ESG and CSR for Business Transformative Models: An Evidence-Based Study

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Abstract

Environmental, Social and Governance (ESG) principles are very important for managing various fostering sustainable practices and global challenges. Simultaneously, Corporate Social Responsibility (CSR) has evolved as an important concept in both business and academic domains over time. This paper focuses on development of CSR and ESG, and also the practical implications, particularly in the purview of ESG Principles. Special attention is given to CSR initiatives of India's hydrocarbon sector, which extends over the dual roles of environmental impact and social contribution of ESG principles. Although notable efforts exist, the alignment of CSR with measurable ESG outcomes remains limited. This research paper highlights theoretical foundations, research gaps or practical trends, emphasizing the need for a more integrated and strategic CSR approach to ESG Principles. It has utilised the case study method to compare the penetration of CSR to realise the ESG goals. Secondary sources of information are collected by following the systematic review guidelines. Findings suggest that engaging interventions like the use of AI, along with other measures, will provide relevant and new comprehension that can be used to reduce CSR that fuels the achievement of ESG principles.

Keywords: Artificial Intelligence, Business models, Corporate Social Responsibility, ESG

1. Introduction

The hydrocarbon sector plays central role in national energy system and having critical engine for economic growth and overall development. It includes a closely linked set of activities that encompass all aspects of the hydrocarbon system - exploration, production, refining, and distribution. Its role can be simply stated - supply fast-growing energy to India, while advancing industrialization and public infrastructure (Sharma et al., 2024)

Environmental, Social, and Governance (ESG) principles have become an important framework for investors, policymakers and society for evaluating corporate performance beyond financial metrics. The ESG principles

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cater to a huge range of issues, like environmental, climate change, IR practices, diversity, human rights and corporate governance (Aich *et al*., 2021)

A crucial tool for companies to inform stakeholders about their environmental, social, and governance performance is corporate social responsibility reporting (Hoang, 2018). CSR is essential for resolving problems and encouraging accountability and transparency in the hydrocarbon sector, whose operations have an important impact on the environment and society (Bernardino, 2021).

Also, Artificial Intelligence has emerged as a technology, that is driving innovation and efficiency in all industries. AI can analyze massive amounts of data, which allows for more accurate market forecasting and risk assessments, thereby helping management in making strategic decisions. More importantly, AI has the potential to foster a sustainability culture by enhancing waste reduction activities and awarding internal supervision. Employee participation in sustainability programs and a sense of responsibility can be enhanced by using AI-driven insights and data visualization to clarify difficult sustainability concerns. AI can be used to provide resource optimization and sustainability in accordance with an organization's goals. Additionally, the AI-human mix keeps an organization's performance sustainable while enhancing adaptability and addressing changes in society, customers, and the environment.

1.1 Literature Review

The systematic literature review shows a significant and accelerating convergence between AI, CSR, and ESG. Various studies on AI and ESG integration propose protocols and frameworks to evaluate the impact of AI in the ESG context (Satra, 2021; Brusseau, 2023).CSR in the hydrocarbon sector was often perceived as a peripheral activity, driven by regulatory compliance (e.g., the Companies Act, 2013 in India). These initiatives often lacked a deep connection to the core business and its inherent environmental and social risks.

CSR is very important in the hydrocarbon industry because of the sector's impact on economies and the environment. Stakeholders anticipate that robust corporate social responsibility (CSR) initiatives will assess corporate contributions and impacts, specifically considering the environmental risks associated with the extraction and production of oil and gas, in addition to the industry's social and economic importance (Karaman *et al.,* 2021). In the long run, CSR in the hydrocarbon industry will continue to grow beyond the disclosure of ESG scores and become more integrated into the vision and goal of organizations. Instead of considering CSR as a distinct activity, companies are required to include ESG goals in their overall business strategy, from supply chain management and product creation to risk management and investment choices (Hsu *et al*., 2022).

It has been observed that companies operating sustainably can manage risks, emphasize this change in perception while exploring new opportunities and develop resilience in the worldwide context (Martínez-Peláez et al., 2023). Good sustainability reporting with increased responsibility for sustainability by organizations and individuals, not only identifies various environmental, material, social and governance issues but also enhances long-term strategies (An, 2023).

According to Taleghani et al. (2017), the main problems faced by the Hydrocarbon Industry are disposing various residues generated, transportation and storage. Petroleum industry contributes 15% to India's GDP (S Simonsen et al,2018). The hydrocarbon sector is largely contributing to environmental issues but also being a major contributor to society through its CSR initiatives.

