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Critical Technology Environment Management With CSR in BCCL

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Abstract: ***Mining is the most dangerous peacetime profession and coal mining is more so because of fire by spontaneous combustion, methane explosion, etc. Out of 7 subsidiaries of Coal India, Bharat Coking Coal Ltd. have maximum environmental challenges. The authors have studied the critical issues of management and presented summarily how the problems are being tackled. CIL has strongly fostered the belief that people living in mining areas are important stakeholders in the process of mine development and taking various activities for the development of the area. In this paper, the roles of different stakeholders in a coal company are analyzed for all-around development and cooperation. The global scenario on CSR has also been studied. In this paper, the authors have described special studies in sustainable mining with stakeholder engagement in Bharat Coking Coal Ltd, a subsidiary of Coal India Ltd, a major producer of valuable coking coal in India. The results ensured trouble-free operations among highly unemployed people in the mining areas, because of the closure of uneconomic mines.***
Keywords: Mines Fire Control; Pollution Control; Impact of Mining: Corporate Social Responsibility; Stake-holders role; Inclusive Growth.

I. INTRODUCTION

International environment protection standards ISO 14000 and ISO 14001 as also ISO 19011 help in auditing. Corporate Social Responsibility is now guided by ISO 2600. Standard SA 8000 of Social Accounting International Guidelines is also helpful. Corporate Social Responsibility of corporations begun with Carroll in 1999 and implementation around 2008 is showing results around the world. Out of the UNDP goals, GOAL 17: Partnerships to achieve the Goal has been exemplified here with Corporate Social Responsibility. Corporate Social Responsibility (CSR) has been considered by Coal India subsidiaries an important vehicle for pacifying local communities and minimizing the impact of mining. Case studies of mining in South Africa and Zambia suggest that there are still important gaps between mining companies in CSR activities. CSR policy should ensure adherence to the law, ethical standards, and international norms. Businesses would embrace responsibility for the impact of their activities on the environment, consumers, employees, communities, stakeholders, and all other members of the public sphere. A study on the CSR activities of 300 corporate houses, conducted by an industry body in June 2009, revealed that Corporate India has spread its CSR activities across 20 states and Union territories, with Maharashtra gaining the most from them. According to the Indian Companies Act 2013 and as per DPE guidelines, coal companies have undertaken CSR activities. With the rapidly changing corporate environment, more functional autonomy, operational freedom, etc. The coal mining operations in the Jharia Coalfield, now in BCCL have been done for more than 100 years by the erstwhile private owners. Due to the unscientific mining methods adopted by them, large areas of coal mines were subjected to mine fires and subsidence, which had resulted in critical social and environmental problems in the area. So, critical studies of progressive technology, environmental improvements with CSR have been included in this paper.

Table 1 shows the development of CSR in India.

Table 1- Development of CSR In India

SIGNIFICANT MILESTONES IN EVOLUTION OF RESPONSIBLE BUSINESS CONDUCT IN INDIA 2009
Corporate Voluntary Guidelines released to encourage corporates to voluntarily achieve high standards of Corporate Governance 2011
Endorsement of United Nations Guiding Principles on Business & Human Rights by India 2011
National Voluntary Guidelines on Social, Environmental, and Economic Responsibilities of Business (NVGs) were released to mainstream the concept of business responsibility 2012
Securities and Exchange Board of India (SEBI) mandates the top 100 listed companies by market capitalization to file Business Responsibility Reports (BRR) based on NVGs. 2013
Enactment of Companies Act, 2013 2014 Section 135 of Companies Act, 2013 on Corporate Social Responsibility (CSR) comes into force. 2015
High-Level Committee Recommendation on CSR (HLC-2015)

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II. ENVIRONMENT SOLUTIONS IN COAL INDIA

Coal India has adopted CSR as a strategic tool for sustainable growth. Hence, the primary beneficiaries of CSR as per CIL Policy are land losers, PAP (Project Affected People), and those staying within the radius of 25 km of the Project (Samanta & Samaddar, 2003). The company is incorporated under the Companies Act, 1956, and is wholly owned by the Government of India (GOI). Coal India Ltd has wholly-owned Subsidiaries are Eastern Coalfields Ltd, Bharat Coking Coal Ltd, Central Coalfields Ltd, Northern Coalfields Ltd, Western Coalfields Ltd, South Eastern Coalfields Ltd, Mahanadi Coalfields Ltd. and Central Mine Planning & Design Institute Ltd, North Eastern Coalfields.

