Poison PVC: Big Coal Leading PVC Growth in India
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Location of the project

The Gulf of Kutch located in western Gujarat covers an area of 7,350 km², is approximately 170 km long, and up to 75 km wide at its mouth. The Gulf is bordered by Kutch district to the north, Jamnagar district to the south, Rajkot and Morbi districts to the east, Devbhoomi Dwarka district to the southwest, and the Arabian Sea to the west. The Gulf of Kutch is only one of the 4 locations in India where live corals are present. The Gulf is interspersed with freshwater wetlands, mangroves, and tidal mudflats and bounded by extensive coral reef habitat mostly in the south. These ecosystems form the foundation of the unique marine ecology and biodiversity of the Gulf. Fishing and agriculture are the primary livelihood activities in the region. Fishing especially has been a primary activity due to the wide range of fish available in the Gulf.

The first of the industries to come up in the region was a chemical factory at Mithapur in 1937. Since then, the region has seen a steady increase in the development of modern ports catering to the import of raw materials like coal, oil and gas, thermal power plants oil and gas storage facilities and refining infrastructure. Today, the 40 km coastline on both the northern and southern parts of the Gulf are dotted with one or the other such infrastructure.

The Gulf of Kutch is endowed with rich marine and coastal biodiversity. It is considered as a Critically Vulnerable Coastal Area (CVCA) as per the Coastal Regulation Zone (CRZ) Notification 2011 of the Government of India. The Gulf’s biodiversity and unique features like the extensive intertidal areas, mangroves, mudflats, creeks etc. and the livelihoods of the fishing communities, culture and lifestyle are intertwined for several generations. Their contribution to the fisheries sector of Gujarat can be gauged from the fact that while a tenth of Gujarat’s fish catch came from Kutch, more than a third of this is from these traditional fishing communities.

In Kutch district, currently, there are 3 coal-based power plants - 4,000 MW by Tata Power, 4,620 MW by Adani Power and 300 MW by OPG group. There are two ports operated by Adani (one of which is exclusively handling imported coal). A slew of additional projects have been announced within the SEZ that are operated by the Adani group, among them is a PVC plant with a capacity of 2 million tons per annum. Project expansions and operations, the additional coal handling at the port and the operations of a highly toxic industry will compound environmental hazards.
and increase the health risks for the people while further polluting the environment and accelerating the degradation of the ecology. Based on the current practise, the Government provided the environment clearance for this project based on the traditional environment impact assessment (EIA), not a cumulative one that would consider the existing projects and their impacts.

Towards the south, 30 km across the gulf from Mundra coast, there is the 1200 MW Essar Thermal Power station at Vadinar, Reliance’s Jamnagar Refineries at Motikhavdi, the largest in the world has a refining capacity of 70 MMTPA. Nayara Energy also has its refinery in Vadinar with a 20 MMTPA capacity and a planned expansion to 46 MMTPA. All the 3 companies have dedicated coal, oil and gas terminals according to their needs.

![Figure 1: Map of Gulf of Kutch](image)

Based on data from the Industries Commissionerate, Gujarat, **Kutch is one of the top 4 districts** to receive large projects and investments for these projects. Further, **chemicals and petrochemicals are a significant recipient for projects and investments** in Gujarat. An analysis of this data suggests that it is those districts which have significant chemicals and petrochemicals industry which have been the recipients of projects and investments. The graphs below based on the Industries Commissionerate data makes the picture rather clear:
This has resulted in large-scale and rapid physical destruction of mudflats, uprooting of mangroves, blockage of tidal inlets, creeks and reclamation along the coast. From oil spills to effluents dumped by thermal power plants and refineries, the ecology of the region has taken a serious beating over these decades of unfettered industrial activity. On the social side, the existing traditional fisher communities have witnessed the loss of their customary rights, livelihood, food source and shelter areas. They have not been adequately resettled or compensated in this course of development. Fish diversity and yields have come down and fishers have had to face the brunt, by moving towards the north of the Gulf in search of better catch, making them vulnerable to threats that come with fishing in the open sea. On the other hand, fishers have reported that up to 40% of their catch includes plastic, exacerbating an already challenging situation.
Several government and private institutions have studied the Gulf of Kutch for its ecological health and the impacts of existing projects on the people living in this region. These reports have warned that further developments without factoring the ecology health and livelihoods of the people would have long-term and irreversible damage. Some court-appointed committees have also suggested that project-specific impact assessments would no longer serve the purpose and that a cumulative impact assessment at the landscape level is needed.

The government’s approach to project-based EIA is misleading and allows for regulatory bodies to grant clearances without a holistic understanding of the impacts of fossil fuel-based industries on a region.

In September 2013, in response to a complaint by Machimar Adhikar Sangharsh Sangathan (MASS) and Kheti Vikas Seva Trust regarding environmental concerns in the Mundra port area, the Ministry of Environment and Forests constituted a Committee to inspect M/S Adani Port and SEZ Ltd. Mundra, Gujarat and its proposed activities. The Committee headed by Ms Sunita Narain, Director General of, the Centre for Science and Environment, submitted its report in 2014. One of the key recommendations of this Committee was, “The Committee recommends that MoEF should commission a comprehensive study on the cumulative impacts of projects, which have already been granted clearance. This study should be used to assess and mitigate impacts in the region. All future port and power plant projects should be assessed for clearance based on cumulative impacts.”

