

Environmental Impact Assessment (EIA) System in the Indian Textile Industry: A Few Case Studies

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Abstract—The textile industry in India is one of the oldest and fastest-growing industries in the country and it plays a crucial role in the economy by providing livelihood to a vast workforce. However, this progress comes at the cost of environment. The textile industry is responsible for emitting approximately 1.2 billion tons of greenhouse gases, which exceeds the combined emissions of international flights and maritime shipping. The industry generates three types of waste, namely liquid effluents, air emissions, and solid waste. The textile industry is a chemically intensive industry; using approximately 2000 different varieties of chemicals ranging from dyes to transfer agents. The use of energy, effluent water, its increased pH, discharges from dyes, de-framers, bleaches and other strong chemicals cause environmental pollution, increased global warming ultimately and also these textiles need a landfill space. As a result, there is growing concern among governments and the public about the environmental impact of development activities. EIA is a tool to anticipate the likely environmental impacts that may arise out of the proposed developmental activities and suggest mitigation measures and strategies. However, there is a lack of comprehensive research on the effectiveness of EIA in practice among the textile industry in India. This study attempted to bridge this gap by analyzing the EIA practices of five textile manufacturing units. The results of the research led to list of suggestions that can be useful to academia, policymakers, and industry leaders in promoting better EIA practices and establishing a more effective system for the Indian textile industry.

Keywords: Environmental Impact Assessment, EIA practices, textile & apparel, environmental issues, India.

INTRODUCTION

The Textile & Apparel Industry

According to the United Nations Environmental Program, the fashion sector, involves textile and apparel creation, and is known to be the second-largest economic activity globally in terms of trade, worth \$ 1.44 trillion (Mukherjee, 2015). After agriculture, the textile sector provides the second-highest employment rate (Slow Nature, 2013). In 2021, global apparel consumption is estimated to be around \$1.5 trillion, with a projected recovery of 16% after a slump in 2020. With

improving economies and growing purchasing power, the consumption of goods, is expected to rise and textiles will be an important part of it (UNIDO, 2000), (Hasanbeigi et al., 2013). The growth in population and economy will lead to an increased textile production and consumption, which will have adverse environmental effects such as increased energy and water usage, as well as the release of carbon dioxide and other harmful emissions (Hasanbeigi et al., 2013).

The textile sector is one of the oldest industries in the Indian economy and contributes approx. 11% of total exports, which is one of the largest (Pratap Choudhary & Islam, 2017). The Indian textile industry is a major contributor to the national economy in terms of net foreign exchange earnings and share in the GDP [21]. Building a Roadmap for \$ 250 Billion Sustainable Textile Industry, the India Retailing Bureau report says that the growing domestic market and increasing disposable income of developing economies such as China, and India are leading to higher growth rates than developed countries. India is the 4th biggest supplier in the world (India Retailing Bureau, 2023) and has a share of 5 % in the global textiles and apparel trade (India Retailing Bureau, 2023), (Ministry of Textiles, 2020). China and India together account for 59% of the total apparel market while the remaining 41% is shared by the rest of the world (India Retailing Bureau, 2023). Apparel demand in India currently stands at \$ 78 billion. It is dominated by the domestic market with approx. 74 percent share of India's total textile and apparel market (Nayyar et al., 2020). The Indian textile industry contributes to the national economy in several ways by providing employment to various sections of society, including the rural, poor, and economically backward. The unorganized sector consisting of handloom, handicrafts, and sericulture, operated on a small scale and using traditional tools and methods. And the organized sector comprises of spinning, apparel, and garments segments, applying modern machinery and

techniques such as economies of scale (Environment et al., 2013).

The Environmental impacts of the Textile Industry

The textile industry is chemically intensive; involving approx. 2000 different varieties of chemicals, ranging from dyes to transfer agents. Water, an elixir that is increasingly becoming scarce, and also getting contaminated due to the chemical treatments of textiles and also harming the environment in the long run. The effluent water, with increased pH, discharges from dyes, de-framers along with bleaches and other strong chemicals cause environmental pollution and increase the global warming ultimately (Fibre2Fashion 2019) and also these textiles need a landfill space (Steinberger et al., 2008). According to Pulse of the Fashion Industry report from 2017, natural fibers have a significant negative impact on the environment. While Silk causes depletion of natural resources and global warming, cotton and wool are associated with water scarcity and greenhouse gas emissions, respectively (Nill & Wick, 2013), (Nikolina, 2019). A synthetic alternative, polyester which is made from fossil fuels, is not biodegradable and comes with its own issue of microplastic discharge (Nikolina, 2019). The textile industry having a complex supply chain (Eryuruk, 2012), involves social and worker issues such as unfair wages, labor rights, and safety (Butow, 2014). The whole textile chain, when observed closely, from spinning to finishing reveals; an extensive use of water, energy and chemicals. These activities lead to the generation of non-biodegradable wastes, while the use of chemicals leads to allergies, affects fertility and might even lead to carcinogenic and neurological effects (Torres, 2013)

