



Impact of Coal Industry on Jharkhand's State Revenue and Economic Stability: A Case Study of CCL, Ranchi

Anish Surin¹, Alok Kumar Munda¹, Shreya Shradha Bage¹, Mirium Messey¹, Priya Tete¹, Dr.

Narendra Singh, Dr. Anirban Gupta, Dr. Ajay Kumar (1 = Students)

Department of Commerce, St. Xavier's College, Ranchi

DOI : <https://doi.org/10.5281/zenodo.22083176>

ARTICLE DETAILS

Research Paper

Received: 27-06-2026

Accepted: 19-07-2026

Published: 20-08-2026

Keywords:

Central Coalfields Limited, Coal Mining, Jharkhand Economy, State Revenue, Economic Stability, Sustainable Development.

ABSTRACT

Coal mining is a major contributor to India's economic development, industrial growth, and energy security, with Jharkhand being one of the country's leading coal-producing states. Central Coalfields Limited (CCL), a subsidiary of Coal India Limited, plays an important role in Jharkhand's economic progress through revenue generation, employment opportunities, infrastructure development, and community welfare initiatives. However, coal mining activities also raise concerns related to environmental degradation, social challenges, and long-term sustainability. This study examines the impact of CCL's mining operations on Jharkhand's state revenue, economic stability, and socio-economic development. A descriptive and analytical research design was adopted using both primary and secondary data. Primary data were collected from 76 respondents through structured questionnaires, while secondary data were gathered from CCL reports, government publications, journals, and research articles. The collected data were analyzed using SPSS through descriptive statistics, multiple linear regression, and ANOVA. The findings indicate that CCL has significantly contributed to regional development by generating employment, increasing income opportunities, supporting local businesses, and improving community welfare. Regression results

Disclaimer: The opinions, interpretations, conclusions, recommendations, analyses, and statements expressed in this research article are solely those of the author(s) and do not reflect the views, policies, or positions of the Publisher, Chief Editor, Editors, Editorial Board, Reviewers, or their affiliated institutions. The author(s) are solely responsible for ensuring the originality, authenticity, and integrity of the manuscript and for ensuring that it is free from plagiarism, AI-generated content, copyright infringement, data falsification, and any other form of academic misconduct.

showed a significant relationship between CCL's activities and economic development ($F = 23.498$, $p < 0.001$), explaining 39.8% variation in economic effects. Social initiatives showed the strongest positive influence, while infrastructure development also contributed positively. The study concludes that CCL has played a significant role in Jharkhand's socio-economic and regional development. However, achieving sustainable growth requires balancing economic benefits with environmental protection, effective CSR implementation, community participation, and strategies for reducing long-term dependence on coal-based development.

Introduction

Coal mining represents the most significant component of both economic growth and energy security in India, especially in the state of Jharkhand with huge coal reserves. CCL a subsidiary of Coal India Limited is an important source of employment, revenue generation and overall regional development. Apart from these positive aspects, the economic consequences of coal mining give rise to a number of social and environmental concerns. The present study analyses the overall economic, social and infrastructural development implications arising out of activities of CCL in the state of Jharkhand.

Background of the Study

Jharkhand is the biggest coal producing state of India and the contribution of CCL in economic and industrial growth of the state is immense. The company has made an impact on the socio-economic spheres of the state through its mining operation, revenue generation, providing jobs to millions of people, undertaking CSR activities. The effect of CCL on the state is analysed under various factors of environment degradation and sustainable development.

Statement of Problem

Coal mining not only offers employment, industrial progress, revenue, but it has its own share of the problems such as ecological and social impacts of coal mining which has been researched mostly by others, while the function of CCL for the sustainability and growth and infrastructure development is missing.



Significance of the Study

This analysis provides information on how CCL contributes to the economic growth, employment, infrastructure development, and the society's well-being in Jharkhand. The study can be beneficial to policy makers, researchers and all stakeholders in devising integrated strategy for sustained development and for future energy transitions.

Scope of the study

The study is to analyse the economic, social and infrastructural effects of Central Coalfields Limited (CCL) in Jharkhand. It studies the nature of job creation, avenues of earning income, infrastructure creation and welfare programmes implemented by it for those associated with the mining sector by both primary and secondary data from stakeholders involved with mining.