From oil spills to effluents dumped by thermal power plants and refineries, the ecology of the region has taken a serious beating over these decades of unfettered industrial activity. On the social side, the existing traditional fisher communities have witnessed the loss of their customary rights, livelihood, food source and shelter areas. They have not been adequately resettled or compensated in this course of development.
Simultaneously, in September 2013 the National Centre for Sustainable Coastal Management (which is a part of the Ministry of Environment and Forests) and the Government of Gujarat’s Gujarat Ecology Commission conducted a 2-day “Workshop on Cumulative Environmental Impact Assessment of Gulf of Kachchh, conducted in Gandhinagar, Gujarat, India” based on which it released a document, ‘Gulf of Kachchh. A Framework for the Cumulative Environmental Impact Assessment.’ This framework acknowledges the need for a cumulative impact assessment in the Gulf of Kutch and details out a 5-step process.

Despite key experts and government ministries and institutions acknowledging and even proposing a cumulative impact assessment in the Gulf, such an exercise has not been conducted even 9 years after it was first recommended.

**PVC Production Process**

India’s history of producing PVC from coal goes back to 1961 when Calico Mills established the first plant in Mumbai with a capacity of 6 KTPA (kilo tonne per annum). PVC can be produced through ethylene and acetylene, where ethylene requires caustic soda to make PVC and acetylene requires a coal-based calcium carbide process.

PVC is commonly made by combining ethylene which is derived from petroleum or natural gas, with chlorine to yield ethylene dichloride (EDC), which is converted to polyvinyl chloride (PVC). In the case of coal, coal is converted to calcium carbide - which is used to obtain acetylene - acetylene is reacted with hydrogen chloride over a mercuric chloride catalyst to obtain polyvinyl chloride (PVC) (Figure 4).

The process of making PVC from coal generates residue of mercury in the ash that the factories excrete, this mercury-laced ash has been known to cause major environmental and health hazards, even more than ethylene-based production.
The coal-based PVC synthesis technology uses relatively simple, low-cost equipment compared with ethylene-based methods. Coal-based method is also known for its lack of requirement of automation where workers with low-level skills can operate and maintain the process. Modern ethylene-based methods require more expensive machinery, and a higher level of skill to operate and service that machinery.

Relatively easy, the coal-based method is not only known for its simplicity, but also for being notoriously hazardous for the environment and energy inefficiency, taking as much as twice the amount of energy compared to the ethylene-based method.

Despite the negative things about Coal-to-PVC plants, they make up the majority of PVC production in China. Due to the lower cost of the machinery, there are lots of small-scale plants which produce PVC from coal. Therefore PVC plants have contributed heavily to hazardous air pollution levels, toxicity in natural water sources, and mercury poisoning through groundwater and atmospheric air.

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India signed the Minamata convention in 2018 and became the 93rd country to do so. As of September 2020, 123 countries have signed the convention to reduce mercury contamination from the environment.

Back to Indian PVC manufacturing, there are three types of manufacturing processes; Polymerisation of Vinyl chloride monomer (VCM) is a straightforward process of creating a long chain of vinyl chloride monomers to make the vinyl chloride polymer known as PVC. Coal/Calcium carbide method, and ethylene method which is preferred by Indian manufacturers.

After the inception of the Minamata Convention on Mercury (named after the Minamata disease caused by mercury poisoning), there have been occasions where the Chinese government has tried to push the manufacturers towards ethylene-based plants, but with limited success. The incentives to change the cheap machinery with the costlier one have remained short, making the smaller producers more reluctant on spending money on upgrades of manufacturing plants.

Source: Market Research
Chlorine is an important product for PVC manufacturing and it is produced from the electrolysis of salt. The saltwater is electrically charged, which splits the salt molecules and generates chlorine and caustic soda. Caustic soda is used in a wide variety of sectors including Textiles, Alumina, Pulp, and Paper. In India, approx 7.8% of chlorine is used to make PVC while globally the number is as high as 40%. Therefore the ‘Chlor-Alkali’ industry in India is driven by caustic soda rather than chlorine and is also dependent on the PVC industry.

Chlorine is required for both methods of PVC production, and it releases highly toxic pollutants into the environment. The coal/Calcium Carbide method releases asbestos and mercury, while the oil-based method uses toxic Perfluoroalkyl and Polyfluoroalkyl Substances (PFAS) to produce chlorine gas. It is known that chlorine combined with carbon-based materials creates some of the worst toxins which are very stable and not easily broken down naturally. While newer formulations of PVC have phased out phthalates, lead stabilisers and cadmium stabilisers, PVC continues to be extremely toxic.

“It is known that chlorine combined with carbon-based materials creates some of the worst toxins which are very stable and not easily broken down naturally. While newer formulations of PVC have phased out phthalates, lead stabilisers and cadmium stabilisers, PVC continues to be extremely toxic.”
Adani’s Coal to PVC Plant

One of the largest Indian conglomerates engaging in mining and exporting coal, the Adani Group announced in 2021 that it intends to establish a PVC manufacturing unit in an area that is part of the land occupied by Adani Ports and SEZ Limited, located at Mundra, Gujarat. SEZ is an acronym for special economic zone which is a designated area within which tax laws applicable with the “domestic tariff area” do not apply. In other words, an SEZ is akin to a country within a country.

The Adani Group has coal mining operations in India, Indonesia, and Australia. In India, it is the largest Mine Developer and Operator (MDO) in the private sector and among all coal mining companies in the country, it is second only to Coal India Limited, the public sector company with seven subsidiaries that describes itself as the world’s largest government owned coal producer. The Adani Group has expanded its operations by actively participating in auctions for commercial coal mining rights that have been conducted by the Indian Government in recent years.