A. Mine Environment in BCCL

The biggest reserve of coking coal needed for steel plants is in BCCL, a subsidiary of Coal India. For environment control, BCCL pioneered the cluster concept for the preparation of EIA (Environment Impact Assessment). EMPs (Environment Management Plan) for grant of Environment Clearance of its mines include CSR.

MoEF (Ministry of Environment & Forest) has approved Cluster Concept for obtaining environmental clearance for all the mines of BCCL into 17 Clusters and has already issued Environment clearance of 16 clusters covering all its mines & their integrated washeries in Jharkhand.

BCCL is the 1st company in the coal mining industry, rather the mining industry which has prepared a Road map for ecological restoration through Forest Research Institute (FRI), Dehradun, and constituted a dedicated team for successful implementation. Ecological restoration has been done over 69 Ha of mined-out land/OB dumps during 2011-2013 and a further 51.69 Ha is taken up in 2015. The Master Plan for dealing with fire, subsidence, and rehabilitation in the leasehold of BCCL was approved on 12th Aug. 2009 by Govt. of India with an estimated investment of Rs.7,112.11 crores for Jharia Coalfields. Implementation is being done in stages as per urgency and priority.

Old mine fires could not be controlled even after spending more than Rs.100 crores through various methods like sand flushing, chemical treatment, blanketing, etc. However, after adopting Strategic Plan, the fire area has been reduced from 8.9 sq. km, as assessed in Master Plan to 2.18 sq. km as per the satellite survey done by National Remote Sensing Centre, ISRO, Deptt. of Space, Hyderabad in March-2014. This could be achieved only due to the successful “excavation method i.e. digging out of fiery coal” adopted by BCCL. This 2.18 sq. km fire area is in the locality where BCCL colonies, encroacher colonies, and other residents are situated in fire-affected Jharia Coalfield pockets.

B. Land restoration / reclamation

Monitoring of clusters of (Opencast + Underground) coal mines of Bharat Coking Coal Ltd. (BCCL), based on satellite data, on every three-year basis. The objective of the land restoration/reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, and distribution of wasteland, agricultural land, and forest in the leasehold area of the project. The study reveals that out of total mine leasehold area of 5883.96 Ha. of the above-mentioned 04 nos. clusters of BCCL taken up for the land reclamation monitoring during the year 2018-19; the total excavated area is 1075.76 Ha. (18.28%) out of which 73.92 Ha. (6.87%) has been planted (Biologically Reclaimed), 625.15 Ha. (58.11%) is under backfilling (Technical Reclamation).

C. Mining with Firefighting

In Jharia coalfields of BCCL, the first Master Plan made with the collaboration of Polish experts envisaged maximum underground mining. Later, the Master Plan was modified with the help of Russian experts, identifying blocks I to IX for opencast mining. Because of a shallow cover of old workings of thick seams, subsidence created large crevices, creating seemingly uncontrollable fires.

By the time of the nationalization of coal mines in 1972-73 and taking over the mines by BCCL, the situation of mine fires was grave. The fires extended to an area of about 9 sq. km, as assessed by a World Bank team. However, after adopting Strategic Plan, the fire area has been reduced from 8.9 sq. km to 2.18 sq. km as per the satellite survey done by the National Remote Sensing Centre, ISRO, Deptt. of Space, Hyderabad (March-2014).

