

# The 2% Policy Test: Statistical Assessment of SECL's Sectoral CSR Allocation for Mining Communities (2019–2024)

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## ABSTRACT

**Purpose of the Study:** This study aims to analyze the year-wise trends and sector-wise allocation patterns of Corporate Social Responsibility (CSR) expenditure by South Eastern Coalfields Limited (SECL) from 2019–20 to 2023–24. This study seeks to evaluate the effectiveness and strategic focus of SECL's CSR investments in addressing community development needs. Drawing on the triple-bottom-line perspective, the study assesses how CSR resources are allocated across social, environmental, and economic dimensions in a public sector coal mining enterprise, contributing to the extractive industries literature.

**Methodology:** The study adopts a quantitative descriptive–analytical approach, using secondary data from SECL's CSR and annual reports (2019–2024). SECL was purposively selected as the sole sample due to its strategic importance in India's coal sector. Regression analysis, ANOVA, and post-hoc tests were applied to examine temporal trends and sectoral differences in CSR expenditure across healthcare, education, environmental sustainability, and rural development.

**Main Findings:** The findings indicate a statistically significant increase in SECL's CSR expenditure from ₹31.8 crore to ₹53.0 crore during 2019–20 to 2023–24, with an average annual rise of about ₹5 crore. Sectoral allocation remains uneven, with healthcare receiving the highest share and environmental sustainability consistently underfunded; these disparities are statistically significant, reflecting targeted CSR prioritisation.

**Applications of this Study:** By applying regression and ANOVA-based inferential analysis, the study moves beyond descriptive reporting to statistically examine trends and sectoral variations in CSR allocation. This study provides actionable insights for policymakers, corporate practitioners, and civil society organizations to optimize CSR investments. This underscores the need for a balanced sectoral focus, stronger monitoring mechanisms, and enhanced stakeholder engagement to maximize social and environmental returns in mining communities.

**Originality of this Study:** By combining trend analysis with sectoral expenditure assessment within the legally mandated CSR framework, this study offers a unique evidence-based evaluation of SECL's CSR practices, contributing to the academic literature and guiding better governance practices in India's mining sector.

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**KEYWORDS:** Corporate Social Responsibility (CSR), SECL, Coal Mining, CSR Expenditure Trends, Sector-wise Allocation, Environmental Sustainability.

## INTRODUCTION

Corporate Social Responsibility (CSR) has emerged as one of the most transformative tools in corporate governance and sustainable development policy. In

India, the enactment of the Companies Act (2013), with its groundbreaking Section 135, which mandates companies to spend 2% of their average net profits on

CSR activities, institutionalized the nation's commitment to inclusive and equitable growth (**Ministry of Corporate Affairs, Government of India, 2013**). Empirical evidence suggests that this mandate significantly increased CSR spending among covered firms, particularly those with low pre-mandate CSR engagement, though the observed increase was largely compliance-driven (**Dharmapala & Khanna, 2018**). For coal-dependent economies, where industrial concentration often coexists with ecological degradation and social disparities, CSR execution is both a responsibility and an opportunity for resource redistribution. A comprehensive review of CIL's CSR policy reveals the consistent achievement of the 2% CSR spending norm, with principal sectoral investments in education, healthcare, and rural development, but with persistent challenges in sustainability and impact evaluation (**Patel & Deshpande, 2024**).

This study focuses on the South Eastern Coalfields Limited (SECL), a Mini Ratna Public Sector Undertaking (PSU), and a primary subsidiary of Coal India Limited (CIL). Operating primarily in Chhattisgarh and parts of Madhya Pradesh, SECL represents a high-stakes case study because of its large operational scale. In Fiscal Year 2023–24, SECL achieved record coal production, with its Gevra and Kusunda mines among the world's largest, collectively accounting for approximately 10% of India's total coal output. The CSR expenditure of South Eastern Coalfields Limited (SECL) steadily increased from ₹31.8 crore in 2019–20 to ₹53.07 crore in 2023–24, reflecting the company's growing investment in community development and social welfare programs. Corporate social responsibility initiatives have significant potential to enhance the quality of life, diversify livelihoods, improve healthcare access, advance education, and promote environmental sustainability in mining communities that face a disproportionate level of industrial risk. The sheer volume of this mandated expenditure necessitates rigorous statistical scrutiny. Therefore, a statistical assessment of the '2% Policy Test' is essential to objectively evaluate its efficacy and provide objective, evidence-based insights into temporal trends and sectoral allocation patterns, particularly in environmentally and socially sensitive extractive industries.