The proposed new coal-to-PVC venture would be executed through Adani Petrochemicals Limited, a wholly owned subsidiary of Group flagship Adani Enterprises Limited. In July 2022, Adani Group successfully secured a loan of ₹6,071 crore from the State Bank of India (SBI), the country’s largest bank. The loan was meant to set up a copper refinery at Mundra. Not long thereafter, the Adani Group approached the SBI once again, this time seeking a loan of ₹14,000 crore. The purpose of this funding was to support the construction of their proposed coal-to-PVC plant. The project was initially estimated to cost ₹19,000 crore, with a substantial portion, around ₹14,000 crore, to be potentially financed by a consortium of banks led by the SBI. According to some reports, the contours of the 15-year loan is being finalised. SBI, like in an earlier instance of a loan given to Adani Enterprises for the Navi Mumbai airport, intends to sell some of the loans to other lenders and intends to retain only ₹5,000 crore. Thereafter, the total project cost went up first to around ₹29,200 crore and then further to roughly ₹34,500 crore (or US$4.2 billion).

The proposed plant will be situated in a three-square-kilometre area and will use 3.1 million tonnes (MT) of imported coal per year to make PVC which would be imported from Australia, Russia, and other countries. This coal is likely to be substantially sourced from the group’s very own Carmichael mine in Queensland in north-west Australia, that has already started sending coal to the Mundra Port or the APSEZ which is part of the Adani Group.
The pre-feasibility report submitted by the Adani Group itself acknowledges that the proposed coal-to-PVC project would require coking coal, thermal coal and “petcoke” blends in the coke oven or coal pyrolysis plant to produce the necessary coke. Petcoke is an abbreviated version of petroleum coke which is a final carbon-rich solid material that is derived from refining crude oil.

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Indian PVC market

According to PlastIndia Foundation’s 2021-22 report, the demand for PVC in 2021-22 was 2.8 MMT, which contributed to 18% of the total demand of major plastics in India. According to the Department of Chemicals & Petrochemicals, PVC installed capacity, production and consumption in 2020-21 stood at 1,493.00, 1,434.12, and 1,836.44 KT respectively. There are a total of 5 producers with Reliance Industries Limited producing 48% of all PVC in India.

Company-wise installed capacity of PVC (Suspension Resin) 2021-22 (KT)

Company-wise installed capacity of CPVC 2021-22 (KT)

Figures 7 and 8: Installed capacity of PVC (Plastics Industry Status Report – India - 2022 (plastindia.org))
According to the same report, PVC was one of the top plastic importers with 1,435 KT being imported in 2021-22.

The following are upcoming PVC projects in India. There is a total planned production of 5,457 KT over the next few years.

<table>
<thead>
<tr>
<th>Company</th>
<th>Grasim Lubrizol</th>
<th>RRPCL</th>
<th>Adani</th>
<th>Chemplast</th>
<th>RIL</th>
<th>HPCL/GAIL</th>
<th>Chemplast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>Gujarat</td>
<td>Maharashtra</td>
<td>Gujarat</td>
<td>Tamil Nadu</td>
<td>Gujarat</td>
<td>Kakinada</td>
<td>Tamil Nadu</td>
</tr>
<tr>
<td>Plastics</td>
<td>CPVC</td>
<td>PVC</td>
<td>PVC</td>
<td>EPVC</td>
<td>PVC</td>
<td>PVC</td>
<td>CPVC</td>
</tr>
<tr>
<td>Capacity (KT)</td>
<td>100</td>
<td>1,500</td>
<td>2,000</td>
<td>35</td>
<td>1,500</td>
<td>300</td>
<td>22</td>
</tr>
<tr>
<td>Timeline</td>
<td>2023</td>
<td>2025</td>
<td>2025</td>
<td>2025</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Figure 09: Upcoming PVC projects in India (https://www.plastindia.org/upload/pdf/Plastics-Industry-Status-Report-India_29112022.pdf)

PlastIndia’s 2021-22 report also compiles government schemes which create a potential for use of plastics. According to the list below, drawn from the report, about 20% of total PVC demand is generated by the government.
<table>
<thead>
<tr>
<th>Government Scheme</th>
<th>Estimated potential plastics (KT)</th>
<th>PVC (KT)</th>
<th>Percentage of total</th>
</tr>
</thead>
<tbody>
<tr>
<td>SwachhBharat</td>
<td>1,895</td>
<td>37.5</td>
<td>1.98</td>
</tr>
<tr>
<td>Smart Cities</td>
<td>1,085</td>
<td>375</td>
<td>34.56</td>
</tr>
<tr>
<td>Clean Ganga River Mission</td>
<td>45</td>
<td>15</td>
<td>33.33</td>
</tr>
<tr>
<td>National Offset Policy for Defence Application</td>
<td>250</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>Digital India</td>
<td>250</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>Make In India</td>
<td>650</td>
<td>200</td>
<td>30.77</td>
</tr>
<tr>
<td>PMAY</td>
<td>150</td>
<td>150</td>
<td>100.00</td>
</tr>
<tr>
<td>Amrut 2.0</td>
<td>300</td>
<td>300</td>
<td>100.00</td>
</tr>
<tr>
<td>City Gas Distribution (CGD)</td>
<td>553</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>Jal Jeevan mission</td>
<td>200</td>
<td></td>
<td>0.00</td>
</tr>
<tr>
<td>Total</td>
<td>5,378</td>
<td>1,077.5</td>
<td>20.04</td>
</tr>
</tbody>
</table>

