

पर्यावरण दर्पण

पर्यावरणीय समाचार पत्रिका

Only one Earth

Living Sustainably in Harmony with Nature



भारत कोकिंग कोल लिमिटेड
धनबाद



VISIT OF INDEPENDENT DIRECTOR, BCCL IN GOKUL PARK, LODNA IN 2022



BCCL REPRESENTING IN VIGYAN SARWATRA PUJYATE AT CIMFR IN 2022





MESSAGE

“Earth provides enough to satisfy every man's needs, but not every man's greed.”

-Mahatama Gandhi

The words of Gandhiji resonates the truth especially in the 21st Century. The earth is carrying and caring for 7.8 billion of us but we are yet to reciprocate this gesture with proactive and transformative innovations towards a greener and cleaner lifestyle. Only One Earth was the motto for the 1972 Stockholm Conference; 50 years on, the motto holds true. This planet is our only home, whose finite resources humanity must safeguard.

Let's celebrate this Environment Day living and effectuating this motto “Only One Earth” In 2022, we hope to see a world turning the corner on the worst of the COVID-19 pandemic. But we do so with the knowledge that we continue to face the triple planetary crises of climate change, nature loss, and pollution and put the well-being of current and future generations at unacceptable risk. Ambitious and coordinated action by governments, businesses and people around the world can prevent and reverse the worst impacts of environmental decline by rapidly transforming key systems including energy, water and food so that our use of the earth becomes sustainable. Transforming social and economic systems means improving our relationship with nature, understanding its value and putting that value at the heart of our decision making

All have individual, complementary and nested roles to play in bringing about cross-sectoral and economy-wide transformative change with immediate and long-term impact. BCCL has been proactive in scripting the tale of decarbonisation and adopting environment friendly technologies. BCCL is geared up for enhanced production (51 MT in 2030) as well as for solar power installation (285 MWP capacity by 2025-26). Further, shifting towards electric vehicles and LNG fitted HEMMS is high on the agenda. To improve upon the technology of mining, BCCL is introducing ripper-based mining technology. Climate change introduces unpredictability, requiring “climate intelligence” to be embedded in decision-making processes, such as capital allocation and real-time monitoring of pollution levels. Thus, for real-time monitoring of pollution levels, 40 online pm10 analysers have been procured and commissioned and will not only help BCCL but the general public to understand and mitigate the rising pollution levels. In addition to its fleet of conventional sprinklers, BCCL has also adopted the state-of-the-art technology of Mist Sprinkler and Fog Canon for mitigating



pollution in JCF. To improve upon the green cover and transform the degraded land, BCCL in 2021-22 has planted 1.86 lakhs saplings and carried ecological restoration and plantation on 1535 Ha of degraded mined out land/OB dumps. BCCL is committed to serve the people of Jharia coalfields through all its efforts and stood by the people during the Pandemic by extending its CSR provisions and making available health facilities and its resources at the disposal of District Administration.

I am feeling delighted to announce the successful roll out of eighteenth edition of BCCL's initiative "Paryavaran Darpan" on the occasion of the WORLD ENVIRONMENT DAY on 5th June, 2022. "Paryavaran Darpan" has been successful providing a platform to spread awareness towards environment amongst the public at large.

SAMIRAN DUTTA
CHAIRMAN CUM MANAGING DIRECTOR
Bharat Coking Coal Limited



MESSAGE

Every year World Environment Day is celebrated globally on 5th June with participation of more than 150 countries for raising awareness about environmental actions & their impacts and inspiring positive change towards environment. “Only One Earth” was the slogan for the 1972 Stockholm Conference (United Nations Conference on the Human Environment) first international meeting on the environment; even after 50 years, this truth still holds – this planet is our only home, we should protect it & make judicious use of its resources. This year 2022 is a historic milestone for global environment community as it marks 50 years of the 1972 Stockholm Conference.

The 2022 World Environment Day campaign #OnlyOneEarth calls for collective, transformative changes to policies & choices on a global scale to make a shift towards greener, cleaner & sustainable earth. The campaign shines a spotlight on climate action, nature action and pollution action while encouraging everyone, everywhere to live sustainably.

“Sooner or later, we will have to recognize that the Earth has rights, too, to live without pollution. What mankind must know is that human beings cannot live without Mother Earth, but the planet can live without humans.”