Empirical studies indicate that SECL's CSR initiatives have significantly contributed to the well-being of rural communities by improving local infrastructure, education, and healthcare facilities in mining-affected areas (**Jha & Shukla, 2019**). The magnitude of SECL's operations means that its

mandatory CSR contribution generates a substantial pool of capital, which carries significant socio-economic weight in its operational region. Critically, the CIL policy mandates that at least 80% of these funds must be spent within a 25-kilometre radius of the mines, focusing directly on local "mining communities" and project-affected persons (PAPs). Therefore, a statistical scrutiny of SECL's spending is essential for gauging the policy's real-world impact in coal-dependent territories.

CSR emerges not only as an expenditure but also as an ethical contract between businesses and society. The 2% policy challenges corporations like SECL to transform profit into purpose, ensuring that the communities at the heart of extraction also lie at the heart of social transformation. The findings of this quantitative assessment offer a definitive, evidence-based evaluation of whether the Indian government's mandatory policy successfully mandates stability and strategic investment in the nation's coal heartlands.

## THEORETICAL FRAMEWORK

The theoretical framework of this study is grounded primarily in stakeholder and institutional theories, which collectively provide a robust foundation for understanding the dynamics of Corporate Social Responsibility (CSR) in the mining sector.

**Stakeholder Theory** posits that companies have a social responsibility towards all parties affected by their operations, extending beyond shareholders to include employees, local communities, government agencies, and environmental groups (**Garriga & Mele, 2004; R. Edward Freeman et al., 2010**). The theory supports the idea that CSR practices must be participative and inclusive, reinforcing the social license to operate and trust-building with communities (**Matikainen, 2022; Strand et al., 2015**).

**Institutional Theory** explains how companies adopt CSR practices to conform to regulatory pressures, social norms, and industry standards to maintain legitimacy within their institutional environment. Organizations strategically engage in CSR not only because of external pressures but also because of internally motivated choices shaped by institutional values and trust (**Risi et al., 2022**). This theory elucidates how compliance mechanisms and institutional pressures incentivize CSR integration into corporate strategies, impacting SECL's expenditure patterns and sectoral focus.

Furthermore, the **Sustainable Development Framework** underpins the importance of balancing economic growth, social equity, and environmental stewardship (**Brundtland Commission, 1987**). CSR

in mining must reconcile operational imperatives with minimizing ecological impact and maximizing social benefits, advocating a triple-bottom-line approach (Jenkins & Yakovleva, 2006). This holistic view supports sector-wise CSR allocation that addresses community health, education, rural livelihood, and environmental sustainability in a coordinated manner.

Together, these theories highlight that SECL's CSR expenditure trends and sectoral prioritization are guided by complex interactions among stakeholder expectations, institutional mandates, and sustainable development goals, framing the analytical lens for this research.

## LITERATURE REVIEW

Corporate Social Responsibility (CSR) in India's mining sector has drawn considerable academic scrutiny following the mandate of 2% CSR spending under the Companies Act (2013). This review sheds light on CSR policy design, sectoral allocation patterns, sustainability outcomes, and emerging trends in coal-dependent communities.

(Agyemang-Duah et al., 2019) based on community-level evidence, demonstrate that CSR initiatives can significantly complement public health provision by improving access to basic healthcare services and enhancing community well-being. Their findings underscore the importance of aligning CSR expenditures with local developmental needs, a perspective that informs the sectoral evaluation of CSR allocations undertaken in the present study.

(Lathabhavan, 2020) critically examines India's mandatory CSR regime introduced under the Companies Act, 2013, questioning whether statutory compliance alone is sufficient to achieve meaningful social outcomes. The study argues that while mandatory CSR has increased corporate spending on social initiatives, it has also led to a compliance-driven approach, often prioritizing expenditure over impact and long-term sustainability. The paper highlights challenges such as limited strategic integration of CSR, uneven sectoral allocation, and inadequate monitoring mechanisms, emphasizing the need to move beyond mere legal compliance toward outcome-oriented and community-centric CSR practices.

(Singal, 2021) provides a comprehensive empirical examination of corporate social responsibility (CSR) initiatives within Indian metal and mining companies. This study highlights how these CSR programs are strategically framed not only as social responsibility efforts but also as key contributors to national development objectives. Singal emphasizes that while CSR activities have gained structured attention, gaps

remain in ensuring that these initiatives translate into meaningful community benefits and sustainable impact.

(Jadon & Rahate, 2022) An Empirical Study of CSR in Indian Coal Mining Sector with Special Reference to WCL, analyse the CSR framework in Western Coalfields Limited (WCL). It highlights the challenges of integrating sustainability into CSR and calls for improved links between corporate spending and community development outcomes. The authors emphasize the long-term benefits of participatory CSR planning.

(Kumar & Sakriya, 2021) presented an evaluative study of CSR in selected mining companies, highlighting the operationalization of the Companies Act (2013) in coal-based PSUs. Their results revealed that both Mini Ratna companies surveyed directed considerable CSR efforts toward infrastructure and skill programs around project zones but lacked continuous evaluation frameworks to measure outcomes effectively.