*Figure 10: Contribution of government schemes to PVC demand*
Issues and Concern of the Project

Picture Credits: Russell Scott Images
Financial Health of Adani Group

The Hindenburg research report published on 24 January 2023, alleged the Adani Group of stock manipulation and accounting fraud, pulling off ‘one of the largest corporate frauds in history’. As per their research, and as confirmed by some senior corporate finance gurus, the seven listed companies of the Adani Group have an 85% downside on their stock price, just on a fundamental basis. This is arrived at by the standard methods used by corporate finance experts for calculating the valuation of any company using the company information available such as cash flow, debt, equity, sector benchmark, etc.

Before the Hindenburg report, an assessment carried out last year by CreditSights, a credit assessment unit of the Fitch Group, points to the group's high indebtedness, over-leveraged operations and debt-driven expansion into highly capital intensive projects in a wide range of new sectors. According to this report, “excessive debt and over-leveraging by the group could have a cascading negative effect on the credit quality of the bond issuing entities within the group and heightens contagion risk in case any entity falls into distress”.

Another report on the extent of over-leveraging of Adani Group's activities appeared in the press in 2019. The report highlighted the complex web of subsidiaries set up by the group to carry on its operations in diverse sectors and pointed to excessive debt-dependence and leverage among the Group's subsidiaries.

According to this report, the group’s combined borrowings of the six listed companies had jumped 40.5% to a mind-boggling level of Rs 2.21 lakh crore in the financial year 2021-22, compared to Rs 1.57 lakh crore in the previous financial year and as per Credit Suisse latest report, the total estimated debt has reached to Rs. 2.6 lakh crore after the acquisition of Holcim’s India businesses of cement manufacturing. Both these upcoming projects are housed within the group company Adani Enterprises Limited (AEL), and already the gross leverage of AEL is 10.4x and ratio of EBITDA to gross interest is 1.6x. The Adani Group as a whole and AEL in particular are exposed to ESG risks due to the large portfolio of coal mines and coal fired thermal power plants. Further, there is no evidence in the public domain of promoter equity capital injections into the group companies which, as per the CreditSights analysis, is needed to reduce leverage in their stretched balance sheets.
Additionally, an investigation by the Directorate of Revenue Intelligence into the alleged overvaluation and over-invoicing of equipment and coal imports highlighting irregularities in imports and exports (aimed at evading tax, or benefiting from incentives) can have a negative impact on Adani Group’s future financial prospects.

Following the release of the Hindenburg report, US$ 108bn was wiped off from the group’s seven listed companies. The American investment bank Citigroup has stopped accepting securities of the Adani group as collateral for loans.

As per Hindenburg’s report, 4 of 7 companies which include Adani Green, Adani Total Gas, Adani Transmission, and Adani Enterprise have negative free cash flow of Rs 28,926 crores.

“Following the release of the Hindenburg report, US$ 108bn was wiped off from the group’s seven listed companies. The American investment bank Citigroup has stopped accepting securities of the Adani group as collateral for loans.”
Indian banks are already burdened with large amounts of non-performing assets. Till June 30, 2022, banks only received Rs. 2.35 lakh crore from the total claims of Rs. 7.67 lakh crore under IBC (Insolvency and Bankruptcy Code) and in the process took a 69% haircut. As per the data available with Bloomberg and Refinitiv, the State Bank of India has a minimum exposure of Rs. 27,00 crore to companies belonging to the Adani Group. the country’s largest lender, the SBI and its depositors have borne the highest burden of NPAs. In 2021-22, as per RBI data, SBI had the highest amount of bad loans and wrote off the highest amount of public money to the tune of Rs. 19,666 crores. In August 2023, there were reports that a list of 331 accounts totalling Rs. 96,278 crores had been identified to sell to Asset Reconstruction Companies (ARCs). SBI’s further lending to the Adani group would only add higher risk of more bad loans. RBI’s official data shows NPAs have come down but this decrease is not due to the recovery of bad loans. The writing off of bad loans is the main reason behind this decrease in the overall NPA amount.

It is important to note that coal-based projects became the principal line item in India’s terrifying bad loans problem, contributing to more than ₹1.74 lakh crores in NPAs. This Coal to PVC project has the potential to join the long list.

According to the Institute for Energy Economics and Financial Analysis (IEEFA), “any highly capital intensive greenfield investment in underground coal gasification, coal-to-gas, coal-to-oil, coal-to-methanol, coal-to-fertilisers or coal to PVC projects, or any similar coal’s alternative usage, is most likely to be a clear repeat of similar historical investment mistakes by China’s coal giants (including China Coal, China Shenhua and Shanxi Lanhua), or in the worst case, may replicate the environmental and economic disaster the now bankrupt Linc Energy coal gasification project proved to be for Australian taxpayers”.

As per the data available with Bloomberg and Refinitiv, State Bank of India has a minimum exposure of Rs. 27,00 crore to companies belonging to Adani Group. the country’s largest lender, the SBI and its depositors have borne the highest burden of NPAs.
The Reserve Bank of India recognizes the potential risks that arise from climate change on the financial systems. Regarding this, the RBI Deputy Governor M Rajeshwar Rao said, “Such risks range from the direct physical risks emanating from adverse climate-related events to loss of reputation and legal risks”. By adopting sustainable financing, banks play an important role in mitigating such risk. This is an important risk factor in light of the category 2 cyclone Biparjoy which made landfall in Naliya within the Kutch district and not far from the proposed coal to PVC project site.