1.2 Research Objectives

This study mainly focuses on the intersection of these three domains: ESG, CSR or AI, with a focus on India's hydrocarbon sector. The Indian hydrocarbon companies have established various CSR programs, where the key challenge is the strategic alignment of these initiatives with measurable ESG outcomes. The use of AI presents an opportunity to bridge this gap. Therefore, this paper, explores the theoretical foundations and practical trends of integrating AI to create better CSR approach that directly supports the ESG goals of the Hydrocarbon Industry.

1.3 Material and Method

We have done a literature search following the PRISMA protocol of Moher et al. (2015) of Scopus, Science Direct, and Web of Science from 2016 to 15th June 2025. The secondary data from various academic journals, industry reports, corporate sustainability disclosures and governmental publications are collected and analyzed to understand the relationship among ESG principles and the application of AI in achieving CSR activities better. Data regarding ESG score and CSR expenditure is collected for various years, and a subsequent graphical comparison is made to achieve this.

A systematic review helps in identifying records that may be overlooked by narrative review methodologies (Tseng et al., 2019). Thus, selected keywords were selected to collect various records from three databases, which were further screened to include those that meet the objective of the study and exclude irrelevant research. The four stages of the PRISMA protocol are used in this study, as presented in the Figure below, to arrive at 20 records. Finally, the selected records were analysed further for study.

Major databases like Scopus and Research Gate, Web of Science and Science Direct are searched to get the PRISMA analysis done. Book Chapters and other published documents that are not indexed are excluded. The keywords used to search the documents are CSR, ESG, AI, and CSR in the Hydrocarbon sector, etc.

The review reflects the fact that there is still very limited research available on ESG-CSR initiatives in the hydrocarbon sector. The interconnection between AI and ESG-CSR is also not studied. Therefore, a major research gap exists in this field. There is even a future scope for studying the cross-sectional data on achieving ESG through CSR and how AI can be used to do so in an experimental study design. We have presented the PRISMA as follows.

1.4 Inclusion Criteria

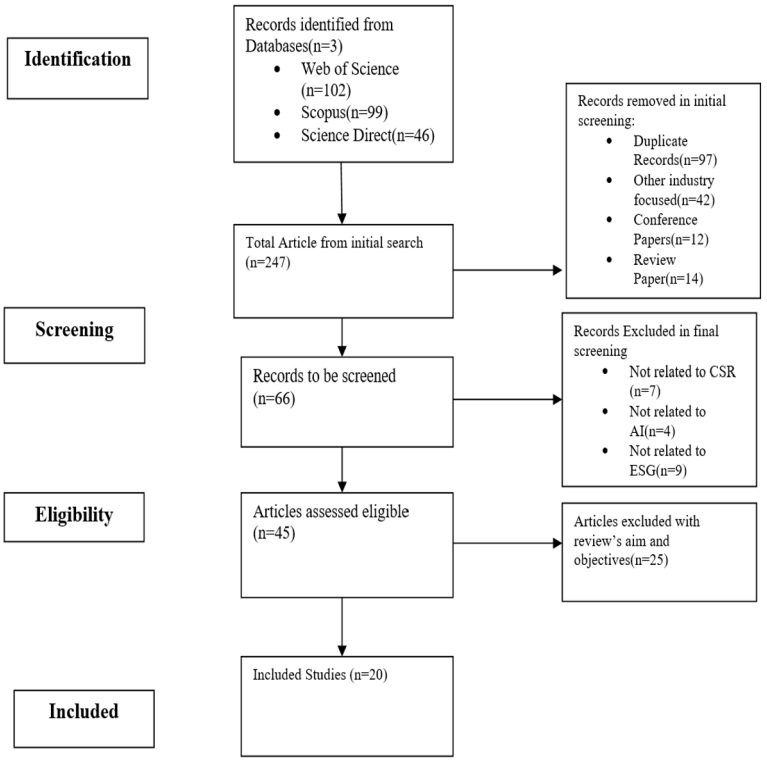
Peer-reviewed journal publications were reviewed for this systematic review, institutional reports and policy documents, published between 2016 and 2025, which are available in full and in English. To be included, studies

needed to have studied the relationship among initiatives in CSR, ESG and AI and they considered both qualitative and quantitative studies, which included case studies, empirical research, and mixed-method research designs. Preference was given to those publications that examined CSR activities in the hydrocarbon and energy industries, although studies from other industries were also considered.

1.5 Exclusion Criteria

Non-peer-reviewed research articles, unpublished research articles, or studies without accessible full-text were eliminated from consideration. Articles presented in languages besides English were excluded due to translation challenges.