(Goswami & Kumar, 2025) discussed CSR's transformation from philanthropy to structured socio-economic investment in Chhattisgarh's coal belt. Using data from SECL and neighboring PSUs, they showed that CSR spending remains health- and education-dominant, with minimal alignment toward environmental goals. The findings echo concerns regarding sustainability imbalances across coal-mining districts.

(Tiwari, 2024) evaluated the CSR practices of South Eastern Coalfields Limited (SECL) in Bilaspur, highlighting their focus on community development, health, education, and environmental management. The findings indicate that SECL's CSR initiatives positively impacted local infrastructure, healthcare, and educational opportunities. This study emphasizes the need for improved reporting and strategic planning to enhance CSR effectiveness. Overall, SECL's efforts align with industry norms but require further refinement to maximize community and environmental benefits

(Ministry of Coal, 2025) This government-released policy report highlights integrated CSR and Sustainability (SD) planning by Coal India Limited. The key areas include afforestation, biodiversity conservation, and public health through eco-friendly technologies. The report underlines the transition toward circular economy practices within coal operations, ensuring livelihood creation and social welfare.

The reviewed literature underscores an evolution from CSR compliance to strategic sustainability,

revealing a heavy concentration in socio-health sectors but insufficient investment in environmental and livelihood domains. Reports from ministries and PSUs demonstrate progress in regulatory standardization; however, studies stress the need for localized participatory CSR models to genuinely uplift coal-mining communities.

## RESEARCH GAP

Most evaluations emphasize either compliance or narrative reporting rather than data-driven assessments that link resource allocation to the principles of inclusive growth (IG). This study fills this gap by conducting a trend analysis using regression techniques to evaluate the significance of changes in annual CSR spending between 2019 and 2024 and a statistical assessment of SECL's CSR expenditure across sectors, quantifying spatial and sectoral disparities to evaluate the efficacy of CSR distribution in achieving balanced socio-economic outcomes. Most empirical studies have not thoroughly examined inter-sectoral disparities using robust statistical tests, such as ANOVA or post hoc analyses, which are essential for revealing nuanced allocation inequities.

This focused statistical lens enhances our understanding of the magnitude and equity of corporate social investments, guiding the development of more effective and accountable CSR policies targeting mining communities.

## RESEARCH OBJECTIVES

1. To analyze the year-wise growth of SECL's CSR expenditure between FY 2019-20 to FY 2023-24, and determine if this growth trend is statistically significant.
2. To compare the distribution of SECL's CSR expenditure across different sectors—Healthcare, Education, Environment, and Rural Development during 2019-24, evaluating whether sector-wise allocation differences are statistically significant.
3. To provide policy recommendations for effective and equitable CSR implementation based on the findings.

## HYPOTHESES

**Hypothesis 1: SECL's annual CSR expenditure has shown a significant increasing trend over the years.**

Null Hypothesis (H0): There is no significant increasing trend in SECL's annual CSR expenditure over the years 2019-2024; any observed changes are due to random variation.

Alternative Hypothesis (H1): There is a significant increasing trend in SECL's annual CSR expenditure over the years 2019-2024.

**Hypothesis 2: The Mean CSR expenditure differs across sectors.**

Null hypothesis (H0): There is no significant difference in the mean CSR expenditure across the different sectors of the SECL.

Alternative hypothesis (H1): There is a significant difference in the mean CSR expenditure across different sectors of the SECL.

**Hypothesis 3: Statistically significant differences exist in sector-wise CSR distribution.**

Null hypothesis (H0): There are no statistically significant differences in the sector-wise distribution of CSR expenditure by SECL.

Alternative hypothesis (H1): There are statistically significant differences in the sector-wise distribution of CSR expenditure by SECL.

## METHODOLOGY

### Research Design

This study employs a quantitative, explanatory design aimed at statistically evaluating SECL's CSR expenditure trends and sectoral allocation over a five-year timeframe. This longitudinal approach allows for a detailed temporal and cross-sectoral investigation, ensuring that the interpretation is grounded in rigorous statistical evidence. This design facilitates the objective examination of hypotheses through rigorous inferential statistics. By adopting this design, this study systematically investigates whether CSR expenditure patterns reflect consistent growth, equality in sectoral distribution, and strategic alignment with corporate and social objectives.

### Data Source

This study utilizes secondary data sourced from SECL's official annual and CSR performance reports for the financial years 2019-20 to 2023-24, available on its official website. These reports contain comprehensive and authoritative records of SECL's corporate social responsibility (CSR) expenditure, including detailed breakdowns across key sectors such as Healthcare, Education, Environment, and Rural Development. All data were carefully organized by year to ensure comparability and validity for statistical examination. The use of official company reports ensures the credibility and accuracy of the data used in this study.