Sustainability is one of SBI’s core values, and to tackle the climate risk bank adopted a sustainability and business responsibility policy. The policy considers the environmental, social and governance risks that the bank would face in its operations. SBI has initiated the integration of the Sustainability and Business Responsibility (BR) Policy with the Risk Management Framework. Two key considerations are informing SBI’s credit decisions as per its Sustainability Policy:

- Socio-economic considerations: Capacity to create economic development in the region, adherence to Labour laws/Human rights. Resettlement and Rehabilitation of the local populace, CSR initiatives etc. to be critically examined.
- Environmental Considerations: Borrowing entity’s outlook on Pollution management (Air, Water and Hazardous waste), the ecological impact of operations, business continuity and disaster resolution arising out of any emergency.

In addition, the bank states its commitment to contribute to the following:

- Implementing energy conservation and energy efficiency initiatives
- Reducing Greenhouse Gas (GHG) emissions
- Managing Waste generation and disposal (hazardous and non-hazardous)
- Adopting environmental best practices, including establishing an environmental management system. Conserve natural resources by adopting the “3 R” (Reduce, Reuse and Recycle) approach towards pollution prevention and effective waste disposal including electronic waste
- Adopting and integrating the energy and environment considerations for all new infrastructural facilities and obtaining relevant certifications wherever possible
Towards creating positive environmental impact, as of 31 March 2022 SBI bank deployed over Rs 32,000 crore for renewable energy projects.

However, at the same time, SBI is the largest lender in fossil fuel projects in the country. From 2016-2022, SBI has financed 56 companies with a total of US$ 30,290.97 million. SBI is constantly using public money to finance these projects.

Furthermore, Adani Group has a history of engaging in human rights violations against the Wangan and Jagalingou tribes in the Carmicheal coal mine in Australia. It has commercial ties with the Myanmar Economic Corporation (MEC). MEC is controlled by Myanmar’s military and they are responsible for orchestrating brutal human rights violations against Rohingya Muslims, and in general. In India, the group has displaced Indigenous people of the Gond tribe in Hasdeo, Chhattisgarh. Investing in Adani Group makes SBI Bank complicit in the human rights violations that Adani Group orchestrates from Australia to India.

In light of the above commitment by the bank, especially those relating to the reduction of carbon footprint, and greenhouse gas emissions and avoiding harmful health impacts on the people, the SBI is not only violating its ESG guidelines but investing public money in coal to PVC project and Adani Group, in a company whose financial viability has been deemed suspect is a violation of the trust that crores of people have reposed in these public sector banks.
Contribution of the project to the ongoing climate crisis

Coal-to-PVC remains an energy-intensive and highly polluting method for manufacturing plastic. Coal-based plastic creates three times the GHG emissions than conventional plastic. This coal-to-PVC plant with 39 flue gas stacks and 113 process vent stacks will emit large amounts of particulate matter which causes eye, lung and throat irritation, respiratory issues, lung cancer, problems with babies at birth and heart diseases. It will release toxic sulphur dioxide, a GHG which affects the respiratory system and particularly lung function, which causes coughing, mucus secretion, aggravates conditions such as asthma and chronic bronchitis, also causes acid rains and is harmful for vegetation. Nitrogen oxides responsible for the creation of GHG gas in the form of tropospheric ozone and other hazardous gases which will substantially increase the threat to climate, the planet and the people in Mundra will also be released.

The petrochemicals industry operates in a highly carbon-intensive manner, where one carbon compound is utilised to create another, often relying on energy derived from carbon-based fuels like coal and gas. Moreover, the environmental impact of the manufacturing processes extends beyond the production phase, as the use of petrochemicals also contributes to carbon emissions. Additionally, the disposal of waste from petrochemical processes releases harmful chemicals into the environment, exacerbating environmental concerns. In addition, there are significant health implications associated with the use of petrochemicals, as these have been linked to various forms of cancer in humans.

Thus, how can SBI which claims to undertake ‘initiatives intended to drive progress on the United Nations Sustainable Development Goals (SDGs)’ decide to invest in petrochemicals? Such disastrous potential health impacts of Coal to PVC, undermine SBI’s claims of having contributed to ‘3 SDGs- Good Health and Wellbeing, Clean Water and Sanitation, and Industry, Innovation and Infrastructure’ in its 2023 Annual Report. The SBI has stated its commitment to national development goals, developing communities, reducing the carbon footprint of its operations, and aligning its initiatives to the global Sustainable Development Goals (SDGs).
EDC or ethylene dichloride is a colourless liquid with a sweet chloroform-like odour. It is primarily used as an intermediate in the production of vinyl chloride, which is further used to manufacture polyvinyl chloride (PVC) resins. VCM or vinyl chloride monomer is a crucial building block in the production of PVC. Through a process called polymerization, VCM molecules combine to form the long-chain polymer structure of PVC, giving it its unique properties and versatility.

According to the Living Future Institute, “The Living Building Challenge (LBC) Red List” comprises products that are considered the worst-in-class due to their detrimental effects on the environment, their ability to bio-accumulate in the food chain, and the harm they pose to workers involved in their manufacturing and handling in factories. It is concerning to note that both PVC as a final product and the compounds used in its production find themselves on this list. These substances have been identified as contributing to pollution and causing adverse impacts on ecosystems and human health, making it crucial to adopt more sustainable and environmentally friendly alternatives.