-Evo Morales

Individual choices do make a difference but it is only collective action that will create the transformational environmental change which we need for advancement/ making a shift towards a more sustainable Earth, where everyone can flourish & live sustainably in harmony with nature. Both Industry and individual has work hand in hand for protection of our Mother Earth. As a responsible mining corporate, BCCL has been proactively working towards restoration of mother earth. For the same BCCL has reclaimed 1535 Ha of mined out degraded land, set up eco-parks in the coalfield areas and has adopted new technologies in the field of pollution control measures such as fog canon, mist sprinklers etc.

It gives me immense pleasure to know that the Environment Department of BCCL is publishing eighteenth edition of its Environment newsletter “Paryavaran Darpan” on the occasion of World Environment Day on 5th June 2022. BCCL’s environment newsletter “Paryavaran Darpan” is successfully spreading awareness amongst the stakeholders about the environmental initiatives being taken by BCCL for protection of ‘Only one Earth’.

I hope that this newsletter will continue to make readers become well versant with the environmental activities being done in BCCL and inspire them to support the efforts of the company.

KUMAR ANIMESH
Chief Vigilance Officer
Bharat Coking Coal Limited



संदेश

मुझे यह जानकारी अत्यंत हर्ष हो रहा है कि 'विश्व पर्यावरण दिवस – 2022' के अवसर पर बीसीसीएल की पर्यावरण पत्रिका 'पर्यावरण दर्पण' का 18वाँ अंक प्रकाशित होने जा रहा है। इस वर्ष विश्व पर्यावरण दिवस का विषय 'केवल एक पृथ्वी' है अर्थात् हमारे अनंत ब्रह्माण्ड में करोड़ों आकाशगंगा हैं जिनमें करोड़ों ग्रह हैं किन्तु पृथ्वी ही एक मात्र ऐसा ज्ञात ग्रह है जिसपर जीवन संभव है। अतः पृथ्वी पर मानव जीवन संभव बनाये रखने के लिए हमें पृथ्वी का संरक्षण करना होगा और इसके लिए हमें हर संभव प्रयास करने होंगे और न केवल राष्ट्र अपितु इस संसार को सतत् विकास के द्वारा ही आधुनिकता की ओर अग्रसर रहना होगा।

कोयला राष्ट्र के विकास के लिए अत्यंत आवश्यक है जिसकी सतत् रूप से आपूर्ति हेतु कोल इण्डिया एवं बीसीसीएल निरंतर प्रयासरत हैं एवं इसके साथ-साथ पर्यावरण व सामाजिक उत्थान के लिए भी बीसीसीएल यथासंभव प्रयासरत है। कोयला खनन के चलते पर्यावरण पर जो अस्थायी प्रभाव पड़ता है उसके लिए बीसीसीएल अनेक उपाय कर रहा है जैसे की खनन में उपयोग होने वाले आधुनिक उपकरणों का प्रयोग जो प्रदूषण को कम करने में सहायक है, निरंतर जल छिड़काव के लिए नई तकनीक वाले मिस्ट स्पिन्कलर्स व फौग कैनन इत्यादि। बीसीसीएल वायु प्रदूषण को ससमय मापने हेतु अपनी खदानों में PM₁₀ analyser संयंत्र लगा चुका है। साथ ही बीसीसीएल अपनी उर्जा जरूरतों को पूरा करने के लिए पारंपरिक उर्जा स्रोत को सौर उर्जा से प्रतिस्थापित करने के लिए भी प्रयासरत है जिसके लिए वर्ष 2025-26 तक 285 मेगावाट सौर उर्जा संयंत्र स्थापित करने की योजना है। बीसीसीएल द्वारा हर वर्ष की भांति हरित क्षेत्र बढ़ाने के उद्देश्य से इस वर्ष भी अपनी खदानों के ओबी डंप व उत्खनित भूमि पर वृक्षारोपण का कार्य कराया जा रहा है।

झरिया कोयला खनन क्षेत्र में रहने वाले लोगों की बेहतर जीवन शैली व हरियाली के लिए, ईको-पार्कों की स्थापना पर भी जोर दिया जा रहा है।