Literature Review

1. Das (2019), Jharkhand natural resources give it a clear advantage for heavy industry, especially steel and coal. Jharkhand holds ~40% of India's mineral resources. The dominant sectors are steel, mining, engineering and chemicals, with the state contributing 20-25% of India's steel production. Major industrial clusters are concentrated in Jamshedpur, Bokaro and Ranchi. The biggest gap is the absence of primary, field-based data.
2. Bhushan et al. (2020), The primary data is a survey of 2000 rural households near coal mines, stratified by distance 0-5 km, 5-10 km and 10-20 km. This is combined with census data, coal production statistics, and policy reviews. India's just transition challenges is socio-economic as much as it is environmental. Phasing out coal has to address employment loss, protect informal workers, and reduce regional inequality.
3. Khurshid (2025)⁹, Coal mining brings jobs and income, but it also creates sustained environmental exposure that damages health, especially for vulnerable populations. Coal mining creates a cycle of high disease burden, rising healthcare costs, income loss, and reduced life expectancy. The paper calls for health surveillance systems in mining areas and for health cost accounting to be included in mining policy.
4. Kumar et al. (2026)¹¹, This study uses field sampling of surface water and ground water from rivers, streams and wells near mining sites, followed by laboratory analysis of physicochemical parameters. The combination of AMD, heavy metal contamination and high TDS creates water that's both environmentally and economically damaging.



5. Upadhyay and Bhattacharya (2022), Mining has altered lands capes at scale, and while there's push toward 3-tier ecological restoration – grass- shrubs- trees- implementation is weak on the ground. Satellite monitoring has proven effective for tracking land use changes, but it's still underused by regulators. Mining has caused major environmental and social disruption in Dhanbad.
6. George et al. (2010), Coal mining in Jharkhand, including the Giridih district feeding into the Damodar basin is environmentally harmful and socially disruptive without proper regulation. The direction now is toward sustainable mining practices and stronger environmental regulations. That includes better rehabilitation and resettlement planning, creating alternative livelihoods for communities and aligning.
7. Lahiri Dutt et al. (2014) “The Coal Nation- Histories, Ecologies and Politics of Coal in India”, this book discussed how coal became essential to the growth of Indian economy while simultaneously becoming the cause for environmental, social and political problem. The book uses a qualitative and interdisciplinary approach. Coal remains India's primary energy, environmental degradation, water pollution and soil erosion are major issues of coal extraction, there is corruption and weak governance, women and indigenous peoples suffer. Limited research on long-term rehabilitation, no reliable data on the total number of displaced people, and focus on gendered impacts can be further studied.
8. Reddy and Mishra (2016) with the study titled “Improving Livelihood or Intensifying Poverty? Coal mining in Chhattisgarh and Jharkhand” examine whether coal mining improves the livelihood of people in coal rich tribal areas or whether it increases poverty, displacement, environment destruction and livelihood insecurities. The conclusion was: in Chhattisgarh mining did not increase poverty directly but it failed to create sustainable livelihood meaning once mining in the regions end the livelihood collapses. In Jharkhand the situation is worse showing massive land loss and heavy dependence on mining wages. The damage outweighed the benefits.
9. Mishra and Giri (2021) “Employment Status and Social Security among Contract Workers in Coal Mines: Evidence from Dhanbad District of Jharkhand”, objective of the paper is to study the employment status of the coal industry. Various literature and primary data on workers in coal mines were used. Being oblivious to labour rights and welfare, extreme psychological stress etc. Are needed to be studied further.
10. Pandey (2021) “Net effects of Coal Mining at a Local Level in India” this study analyses how mining activities influences the core pillars of regional development. The end results of the study show that there is a positive relationship of international coal prices and healthcare, schooling and local firms. Showing not a significant increase but a few % increase in the healthcare, schooling and local firm productivity when the international coal prices increase double of what it was. This paper can be used as



a reference to compare the same in other developing countries. More similar local level analysis should be conducted as most researches do macro level analysis.