This could be achieved only due to the successful “excavation method i.e. digging out of fiery coal” adopted by BCCL. This fact has also been acknowledged by NRSC in their report. This 2.18 sq. km fire area is in the locality where BCCL colonies, encroacher residents are situated in fire-affected Jharia Coalfield pockets. Figure 1 shows mining with fire control by water quenching in a quarry of BCCL.

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Figure 1: Mining With Fire Control

D. Use of Pumped Water

For gainful use of water being discharged from the mines, a scheme is already under execution for Rs 11.72 cr. by laying out a pipeline network of approximately 45 km. With the help of this scheme, approximately 47 million gallons (MG) surplus mine water presently being discharged into natural watercourses from Barora, Block-II & Govindpur Areas of BCCL will be stored in two reservoirs respectively of storage capacities 16MG & 31MG and area 4.0ha & 4.5ha approx. situated at Behrakudar & Khonathi villages of Bagmara Block of Dhanbad District. Under this scheme of BCCL, the villagers residing nearby and having their cultivation fields in reasonable proximity will be benefited in carrying out their agricultural works in all seasons which at present is dependent on rainwater in the monsoon.

III. POLLUTION CONTROL MEASURES

Monitoring of air, water, and noise pollution is done regularly and preventive measures are taken. Quarterly Reports on the above have to be submitted to the Ministry in a prescribed format.

A. Air Pollution Control

The oldest legislation is Bengal Smoke Nuisance Act- 1905, then Indian Boiler's Act- 1923, and many industries have to follow related Acts and Rules made in states. According to the Air (Pollution & Control) Act 1981, permissible limits of SPM (Suspended Particulate Matter) in micro-gm/m3 and gases in ppm (parts per million) are given. Major steps for air pollution control, which are usually being taken in scheduled industries: -

1) Paving of transport roads and haul roads in quarries;
2) Follow up with the State Govt. for maintaining, for public roads passing through;
3) SPM control for the new units, as well as old ones;
4) Regular water spraying on the unpaved transport roads;
5) Use of surfactant kind of chemicals for binding the dust on unpaved roads;
6) Dust control with the mechanical suction dust-traps;
7) Spraying of water in the dusty workplaces;
8) Water spraying in dust generation sources;
9) Deploying or redesigning machines generating less dust;
10) If the dust control is not effective, then dust masks are for use by employees.

B. Water Pollution Control

Chemical checks of water and effluents at certain sampling points (Kilian, T., & Hennigs, N. 2014) are to be made for projects quarterly. Bacteriological tests for drinking water are to be done in a certified laboratory. In summer and monsoon, water pollution is generally found maximum and bleaching powder is used in most wells. Cemented drains are to be made at suitable locations in colonies, so that groundwater is not polluted. Now, Government is subsidizing common effluent treatment plants for neighboring industries. Other relevant legislations are The River Boards Act-1956, The Merchant Shipping (Amendment) Act- 1983. According to Water (Pollution & Control) Act 1974, limits of pollution as per monitoring standards in mg/l are: pH-5.5-9.0, TSS-100, TDS-2100, BOD-30, COD-250, oil and grease-10, Chlorides-1000, Cyanides-0.2, Sulphides-2.0, Sulphates-1000, Fluorides-2.0, Boron-2.0, Arsenic- 0.2, Cadmium-2.0, Lead-0.1, Copper-3.0, Chromium-2.0, Mercury- 0.01, Nickel-3.0, Selenium-0.05, Zinc-5.0 etc.

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C. Noise Pollution Control

Persistent high noise pollution may cause hearing impairment. Prescribed limited are given in noise are available. Portable Noise-level Meter monitoring on regular basis in noisy machines, could identify defects. To reduce the noise level, corrective actions are taken by repairing, improving silencers, mufflers, etc. Condition monitoring by noise is being undertaken for machines to prevent break down. Machinery creates more noise beyond the permissible limit, indicating the need for timely maintenance. Heavy blasting in quarries creates noise and vibration damage, which can be minimized by sequenced millisecond delay initiation.