### Variables

The following variables were considered in this study. The dependent variables include: (i) Annual CSR expenditure, a continuous variable measured in crore Indian Rupees (INR), representing SECL's total yearly spending on corporate social responsibility initiatives from 2019-20 to 2023-24; and (ii) Sector-wise CSR expenditure, continuous variables

indicating the amount allocated to key focus areas: Healthcare, Education, Environment, and Rural Development across the same period. The independent variable is time, categorized year-wise from 2019–20 to 2023–24, which serves to analyze both the trend of overall CSR growth and the variation in sectoral allocations over time. This variable structure facilitates a precise statistical evaluation of the SECL's CSR expenditure behavior and its temporal and sectoral dynamics.

### Data Analysis Techniques

The data analysis for this study involved two major components: trend and sectoral allocation analyses. Regression analysis was used to examine the year-wise growth of SECL's CSR expenditure from 2019–20 to 2023–24, testing whether there is a statistically significant upward trend. The significance of this

relationship is evaluated through the p-value, B coefficient, and  $R^2$ , which indicate statistical significance, the rate of growth, and the proportion of variance explained by time, respectively. To explore differences in CSR expenditure across sectors, One-Way ANOVA is employed to test whether mean expenditures vary significantly among Healthcare, Education, Environment, and Rural Development. Levene's test was conducted to check the assumption of equal variances, and in cases where this assumption was not met, the Games-Howell post hoc test was applied to identify which sectoral means differed significantly from each other. All analyses were performed using SPSS software at a significance level of 5% ( $p < 0.05$ ). Microsoft Excel was used for graphical representations, such as line graphs and bar charts, to visually support the statistical findings.

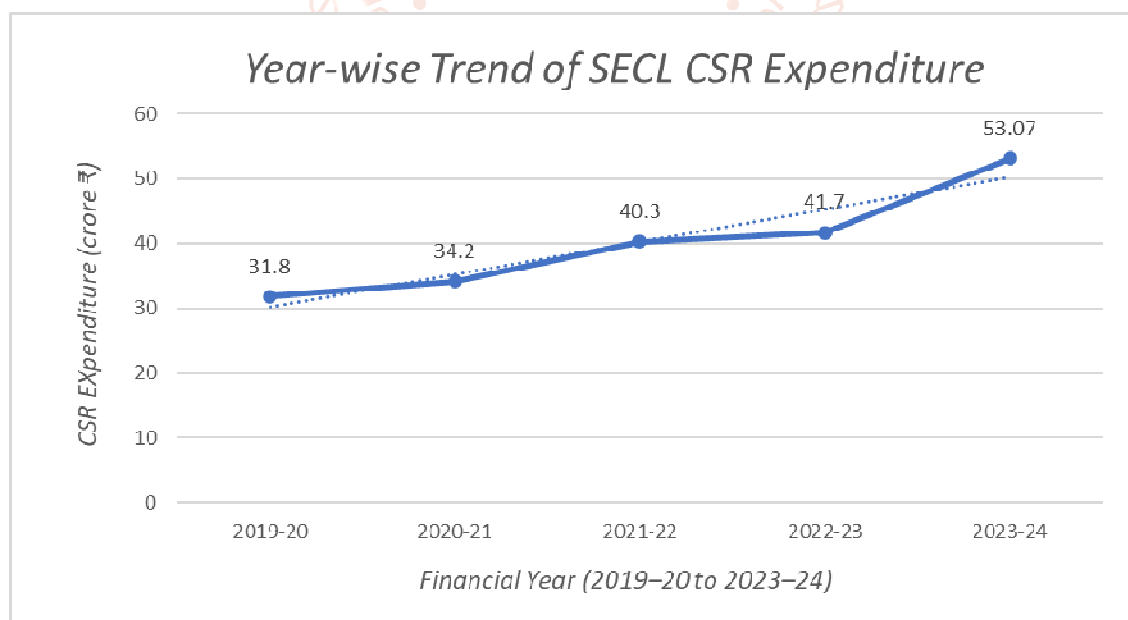
## DATA ANALYSIS AND INTERPRETATION

### 1. Year-wise Trend of CSR Expenditure (2019–20 to 2023–24)

**Table 1: Year-wise Sectoral Distribution of SECL's CSR Expenditure (2019–20 to 2023–24) in ₹ Crore**

Year	Healthcare	Education	Environment Sustainability	Rural Development	Total CSR Expenditure
2019-20	10.5	8.3	5.2	6.7	31.8
2020-21	12	9	5.5	7.5	34.2
2021-22	13.5	10	5.8	8	40.3
2022-23	14	11	6	8.3	41.7
2023-24	14.8	11.2	6.1	8.6	53.07

Source: SECL Annual CSR Reports (2019–2024); compiled by author. <https://secl-cil.in/csr-secl.php>



**Figure 1: Year-wise Sectoral CSR Expenditure by SECL (2019–20 to 2023–24)** Source: SECL Annual CSR Reports (2019–2024); compiled by author. <https://secl-cil.in/csr-secl.php>

The year-wise trend of SECL's CSR expenditure from 2019–20 to 2023–24 is visualized using a line graph. This graph clearly shows a consistent upward trajectory in total CSR spending over the five-year period. Visual evidence indicates sustained growth in CSR investments year-on-year, highlighting SECL's increasing commitment to community development and sectoral spending. This upward trend sets the foundation for

statistically testing whether these observed yearly increases are significant and systematic rather than random fluctuations.