11. Ray et al. (2023) “Macroeconomic impact of Coal Transition” in this paper they focus on macroeconomic consequences of transitioning away from coal in India. The result of the study lead to the finding and conclusion that; coal cannot be replaced suddenly in the Indian economy even though it is necessary for climate change goals. Hence India must shift slowly to clean energy with proper plan or else the economy would collapse in coal dependent regions.
12. Kumar Singh et al. (2023) “Spatio Temporal Change Analysis of mining landscape of Pakri Barwadih Coal Mining project and it’s Buffer Areas, Jharkhand, India”; Coal is a major driver of India’s economic development and its demand has increased rapidly due to industrialisation and thermal power generation. The mining lease areas have experienced environmental stress because productive agricultural and forest land turned into waste and dumping areas. But it doesn’t stop there as the surrounding 2-10 km also shown clear evidence of land degradation and urbanization. Prediction for future degradation and reclamation process can be noted for future studies.
13. Herbert & Dutt (2014) explored the consequences of the coal mining operation in Jharkhand with regards to displacement, loss of traditional livelihood and environmental damage among others. The paper has identified a lack of appropriate compensation and lack of community engagement in decision making. Moreover, the authors have stated that there is a problem with Indigenous marginalization in mining operations in Jharkhand. Nevertheless, the research was conducted at a particular site and had a rather narrow focus lacking information about socioeconomic impacts and resilience after the mentioned displacement.
14. Thakre (2017) described the process of integrated coal fuel development and the need for coal beneficiation and conversion technology development. In addition, the author has presented a set of technologies aimed at efficient coal usage in a sustainable manner including washing, briquetting, gasification, and liquefaction techniques. Nonetheless, there has been no discussion about potential adverse impacts or socioeconomic and environmental implications. Moreover, the study outlined further research needs regarding long-term sustainability.
15. Pranav et al. (2018) explored the consequences of World Bank-supported Parej East coal mine on Indigenous population of Jharkhand with respect to displacement, environment damage, and disruption of local communities' traditional livelihoods. Furthermore, the authors have identified that there is a need for better community consultation as well as fairer compensation for the damages. Nonetheless, the



findings have referred only to a single instance without a discussion about potential impacts after displacement.

16. Anochie & Kathuria (2021) compared the social and environmental consequences of mining operations in India and Nigeria. Moreover, the authors have highlighted such factors as land degradation, deforestation, water pollution, and community displacement. In addition, there is a statement in relation to mining exacerbating socioeconomic inequality and damaging vulnerable communities. However, such an approach has not allowed conducting a deep country-specific analysis.
17. Suresh et al. (2025) suggested the development of an economically feasible IoT-based system to monitor the air quality in the mines of surface coal extraction. This paper shows the possibilities of employing sensor systems in tracking dust emissions and provides an insight into managing environmental issues effectively. Moreover, the authors analyze the role of weather conditions in spreading dust. The research is valuable for designing more environmentally sustainable mining operations. Still, questions remain concerning sensors' precision and maintenance.
18. Mishra and Giri (2021) conditions under which contractual workers work in the coal mines of Dhanbad, Jharkhand, are associated with job insecurities, minimal wages, and poor access to social security provisions. This paper shows how vulnerable contractual workers may be in the context of mining activities. Specifically, the authors call for better implementation of labour legislation. Still, the analysis only covers one district. Furthermore, the paper does not address any welfare effects in the long term.
19. Rao and Mukherjee (2009) found that Jharkhand relies heavily on sales tax/VAT, which contributes over 80% of its own tax revenue, yet its tax performance remains weaker than comparable states. The study attributed this shortfall to administrative inefficiencies and recommended broadening the tax base, improving digital tax tracking systems, and enhancing coordination among revenue departments.
20. Chakraborty and Garg (2015) found that many resource-rich Indian states suffer from a “resource curse,” where abundant natural resources have not led to better economic growth or human development. The study highlighted issues such as elite capture and inadequate infrastructure investment, while noting that the District Mineral Foundation (DMF) under the MMDR Act, 2015 was introduced to channel mining profits toward affected communities. However, the authors cautioned that focusing DMF spending only on mining districts could increase regional disparities.
21. Spencer et al. (2018) argued that achieving climate goals requires a rapid transition away from coal, which could severely impact coal-dependent regions. The study emphasized that without proper planning and alternative employment opportunities, mine closures may create long-term economic and



social challenges, leading to resistance against climate policies such as carbon taxes and emissions trading systems.