How can SBI which claims to undertake ‘initiatives intended to drive progress on the United Nations Sustainable Development Goals (SDGs)’ decide to invest in petrochemicals? Such disastrous potential health impacts of Coal to PVC, undermine SBI’s claims of having contributed to ‘3 SDGs-Good Health and WellBeing, Clean Water and Sanitation, and Industry, Innovation and Infrastructure’ in its 2023 Annual Report.

<table>
<thead>
<tr>
<th>Product</th>
<th>EDC to air</th>
<th>EDC to water</th>
<th>VCM to air</th>
<th>VCM to water</th>
</tr>
</thead>
<tbody>
<tr>
<td>EDC synthesis (1 ton)</td>
<td>–</td>
<td>7</td>
<td>–</td>
<td>–</td>
</tr>
<tr>
<td>VCM synthesis (1 ton)</td>
<td>5000</td>
<td>1</td>
<td>1000</td>
<td>1</td>
</tr>
<tr>
<td>PVC polymerization (1 ton)</td>
<td>–</td>
<td>–</td>
<td>5100</td>
<td>–</td>
</tr>
</tbody>
</table>

*Figure 11: Release of EDC and VCM (cancerous) in PVC production stages; Norwegian government estimate, 1993. Image Source: Joe Thornton, healthybuilding.net*
Based on the current production capacity, the Adani Group’s mining operations account for at least 2.95% of global CO2 emissions from coal. Instead of transitioning away from coal, the mining capacity of the Adani Group rose by 58% from FY2021 to 2022. Yet another greenfield coal-to-plastics venture by the Adani Group is concerning.

The Prime Minister had announced India’s aim of achieving net zero emissions by 2070 and is committed to phase down coal production and power generation. Giving environmental clearance for a 2-million tonne per annum coal to PVC plant, and financing such a project with use of public money renders these climate commitments ineffective.

In one report by Federation of Indian Chambers of Commerce and Industry (FICCI), they acknowledge that coal to PVC technology used in China is an energy intensive and polluting method and at the same time celebrate Adani’s project as a game changer for the Indian economy which will reduce dependence on imports. This very polluting project will put the heath, safety and livelihoods of thousands of people at risk, and contribute to the ongoing climate crisis.

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According to the Living Future Institute, “The Living Building Challenge (LBC) Red List” comprises products that are considered the worst-in-class due to their detrimental effects on the environment, their ability to bio-accumulate in the food chain, and the harm they pose to workers involved in their manufacturing and handling in factories. It is concerning to note that both PVC as a final product and the compounds used in its production find themselves on this list. These substances have been identified as contributing to pollution and causing adverse impacts on ecosystems and human health, making it crucial to adopt more sustainable and environmentally friendly alternatives.

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Impact of the Projects on Communities, Environment and Coastal Climate

Livelihoods

People of Mundra are already affected by pollution - air, ground and coastal waters and soil - from existing thermal power plants and other industries in the region. Power plants’ cooling systems discharge thermal pollution into the sea, degrading the local marine ecosystem and resulting in the decline of critical fish stocks and other marine resources. In a survey done by the Centre for Financial Accountability in 2019 in nearby villages, people reported that intake and outfall channels of the thermal power plants have caused the seawater to contaminate the groundwater, such that it can no longer be used by farmers for irrigation or as drinking water.

An increase in large polluting industries in the same place will have a dangerous impact on territorial and aquatic ecosystems. The industrial activities in the region have affected nearly 10,000 fishery workers. The fish workers of Tragadi bandar (harbour), Kothadi bandar, and Navinal, (who were impacted by the in-take and outfall channels of the thermal projects) are left on the verge of penury. As per the Fisheries Department Bhuj, the Navinal/Kutadi Bander had an annual fish catch of 646 MT with a value of INR 3.79 crore while Tragadi Bandar had an annual fish catch of 2010 MT with a value of INR 9.65 crore for the period 2000-2005. The thermal power plants, and later the development of Adani’s West port led to the displacement of 35 fisherfolk families of Kuthadi Bandar which impacted their livelihood.

Fishworkers are forced to go to deep waters for fishing as there are no fish left near the coast making them vulnerable to vagaries of nature. Fishworkers in and around Mundra have reported that this has also put a complete stop to Pagadiya (on foot) fishing, usually done by women and fishworkers who can’t afford to use boats. Nearly 1000 Pagadiya families who fish in the intertidal zone are affected by the industrial activities.
Farmers from Navinal, Mota Kandagara and Siracha, with the groundwater turning saline, have to rely on rains as bore well water is no longer fit for irrigation and where people are still using it for irrigation, the quality of the crop has deteriorated. Coal dust and fly ash that settles on the crop affects its quality, especially of cotton (which becomes black in colour) and dates (coal dust and fly ash allow water to settle on it which ruins the fruit).

Health

Coal dust and fly ash from the existing industrial setup in Mundra cover homes, crops, salt resources, and fish laid out to dry, damaging agricultural production, polluting the air, contaminating food and causing respiratory problems among the local population. Adani Group’s coal-to-PVC plant will further increase the pollution load in the surrounding environment resulting in the escalation of health problems for the people of Mundra.