**Table 2: Model Summary for Regression of Year-wise CSR Expenditure by SECL (2019–20 to 2023–24)**

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.955 <sup>a</sup>	.912	.883	2.83171
a. Predictors: (Constant), Year_Code				

The regression model summary reveals the strength and explanatory power of the year as a predictor variable for CSR expenditure. The R value of 0.955 indicates a very strong positive correlation between the year and CSR expenditures. More importantly, the R Square value of 0.912 shows that 91.2% of the variance in total CSR expenditure during the study period is explained by time (year variable). This suggests that annual changes in expenditure follow a highly predictable pattern linked to temporal progression, underscoring the model's appropriateness for trend assessment.

**Table 3: ANOVA Results for Regression of SECL's Annual CSR Expenditure**

ANOVA <sup>a</sup>						
Model	Sum of Squares	df	Mean Square	F	Sig.	
1	Regression	250.400	1	250.400	31.227	.011 <sup>b</sup>
	Residual	24.056	3	8.019		
	Total	274.456	4			
a. Dependent Variable: TotalCSRExpenditure						
b. Predictors: (Constant), Year_Code						

The ANOVA results assessed whether the regression model significantly fit the data better than a model with no predictors. The F-statistic value of 31.227, with an associated significance level ( $p = 0.011$ ), demonstrates that the model is statistically significant at the 5% level. This implies that the observed pattern of increasing CSR expenditure over the years is unlikely to be due to chance variations and confirms the existence of a real increasing trend governed by the "Year" variable.

**Table 4: Regression Coefficients for Year-wise Prediction of SECL's CSR Expenditure**

Coefficients <sup>a</sup>						
Model	Unstandardized Coefficients	Standardized Coefficients	t	Sig.		
	B	Std. Error	Beta			
1	(Constant)	25.202	2.970		8.486	.003
	Year_Code	5.004	.895	.955	5.588	.011
a. Dependent Variable: TotalCSRExpenditure						

The coefficient table provides parameter estimates for the regression equation. The unstandardized coefficient (B) for Year\_Code is 5.004, meaning that SECL's CSR expenditure has increased by approximately ₹5.004 crores on average with each successive year. The associated p-value of 0.011 affirms that this annual increase is statistically significant. The constant of 25.202 represents the estimated CSR expenditure in the baseline year when Year\_Code = 0. The standardized coefficient (Beta = 0.955) further highlights the strength and directionality of this increase.

Taken together, these analyses provide strong corroborative statistical evidence for rejecting the null hypothesis (H<sub>0</sub>) that there is no significant increasing trend in SECL's CSR expenditure over the years. The multiple layers of analysis from clear graphical visualization to rigorous statistical testing lead to the acceptance of the alternative hypothesis (H<sub>1</sub>) that there is a significant increasing trend in SECL's annual CSR spending from 2019–20 to 2023–24. This consistent and statistically validated growth in CSR expenditure reflects SECL's escalating engagement in social responsibility initiatives during the study period.