वैश्विक महामारी, COVID-19 के समय में सामाजिक दायित्व के निर्वहन हेतु धनवाद में जन सामान्य की विभिन्न रूप से सहायता की है। बीसीसीएल ने अपने केन्द्रीय चिकित्सालय को COVID-19 के उपचार के लिए समर्पित किया जहाँ से सैकड़ों COVID-19 रोगी स्वस्थ हुए हैं।

पर्यावरण के प्रति जागरूकता लाने वाली बीसीसीएल की पर्यावरण पत्रिका 'पर्यावरण दर्पण' के 18^{वें} अंक के प्रकाशन पर मैं पर्यावरण विभाग को बधाई देता हूँ। आप सभी को 'विश्व पर्यावरण दिवस- 2022' की हार्दिक शुभकामनायें। मेरी यही कामना है कि हम सब व्यक्तिगत स्तर एवं संस्थागत रूप से इस पृथ्वी को जीवन के लिए एक बेहतर ग्रह बनाने का प्रयास करते रहें।

पी. वी. के. आर. मल्लिकार्जुन राव
निदेशक (कार्मिक)
भारत कोकिंग कोल लिमिटेड



MESSAGE

World Environment Day 2022 is being celebrated with a very apt and expressive campaign **#OnlyOneEarth** calling for transformative action in energy sector to protect and restore our planet maintaining present and future requirements, holds significance. Today the biggest challenge that our growing coal industry faces is Sustainable Growth. The industry is adopting new technologies to keep pace with energy security of the nation. Awareness and exchange of ideas is important aspect to achieve objectives. The Newsletter of Bharat Coking Coal Limited (BCCL) “**Paryavaran Darpan**” has now become a platform for putting our thoughts and ideas for greener and cleaner Environment in coal mines.

We as one of the Prime Energy providers of our country face a dilemma of becoming energy efficient and safeguarding our rich biodiversity. The task ahead is not easy but knowing all the difficulties we have attempted to align ourselves as Sustainable organization and some of the key steps taken at BCCL in this regard that can be highlighted are establishing a robust self-monitoring system by installing Online PM10 Analyzers in all mines/railway sidings. This will be further strengthened by procurement of Continuous Online Ambient Air Quality Monitoring Systems (CAAQMS) with more analyzers (PM2.5; SO₂; NO_x; CO). In steps to monitor the water environment, for the first time in Jharia coalfield, a network of Piezometric wells has been established to monitor the ground water level and quality. The Source Apportionment Study provides scientific base for planning mitigative measures by all stakeholders for better environment of Jharia Coalfield.

The next step after monitoring is developing suitable mitigation measures for controlling the fugitive dust for achieving the targets set up as per the National Clean Air Programme (NCAP). BCCL has already added Fog Canons (trolley and truck mounted, both) and HEMM based Mist Sprinkler with 28 KL tank capacity in its fleet of water sprinklers for most efficient dust suppression without minimum water usage. Further, BCCL is continuing its drive for plantation at reclaimed areas/OB dump/roadside for mitigation of pollution and better environment, the biologically reclaimed areas are also converted into eco parks for recreational purpose of local communities.

By improving the mining based technology, introducing blast free technologies, tapping solar insolation, CBM project exploration to tap CBM resources, steps are being taken towards carbon neutrality. In addition, Washeries based on new technologies are being added to enhance coking coal supply to steel sector.

These steps need to be augmented in more expansive capacity and will thus surely make our highest coal production targets sustainable. A managed and sustainable Environment will provide the Social License to Operate and this requires participation of all individuals. I hope these Goals will surely be achieved while protecting our mother earth and living in harmony with nature. With this, I Congratulate Environment Department for the 18th Issue of Paryavaran Darpan and wish it all success.

(Sanjay Kumar Singh)
Director (Technical) Operations
Bharat Coking Coal Limited

सम्पादकीय

पर्यावरणीय समाचार पत्र “पर्यावरण दर्पण” का नया अंक प्रस्तुत है.

प्रतिवर्ष विश्व पर्यावरण दिवस पर हम अपनी प्रतिबद्धता व्यक्त करते हैं. प्रतिवर्ष यह दिन विश्व की ज्वलंत पर्यावरणीय समस्याओं में से एक को चुनकर उस पर सभी का ध्यान आकृष्ट करता है एवं लक्ष्य की प्राप्ति के लिए सबका आह्वान करता है . मानव सत्यता को ध्यान रखना होगा कि इसके पास “केवल एक विश्व” है, जिसमें इसे अपने आपको अक्षुण्ण रखना है. हमें विकास के पथ पर तेजी से अग्रसर होना है पर पर्यावरण को संतुलित रखते हुए .