However, the regulators and consumers both are equally concerned about the environmental impacts of textile production (Vollrath et al., 2013). Over the past 3 decades, the production bases for textiles and apparel have moved from the USA and EU to Asian countries. Cheap labor, natural resources, and favorable economic policies are the main reasons behind this shift (Wazir Advisors, 2016). Although the US and Europe are the most important hubs of textile consumption, manufacturing is now mainly concentrated in Asian countries, including China, India, Bangladesh, Vietnam, Sri Lanka, and Pakistan (Wazir Advisors, 2016). This shift has also led to a shift in environmental impact (Chen & Burns, 2006).

Addressing the Environmental Issues through Environmental Impact Assessment (EIA)

Development projects in the past did not involve deep consideration to their environmental consequences. In view of the colossal damage caused by such projects, to the environment, governments and public are now increasingly concerned about their environmental impacts. In order to address the various environmental issues, Environmental Impact Assessment (EIA) was introduced as a decision-making tool. It is a formal process that predicts the environmental consequences of any development project. Its goal is to identify and address potential problems in the early

planning and design stages. (Pratap Choudhary & Islam, 2017). EIA is a tool to anticipate the likely environmental impacts that may arise out of the proposed developmental activities and suggest mitigation measures and strategies (PMFIAS, 2019).

The Stockholm Declaration of 1972 perhaps the first breakthrough to conserve and protect the human environment at the global level, and mandated the states to adopt legislative measures for protecting and improving the environment. Accordingly, since 1973, the Article 48A of the Indian Constitution directed the States to encourage protection and improvement of the environment and ensure to safeguard forests and wildlife of the nation. Similarly, as per clause (g) of Article 51A, every citizen of India has the duty, to protect and improve the natural environment including forests, lakes, rivers and wildlife and be compassionate towards all living creatures. The Articles 48A and 51A (g) cumulatively emphasises that the 'State' as well as the 'citizens' both now have constitutional obligation towards conserving, perceiving, protecting and improving the environment (Agarwal, 2005b)(Agarwal, 2005).

Environmental Impact Assessment in India

The Environmental Impact Assessment (EIA) was introduced in India in 1994. It relies on a strong institutional framework with support from legislative, administrative, and procedural set-ups. Both central and state authorities share the responsibility of developing and managing it (Paliwal, 2006). It is important to carefully consider decisions that may have a significant impact on the natural environment and communities. Regular review of progress and future challenges is worthwhile (Morgan, 2012). The International Association for Impact Assessment (IAIA) defines an EIA as ‘‘The process that identifies, predicts, evaluates and mitigates the biophysical, social, and other relevant effects of development proposals before major decisions being taken and commitments made (Mazumdar, 2000).

India has implemented various laws and regulations to safeguard its natural resources, including air, water, land, coastal areas, forests, biodiversity, and wildlife. To ensure compliance with these laws, India has established a comprehensive institutional framework (Turaga & Sugathan, 2020). In India, legal measures have been developed by the judiciary in an effort to address environmental concerns, including Green Benches in state high courts, the National Green Tribunal (NGT), and public interest litigation (PIL) (Government of India 2010). India also recognizes the Environmental Impact Assessment (EIA) as a crucial component of its environmental policies, which aims to promote sustainable development in the future (Banham & Brew, 1996). Environmental impact assessment (EIA), a process of predicting and preventing adverse impacts of development, is utilized in the country (Ariane Dilay, 2018). Various impacts are assessed through the use of a checklist (Trivedi, 2014). A list of key impacts is as follows:

- Impacts on air quality
- Impacts on water quality
- Impacts on soil quality
- Impact on land use
- Noise level
- Wild life habitats
- Species diversity
- Landscape views
- Social and cultural systems
- Settlement patterns and
- Employment levels