2. Sector-wise CSR Expenditure Comparison (2019-20 to 2023-24)

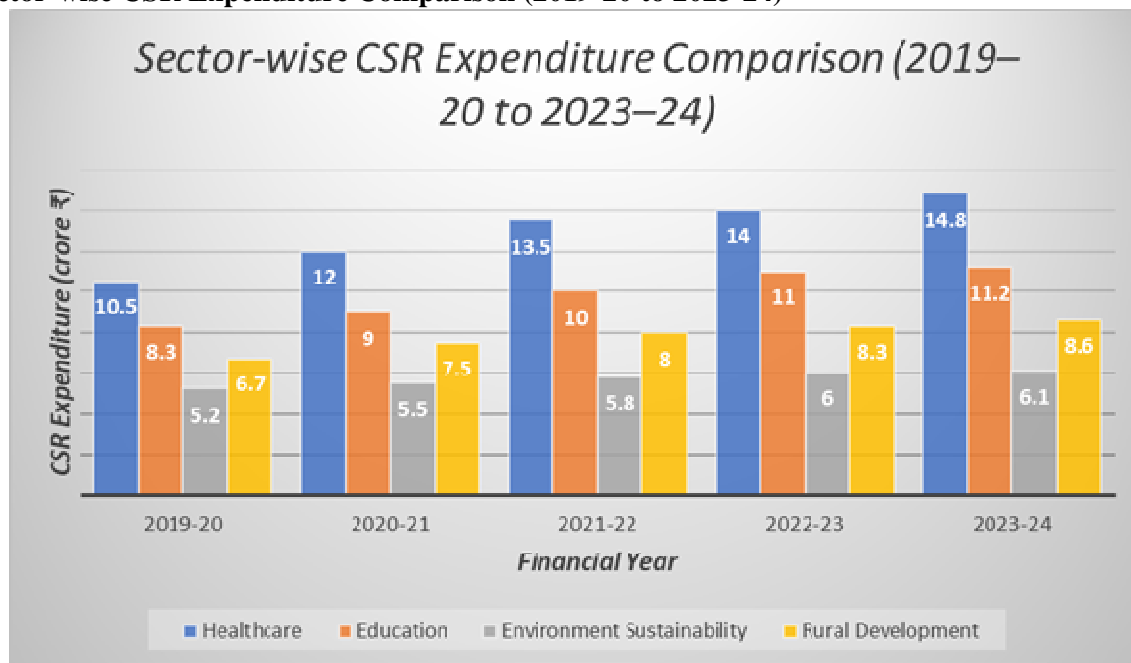


Figure 2 Sector-wise CSR Expenditure Comparison (2019-20 to 2023-24)

Source: SECL Annual CSR Reports (2019-2024); compiled by author. <https://secl-cil.in/csr-secl.php>

The graphical analysis employs a bar chart to illustrate the distribution and variation of CSR expenditure across four key sectors: Healthcare, Education, Environment, and Rural Development over the five-year span from 2019-20 to 2023-24. The chart visually highlights the differences in the annual funding levels allocated to each sector. Notably, Healthcare consistently receives the highest funding, reflecting its prioritized status, while sectors such as the Environment and Rural Development receive comparatively lower allocations. The graph also reveals that expenditure in the healthcare sector shows a steady year-on-year increase, whereas other sectors exhibit more fluctuating patterns.

Table 5: Descriptive Statistics for Sector-wise CSR Expenditure by SECL (2019-20 to 2023-24)

	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
Education	5	9.900	1.2530	.5604	8.344	11.456
Environment Sustainability	5	5.720	.3701	.1655	5.260	6.180
Healthcare	5	12.960	1.7126	.7659	10.834	15.086
Rural Development	5	7.820	.7463	.3338	6.893	8.747
Total	20	9.100	2.9362	.6565	7.726	10.474

The results of the descriptive statistics provide a summary of the central tendency and variability in CSR expenditure across the four sectors. Healthcare has the highest mean CSR expenditure (12.96 crore, SD = 1.71), followed by education (9.90 crore, SD = 1.25), Rural Development (7.82 crore, SD = 0.75), and environment/sustainability (5.72 crore, SD = 0.37). Healthcare exhibited the highest mean CSR expenditure, followed by Education, Rural Development and Environment/Sustainability. The standard deviations and confidence intervals indicate that expenditures in Healthcare and Education are relatively more variable than those in Environment/Sustainability and Rural Development. These findings offer preliminary evidence of disparity in the allocation of CSR funds, and there is clear descriptive evidence of unequal mean expenditures across sectors, with healthcare being the most prioritized and environment/sustainability the least.

Table 6: Levene's Test of Homogeneity of Variance for Sector-wise CSR Expenditure

Tests of Homogeneity of Variances					
		Levene Statistic	df1	df2	Sig.
CSR expenditure value	Based on Mean	4.100	3	16	.025
	Based on trimmed mean	3.919	3	16	.028

Levene's test results assess whether the variance in CSR expenditure is consistent across sectors, which is a critical assumption for ANOVA. The significance value for "Based on Mean" is 0.025 ( $p < 0.05$ ) and "Based on Trimmed Mean" is 0.028 ( $p < 0.05$ ), suggesting that there are statistically significant differences in variance across sectors. This violation of homogeneity of variance implies that a standard ANOVA may not be wholly robust; therefore, it is necessary to employ post hoc tests designed for unequal variance, such as the Games-Howell test, to ensure accurate pairwise comparisons.

**Table 7: One-Way ANOVA Results for Sector-wise CSR Expenditure**

ANOVA					
CSR expenditure value					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	143.012	3	47.671	36.691	.000
Within Groups	20.788	16	1.299		
Total	163.800	19			

The one-way ANOVA results demonstrate that sector-wise mean CSR expenditures differ significantly ( $F = 36.69$ ,  $p < 0.001$ ). This suggests that there is at least one sector for which the mean expenditure is statistically different from that of the others. The large F-value and highly significant p-value provide strong statistical evidence supporting the existence of differences in CSR allocation patterns across sectors. This result indicates that the variability in CSR expenditure attributable to differences between sectors is substantially greater than the variability within sectors, thus providing strong evidence that at least one sector's mean CSR spending differs significantly from the others.