विकास के लिए उर्जा का महत्वपूर्ण स्थान है. भविष्य की उर्जा आवश्यकताओं को पूरा करने की योजना में पर्यावरण संरक्षण का ध्यान रखते हुए भारत ने ग्लासगो सम्मलेन में अपना लक्ष्य निर्धारित किया है. वर्तमान में भारत के कुल विद्युत् उत्पादन क्षमता 399.5 GW में जीवाश्म इंधन का योगदान 236.1 GW(59.1%) है जिसमें कोयला आधारित ताप विद्युत घर की क्षमता 204.1 GW (51.1%). गैर जीवाश्म इंधन का योगदान 163.4 GW है जिसे बढ़ा कर 2030 तक 500GW करना है ताकि विद्युत् की आधी आवश्यकता इससे पूरी की जा सके. अतः कोयला क्षेत्र को भी इसके अनुरूप अपना योगदान बढ़ाना होगा.

विकास के साथ नयी तकनीकें भी विकसित हो रहीं हैं जिससे कोयला उत्पादन, कोयले से विद्युत् उत्पादन, इसका वितरण एवं उपभोक्ता द्वारा उपयोग, हर स्तर पर सुधार लाया जा सकता है एवं चरणबद्ध तरीके से लागू भी किया जा रहा है. इससे पर्यावरण पर भी अनुकूल प्रभाव अपेक्षित है.

सतत बिकास की अवधारणा पर कार्य करते हुए भारत कोकिंग कोल लिमिटेड ने इस दिशा में अनेक कदम उठाये हैं. परियोजनाओं को नई तकनीकों को ध्यान में रखकर विकसित किया जा रहा है. धुल दमन के लिए मिस्ट स्प्रेण्कलर, फोग कैनन आदि का प्रयोग किया जा रहा है तथा कोयला परिवहन पथ को पक्का बनाया जा रहा है . साथ ही पर्यावरणीय पुनरुद्धार के सिद्धांत पर वृक्षारोपण से खनन उपरांत भूमि को बेहतर उपयोग हो सकेगा . ऐसे कुछ क्षेत्रों को उद्यान के रूप में भी विकसित किया गया है जो कि स्थानीय समुदाय में लोकप्रिय हैं .

झरिया कोलफील्ड एवं धनबाद घनी आबादी के क्षेत्र हैं एवं राष्ट्रीय स्वच्छ वायु कार्यक्रम में धनबाद को शामिल किया गया है. भा.को.को.लि. इसे सफल बनाने के लिए अपनी भागीदारी निभाने को कृतसंकल्पित है एवं इस हेतु सीएसआईआर - राष्ट्रीय पर्यावरण अभियांत्रिक अनुसंधान संस्थान द्वारा वायु प्रदूषण में स्रोत विभाजन अध्ययन (सोर्स अपोसोन्मेंट स्टडी) कराया गया है. इसे ध्यान में रखते हुए धनबाद के सभी हितधारकों को अपनी भूमिका निभानी होगी ताकि स्वच्छ वायु कार्यक्रम सफल हो सके.

मानव विकास में प्रकृति ने संसाधन उपलब्ध कराकर अपना अहम् योगदान दिया है. इन संसाधनों का विवेकपूर्ण उपयोग पर्यावरण संरक्षण के लिए आवश्यक है. आइये, अपने दैनिक जीवन, अपने कार्यक्षेत्र का विश्लेषण करें एवं प्रकृति के साथ सद्भाव सहित रहने की दिशा में कदम बढ़ाएं.

शुभकामनायों सहित
प्रधान संपादक

A PEEK INSIDE....