A disturbing incident, such as the Ohio train derailment in February 2023, highlights the dangers of toxic vinyl chloride, a raw material for producing PVC. Local residents in East Palestine experienced health issues like headaches and nausea and had to be evacuated, while around 45,000 fish died in the Ohio River. Long-term exposure to vinyl chloride, classified as a Group 1 carcinogen, can lead to liver cancer. The haunting memory of the Bhopal gas tragedy of 1984, which claimed the lives of 8000 people, serves as a grim reminder of the potentially catastrophic consequences of industrial disasters. The presence of PVC facilities poses a similar level of risk.

In 2007, the Tamil Nadu Pollution Control Board had instructed ChemPlast to conduct a study on the health impacts due to the petrochemicals (predominantly PVC) being produced in its Mettur plant. It released a report in 2008, which was peer-reviewed by a group of doctors from the Government Mohan Kumaramangalam Medical College and Hospital in 2009. The doctors found, “the appalling scenario prevalent in Mettur of indiscriminate disposal of hazardous wastes and the resultant devastation of environment and public health. Chemplast Sanmar’s factories, including the PVC plant, were found to be responsible for polluting the water and soil of the area. The company has dumped toxic wastes – including mercury-bearing sludge and EDC/VCM tars from PVC production in pits. This has led to serious contamination of groundwater, and this contamination is spreading.” Water samples from open and dug wells showed toxic levels way over those prescribed by WHO and identified a host of fatal illnesses that the local population was suffering from.
Climate catastrophes

The vulnerability of Mundra to severe cyclones, as evident from category 3 cyclone Biparjoy in June 2023, adds another layer of concern. As the global temperatures and ocean surface temperatures are rising due to the climate crisis, the cyclones are becoming more intense along the Indian coast. The Intergovernmental Panel on Climate Change (IPCC) in its Sixth Assessment Report mentioned that tropical cyclone activity has increased in the Indian Ocean and Arabian Sea. Another study published by Climate Dynamics showed how the tropical cyclone activity in the Arabian Sea has intensified over the years as compared to the Bay of Bengal.

The intense cyclone activity is not only going to impact the people but the infrastructure would be damaged. Nagarjuna refinery in Tamilnadu was similarly impacted by cyclone Thane in 2011 and the company had to eventually file for bankruptcy causing a loss of thousands of crores to their lenders.

Moreover, experts suggest that mangroves are beneficial in reducing the impact of winds and flooding during cyclones. However, a report by H S Singh, Chief Conservator of Forests, Gujarat Forest Department published in early 2007 reports the drastic loss of mangrove forest in the Gulf of Kutch, especially along the Gujarat coast like Mundra and Hazira where the mangroves disappeared overnight mainly due to the industrial activity. Later, in 2013, Sunita Narain Committee also reported the widespread destruction of mangrove forests by the Adani Group. Another industrial activity by the Adani Group will lead to more damage to the mangroves in the region.
Need to phase out PVC

As much as demand for PVC shows significant increase, numerous governments and corporations have made efforts to restrict its use over the past two decades. The toxic chemicals are released during the entire lifecycle of PVC, from production to post-consumption disposal. During the production of PVC, highly persistent chlorinated furans and dioxins, polychlorinated biphenyls (PCB), hexachlorobenzene, etc are produced. These persistent organic pollutants are listed in the Stockholm Convention which India ratified on January 13, 2006.

Majority of the countries in the European Union have restricted the use of PVC. In 1995, the Swedish parliament voted to phase out soft and rigid PVC, and subsequently this led to a decrease in total PVC use by 39 percent from 1994-1999.

In Germany, more than 200 communities including Berlin and Bonn have written policies to eliminate use of PVC. The four largest cities in the Netherlands-Amsterdam, Den Haag, Rotterdam, Utrecht, have restricted use of PVC in construction. In 1997, Barcelona (Spain) was declared ‘free of chlorine products’ which included PVC as well.

Denmark government initiated multiple steps to restrict the use of PVC which included, a tax on PVC of $0.3 USD/kg, a higher tax on PVC additives, prohibition on incineration, etc. In 1999, Argentina placed a ban on soft toys made of PVC. Likewise, European toy manufacturers and retailers announced to stop selling vinyl toys.

Adani’s Coal to PVC plant is being built under the pretext that there is a deficit in India’s production of PVC. Important to note is that the deficit in 2021-22 was only to the tune of 1,435 KT, but the planned capacity addition across the 7 upcoming greenfield / expansions is almost 4 times this amount. Further, almost 20% of PVC demand is being generated through government schemes.
Further, there are substitutes to the use of PVC for common building components and interior finishes.

The major car manufacturers including BMW, Ford, General Motors, Honda, Nissan, Toyota, Volkswagen, etc have policies to restrict use of PVC. Electronic manufacturers Apple and Google have also phased out PVC from their products.

In 2021, Sri Lanka too banned the use of PVC for agrochemical packaging.


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India’s commitment to combat plastic pollution - policy interventions

99% of plastics are made from fossil fuels, which in India is primarily from oil. Given that polymers are used for making plastics, plastic pollution starts from when the fossil fuels used for making it are mined to refining for building blocks and polymers, production of plastics and emissions from post-consumption management.