**Table 8: Games-Howell Post Hoc Test Results for Pairwise Sector Comparisons (CSR Expenditure)**

Multiple Comparisons						
Dependent Variable: CSR expenditure value						
Games-Howell						
(I) Sector of CSR Expenditure	(J) Sector of CSR Expenditure	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Education	Environment Sustainability	4.1800*	.5843	.004	1.968	6.392
	Healthcare	-3.0600	.9490	.053	-6.164	.044
	Rural Development	2.0800	.6522	.063	-.122	4.282
Environment Sustainability	Education	-4.1800*	.5843	.004	-6.392	-1.968
	Healthcare	-7.2400*	.7836	.002	-10.298	-4.182
	Rural Development	-2.1000*	.3726	.006	-3.400	-.800
Healthcare	Education	3.0600	.9490	.053	-.044	6.164
	Environment Sustainability	7.2400*	.7836	.002	4.182	10.298
	Rural Development	5.1400*	.8355	.005	2.157	8.123
Rural Development	Education	-2.0800	.6522	.063	-4.282	.122
	Environment Sustainability	2.1000*	.3726	.006	.800	3.400
	Healthcare	-5.1400*	.8355	.005	-8.123	-2.157

\*. The mean difference is significant at the 0.05 level.

The Games-Howell post hoc test results detail pairwise comparisons between all sector combinations, accounting for unequal variances and sample sizes. Significant differences in the mean expenditure were observed between several sector pairs:

- Education vs. Environment/Sustainability: Mean difference = 4.18,  $p = 0.004$  (significant)
- Environment/Sustainability vs. Healthcare: Mean difference = -7.24,  $p = 0.002$  (highly significant)
- Environment/Sustainability vs. Rural Development: Mean difference = -2.10,  $p = 0.006$  (significant)
- Healthcare vs. Rural Development: Mean difference = 5.14,  $p = 0.005$  (significant)
- Other comparisons (such as Education vs. Healthcare and Education vs. Rural Development) are marginal ( $p = 0.053$  and  $0.063$ ) and narrowly miss the traditional significance thresholds.

Environment/sustainability consistently receives statistically less allocation than other sectors, and healthcare receives consistently more. The results underscore that allocation disparities are statistically robust, rather than

occurring by chance, properly validating the rejection of the null hypotheses regarding equal means and distributions across the sectors.

A sector-wise analysis of SECL's CSR from 2019–20 to 2023–24 shows clear evidence of funding disparities. Descriptive statistics highlight substantial differences in averages, and this is confirmed by ANOVA, which proves that the overall differences are statistically significant. Given the unequal variances, the Games-Howell test is appropriately used and demonstrates that most sector pairs have significant differences in CSR expenditure. These robust statistical findings mean that both Hypothesis 2 (mean sector spending differs) and Hypothesis 3 (distribution across sectors is not even) are decisively supported. Thus, SECL's CSR allocation pattern is statistically unequal, with Environment/Sustainability being notably underfunded and Healthcare being the most prioritized. This nuanced statistical insight provides strong guidance for future strategic CSR planning and sector equity.

## DISCUSSION

The present study reveals a robust and statistically significant upward trend in SECL's annual CSR expenditures from 2019-20 to 2023-24, with regression analysis indicating that over 91% of the expenditure variance is accounted for by time progression. This sustained growth demonstrates SECL's strong adherence to the 2% CSR policy mandated by the Companies Act, reflecting an increasing corporate commitment to social welfare in the mining communities of Chhattisgarh and Madhya Pradesh. For readers, this trend illustrates how regulatory frameworks can successfully incentivize progressive corporate investments in social programs over time.

Sector-wise analysis shows a marked preference for healthcare-related CSR activities, which consistently received the highest funding across the study period, underscoring SECL's prioritization of public health initiatives in CSR spending. However, disparities in allocation were observed, with Environment/Sustainability sectors receiving relatively lower funds, indicating room for a more balanced sectoral distribution to address holistic community needs. Given mining's inherent ecological impact, increasing investment and attention to environmental initiatives can enhance the long-term sustainability of CSR outcomes. This gap highlights a vital opportunity for SECL to expand its CSR vision to include a more balanced and ecosystem-conscious approach.

The statistically significant differences in sectoral spending patterns, confirmed by homogeneity and post hoc tests, emphasize strategic focus areas within SECL's CSR framework. This signifies that SECL's CSR strategy is not uniform but deliberately focused, with resource allocation guided by sector-specific priorities and impact assessments. This strategic differentiation is essential for maximizing the effectiveness of CSR funds; however, it also demands continuous evaluation to ensure that all community needs, including ecological sustainability, are adequately addressed.