Significance of the Study

The development model followed after independence in 1947, of large-scale industrialization, exploitative resource utilization and scant concern for sustainability have led to environmental degradation, as have the failure of the environmental administration, governance, and regulatory infrastructure to keep pace with the magnitude of economic growth in India since economic liberalization in 1991 (Turaga & Sugathan, 2020). EIA is a critical tool in planning for industrial and infrastructure development. It ensures the protection and conservation of the environment and natural resources (International Labour Organization, 2021). However, challenges persist, including the need for greater transparency, accountability of regulators, and better public participation (Roy Choudhury, 2014). Inadequate funds, time for conducting assessments, lack of baseline data and experienced consultants, absence of quantitative impact assessment methods, failure to consider project alternatives, neglect of public concerns raised during EIA review, subjective and quantitative nature of EIA review criteria, and lack of an independent EIA review body are some of the challenges faced by EIA (Nadeem & Hameed, 2006). There is a lack of timely availability of reliable and authentic environmental data. and absence of agency that consolidates or enhances this EIA data in a form required by environmental impact assessment practitioners. generating the EIAs and receiving timely clearances from regulators are some issues highlighted by (Mazumdar, 2000). Lack of credibility of public participation is another problem that needs to be addressed (Department of Ecology, n.d.). India, just as many developing countries, lack the availability of published information relating to the use of EIA and the degree to which it enables to achieve the desired results. This is due partly to the relatively recent adoption of EIA in some countries and partly to the complexity of collecting systematically recorded information owing to understaffed and underfunded institutional structures (Banham & Brew, 1996). Improving the practice of EIA in India is crucial for environmental protection and sustainable development (Azri et al., 2013).

A preliminary survey revealed that the EIA practices in the textile sector are not aligned with the government guidelines and pollution norms set by the authorities. This underlines the requirement of a comprehensive study of current practices and scope for improvement, policy changes to enable sustainable

business practice of EIA in the country. Therefore, this study was carried out to understand the EIA and its application to the textile sector & the legality and scope of implementation for EIA in Industrial setups. The study provides recommendations to manufacturers to understand and close the gaps in their EIA practices.

METHODOLOGY

The purpose of research methodology is to accomplish the set objectives in research by using an appropriate and relevant system of methods. This is exploratory research. The first action included the study of EIA practices in India through review of available literature. This was followed by sample selection to assess the EIA in actual practice among textile manufacturers in India. In order to fulfil the objectives of the research, a field survey was conducted, to gather firsthand information about current EIA practices among selected textile manufacturers, using convenience sampling method. The data collection from field work was supported with a detailed literature survey. The research was carried out in the following manner.

Phase I - Exploratory phase

A preliminary literature survey was done to explore the scenario of EIA and its implementation in Indian textile industry. A number of research publications and reports were studied to understand the issues in the implementation of EIA in several countries including India. To assess the current EIA practices among Indian textile manufacturers, five textile units were selected using the method of convenience sampling, from various zones of the country and coded in order to maintain confidentiality. Manufacturing units were selected from Surat, Jammu, Chennai, Delhi & Sonipat. The information was collected using primary and secondary sources. The primary information was collected using a combination of interview and observation techniques. Questionnaires were prepared to obtain relevant information from the manufacturers. Interviews were conducted in face-to-face meetings to obtain authentic and complete information.

Table 1: Profiles of the Companies selected for Evaluation of the EIA system in India

S. No.	Company name	Geographical location	Scale production MT/year
1	A	Surat, Gujrat	2,550
2	B	J & K	37,590
3	C	Erode, Tamil Nadu	8,100
4	D	Kundli, Dehi	750
5	E	Panipat, Haryana	2,700

Phase II - Data collection

Data collection was done from both primary and secondary sources. Primary data was collected through interviews with textile manufacturers. Visits were made to various sections of the units to collect firsthand information about manufacturing processes, set up of the machine as well as their working system. Interviews were conducted with the owners and employees of the textile manufacturing units. Observation method was followed to assess the general working environment, manufacturing methods, technology used, waste treatment techniques, supply chain etc. and this helped in substantiating the data collected during interviews.

Phase III: Analysis phase

The findings of the field work obtained through interviews and observation were studied in detail to understand the expectations laid down by EIA guidelines and its actual implementation. The results of the field survey were compared with those reported by other similar studies to validate the findings and identifying and understanding the reasons for gaps in the implementation. The results were compared with the EIA implementation scenario of other countries for a broader understanding of the issues on a global scale. The findings of the study along with a detailed literature survey were utilized to prepare a report, which illustrates the gaps in implementation of EIA in India and presents the current scenario as studied by other researchers.

