

# Role of Environmental Impact Assessment (EIA) System in Enhancing Environmental Sustainability in the Indian Textile Industry

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**Abstract**—The textile industry in India is one of the oldest and fastest-growing industries in the country, playing a significant role in the economy and workforce. However, this progress has come at a great environmental cost, making the textile industry one of the largest polluters worldwide. As a result, there is growing concern among governments and the public about the environmental impact of development activities. To address this issue, Environmental Impact Assessment (EIA) was introduced to identify potential environmental impacts and suggest mitigation strategies. However, there is a lack of comprehensive research on the effectiveness of EIA in promoting environmental sustainability in the textile industry in India. This article aims to bridge this gap by reviewing current research and identifying areas where EIA implementation can be improved. The findings of this study can be beneficial to academia, policymakers, and industry leaders in promoting better EIA practices and establishing a more effective system for industries like textiles.

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

## 1. INTRODUCTION

### 1.1 The Global Textile & Apparel Industry

The fashion industry is one of the world's largest and oldest industrial sectors, encompassing textile and apparel creation. According to the United Nations Environmental Program, it's the world's second-largest economic activity in terms of trade, valued at \$1.44 trillion [1]. In 2021, global apparel consumption is estimated to be around \$1.5 trillion, with a projected recovery of 16% after a slump in 2020. This sector is expected to grow at a CAGR of 4% from 2019, reaching \$2 trillion by 2025 (India Retailing Bureau, 2023). The textiles and apparel trade has been consistently growing, reaching \$823 billion in 2018 with a CAGR of four percent since 2005. It's expected to continue growing, reaching \$1 trillion in 2025 with a promising growth rate of over three percent when compounded annually [3]. The Asia-Pacific Textile Market is currently estimated at USD 381.47 billion in 2023 and is expected to grow to USD 432.69 billion by 2028 with a

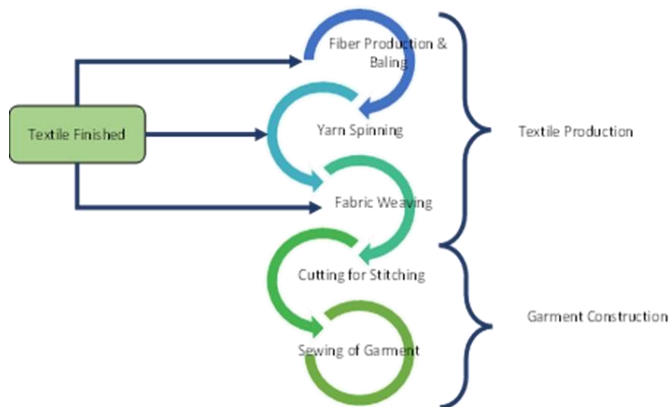
CAGR of 2.55% in the forecast period (2023-2028) [4]. After agriculture, the textiles sector provides the second-highest employment rate [5].

### 1.2 The Global Impact of Textile Industry

The textile industry holds a notorious reputation for being the second most polluting industry [6], [7], [5], behind the oil industry [8]. It is responsible for emitting approximately 1.2 billion tons of greenhouse gases, which exceeds the combined emissions of international flights and maritime shipping [8]. This is due to various activities such as agriculture, livestock, materials, processing, and transportation [5]. The industry generates three types of waste, namely liquid effluents, air emissions, and solid wastes [9]. In a 2017 report by Global Fashion Agenda (GFA), the European Union's consumption of textiles resulted in an estimated 4 to 6% environmental footprint. According to the Pulse of the Fashion Industry report in 2017, by Global Fashion Agenda & Boston Consulting Group, the global textiles and clothing industry consumed 79 billion m<sup>3</sup> of water, emitted 1,715 million tons of CO<sub>2</sub> and generated 92 million tons of waste in 2015. These numbers are expected to increase by at least 50% by 2030, following a business-as-usual scenario [10]. Fig. 1 below, adapted from [11], provides a general overview of the manufacturing steps involved in textile production. Fig. 1 presents an overview of textile and apparel manufacture.

The textile industry has a complex supply chain [12] that involves social and worker issues such as fair wages, labor rights, and safety [11]. From spinning to finishing, the industry uses large amounts of water, energy, and chemicals, generating non-biodegradable waste and causing health issues such as allergies, fertility problems, and even cancer and neurological effects [13]. Big apparel groups like H&M and PVH provide employment to thousands of workers in Ethiopia, but many of them struggle to make ends meet. Despite showcasing projects like the Hawassa Industrial Park,

the reality is that Ethiopian garment workers face financial difficulties [14].