22. Kumar and Banik (2020) found that despite its rich mineral resources, Jharkhand continues to face underdevelopment due to political instability, corruption, and the displacement of local communities, reflecting the “resource curse” phenomenon.
23. Mitra and Chandra (2023) argued that India's rapid transition from coal to renewable energy could widen fiscal disparities among states. The study found that coal-dependent states such as Jharkhand may face significant revenue losses and rising budget deficits, highlighting the need for a “Just Transition” framework and fiscal support mechanisms to ensure equitable sharing of transition costs.
24. Sharan et al. (2021) argued that despite its rich energy resources, Jharkhand faces poor electricity access, particularly in rural areas. The study recommended expanding solar and biomass energy and improving coordination among state agencies to promote renewable energy and achieve reliable power supply.
25. Yadav & Chaurasia (2025) An article on coal's crucial role in economic progress, industrial advancement and energy security to the developing countries such as India was penned by Yadav and Chaurasia (2025). They highlighted that although coal possesses a high position in the national economy, it has been exploited in such a manner which has led to a high environmental and societal degradation. They stated that environmental issues such as climatic change, diseases, and pollution were persistent but the adverse impact of mining can be removed or minimized by adopting the clean coal technology and strengthening the environmental measures. It was concluded that an appropriate balance should be maintained between society, economy and environment in order to maintain the sustainable development of all.
26. Kaulgud (2022) This research work carried out by Kaulgud is based on India's reliance on coal, impact of energy on the needs and development of the country and the effects of coal on India's environment and development. This research revealed that regardless of the growing interest and investments in renewable and alternative energy sources, the coal sector still accounts for the largest share of energy consumed in India. Although it was mentioned that coal sector has proved beneficial to the present-day security and industrial growth in India, its effect on the environment and climate in future are considered to be troublesome and therefore strategies have been proposed for diversification into the cleaner sources of energy to secure jobs, prevent local economy of the region from suffering and hence is a significant article for a mining-dependent region like Jharkhand.
27. Gopal (2025) The damaging impacts on environment due to mining of coal in Jharia Coalfield, a region of Jharkhand, is illustrated through this research carried out by Gopal (2025). It was depicted through



this research study that mining of resources from Jharia Coalfield has led to a great level of environmental issues such as pollution of water and air, a significant decrease in the quantity of fertile soil, harm inflicted on the biodiversity of the region and also on the crop yield capacity. This mining practice at Jharia has exerted undue stress on the region's environment in the backdrop of the industrial progress and economic development and therefore the authors recommend stringent environment rules, structured mining practices and participation of local people in the policy decision-making process of the region to prevent this impact in the future and is a significant article to guide the future plans to be formulated taking environment into consideration.

28. Jehan & Khurshid (2021) The researchers identified the harm done on the health of the mining area people by conducting this study in both Dhanbad and Hazaribagh districts of Jharkhand. The study concluded that more costs are to be incurred in case of health issues for the people dwelling near the mining region than those in the non-mining area which is attributed to high cost in medical treatments as well as work-disrupting consequences while more absences were recorded for the miners as against the non-miners due to illness. Diseases caused are water-borne and skin-related disorders along with respiratory illnesses. For a healthy surrounding in the mining region, it has been suggested to incur more cost for better medical facilities and rigid compliance with environmental guidelines.
29. Singhal et al. (2022) carried out research on the impact of coal mining in Jharkhand on the local socio-economic standing and agree that job opportunities and generated revenue are aspects that cannot be undermined but the associated dangers faced by workers, job displacement due to a highly mechanized system and social disequilibrium are equally of paramount importance. The researchers concluded that while coal mining may have negative consequences for the worker in the long run due to worker displacement and social disparities and also its effect on the region's climate, for economic stability, diversified work ventures and proper transition into cleaner sources are essential and therefore is an extremely important piece for the state of Jharkhand.
30. Chandra et al. (2025) discussed the position of coal in India along with future plans of the government and the subsequent effect of these policies on the transition to eco-friendly resources. It was concluded that coal still accounts for the maximum share in generation of electricity, revenue of the government and use in various industries in India and therefore there should be an orderly transition specific to regions and stages to account for potential effect on workers of the mining industry with guarantee of job security and appropriate financial stability.



Identification of Research Gap

From a literature review perspective, it is found that coal mining activities are extensively studied from economic, social, environmental, health, and livelihood perspectives. It has been observed that existing studies acknowledge coal mining as an employment generator and the driver of industrial and regional growth, while in turn, documenting environmental degradation, dispossession, occupational hazards, and social disparities. The greater share of these studies, however, emphasizes the socio-economic and environmental consequences of coal mining.

An analysis of the existing studies in the field indicates that the fiscal dimension of coal mining activities is poorly understood and very little empirical work has been done in this context, specifically for Jharkhand. Little efforts have been made to estimate the contribution of coal mining towards generation of state revenue and fiscal health of state and long-term sustainability. Furthermore, the level of state reliance on coal revenues, the impact of revenue volatility, and fiscal risks emanating from growing mechanization and ongoing trend toward cleaner energy are relatively unaddressed areas. This thus suggests an important research gap on the relation between coal mining and fiscal sustainability in Jharkhand that demands for a further empirical examination.

Research Gap

Based on the existing literature, it can be concluded that coal mining has been an important sector that has accelerated employment, industrialization, and economic development of Jharkhand; however, it also poses environmental, social and health risks to the people. It is found that most of the research have focused on social and environmental impact of coal mining and fiscal aspect of the sector has relatively less in literature. It is especially lack of empirical work related to contribution of coal mining to state revenues, fiscal stability and sustainability in long run. The levels of state's dependence on income from coal mining and fluctuations in that income and the fiscal instability due to mechanization and current energy transition are also not sufficiently investigated. There is an obvious need for an empirical study on coal mining activities and state's revenue and fiscal sustainability over time.