Figure 1: PRISMA chart of selection of studies



Source: Author's own Creation

2. Case Studies from the Indian Hydrocarbon Sector

To better understand and explore further, we have carefully chosen two of the main Fortune 500 companies of India pertaining to the Hydrocarbon Sector, Oil and Natural Gas Corporation Ltd (ONGC) & Bharat Petroleum

Corporation Ltd (BPCL). In Table 1, we have compared both companies' AI, ESG, and CSR areas, and in Table 2, we have tabulated the last five years' CSR expenditure of both. This gave us a clear picture of how both are using and aligning ESG, CSR, and AI strategies.

Table 1: ONGC and BPCL at a glance on AI

	ONGC	BPCL
Vision on AI	To lead the AI revolution of the energy sector, creating an AI and data-driven enterprise that is faster, smarter, and more flexible than ever before.	To build customer-friendly and innovative solutions that are connected, readily available, smart, and provide a single window of service to customers uninterruptedly.
ESG Goals	The ESG Goals are integrated deeply into its operations, focusing on reducing the environmental impact, validating the highest standards of corporate governance and promoting social well-being.	Detailed environmental, social and governance (ESG) initiatives, BPCL aims to showcase how they address significant sustainability challenges and leverage opportunities to create a positive impact.
CSR Areas	Healthcare, Education, Livelihood Projects, Environmental Conservation, Infrastructure Development, etc	Sustainability and Renewable Energy, Healthcare, Education, etc
AI introduced areas	Explorations, HR, etc	Operations, HR, Marketing, etc
Strength	Collaboration with CDAC	Collaboration with Microsoft, Deloitte
Weakness	Controlled by the Government as the majority shareholder is the President of India. So it takes a long time to get permission to implement new technology, including AI implementation.	The Government is planning to disinvest in the long term, which is making investors and employees unsure about the future.
Opportunity	AI can be implemented in terms of safety measures, better forecasting, and managing CSR activities like community engagement, automated ESG reporting, safety management etc	Similarly, AI can be implemented in relevant fields, including ESG goals and CSR management. The company can use AI for better environment management, controlling carbon footprints etc.

Source: Author's own Compilation

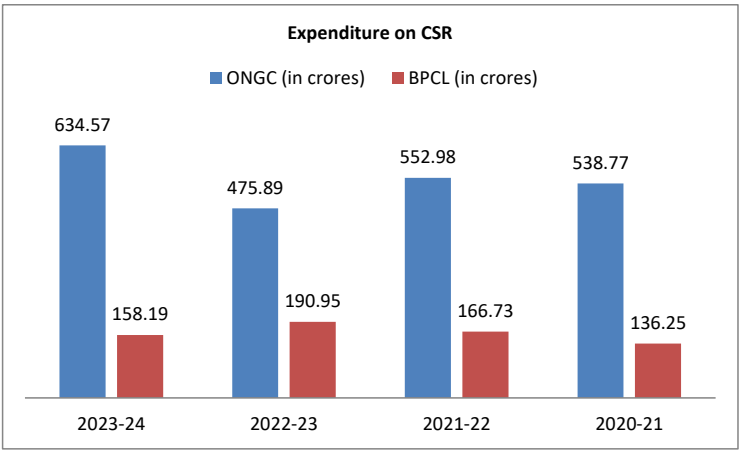
In Table 2 and Figure 2, a comparison between ONGC and BPCL has been made with regard to the expenditure on CSR during the last five years from 2019 to 2025. It is observed that ONGC is making a greater contribution to CSR expenditure than BPCL in absolute terms. This is because, ONGC is a big company with more profit as compared to BPCL, and according to the rule, and industries are required to invest at least 2% of their profit in CSR. But the trend of investment in CSR over the last five years is almost the same for both companies.

Table 2: ONGC and BPCL CSR expenditure of the last 5 years

Year	ONGC (in crores)	BPCL (in crores)
2023-24	634.57	158.19
2022-23	475.89	190.95
2021-22	552.98	166.73
2020-21	538.77	136.25
2019-20	571.81	198.98

Source: Annual Reports of ONGC and BPCL, various years [2019- 2024]

Figure 2: A comparison of CSR Expenditure by both ONGC & BPCL (2020-2024)