RESULTS & DISCUSSION

The results obtained and analysis is discussed in the section below. To achieve the objective of research, a survey of selected textile units was conducted. During the evaluation, reports of previous 2-year and current reports were seen as per protocol. During evaluation of the reports, various aspects were checked including, inlet water quality, outlet water quality, fitness certificates by agencies to check hardness, e.g. pH, color, odor, TDS, TSS, Barium no., government report of sludge disposal etc. The evaluation also covered fuel quality used – calorific value, ash content, moisture content, per kg steam generation in the boiler, ash generation and air quality index, noise pollution report (limit – 50 decibels, as per Sec 2 (a) Prevention & Control of Pollution Act, 1981). This information was collected after interviewing the company owners and subordinates, and the data was substantiated with observation method. A score of 5 was given for meeting maximum requirements of EIA and a score of 1 was given to companies with very low compliance level. Table 2 presents the information collected with a scoring from 5 to 1 depending on the level of compliance of each company.

Table 2: Evaluation of the EIA system in India

Basic Standards & Environmental Measures & Compliance Level among textile manufacturers	Level of Compliance				
	Company Name	A	B	C	D

Section 1: Awareness of Regulations and Compliance					
1. Are you aware of the regulations and guidelines governing the treatment processes in your facility? (Yes/No)	4	5	5	5	4
2. How do you ensure compliance with these regulations and standards?					
a. Regular audits and inspections	2	4	5	3	1
b. Monitoring and reporting	2	4	5	4	1
c. Other (please specify)	2	4	5	3	1
Section 2: Maintaining Standards and Records					
3. How do you maintain the treatment standards within your facility?					
a. Regular monitoring and testing	2	4	5	3	1
b. Adherence to recommended procedures	2	4	5	4	1
c. Continuous improvement measures	2	4	5	3	1
4. Do you maintain detailed records of your treatment processes? (Yes/No)					
a. If yes, please describe the record-keeping process.	2	4	5	3	1
b. If no, what steps will be taken to implement record-keeping?					
Section 3: Qualified Staff and Training					
5. Do you have qualified staff responsible for the treatment operations? (Yes/No)					
a. If yes, provide the job titles and qualifications of the responsible staff.	2	4	5	2	1
b. If no, how do you plan to ensure qualified staff are assigned?	2	4	5	3	1
6. Is there a training schedule in place for the staff involved in treatment operations? (Yes/No)					
a. If yes, describe the training program and its frequency.	2	4	5	3	1
b. If no, how do you plan to implement a training schedule?	2	4	5	3	0
Section 4: Quality of Chemicals and Fuel					
7. How do you ensure the quality of chemicals used in the					

Effluent Treatment Plant (ETP)?					
a. Source from reputable suppliers	2	4	5	5	1
b. Regular testing and quality checks	2	4	5	5	1
c. Certification of chemical quality	2	4	5	5	1
8. How do you ensure the quality of fuel used in boilers?					
a. Source from reputable suppliers	2	4	4	3	1
b. Regular testing and quality checks	1	4	5	4	1
c. Certification of fuel quality	1	4	4	3	1
Section 5: Calibration and Testing					
9. How often are the equipment used for daily testing calibrated?					
Frequency	1	4	5	2	1
10. How frequently do you conduct testing of the treatment processes, and how are the results recorded?					
Frequency	2	5	5	4	1
Section 6: Process Flow and Safety					
11. Is the actual flow of your treatment process in line with the given standard flow chart? (Yes/No)					
a. If yes, how do you ensure this alignment?	1	4	5	3	1
b. If no, what measures are taken to correct deviations?					
12. What safety measures are in place to protect workers and the environment from hazardous aspects of the treatment process as per the law?					
a. Personal protective equipment (PPE) and other safety equipment	1	3	4	3	1
b. Emergency response plan	2	4	5	3	1
c. Safety training and awareness	1	5	4	5	1
13. How do you monitor and control the impact of pollutants on human beings and the environment?					
a. Regular sampling and analysis	1	4	5	3	1
b. Environmental impact assessments	1	3	3	2	1
c. Mitigation measures	1	3	3	2	1
OVERALL SCORE	38	92	109	77	22

Following interpretation can be made from Table 2:

1. The findings from the survey revealed that companies are generally aware of regulations and guidelines governing the treatment processes that need to be followed. However, there is a wide variation among the selected

units regarding the level up to which they follow the guidelines. A list of equipment, detailed usage instructions, mandatory safety measurers etc. ought to be in place, in a proper legible and accessible form in official as well local language. The compliance to regulation is higher among large manufacturing units.