IV. REHABILITATION & RESETTLEMENT

Because of the extensive fire-affected area of the coalfield, JRDA (Jharia Rehabilitation Development Agency) was created by the MOC (Ministry of Coal) for BCCL. JRDA is managing shifting, rehabilitation/resettlement, and welfare of the identified families residing at fire and subsidence affected areas of Jharia Coalfield. State government Commissioner is the Chairman, and Deputy Commissioner of Dhanbad district is the Managing Director, who operates with the collaboration of Chairman-cum-Managing Director of BCCL.

JRDA has completed a demographic/ socio-economic survey of 84497 families in 569 sites out of 54159 in 595 sites as per the master plan. JRDA has to construct a total of 54159 houses in two phases within 10 years, by 2021. JRDA has constructed 3072 houses at “Jharia Vihar” Belgaria under a demonstration scheme in which it shifted 1169 families and 720 new houses under Master Plan in which 103 families from Dobari& Ghanoodih has been shifted (total 3072 houses completed, total shifting 1272 families). In addition to 2352 houses under the demonstration scheme, JRDA has taken action for 8000 houses till now.

V. CSR IN COAL INDIA

On behalf of Coal India Limited, Central Mine Planning & Development Institute (CMPDI) is setting further guidelines for monitoring in the subsidiaries (Mishra, D.P., Sugla, M. and Singha, P 2013). Schedule VII of the New Companies Act 2013, has given the Scope of Activities under Corporate Social Activities. Implementation (Singh, P.K & Mishra, A.K 2016) of CSR should be started on approval of the Subsidiary Board. The investment of CSR should be project-based and for every project, time-framed periodic milestones should be finalized at the outset. Project activities identified under CSR are to be implemented (Pathak, P. & Singh, S. 2011) by departments or specialized agencies.

CSR is being allocated based on 2% of the average net profit of the company for the three preceding financial years or ₹ 2.00 per tonne of coal production of the previous year whichever is higher. As part of its corporate social responsibility, Coal India Limited which is India’s biggest public sector company has spent nearly ₹ 2,356 crore during the last five years on the welfare of the people living in & around coalfields in different parts of India. The CIL has and its subsidiaries have more than 400 mines in eight different states of the country. National Miner Coal India Ltd (CIL) spent a total amount of Rs 1,977.76 crore on CSR during FY16-17 and FY19-20. Similarly, NLC (India) Ltd along with its subsidiary NTPL collectively spent Rs 213.75 crore on CSR during the period.

A. CSR IN BCCL

Works done under Community Development Program in BCCL are as follows: -

1) Installation/Repairing of Hand Pumps.
2) Digging/renovation of Wells/Ponds/Dam etc.
3) Water Supply through pipelines.
4) Construction/Renovation and repair of Community Centre/building.
5) Construction/repair of Roads/Culverts.
6) Construction/repair of the school buildings.
7) Organizing Medical Camps and CSR clinics for General mass.
8) Organize Sports and cultural activities.
9) Imparting training and giving resources for self-employment linked skill development training.
10) Organizing vocational training courses for PAPs of the company.

On CSR the authors suggest that as per the Report to QCI that most of the wards of (DMC) Dhanbad Municipal Corporation fall in the leasehold areas of BCCL, many of which are not working. BCCL is under CIL and public shares have been and are still being issued and so BCCL is not in a position to divert funds. But, the upkeep, maintenance, and sanitation works of its colony have inherited the responsibility of BCCL. Moreover, BCCL can allocate the major share of the CSR (Corporate Social Responsibility) fund, especially for works done by DMC in their leasehold areas.

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B. CSR for Covid Control

CSR in BCCL under Global Pandemic of COVID-19, the following works are being done: -

1) Food Material Packets Distribution – Because of COVID-19 and lockdown in the country, BCCL took the initiative to distribute 24,000 Nos. of food material packets for an approximate cost of ` 48 Lakhs to the needy people of society in and around Dhanbad.

2) Face Mask and Sanitizers/ Hand Wash/ Soap Distribution – BCCL took measures to curb the situation of COVID-19 by distributing 15,000 Nos. of face masks and sanitizer/ hand wash/ soap at an approximate cost of ` 6 Lakhs to the needy section of the society in and around Dhanbad.