![Diagram of plastic production process](bpf.co.uk)

The Indian government has often reiterated that it is committed to combating plastic pollution. Cleanups under Swachh Bharat Mission and the single-use plastics ban on 19 items under the Plastic Waste Management Rules, 2021 are quoted as steps taken towards this end. However, data from the Department of Chemicals and Petrochemicals suggests that India has not only been increasing its polymer (from which plastics are made) production and consumption, but that exports have also
been increasing. The CAGR for 9 years between 2013 - 2019 for imports of polymers was 3.58% as against exports which was at 7.79% making the net imports of only 0.88%. Also notable is the fact that India spends significant resources in managing plastic waste, by some estimates this is twice the defence budget of India.

In India, polymers comprise 29% of all petrochemicals and 22.7% of all chemicals and petrochemicals produced. Olefins which are building blocks for polymers and other petrochemicals have a 28% share in total petrochemical products and 22.5% share in all chemicals and petrochemicals produced in 2020-21. Important to note, that the onset of COVID in December 2019 affected the production of chemicals and petrochemicals and is therefore lower than 2019-20.
This increasing trend in polymers specifically and petrochemicals in general is not a matter of chance, but the result of a series of policy initiatives. The government’s Petroleum, Chemicals and Petrochemical Investment Region (PCPIR), 2007 policy has clearly incentivised the sector by providing basic infrastructure like water, electricity and land at subsidised rates. Under the new PCPIR Policy 2020 - 2025, the government intends to provide viability gap funding for infrastructure projects and smart utilities for a value of up to 20%. Even the National Investment Pipeline has been mobilised to support polymer production in the country. According to FICCI’s report, ‘India: A Global Manufacturing Hub for Chemicals and Petrochemicals, “Petroleum, Chemicals and Petrochemicals Investment Region (PCPIR) infrastructure projects are also being prioritised in the NIP. 14 projects worth USD 2.65 billion and focusing on the development of road, airport, water supply, electricity distribution have been proposed by the Paradeep PCPIR. Similarly, the Dahej PCPIR has proposed five projects worth USD 0.52 billion, focusing on the development of roads, bridges, water supply and effluent treatment/ disposal.”
The Sagarmala programme has also been pivoted to support the petrochemical industry. According to the same FICCI report, “Under the Sagarmala Programme, Project Unnati has been launched by the Government to improve the efficiency and productivity key performance indicators (KPIs) for the 12 major ports in India. Around 116 initiatives were identified across 12 major ports to unlock more than 100 MMTPA capacity just through efficiency improvement. 93 initiatives have already been implemented to unlock more than 80 MTPA capacity”. In July 2023, the government announced that it was considering the implementation of the production-linked incentive (PLI) scheme for the chemicals and petrochemical sector.

Finally, according to the FICCI report, investments in the petrochemical industry was approximately USD 17.1 billion by 2021 with a planned investment of USD 87.4 billion, which is about 5 times the current investment.

Given the above context, there is a clear dissonance between the government’s declaration that it intends to combat plastic pollution and the impetus being given to the petrochemical industry, of which polymers are a significant segment.

Further, even in the case of the ban on 19 single use plastic (SUP) products, apart from a select few most of the items banned are those used by street vendors and small shop owners. None of the SUPs used by Fast Moving Consumer Goods companies like sachets and plastic bottles are banned. The 2021 Rules treat SUPs generated by FMCG and non-FMCGs differently (except for the straws attached to packaged branded beverages). While there is a ban on non-FMCG
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SUPs, companies in the FMCG category have been allowed to go scot-free since accountability measures like Extended Producer Responsibility (EPR) are only introduced in diluted forms allowing for the use of these toxic materials by paying a small fee and staggering transition over 3 years.

Finally, the government of India has taken a regressive position in the Global Plastics Treaty being negotiated under the aegis of the UNEP, where it is pushing for consensus as a method of decision-making, rather than majority voting. Past experiences have shown that consensus would only serve to dilute the treaty, which would then be toothless in holding countries accountable for the commitments they make.
Recommendations
Stay the EC granted to the project and stop any potential investment

The Adani coal-to-PVC project was granted an EC despite several concerns and reservations by the local communities. Annexures 1 and 2 of this note are copies of submissions made by the local communities during the Public Hearing and subsequently to the EAC. To instil trust of the people in the government, people’s concerns need to be heard and responded to.

Moratorium on further industrialisation of the Gulf of Kutch until completion of Cumulative Impact Assessment (CIA)

The Sunita Narain Committee had recommended that a CIA of the Gulf of Kutch (including developments in the northern and southern parts of the Gulf) be conducted before any other polluting industry is set up. There should be a moratorium with immediate effect and any clearances for any industry should be given only once a CIA looking into all aspects - environment, social and economic - is conducted.

Study on the impacts of PVC to identify essential use of the polymer

Globally, PVC is being recognised as a ‘poison plastic’. The government of India needs to study the impacts of PVC production and use on the water, air, soil and health of human beings and animals. Burning PVC is considered extremely dangerous and unless other safer ways of disposal are not identified, its production and use need to be curtailed.

Pressurise the SBI and other Indian banks to not invest in the project

Finally, to instil investor confidence, it is critical that SBI be encouraged to step away from its commitment to investing in this project, which will also help other investors to rethink their intention to invest in the project.
Centre for Financial Accountability (CFA) engages and supports efforts to advance transparency and accountability in financial institutions. We use research, campaigns and trainings to help movements, organisations, activists, students and youth to engage in this fight, and we partake in campaigns that can shift policies and change public discourse on banking and economy.

We monitor the investments of national and international financial institutions, engage on policies that impact the banking sector and economy of the country, demystify the world of finance through workshops and short-term courses and help citizens make banks and government more transparent and accountable, for they use public money.