2. A mandatory need of regular audits as well as proper monitoring and documentation is carried out, in bigger organisations as per mandatory requirement. As per their client's requirement, in order to maintain their audit standards and records, such companies keep a proper documentation in the physical as well as digital mode. All such records are maintained in a periodical manner as per company protocol.
3. For the success of all operations there is a need of qualified and trained staff to operate the machinery and equipment in an efficient way, with correct use of technology and maintaining proper work practices and safety protocols. Here we need to emphasise a regular training schedule and updated knowledge sessions. It is noteworthy that among small scale companies, it is difficult to hire trained and qualified staff for such operations on a regular basis.
4. It is very important that all such operations where chemicals are used, they must pass a quality standard according to environmental regulations. The sourcing of quality & certified chemicals and fuels is beneficial for process efficiency and environment, safety of workplace and the environment. Smaller companies prefer economical sourcing rather than high quality chemicals and fuels thereby contributing to greater environmental damage.
5. Equipment calibration is carried out on a regular basis; daily, weekly, monthly, 6 monthly and annual bases. Smaller manufacturers even fail to carry out frequent calibration of equipment on a regular basis.
6. When a new textile unit set up, they submit all necessary information such as infrastructure, machines, production capacity, product type etc. with all utility set up such as boiler, ETP, DG set, with their plan for the disposal of hazardous waste etc. It was found that the actual flow of treatment processes is not in alignment with the given standards, among smaller units. The lacking companies expressed their willingness to redesign the process flow. When it comes to safety measures the guidelines are in place to protect workers and the environment from hazardous aspects of the treatment process. However, smaller companies are adhering to only the most basic requirements. Their ERP and safety training and awareness also need better compliance. Larger companies have better provisions for mitigation measures for controlling pollution.

SUMMARY & CONCLUSION

The above results show that the practices of Environmental Management vary widely among textile manufactures. Various factors govern the awareness level and the extent of

implementation of EIA compliance guidelines. Size & scale, customer base – domestic/export) of the manufacturing unit, geographical location are the factors that can affect the compliance.

Overall grading was found to be highest for Company C with a score of 109/130. The company is based in South India. The better compliance score of company C may be attributed to the company being large scale and having an international client base which acts as a boost towards better environmental compliance. Company B is not far behind and scores high due to its large-scale production and international client base. Company C has many gaps in EIA and needs to focus on improving through channelizing its efforts and funds towards better compliance. Company A and E fared quite poorly on all scales. Incidentally they are smaller in scale and have a smaller and domestic client base which doesn't demand high compliance level.

RECOMMENDATIONS:

A few suggestions are made for establishing a better compliance among all levels of textile manufacturers:

- Creating awareness on benefits of using modern technology in operations
- Resource management – fuel, water and other resources result in efficiency that leads to better economic returns.
- In view of the findings of the study, we suggest reforming existing legislation and strengthening administrative arrangements. Secondly, we recommend incorporating sector-specific considerations into the Environmental Impact Assessment (EIA) system, such as providing guidelines on EIA methodology, contents of the EIS, EIS review, and implementation monitoring in a simple language.
- We recommend implementing measures promised in the EIS and providing accreditation for EIA consultants in all areas of legal violations. These recommendations mainly target small and mid-level textile industries, which currently lack adequate EIA actions. It is important to follow good practices for ensuring a healthy environment, rather than simply completing legal requirements. These practices are needed for all organized and non-organized textile industries.
- Manufacturers are required to maintain approximately 200 types of record sheets, such as ETP, water quality, water hardness, and water TDS checked at various stages. However, such extensive record keeping can become overwhelming in practice, leading to the creation of forged or demo records to keep up with audits. To simplify the process, companies could adopt a more streamlined record keeping method, such as using Pivot or Gantt charts to store and organize data in the long term.
- There are numerous agencies responsible for monitoring records, but they do not physically observe ground realities. As a result, they do not have an accurate understanding of what is happening on the ground. In order to enhance EIA practices, education on best

practices and their benefits should be provided to manufacturers and workers through frequent trainings, workshops, and simple literature.

- While solar power and PNG are eco-friendly, they are not economical. Thus, smaller manufacturers are compelled to choose cheaper options. One potential solution is to offer flexible energy supply options.
- The staff need to be provided updated knowledge and training opportunities on a regular basis. Having qualified and trained staff is an issue with smaller scale companies as they make do with unskilled staff and also lack in providing trainings to their staff.

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