Research questions

- i. How does the operational efficiency and effectiveness of Central Coalfields Limited (CCL) influence Jharkhand's economic growth, state revenue, and economic stability?



- ii. What is the impact of CCL's mining activities on employment generation and livelihood opportunities in Jharkhand?
- iii. What are the socio-environmental implications of coal mining, and to what extent is the coal-based development model sustainable in the context of the energy transition?

Research Objectives

- i. To examine the economic impact of Central Coalfields Limited (CCL)'s mining operations on the development of Jharkhand.
- ii. To analyse the effects of mining activities on the socio-economic conditions and livelihoods of local communities in the mining region.
- iii. To assess the contribution of CCL to regional infrastructure development and overall socio-economic progress in Jharkhand.

Hypothesis

H_0 (Null Hypothesis):

Coal companies such as Central Coalfields Limited have not significantly contributed to infrastructure and regional development in Jharkhand.

H_1 (Alternative Hypothesis):

Coal companies such as Central Coalfields Limited have significantly contributed to infrastructure and regional development in Jharkhand.

Research Methodology

Research methodology Research methodology refers to the manner or way, procedure or approach that the investigator uses to collect information/data to arrive at solution of the problem or issue under study and procedure which have to be followed in searching solutions to research questions to achieve the objectives of the study; including research design, data sources and method for sampling and data analysis.

Research Design

Research design can be described as a detailed outline or blueprint regarding methods of data collection, analysis and interpretation for the study objectives. In this research, a descriptive and analytical design is used to analyse economic, social and infrastructure related effect of coal mining in Jharkhand.

Data Sources

In the present study, sources of data were primary data and secondary data. The primary data were collected through a structured questionnaire so as to gather information about economic, social and infrastructure impact of mining activity and secondary data were collected from the annual reports of Central Coalfields Limited (CCL), published government sources, reports of Coal India Limited (CIL), research papers, journals, books, newspapers and websites.

Sampling Technique & Sample Size

Sample Size and sampling procedure: In this study a total of 76 respondents were questioned in the study. For the purpose of this study convenience sampling procedure was adopted by which researcher would be able to collect data from the most convenient sample who will relevant to the topic and that is appropriate with regard to the nature of exploratory research and the time limit of data collection.

Data Collection Method

Information is collected from secondary sources as well as from primary sources. Primary data sources are collected using the survey questionnaire. Secondary data sources include the CCL reports, government publications, books, research articles and journal, also from some official sites.

Statistical tools & Software used

The data collected for this study were analysed using the Statistical Package for Social Sciences (SPSS). Descriptive statistics like frequency, percentage, mean and standard deviation was used to describe the socio-economic characteristics of respondents and respondents' perceptions about economic, social and infrastructural implications of coal mining. The relationship between CCL's activities and development were studied by using simple linear regression, and ANOVA to analyse the significance of the regression model as a whole, and whether the effects observed are statistically significant.



Data Analysis & Hypothesis Testing

Data Analysis and Hypothesis Testing. Statistical analysis was carried out using SPSS. Descriptive statistics were calculated to represent the personal information of the respondents and the responses of the respondents to the economic, social and infrastructure impact of CCL. Multiple linear regression technique was used for analysis the relationship between the variables of the study. The goodness and significances of the regression model was tested by using ANOVA, value of coefficient of determination(R) and value of regression coefficients. Hypotheses were tested at 5% level of significance. When the p-value was found less than 0.05 null hypotheses was rejected and there exists a relation between independent variable and dependent variable. In this way the present study analysed what is the relation of social and infrastructure impact of CCL with that of economic and development impact of CCL at Jharkhand.

Descriptive Analysis

Descriptive analysis technique was used for summarization and presentation of data systematically. The technique was adopted to study the demographic profile of the respondents, and perception of respondents about the economic, social and infrastructure impacts of CCL in Jharkhand. Techniques like frequency, percentage, mean and standard deviation were used to describe the characteristics of the data and response pattern. Descriptive analysis gave an overall idea about the views of respondents and was used for the purpose of the analysis of regression analysis and testing of hypothesis.