3) Food Packets to Migrant Labourers – 16,600 Nos. of food packets at an approximate cost of ` 5.75 Lakhs were distributed amongst migrant laborers traveling through Dhanbad in different Shramik Special Trains by BCCL with the help of Dhanbad Rail Division of the East Central Railway zone.

4) Financial assistance of Rs 10 lakhs was provided to Municipal Corporation, Dhanbad towards procurement of fogging machine and sprayer for tackling COVID-19 situation via depository mode.

5) Financial assistance of ` 4 crores was provided to Dy. Commissioner, Dhanbad towards various measures for tackling the COVID-19 situation in Dhanbad via depository mode.

VI. STAKEHOLDER STUDY FOR CSR

The State of Corporate Responsibility in India Poll‖, a survey conducted by Tata Energy Research Institute (TERI), the evolution of CSR in India has followed a chronological evolution of 4 thinking approaches: 1) Ethical: Till 1950 Voluntary commitment by companies to the public welfare; 2) Statist: from 1950 to 70- State ownership and legal requirements determine Corporate responsibility; 3) Liberal: from 1970 to 90- Corporate responsibilities limited to private owners (Shareholders); 4) Stakeholder: from 1990 onwards- Companies respond to the needs of stakeholders-customers, employees, communities, etc.

Specific case study of BCCL, a subsidiary of CIL, where a Board level Committee on Sustainable Development on 21st April of 2012, backed by Area Level Committee on Sustainable Development. Stakeholders (Colleoni, 2013) play a critical role, in the growth of a company. Employees are the internal stakeholders (Lane & Devin, 2017) periodical meetings are held with grievance handling, inviting suggestions for the growth of the company. External stakeholders are also called for meetings like District authorities, customers, suppliers, contractors, safety authorities like DGMS, etc. Table 2: shows stakeholder Analysis in BCCL, a subsidiary of Coal India by the authors.

Table 2: Stakeholder Analysis In BCCL

STAKEHOLDER	ENGAGEMENT TYPE	FORUM	FREQUENCY & AGENDA
Employee	Discussions/Dialogue	Grievance Handling	3-tier Grievance handling at the corporate, area, and unit level. Redressal as needed.
Employee	Meeting	Performance Review	Annual performance review for both executives and staff.
Employee	Vocational Training	Training	Refresher vocational training for employees. Special training courses for executives or out-company as required.
Employee	Response on queries	Employee Welfare	Welfare Board stresses quality of life in workplaces as well as in residential areas.
Contract Workers	Consultations	Grievance handling	Six trade unions have quarterly meetings, as well as INMOSA, DGMS, CMEWA give suggestions at the Corporate level (CCC) and Area level (JCC).
Contract Workers	Company Vocational Training Center	Training	Special courses on health and safety are given first and then periodically.
Project Affected People	Meetings to assess demand	Identification	Jobs against land acquired. Training for income generation
Project Affected People	Requirement and availability	Rehabilitation	Jharia Rehabilitation and Development Authority and Co-operative Society help.
Local Community	Complaint/Suggestions	Need Assessment	CSR projects are identified based on needs assessed at the Area level.
State Government	Consultations	District Administration	Dhanbad Action Plan on health, safety with finance.

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VII. CSR PROGRESS IN BCCL

BCCL has already established a CSR department and executed community development projects over the years. BCCL has spent net profit of 1.7% in 2011-12, 1.0% in 2012-13 and 1.85% in 2013-14. CSR projects are decided based on need assessment in 12 administrative areas on committee recommendations. For the creation of social community wealth under the CSR Scheme, BCCL for the last two years is engaged in installing Solar Street Lights in peripheral villages under its command area to promote the use of alternative and renewable energy sources. BCCL has already installed 300 Solar street lights.