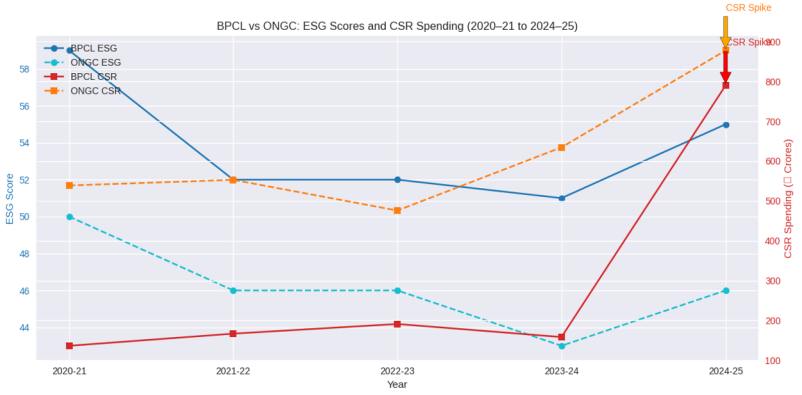
Source: Annual Reports on CSR, various years

Table 3: CSR and ESG (Score) achievements in the ONGC and BPCL over the years

Company/YEAR	2020-21		2021-22		2022-23		2023-24		2024-25	
	ESG	CSR (in Cr)	ESG	CSR (in cr)	ESG	CSR (in cr)	ESG	CSR (in cr)	ESG	CSR (in cr)
BPCL	59	136.2	52	166.7	52	190.9	51	158.2	55	790.1
ONGC	50	538.8	46	552.9	46	475.9	43	634.6	46	877.9

Source: Annual Reports on CSR, ONGC and BPCL, ESG - https://www.lseg.com/en/data-analytics/sustainable-finance/esg-scores

Figure 3: Comparison of CSR Expenditure vs ESG Score of ONGC & BPCL (2020-2024)



From the above table, it is clear that ESG scores and expenditure made on CSR activities are not correlated. It is revealed that CSR expenditure made by ONGC is quite higher as compared to BPCL, but in terms of ESG score, ONGC is lagging behind BPCL for all the years from 2021-22 to 2023-24. This reflects the fact that by looking at the company's CSR expenditure, the company's contribution to achieving environmental, social and governance goals cannot be measured. AI may play an influential role in bridging this gap. Through a proper AI implementation strategy, the CSR fund could be redirected to achieve ESG goals, specifically in the hydrocarbon sector, and also across all sectors in general.

In parallel, the emergence of evidence in Indian public sector undertakings (PSUs) confirms a strong relationship among ESG, good practices, and CSR. The “golden triangle framework” of ESG–CSR integration, outlines that firms that align ESG scores, CSR funds and activities have a stronger sustainable performance and greater social

impact. Overall, these developments indicate a shift globally, that is towards strategically aligned, evidence-based CSR that supports SDG achievements to reinforce corporate legitimacy, governance and long-term sustainability (Stefanescu 2022) (Saivinod and Sivakumar 2025).

2.1. Case Study 1: Oil and Natural Gas Corporation Ltd

The largest upstream company is a well-known contributor to CSR initiatives through projects done in education, healthcare and skill development. Aligning these CSR projects with measurable ESG scores is a key area of importance.

ONGC is using AI for maintenance of its various infrastructure, including offshore platforms and pipelines. The Project DOT is an initiative that influences every activity of the company, showing ONGC's commitment to leveraging new technologies. ONGC is investing highly in its Artificial Intelligence and Machine Learning projects in the next few years to lead the energy sector's AI revolution. Recently, ONGC partnered with C-DAC India to use the AI-driven energy solutions through the project AIRAWAT. This collaboration increases High Performance Computing & AI capabilities, focusing smarter exploration. To inculcate the AI culture, project 'Udhbhav' started in 2025 with a vision to empower the future of energy by fostering AI-driven innovation and enhancing the skill set of ONGC employees.

2.2 Case Study 2: Bharat Petroleum Corporation Ltd (BPCL)

BPCL, having the largest refiners in India, has made a significant contribution to CSR initiatives through projects spanning across India and different sectors. By collaborating with a firm called UptimeAI for plant operations and maintenance, BPCL, another Fortune 500 company, is making a significant move toward sustainability through AI initiatives. To improve operational efficiency, enhance sustainability, and improve dependability, BPCL launched UptimeAI's cutting-edge AI-based plant monitoring solution, "AI Expert.". Again, Urja, which is an AI-enabled chatbot, is the first in the oil and gas industry of the country to provide its customers with an interface for a faster resolution of issues and a seamless self-service experience. A brilliant example of societal benefits arising out of the CSR initiative is the 'bandicoot', an AI-driven sewage manhole cleaning robot for Mumbai Refinery and Mumbai Municipal Corporation. BPCL has launched the country's first AI-enabled LPG ATM named 'Bharat Gas Insta' for customer safety and convenience. BPCL has integrated its investments, strategy, social and environmental ambitions to move towards ESG. BPCL is going to invest Rupees 88 Crore through Project Ankur to start various AI-based Startups in India. Also in the HR front, BPCL is using AI in recruitment, medical bill reimbursement, human resource management system, environmental monitoring and prediction system management, waste management, community engagement, etc.