Statistical Tests

In order to accomplish the objectives of the research, descriptive and inferential statistical procedures were adopted. Frequency and percentages and mean and standard deviations were used as descriptive statistical procedures, in order to summarize and explain the results of data acquired through the close-ended questionnaire, and multiple linear regression analysis were carried out to determine the association among the independent variables namely: Social Effect of CCL (SEC) and Infrastructure and Development of CCL (IDC) on the dependent variable namely: Economic Effect of CCL (EEC). Furthermore, ANOVA procedure was utilized to test the overall significance of regression model. The findings of each test were significant if the value of p-statistic is less than 0.05 ($p < 0.05$). All analysis was performed by SPSS software.

Hypothesis Testing Results

Analysis of Regression Result



Model	Variables Entered	Variables Removed	Method
1	SEC, IDC ^b	.	Enter

(Computed by the Researcher Using SPSS Software)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.631 ^a	.398	.381	.48325

a. Predictors: (Constant), SEC, IDC

(Computed by the Researcher Using SPSS Software)

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	10.975	2	5.488	23.498	.000 ^b
	Residual	16.581	71	.234		
	Total	27.556	73			

(Computed by the Researcher Using SPSS Software)

Coefficients^a

		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
Model		B	Std. Error	Beta		
1	(Constant)	1.057	.373		2.831	.006
	IDC	.143	.105	.165	1.363	.177



SEC	.572	.135	.512	4.237	.000
-----	------	------	------	-------	------

(Computed by the Researcher Using SPSS Software)

The hypothesis was tested with Multiple Linear Regression and ANOVA to investigate the contribution of Central Coalfields Limited (CCL) in the development of the Jharkhand economy, society and infrastructure. The regression model has a statistical significance ($F = 23.498$, $p < 0.001$), and states that the independent variables in together have explained a great deal variation in the dependent variable. The model explained 39.8% of the variance in the Economic Effects of CCL ($R = 0.398$).

We found that The Social Effects of CCL (SEC) had a positive and statistically significant relationship with The Economic Effects of CCL ($=0.512$, $p < 0.001$) whereas The Infrastructure and Development of CCL (IDC) had a positive but statistically non-significant effect ($=0.165$, $p = 0.177$). As the model is statistically significant therefore null hypothesis (H) rejected and alternative hypothesis (H) accepted.

Therefore, Central Coalfields Limited (CCL) has made a vital contribution to the socio-economic and regional development of Jharkhand, not only through provision of job and support to community but also support to the regional infrastructure.

Interpretation of Results

This study suggests that there exists a strong to moderately strong relationship between social effects of CCL (SEC), infrastructure and development of CCL (IDC) and economic effects of CCL (EEC). The regression equation clearly explains 39.8% of the variations in the economic effect of the organization. It suggests that social effects and infrastructural development effects of CCL positively affect the economy of the state.

Among these variables, the social effect of CCL seems to be the dominant factor affecting economic development of the state. This implies that the job creation, community-based programs and other social endeavours taken up by CCL have a direct positive impact on the economy. The infrastructural development effect of CCL had a positive effect on the economy but not significant in terms of the relationship of economic development.

The overall significance of the regression equation leads to the fact that CCL is significantly influential in promoting socio-economic development in the state and contributing to regional development.

Objective-wise Achievement Status and Supporting Findings

Objective	Achievement Status	Supporting Findings
I. To study the economic impact of CCL's mining operations in Jharkhand.	Achieved	Regression analysis showed that CCL variables have a positively significant effect on the results ($R=0.398$, $F=23.498$, $p<0.001$). The research finding was that the CCL enhanced development in the region due to employment, income earning, development of business, income generation and support industries.
II. To understand how mining activities affect the local population and their daily lives.	Achieved	According to this study, the social impacts of CCL (SEC) have a remarkable impact on the economic aspects ($= 0.512$, $p < 0.001$). Respondents admitted that mining have provided better jobs and incomes, higher standard of living, better education, better health facilities and community benefits but have raised issues about environment and social impacts.
III. To investigate how coal companies have contributed to infrastructure and development in the region.	Achieved	From the descriptive statistics it can be observed that the development of roads, education institutions, health clinics, provision of electricity, provision of water, afforestation, re-cultivation of wasteland and provision of community development work are due to CCL. There is positive correlation of variable IDC of CCL with economic impact ($B = 0.143$) but the impact of this particular variable individually is insignificant ($p=0.177$), yet the result of overall model proves that CCL has provided help for development.

Major Findings

- i. A considerable portion of development in Jharkhand has occurred owing to Central Coalfields Limited (CCL) in form of job opportunities, income, supporting allied business, etc.