Source: J. Butow, 2014

**Fig. 1: Overview of textile product manufacturing steps**

The Pulse of the Fashion Industry report from 2017 found that natural fibers have a significant negative impact on the environment. Silk is especially damaging due to its depletion of natural resources and contribution to global warming. Cotton and wool also have negative effects, contributing excessively to water scarcity and greenhouse gas emissions, respectively [15], [10]. Nitrous oxide, a potent greenhouse gas, is mainly emitted from fertilizer and manure applications in agriculture, while methane is mainly emitted from livestock production, rice production, and handling of manure [16]. The industry is now exploring less frequently used natural fibers, such as hemp, flax, linen, and nettle, which require fewer resources in terms of water, fertilizers, and pesticides. However, polyester, a synthetic fiber made from fossil fuels, is not biodegradable and comes with its own issues of microplastic discharge [10]. The textile industry is a chemically intensive, with approximately 2,000 different chemicals used from dyes to transfer agents. These chemicals contaminate water and the environment in the long run. The effluent water, with its increased pH and discharges from dyes, de-framers, bleaches, and other strong chemicals, pollutes the environment, increases heat, causes global warming, and requires landfill space [17].

As economies improve and purchasing power increases, the consumption of goods, including textiles, is expected to rise [18], [19]. The resulting increase in textile production and consumption, will have adverse environmental effects such as increased energy and water usage, as well as the release of carbon dioxide and other harmful emissions [19].

### **Textile Industry in India and Environmental Impacts**

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 [9]. The textile industry is a major contributor to the national economy in terms of net foreign exchange earnings and share in the GDP [21]. India is the 4<sup>th</sup> biggest supplier in the world [2] and has a share of 5 % in the

global textiles and apparel trade [2], [22]. 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. China and India together account for 59% of the total apparel market while the remaining 41% is shared by the rest of the world [2]. 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 [3]. 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 [23]. The textile industry is broadly segmented as unorganized and organized. 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 [9].

The textile industry's technological advancements have made it a viable option for industrialization in poorer countries. Some of these countries have seen significant growth in output within the sector [24]. However, the environmental impact of textile production is a growing concern for regulators and consumers alike [25]. Over the past 30 years, the production bases for textiles and apparel have shifted from the USA and EU to Asian countries due to the availability of cheap labor, natural resources, and favorable economic policies [26]. This shift has also led to a shift in environmental impact [20]. Countries like India, Bangladesh, Indonesia, Pakistan, Vietnam, Cambodia, and Thailand have seen a surge in textile and apparel manufacturing, along with China. Although the US and Europe are the largest consumption bases, manufacturing is now concentrated in Asian countries, including China, India, Bangladesh, Vietnam, Sri Lanka, and Pakistan [26].

### **1.4 Addressing the Environmental Issues Through Environmental Impact Assessment (EIA)**

In 1972, the Stockholm Declaration was created with the goal of safeguarding and preserving the environment on a global scale. The agreement required countries to establish laws that would improve and protect the environment [27]. Sustainable development policies and strategies have been introduced [28] to encourage industries to prioritize environmental protection and exhibit socially responsible behavior [29]. Therefore, it is essential to evaluate the sustainability performance of industrial sectors to effectively meet environmental sustainability requirements.

In the past, development projects were carried out without considering their impact on the environment. However, due to the significant harm caused, both governments and the public are now concerned about the environmental effects of such

activities [30]. A study published in *The Lancet* from the Global Burden of Diseases, Injuries, and Risk Factors Study, 2019, estimated that pollution causes approximately nine million deaths annually, an increase from the 2015 estimate of three million per year. The study also found that 90% of pollution-related deaths occur in low- and middle-income countries, with the highest number of deaths in India (2.36 million) and China (2.1 million). This information is corroborated by news reports, including a Greenpeace report that identified 22 of the world's 30 most polluted cities as being in India, with Delhi as the world's most polluted capital city [31].

To address these environmental issues, Environmental Impact Assessment (EIA) has been 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. EIA also identifies the environmental, social, and economic impacts of a proposed development program before final decisions are made [9]. The International Association for Impact Assessment (IAIA) defines EIA as the process of identifying, predicting, evaluating, and mitigating the biophysical, social, and other relevant effects of development proposals prior to major decisions being taken and commitments made. EIA is crucial in anticipating potential environmental impacts and suggesting mitigation measures and strategies for proposed developmental activities [30].