A. Medical CSR

BCCL has fourteen Medical Mobile Vans (MMVs) equipped with doctors, paramedical staff serving different 222 villages situated in and around the mining areas on working days. The villagers are examined by experienced clinicians and medicines are dispensed free of cost to them. This provision has been made by BCCL exclusively under CSR activities for the benefit of villagers by providing them free medical assistance. The total beneficiaries till December 2009 were 59879.

B. Wellness Clinics

15 Wellness Clinics are functioning in BCCL in all the hospitals/Regional Hospitals besides Central Hospital, Dhanbad for 1 to 2 hrs for counseling the patients for modifying their lifestyle. Happy life, the importance of morning walks, how to get rid of stress, the value of yoga and different types of exercise, etc. Such clinics extend awareness (Liangrong Zu 2019) amongst the employees for lifestyle management thus lowering the no. of man-days lost at their worksite. The total no. of beneficiaries till December 2019 was 3518.

C. CSR Clinics

BCCL has embarked upon by opening of free CSR clinics from 01.04.2009 to provide free patient consultation at Central Hospital (PHC Building, Kalyan Bhawan) and subsequently at all 14 Regional Hospitals which is open to all. These clinics run for one./two hour daily in the morning hours and free medical advice is given to people around Colliery areas. The total no. of beneficiaries till December, was 4953.

D. Artificial Limb Centre

Under CSR activities BCCL has started one clinic at PHC Building Kalyan Bhawan, Jagjivan Nagar. The clinic aims to examine and enlist handicapped persons for free prosthesis. About 11(eleven) such handicapped persons were helped at this center.

E. Drinking Water Facilities

BCCL has provided deep borewells, tube-wells, pumps/motors, open wells, in the peripheral villages of BCCL. Water supply through the pipeline, through water tanker, is also provided to the villages.

F. Education

BCCL is Extending financial aid for educational facilities to 83 nos. Private Committee Managed schools. Measures are taken to promote women's literacy and career development.

G. Community Development

CSR has indirect impacts on core business products/services of a company (Thien George T.K 2016). BCCL has taken various measures on community development in the peripheral areas of the Company. It includes the construction of Community Centre/Marriage Hall, construction of Road, construction/ Renovation of Ghats, Construction of Gymnasium and Martial Arts Training center, etc.

H. Skill Development

Trade training has been provided to 62 unemployed youth through ITI of Jharia Vihar, Belgaria, Distribution of Stitching machine to the villagers (women) for self-employment, Construction of computer center and sewing training center at Belgaria, Jharia, etc. Specific activities include:- Duckery Project for Noonudih Village; Training on Eco-Restoration by Forest Research Institute (FRI), Dehradun, India 124 PAPs have already been imparted the training; Electrical Appliance Maintenance & repair; Carpentry; Computer Accounting; Cosmetology; Dairy training; Mushroom Cultivation, etc.

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I. Aquaculture and Fisheries

In this continued pandemic of Corona, economies in all spheres are affected, including mining. As CSR and for cost-saving in ECL, some innovations on mine closure were done, especially in abandoned water-logged quarries. Reference is invited to the circular No- 55011-01-2019-CPAM of Government of India, Ministry of Coal, dated 27 August 2009 on Mine Closure Guidelines. Para No-7 mentions that certain activities to be included in the mine closure plans, necessary for safety and conservation. Normally landowners of abandoned mine quarries demand the restoration of land by filling it up for use. There was a trade union movement in ECL, around 1995 for restoring old around 100 quarries, which were abandoned even before ECL was nationalized and most of them were water-logged. The abandoned quarries had mostly worked thick seams and on the overburden dumps, tree plantations were done. Transportation of overburden to such quarries from far away from existing opencast mines, would not only cost but the movement of dumpers on main roads is not permitted. It would have cost ECL hundreds of crores of Rupees. The possible solution for the income of landowners could be done by fisheries, aquaculture. The trade unions agreed and help could be taken from the West Bengal fisheries department. Then, Fisheries department staff helped the water-logged quarry landowners in all respects. Gradually, fisheries started to become a success, and the demand for filling up the abandoned quarries, supported from union sides.