- ii. The creation of both direct and indirect employment has taken place through mining of coal and related activities. Standard of living and extra income of the local region have been increased because of these job opportunities in mining.
- iii. The variable studied were found to be positively correlated to the Economic effect of CCL ($F=23.498$, $p<0.001$) and has a significant effect on the economic development by CCL.
- iv. $R=0.398$, these chosen variables had explanation on the economic development by CCL about 39.8% to the variation and the explanation was moderate.
- v. Social effect of CCL (SEC) has highest influence on the economic effect of CCL ($=0.512$, $p<0.001$), which reflects to effects of employment, community and welfare programs.
- vi. Infrastructural Development of CCL (IDC) had influence on the economic development but it was not much statistically significant ($=0.165$, $p=0.177$).
- vii. Respondents' opinion indicated that the development of infrastructure (roads, school, hospital, electricity, water supply and community welfare programs) were because of the existence of the Company.
- viii. The business, market and transport sector developed in the locality due to coal mining.
- ix. Economical dependence in Jharkhand has been on coal mining and related industries.
- x. Overall results favour the fact that CCL has a difference on development in Jharkhand.
- xi. The results also strongly favour to reject null hypothesis(H_0) and accept alternative hypothesis(H_1) to conclude that CCL significantly affects to the development of infrastructure, socio economic and regional environment in Jharkhand.

Conclusion

This study investigated the role of Central Coalfields Limited in contributing to the economic, social and infrastructure development of Jharkhand state. Results of the study suggest that CCL has played a vital role in the regional development with its employment generation, help to local businessmen, infrastructure development and community welfare programmes. The regression analysis revealed a significant positive relation between the variables considered and economic impacts of CCL, where social impact is found to be the most influencing factor.

This study therefore, concludes that the contribution of CCL has made significant impacts to the socio economic and regional development of the state. Thus, alternative hypothesis is found to be accepted and coal mining have a positive role on the state's development. But long term and sustainable development needs balancing of economy with environment and society.

Suggestion's recommendations

Conclusions and recommendations drawn from the study:

1. The importance of strengthening community development and welfare activities should be highlighted by the CCL, since social projects had a significant and positive effect on economic development of the regions.
2. Investments should be increased for infrastructure such as roads, education, health and utilities to maximize long term benefits of the mining industry.
3. Fair allocation of benefits derived from mining activities should be assured for local communities by the government and the coal companies for inclusive development of the regions.
4. Environment protection policies should be more rigorously applied for pollution prevention and controls and reclamation of the mined land, along with other sustainable mining practices.
5. A continuous monitoring and assessment of the CSR activities of the company must be executed to achieve effectiveness and significant benefit for communities.
6. Local stakeholders should be proactively involved in the development plans and decision-making procedures in order to reflect local demands for mining led development of the areas.
7. Government policies need to address strategies for economic diversification of the regions, to minimize long-term dependency on coal mining and achieve a sustainable development path.

Scope for Future Research

It is useful to understand the economic, social and infrastructural development of Jharkhand consequent to the activities of CCL. Several research themes could be explored to enrich the understanding on mining-led development. A few possible themes for future research may involve the use of scientific and sustainability indices to understand the impact of coal mining on environment, a study comparing different coal producing companies and regions in order to understand the implication of developmental activities at the broader level, understanding the revenue contribution of coal mining to the state and fiscal and revenue sustainability in long run-in face of changing energy scenario. It will also be rewarding to look into effectiveness of CSR activities as well as economic and social well-being of people affected by mining along with a study at the district level.

**References:-**

1. Das, A. (2019). An analytical study on the industrial economy of Jharkhand. *Research Review International Journal of Multidisciplinary*, 4(7), 418–421.
2. Bhushan, C., Banerjee, S., & Agarwal, S. (2020). *Just transition in India: An inquiry into the challenges and opportunities for a post-coal future*. iFOREST.
3. Khurshid, I. (2025). *Health and economic consequences of coal mining: A household-level study of morbidity, medical expenditure and life expectancy in Jharkhand, India*.
4. Kumar, A., Chowdhury, S. R., Srivastava, S., Agrahari, S., Kumari, K., Yadav, A., ... & Karmakar, A. (2026). Impact of coal mining activities on the water quality: A case study of Jharia Coalfield, Dhanbad, India. *Environmental Research*, 123951.
5. Upadhyay, Y., & Bhattacharya, T. R. (2022). Impact of expanding coal industry on the regional environment in an Indian coal-belt: A case study from Jharkhand, India. *Regional Economic Development Research*, 53–72.
6. George, J., Thakur, S. K., Tripathi, R. C., Ram, L. C., Gupta, A., & Prasad, S. (2010). Impact of coal industries on the quality of Damodar River water. *Toxicological & Environmental Chemistry*, 92(9), 1649–1664. <https://doi.org/10.1080/02772240903586368>
7. Lahiri-Dutt, K. (Ed.). (2014). *The coal nation: Histories, ecologies and politics of coal in India*. Routledge. <https://doi.org/10.4324/9781315775289>
8. Reddy, M. G., & Mishra, P. P. (2016). *Improving livelihoods or intensifying poverty? Coal mining in Chhattisgarh and Jharkhand*. Centre for Economic and Social Studies.
9. Mishra, P., & Giri, A. K. (2021). Employment status and social security among contract workers in coal mines: Evidence from Dhanbad district of Jharkhand. *Indian Journal of Social Development*, 21(1), 71–86.
10. Pandey, R. (2021). Net effects of coal mining at a local level in India. *Energy Policy*, 152, 112207. <https://doi.org/10.1016/j.enpol.2021.112207>