3. Results and Discussion

This research underscores the reshaping potential of Artificial Intelligence in bridging gap between traditional Corporate Social Responsibility and the rigorous, data-driven demands of Environmental, Social, and Governance principles. By using PRISMA methodology and two case studies, we found that Artificial Intelligence is driving

various ESG principles, but its actual impact remains unrecognised on CSR implementation, formulation and communication. The evolution of CSR from a government guideline to a strategic move is being supported by AI's ability to give more transparency and measurability into corporate sustainability efforts. For the hydrocarbon sector, an industry under constant criticism to reform, this alignment is not just beneficial but essential for long run.

As found by the case studies of ONGC and BPCL, the application of AI is helping in the practical implementation and enhancing operational safety, reducing emissions, optimizing resource management, and ensuring transparent governance. The need is to formulate effective strategies to adopt various AI tools so that CSR can be best implemented towards the ESG goals – sustained environmental, social, and governance. There is a possibility of more technical collaboration in the CSR activities of both companies by implementing AI-driven techniques. But it is also observed that both companies are using digital techniques and spreading digital equipment to the community for the sustainable development of skills, education, and fulfilment of ESG Goals.

Integrating CSR and sustainability practices into ESG reporting frameworks is increasingly valuable for businesses wishing to validate their commitment to sustainability. Companies are expected to report environmental and social impacts transparently, allowing stakeholders to make informed decisions. The use of CSR in ESG reporting must consider the following elements.

- ESG Score and Standards: Organizations may adopt frameworks such as the Sustainability Accounting Standards Board (SASB), the Global Reporting Initiative (GRI), or the Task Force on Climate-related Financial Disclosures (TCFD) for the purpose of ESG reporting.
- Accountability and Transparency: ESG reporting can help build trust among the company's investors, customers, and regulators and communicate the company's commitment to sustainable business practices.
- Strategic Alignment: Companies can align CSR and ESG goals with their CSR projects while leveraging sustainability to achieve operational goals, build a culture and strengthen overall performance.
- Regulatory Compliance: Adopting ESG frameworks can help companies comply with National and International requiring ESG disclosure like the European Union's (EU) Non-Financial Reporting Directive.

3.1 Policy Implications

Research study analysing the use of AI in implementing and monitoring CSR practices to achieve ESG goals can contribute to policy-making in the long run. It can be encouraged to create better frameworks that awards technology-driven ESG reporting and performance. It is also important from stakeholders' point of view that providing a roadmap for leveraging technology to create authentic, impactful and sustainable corporate value. This analysis shows that there is a need for actions to enhance quality partnerships between AI, CSR and ESG. In the future, AI will be an important factor bridging this gap between CSR and ESG. It is seen that AI implementation has a significant role in the proper functioning and implementation of ESG in various industries, with special reference to the hydrocarbon sector. AI's capability to process big and unstructured datasets and generate predictive insights allows companies to transform their CSR from a reactive, compliance-based function

into a proactive, strategic, and measurable component of their ESG strategy. New and relevant insights will be provided by engaging AI that can be used to reduce CSR to help in achieving ESG principles. The remaining research gaps, particularly around the ethical implications and energy demands of AI, call for continued academic and industry focus to ensure this technological integration. Suppose we consider the hydrocarbon industry for AI adoption to manage its CSR goals, we need to consider the 'skill gap' arising from highly skilled labour and low-skilled labour. Therefore, before implementing the AI strategy, a proper training and development session must be introduced among the employees of the organisation. Once the organisation is ready for the adoption and implementation of AI tools to report its ESG principles, like education, health, biodiversity conservation, skill formation, reducing the carbon footprint, etc., the policy prescriptions must be provided for the smooth functioning of all three pillars- ESG, CSR, and AI implementation.

3.2 Conclusion

The study critically examines the interrelationships between ESG, CSR, and AI. The remaining research gaps, particularly around the ethical implications and energy demands of AI, call for continued academic and industry focus to ensure this technological integration. CSR practice is different from any other business decision-making, and hence, the organisations are required to engage carefully while integrating AI with CSR practice so that it becomes sustainable. Also, there can be some ethical and legal issues. The AI's capability to process big and unstructured datasets and give valuable insights in short time will allow companies to transform their CSR projects to get a good ESG score.

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