations towards sustainability and circularity.

A successful transition to circularity requires a significant shift in operations, culture and organization, product and service development and ecosystem collaboration, supported by relentless focus on customer-centricity and smart application of emerging technologies. A race for “sweet spots” in emerging circular value chains has already begun – we invite chemical companies to use this knowledge paper to embrace this disruption and build a solid foundation for a low carbon sustainable future.

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 156 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 74 companies who are RC Logo Holders.

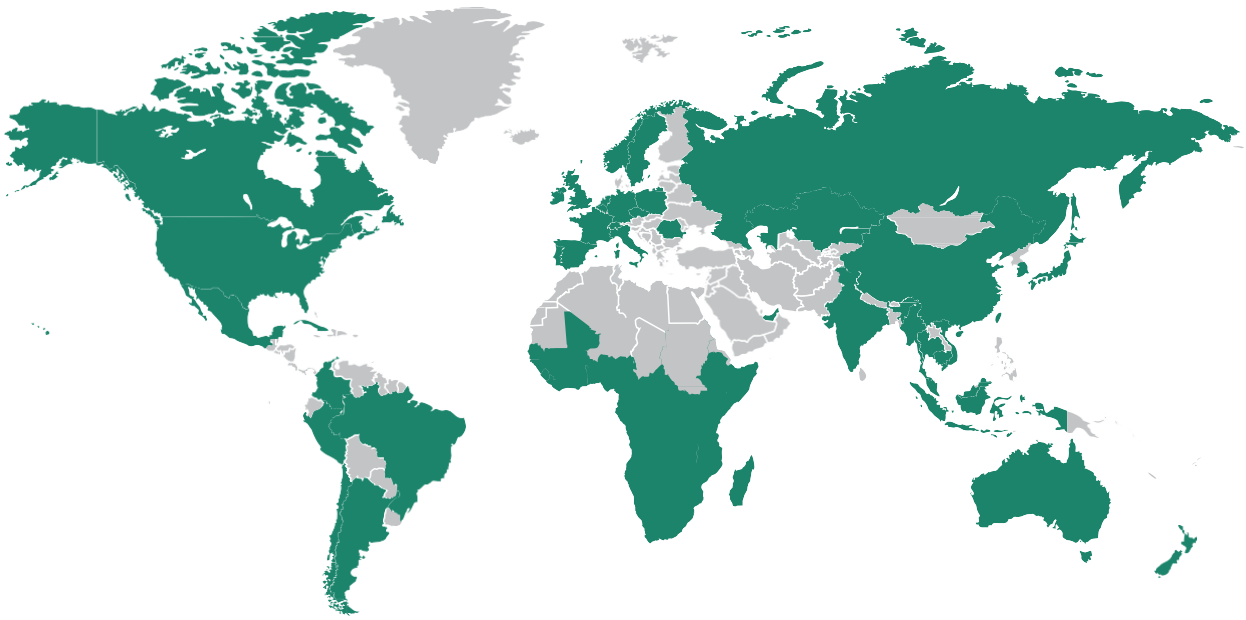
Another pioneer initiative of ICC is the Nicer Globe which is ICC's Responsible Care Initiative for Transport Distribution Safety, Emergency Response and Transport Security. The objective is to foster mutual cooperation and collaboration within the industry for responding to transport emergencies and 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.

About ERM

The business of sustainability



160 Offices

40 Territories & Countries

5500+ Experts

At ERM, sustainability is our business.

As the largest global pure play sustainability consultancy, we partner with the world's leading organizations, creating innovative solutions to sustainability challenges and unlocking commercial opportunities that meet the needs of today while preserving opportunity for future generations.

Our diverse team of world-class experts supports clients across the breadth of their organizations to operationalize sustainability, underpinned by our deep technical expertise in addressing their environmental, health, safety, risk and social issues. We call this capability our "boots to boardroom" approach for its comprehensive service model that allows ERM to develop strategic and technical solutions that advance objectives on the ground or at the executive level.

ERM has had a presence in India since 1995 and today is the leading provider of environmental, health & safety, risk and social consulting services in the Indian market. With over 170 full time staff working out of offices in New Delhi/ Gurgaon, Mumbai, Ahmedabad, Bengaluru and Kolkata, ERM has unparalleled capacity and reach in the region.

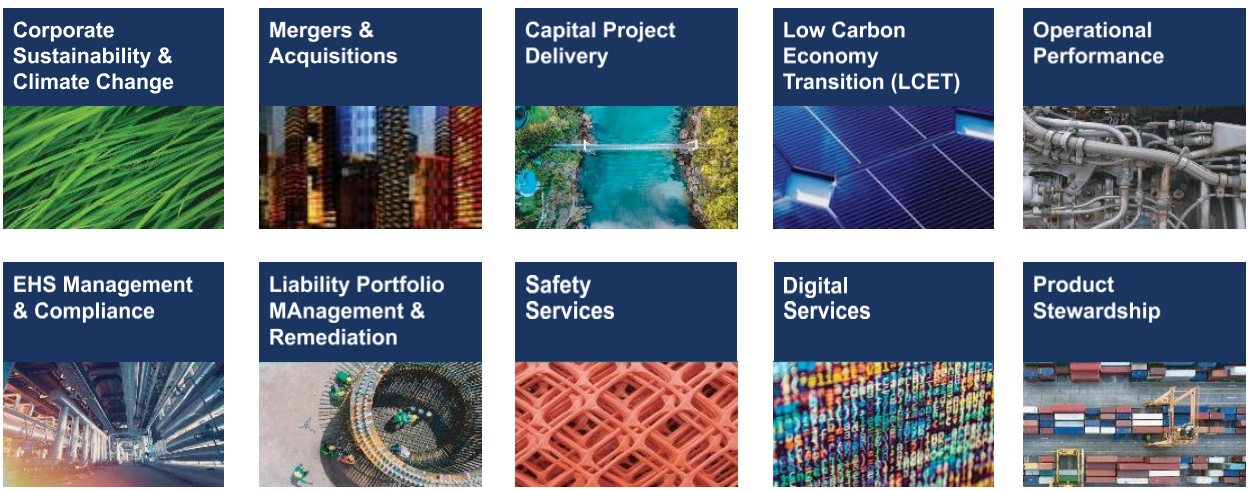
About ERM

ERM is uniquely qualified in the Indian and South Asian region to provide advice and assistance for all phases of a company's evolution. Whether it is reducing risk and liability exposure associated with a transaction, improving environmental, health and safety performance of an operational asset, or mitigating social, community and reputational risks for a major capital project, we can leverage our local and global networks to assemble the best team to meet your needs. ERM's regulatory advisory experience in India also includes the framing of new environmental and sustainable development policies and legislation. In addition to being ISO 9001 certified, ERM has an accreditation from NABET/ QCI (Government of India) as an Environmental Impact Assessment (EIA) Consultant for projects requiring Environmental Clearance from Ministry of Environment and Forests (MoEF) or State EIA Authorities (SEIAAs) for key industrial and infrastructure sector projects.

ERM is also the only firm in India providing turnkey contaminated site management services, including groundwater remediation, Brownfield redevelopment services, soil and groundwater contamination assessments, building decontamination and specialist demolition and decommissioning services.

Services

ERM services support our clients' environmental, health, safety (EHS) and sustainability needs across the entire lifecycle of the business



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