ECL thus saved hundreds of crores of Rupees and the landowners of water-logged quarries continued to gain profit out of fisheries. Encouraged by this success, we were thinking of water fishing technology in deep quarries. Indian Institute of Technology, Kharagpur, Food and Agriculture Department, Deepwater fishing technology with wire-netting method could be applied. The Director then agreed to send a team to ECL for preparing an S&T project and a team of faculties visited ECL several times. The investigations done can be utilized even now, as large deep opencast projects are on the verge of closure, reaching economic cut-off ratio, in other subsidiaries of Coal India. Development deep water fishing technology can save lots of company money while providing a gainful future for land-owners of abandoned deepwater quarries, which will be waterlogged eventually, after abandonment. The government of India has also created Fisheries Department and funds and assistance can be sought.

VIII. CONCLUSIONS

The research established that there was indeed the existence of some health, education, community aid, and livelihood-related CSR activities in the communities of the world. Investing resources in charity, environmental protection, and education pay dividends in corporate reputation, and relationship with employees, competitors, consumers, suppliers, and the local communities is invaluable. The corporate social responsibility of mining industries has to be pragmatic as CSR is for addressing certain societal issues for which there is no alternative approach.

The perspectives of the high-impact stakeholders are taken into consideration while mapping the prioritized sustainability issues across important domains i.e. Economic, Environment, Labour Practices, Human Rights, Social, and Corporate Governance. Compared to other coalfields of India, and even in the world, mines of Jharia coalfields are the most problematic from a safety and environmental pollution point of view, with high-grade coking coal liable to spontaneous combustion. In the public sector setup, the real control has gradually passed over from the management to trade union and political hierarchy. The executives have to get the results from employees even in arduous mining conditions and discipline is essential, for which higher management support is required. The authors feel to just touch upon the following points to identify problems and plan probable solutions: -

1) Critical environment and pollution issues should be managed by multi-objective methods.
2) Punctured or unsafe barrier underground should be dammed of proper design and strength.
3) Similarly, underground inclines through presently unused quarries should also be dammed.
4) Major steps for air pollution control, are being taken in all mines of BCCL.

GICP-SLAM algorithm on the localization and mapping of underground environment can be analyzed from four aspects: point cloud odometer registration, loop detection, plane constraints, and system module running time.

Erstwhile Board level Sustainable Development Committee assisted by Sub-committee headed by nodal officers has been renamed as CSR Committee for monitoring and reviewing various activities to be executed under CSR activities of BCCL. Coal India subsidiaries are getting advantage of public co-operation because of the improvement of the social environment. An innovative approach with stakeholder engagement has been a tremendous impact on the performance of BCCL. Demonstrations and agitations of trade unions and social against mining companies have been well managed for better performance. Over the past several years, MAC, or the Management Association of Canada has increased its work in the international development space of CSR. Even, Malaysia, Ghana, Zimbabwe, etc. have taken up CSR activities in mining.

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Social contribution value per share means the sum of profits for shareholders and other stakeholders. The higher the index, the better CSR performance a company has. The formula is shown as follows: Social Contribution Value per Share=Earnings per Share+ (Total Tax+Employee Cost+Interest Expenditure+Public Welfare Expenditure−Social Cost)/ Shareholder Equity.

A. Abbreviations

CSR- Corporate Social Responsibility; CIL- Coal India Limited; BCCL- Bharat Coking Coal limited; SECL- South Eastern Coalfields Limited; WCL- Western Coalfields Limited; ECL- Eastern Coalfields Limited; MCL- Mahanadi Coalfields Limited; DGMS- Directorate General of Mines Safety; IICM- Indian Institute of Coal management; PAP- Project Affected People; DPE- Department of Public Enterprises; ISRO- Indian Space Research Organization; QCI- Quality Council of India; DMC- Dhanbad Municipal Corporation; SD- Social Development; JRDA- Jharia Rehabilitation Development Authority; CMPDI- Central Mine Planning & Design Institute; MOU- Memorandum of Understanding; MOC- Ministry of Coal.