### 1.5 Environmental Impact Assessment in India

As a consequence of Stockholm declaration, the Indian Constitution directed states to conserve and promote the environment, as well as preserve forests and wildlife. Article 51A (g) states that every citizen has a responsibility to conserve and enhance the natural environment, including forests, rivers, lakes, and wildlife, and to treat all living creatures with kindness. India has implemented various laws and regulations to safeguard its natural resources and to ensure compliance with these laws, it has established a comprehensive institutional framework. It is noteworthy that India is among the few countries that have constitutionally assigned the responsibility of environmental protection to both the state and its citizens [39] and both the government and citizens have a constitutional duty to protect, respect, safeguard, and enhance the environment [27]. including air, water, land, coastal areas, forests, biodiversity, and wildlife. 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 [32]. 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 [33].

Developing nations like India have implemented various environmental strategies, regulations, and programs to address issues such as inadequate waste and sludge disposal systems that arise from increasing industrialization and urbanization. Industrial safety has been governed by British Standard BS 8800 since 1996. The earliest standards for environmental protection and safety were the EU eco-audit directive (EMAS) and later Quality Management Systems and ISO standards [34]. In 2006, an amendment was made to the 1994 notification, resulting in three significant changes. Firstly, the regulation of smaller projects (Category 'B') was decentralized to State level Environment Impact Assessment Agencies (SEIAAs), while larger projects (Category 'A') continue to be regulated by the MOEF. Secondly, the final regulatory approval is given by the MOEF/SEIAA, based on recommendations from the State Expert Appraisal Committee (SEAC) and the Expert Appraisal Committee (EAC). Lastly, responsibility for conducting public hearings was given to the State Pollution Control Boards (SPCB) or the Union Territory Pollution Control Committee (UTPCC), removing responsibility from project proponents. These changes aimed to streamline the appraisal process, improve transparency, and prevent political influence [38].

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 [40]. Department of Environment (DOE) is responsible for implementing the EIA procedure. The Impact Assessment Division (IAD) has a multidisciplinary staff that is supported by an inter-ministerial appraisal committee composed of experts from various related disciplines, such as civil and mining engineering, landscape and human settlement planning, instrumentation, pollution control, ecology, forestry, and environmental sciences, among others. The EIA procedure in India involves screening, scoping, progress reports, preparing interim and final EI reports, reviewing the final EI report, and decision-making [37]. Fig. 2 & 3 illustrate the requirements of an EIA report and the evaluation criteria, as per EIA guidelines in India.

Overview	Executive or non-technical introduction.
Objectives	Describe proposal's aims.
Ideas & Options	Explain concept, alternatives, including no-action.
Plan & Land Use	Discuss proposal, current land use, and policies.
Conditions	Detail present and expected scenarios.
Impact Assessment	Evaluate effects for each alternative.
Comparison & Preference	Compare and select preferred alternatives.
Environmental Management	Strategy, monitoring, and training plans.
Appendices	Including glossary, consultation details, data sources, team qualifications, and report terms of reference.

**Fig. 2: EIA Reports Contents as Recommended by EIA Guidelines**

Executive Summary	Does it cover repercussions, cumulative effects, mitigation, and supervision?
Project Description	Is it complete with environmental impact aspects?
Project Alternatives	Is there a description of alternatives considered?
Baseline Circumstances	Are they clear with data quality comments?
Implications	Are major implications assessed, including unexpected ones?
Mitigation Strategies	Are strategies proposed for negative effects and benefits?
Environmental Management	Are mechanisms like EMP defined for mitigation?
Cost Estimates	Are expenses for recommendations accurately estimated?
Monitoring Program	Is a defined program with cost explanations in place?
Community Involvement	Were locals engaged, and were their concerns addressed?
Clear Reporting	Is the report free of jargon and technicalities?

**Fig. 3: Official EIA Report Evaluation Criteria**

Legal measures have also been developed to address environmental issues. These include Green Benches in state high courts, the National Green Tribunal (NGT), and public interest litigation (PIL), as reported by the Government of India in 2010 [35]. India is one of the few countries to have a specialized court dedicated to environmental protection, following in the footsteps of Australia and New Zealand [41]. The National Green Tribunal (NGT) was established in 2010 under the National Green Tribunal Act of 2010, specifically to handle civil cases related to environmental protection, conservation of forests, and other natural resources. The NGT is also responsible for enforcing legal rights that are related to the environment [42]. Section 20 of the NGT Act requires that principles of sustainable development, precautionary measures, and the 'polluter pays' principle be applied when

making any order, decision, or award [43]. The NGT has issued several judgments that adhere to the 'polluter pays principle' by ordering environmental compensations to be made [44]. Legal measures such as public interest litigation (PIL) have also been developed to address environmental issues., as reported by the Government of India in 2010 [35]. Additionally, India uses the EIA process to predict and prevent adverse impacts of development [36].