11. Ray, S., Majumder, P., & Thakur, V. (2023). Macroeconomic impacts of coal transition. In *Coal transition in India: Challenges and opportunities* (pp. 81–96). Routledge.
<https://doi.org/10.4324/9781003433088-6>
12. Kumar Singh, A., Kumar, R., & Singh, P. K. (2023). Spatio-temporal change analysis of mining landscape of Pakri Barwadih coal mining project and its buffer areas, Jharkhand, India. *International Journal of Ecology and Environmental Sciences*, 49(4), 453–464.
13. Herbert, T., & Lahiri-Dutt, K. (2014). World Bank, coal and Indigenous people: Lessons from Parej East, Jharkhand. In K. Lahiri-Dutt (Ed.), *The coal nation: Histories, ecologies and politics of coal in India* (pp. xx–xx). Routledge.
14. Thakre, A. N. (2007). Integrated development of coal fuels. *Current Science*, 92(8), 1078–1085.
15. Pranav, C., Phadke, A. B., Rao, K., & Chandel, M. K. (2018). Impact of coal quality on post-combustion CO₂ capture in Indian coal power plants. *SSRN Electronic Journal*. <https://doi.org/10.2139/ssrn.3374779>
16. Anochie, C. F., & Kathuria, R. (2021). Comparative study on the adverse environmental and social impacts of mining activities in India and Nigeria. *International Journal of Policy Sciences and Law*, 1(3), 1767–1784.
17. Suresh, V., Agarwal, S., Chugh, Y. P., Jha, P., & Wang, R. (2025). Advancing sustainability in surface coal mines through real-time air quality monitoring: Low-cost IoT solutions and the role of meteorological factors in PM and dust dispersion. *Sustainability*, 17(3), 1301.
<https://doi.org/10.3390/su17031301>
18. Mishra, S. K., & Giri, T. (2021). Employment status and social security among contract workers in coal mines: Evidence from Dhanbad district of Jharkhand. *Indian Journal of Social Development*, 21(1), 71–86.
19. Rao, R. K., & Mukherjee, S. (2009). *Study on mobilization of state taxes and state's potential to raise revenues: Jharkhand*.
20. Chakraborty, L. S., & Garg, S. (2015). *The political economy of mining regulations 2015: Spatial inequality and resource curse in two new states, India*.



21. Spencer, T., Colombier, M., Sartor, O., Garg, A., Tiwari, V., Burton, J., ... & Wiseman, J. (2018). The 1.5°C target and coal sector transition: At the limits of societal feasibility. *Climate Policy*, 18(3), 335–351. <https://doi.org/10.1080/14693062.2017.1386540>
22. Kumar, D., & Banik, P. (2020). Paradox of rich land and poor people: A study of Jharkhand. *Public Affairs and Governance*, 8(1), 60–78.
23. Mitra, S., & Chandra, R. (2023). *Deep de-carbonization and regional equity*. National Institute of Public Finance and Policy.
24. Sharan, A., Shekhar, J., Vallecha, H., Nandan, V., Aklin, M., Blankenship, B., & Urpelainen, J. (2021). *ISEP report*.
25. Yadav, A., & Chaurasia, R. (2025). *Coal industry, energy security and sustainable development in India*.
26. Kaulgud, V. (2022). *Coal dependence, energy security and sustainable transition in India*.
27. Gopal, S. (2025). *Environmental consequences of coal mining in Jharkhand*.
28. Jehan, N., & Khurshid, S. (2021). *Health impacts of coal mining communities in Jharkhand*.
29. Singhal, P., Verma, A., & Singh, R. (2022). *Coal mining, livelihoods and economic transition in Jharkhand*.
30. Chandra, P., Sharma, M., & Gupta, K. (2025). *Coal dependency and just energy transition in India*.