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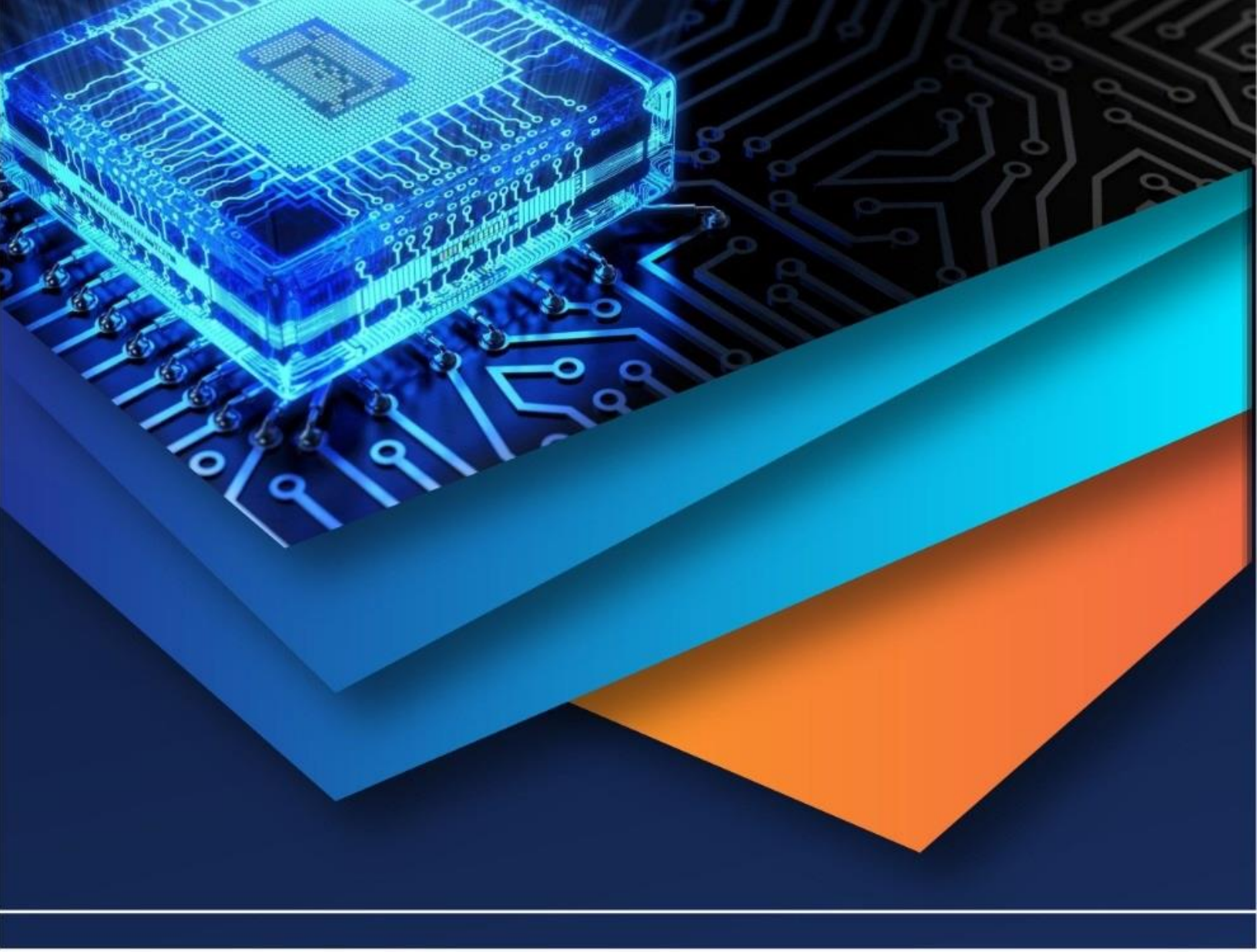

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