## CONCLUSION

The empirical evidence strongly supports the rejection of the null hypothesis of no significant trend in SECL's CSR expenditure. The firm has progressively expanded its CSR budget over five years, with clear sector-based spending patterns that address vital social sectors. The firm's allocation patterns prioritize healthcare, education, and rural development, reflecting its responsiveness to community needs and regulatory expectations. Nonetheless, sectoral disparities, particularly the relative underinvestment in environmental sustainability, suggest opportunities for strategic rebalancing to support holistic development. This study affirms SECL's positive trajectory as a socially responsible entity, while signaling strategic opportunities to enhance equitable and sustainable community development through more diversified and transparent CSR investments.

This study provides valuable insights for policymakers and corporate leaders striving to enhance CSR efficacy and equity in mining regions, reaffirming SECL's role as a responsible corporate citizen in contributing to inclusive growth and sustainable development.

## RECOMMENDATIONS

Based on the analysis, the following detailed recommendations are suggested for SECL to enhance the effectiveness and impact of its CSR initiatives.

### 1. Continuing to Scale CSR Expenditures:

SECL should maintain and further scale its overall CSR expenditure, following the positive growth trend observed from 2019 to 2024. Increasing financial commitments will enable the expansion of ongoing projects and the initiation of new programs to effectively address broader community needs.

### 2. Achieve Balanced Sectoral Allocation:

While healthcare, education, and rural development have been the focus areas with substantial impact, SECL is encouraged to enhance investment in environmentally sustainable sectors. A more balanced allocation will ensure holistic sustainable

development by addressing ecological concerns alongside social welfare.

### 3. Strengthening Monitoring and Evaluation Systems:

To maximize social returns and ensure transparency, robust monitoring and evaluation mechanisms must be established and reinforced. Consistent tracking of project implementation and outcomes will help identify gaps and best practices and guide adaptive strategies for continuous improvement.

### 4. Enhancing Stakeholder Engagement and Participation:

Active and continuous engagement with local stakeholders, such as community members, NGOs, and government agencies, will enable the SECL to better understand and address emerging needs. Participatory development approaches foster community ownership, improve program relevance, and build mutual trust among stakeholders.

### 5. Strengthening Community Participation in Environmental Sustainability Initiatives:

SECL may strengthen its environmental sustainability initiatives by actively involving local communities in the planning and implementation of CSR-funded environmental projects, such as afforestation, land restoration, and water conservation in mining-affected areas. Enhanced community participation could improve project ownership and effectiveness, and may also help scale up environmental sustainability expenditure, which has remained relatively modest compared to the steadily increasing allocations to healthcare and rural development.

### 6. Promoting Strategic Partnerships and Collaborations

Forming collaborative partnerships with government bodies, academic institutions, and civil society can amplify resource mobilization, implementation capacity and impact assessments. Partnerships also provide access to specialized expertise and innovative solutions, enhancing the sustainability and effectiveness of CSR initiatives.

Implementing these recommendations will not only align SECL's CSR activities with regulatory mandates but also significantly enhance the long-term socioeconomic and environmental outcomes for mining communities, ensuring shared value creation and inclusive growth.

### LIMITATION AND STUDY FORWARD

This study had several limitations. It relies exclusively on secondary data from SECL's annual reports, which may lack detailed project-level insights and are subject to reporting bias. The study is limited to CSR data for 2019–2024 and therefore does not

reflect the potential impact of emerging sustainability mandates and India's net-zero commitments, which may influence future CSR allocation patterns in the mining sector. Additionally, the quantitative focus on expenditure patterns does not incorporate qualitative aspects, such as community perceptions or social outcomes. The study also does not factor in external influences, such as economic fluctuations or regulatory changes, that may affect CSR spending. Finally, the geographic and demographic diversity within SECL's operations is not deeply disaggregated, limiting the nuanced analysis.

Future research should address these gaps by incorporating stakeholder-based primary surveys or mixed-method approaches to triangulate CSR claims and outcomes reported in corporate disclosures. The collection of granular, project-specific data and impact metrics would allow for a more precise evaluation of CSR effectiveness. Future studies may incorporate post-2024 CSR data to assess the influence of emerging sustainability mandates and India's net-zero commitments on CSR allocation patterns in the mining sector. Future studies may conduct comparative CSR analyses across Coal India subsidiaries, including WCL, CCL, ECL, and BCCL, to benchmark sectoral allocation patterns and enhance generalizability of findings.

### COMPETING INTERESTS DISCLAIMER:

The author(s) declare that they have no known competing financial or personal interests that could have appeared to influence the work reported in this paper.

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