### 1.6 Issues Involved in EIA Process

EIA is a critical tool in planning for industrial and infrastructure development. It ensures the protection and conservation of the environment and natural resources [45]. However, challenges persist, including the need for greater transparency, accountability of regulators, and better public participation. The Court has intervened in several cases to address these challenges and has ordered the establishment of an independent national environmental regulator to oversee the EIA process and provide a clear institutional framework [38]. The effectiveness of EIA systems depends on various factors, including the EIA participants' capacity, the scrutiny and follow-up procedures, and the influence of relevant stakeholders in the approval and licensing process [45]. In a review, authors [46] have attempted to evaluate EIA practices in different countries, drawing on various studies conducted by researchers. In Brazil, political and economic pressures have led to corruption issues, while countries like Bulgaria, the United States, and Canada are facing challenges with public participation and public hearings. In Canada, India, Mauritius, and many other countries, there are conceptual issues and improper screening and scoping guidelines that make achieving the full benefits of the Environmental Impact Assessment (EIA) process difficult. Public hearings are often viewed by NGOs as a staged process that only appears to involve citizens after the decision has already been made. [46]. A paper reviewed by [47] outlines the current state of EIA legislation and evaluates EIA systems in the Gulf Cooperation Council (GCC) states. This evaluation is based on the frameworks and procedures of EIA regulations and their implementation between the states. The review provides recommendations for improving these practices.

EIA encounters various challenges, including inadequate funds and time for conducting assessments, unavailability of baseline data, lack of experienced consultants, insufficient engagement of stakeholders and regulators during the scoping phase, absence of quantitative impact assessment methods, failure to consider project alternatives, absence of a strong basis for proposed mitigation measures, neglect of public concerns raised during EIA review, subjective and quantitative nature of EIA review criteria, and lack of an independent EIA review body [48]. The lack of reliable and authentic environmental data available in a timely manner adds to the challenge. Several agencies collect environmental data, but there is a lack of consolidation or enhancement of this data for EIA practitioners' use [47]. Despite a multitude of agencies being involved in the collection of the environmental data, no

single organization in India makes it available in one place in a form required by environmental impact assessment practitioners, nor is any organization able to make it available in a form to improve the quality of the EIA. This makes it harder and more time-consuming to generate EIAs and receive timely environmental clearances from regulators [49].

Obtaining timely environmental clearances from regulators becomes a complex and time-consuming exercise. Comparative studies of different countries have highlighted that EIA is a constantly evolving process [47], and the perfect state of EIA has not been achieved yet [48]. In a review paper, the researchers [50] discuss the challenges faced during the pre-decision phase of open-cast coal mines in India and presents the outcomes of EIA reviews undertaken by expert committees. The article highlights several constraints, such as improper screening and scoping guidelines and ineffective monitoring and post-project evaluation. It concludes with suggestions to improve the EIA process in India. Experts from Pakistan and neighboring countries such as India and Bangladesh have also noted the limited capacity of environmental agencies in their respective countries [50][48]. In a paper, the authors [51], suggest that it may be time to consider reforming the EIA process to better achieve its goals, as it has become deeply embedded in many countries worldwide [37]. Improving the practice of EIA in India is crucial for environmental protection and sustainable development. However, without political will, it is challenging to ensure the smooth implementation of EIA guidelines. Both proponents and consultants need to treat EIA respectfully [47].

## 2. RECOMMENDATIONS:

After reviewing the available literature, we have made several recommendations. Firstly, 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. Thirdly, we suggest promoting transparency, accountability, and quality control by establishing the legal status of the stages of EIA and public involvement. Finally, 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. All agencies are aware that air, water, and steam are essential to textile and apparel manufacturing, and these are typically obtained from traditional sources. 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.

## CONCLUSION

To motivate stakeholders to adopt better practices, it's important to provide education, flexibility, and simplicity. Setting achievable targets that aren't too high can increase motivation. Guidelines and regulations should strike a balance between conventional and contemporary practices. Educating stakeholders is key to achieving understanding, motivation, and adherence to expected practices in EIA.

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