संरक्षक

श्री संजय कुमार सिंह
निर्देशक (तकनीकी) संचालन

संपादकीय मंडल

प्रधान संपादक

कुमार रंजीव
विभागाध्यक्ष (पर्यावरण)

संपादकीय सलाहकार

डॉ मनोज कुमार
वरिय प्रबंधक (खनन)
पर्यावरण विभाग

मीना कुमारी

उप प्रबंधक, पर्यावरण

कार्यकारी संपादक

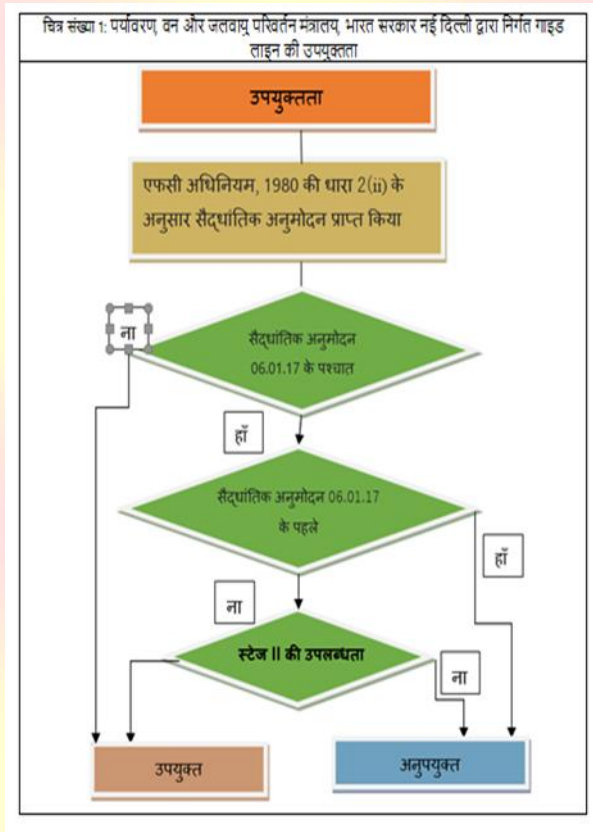
प्रीति झिरवाल
सहायक प्रबंधक (पर्यावरण)

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एनपीवी की दर में संशोधन से वानिकी मंजूरी में प्रयोग होने वाले सीबीआर दस्तावेज पर प्रभाव – एक अध्ययन।

पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, सरकार ने अपने ज्ञापांक संख्या 5-3/2011-FC(Vol-I) दिनांक 6 जनवरी 2022 व दिनांक 19 जनवरी 2022 के माध्यम से NPV की दर में वृद्धि करते हुए लगभग 53% का बदलाव किया। एनपीवी को 1.53 के फिटमेंट फैक्टर के आधार पर संशोधित किया गया। हमारी खदानें इको क्लास III में पड़ती हैं जिसको उपर्युक्त ज्ञापांक के आधार पर तालिका 1 में उद्धरित किया गया है। चित्र संख्या 1, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, सरकार ने ज्ञापांक दिनांक 19 जनवरी 2022 दिशा निर्देश की प्रयोज्यता के बारे में विस्तार से बताती है।

| तालिका संख्या 1 : अध्ययन क्षेत्र में आने वाले इको क्लास III के लिए एनपीवी दर[18] | | | | |
|--|----------------------------------|-----------------|----------|----------|
| | एनपीवी दरें (रुपये/हेक्टेयर में) | | अंतर | % वृद्धि |
| | संशोधन के उपरांत | संशोधन के पूर्व | | |
| सघन वन | 13,57,110 | 8,87,000 | 4,70,110 | 53% |
| मध्यम सघन वन | 12,28,590 | 8,03,000 | 4,25,590 | 53% |
| खुले वन | 9,57,780 | 6,26,000 | 3,31,780 | 53% |
| स्रोत : एमोईफसीसी का ज्ञापांक संख्या 5-3/2011-FC(Vol-I) दिनांक 6 जनवरी 2022 व दिनांक 19 जनवरी 2022 | | | | |



NPV की दर में वृद्धि से लागत लाभ अनुपात (सीबीआर) में पड़ने वाले प्रभाव का पता लगाने के लिए एक अध्ययन किया गया। इस अध्ययन में कुल 32 खनन परिसरों (McM) के मैट्रिक्स का चयन किया गया। इन सभी खनन परिसरों का लागत लाभ अनुपात (CBR) दिनांक 01.08.17 से दिनांक 31.12.21 के बीच तैयार व संशोधित किया गया था और विभिन्न वन हस्तांतरण प्रस्तावों के साथ संगत कर पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार को प्रस्तुत किया गया था।

वन संरक्षण अधिनियम 1980 की धारा 2 (ii) और 2 (iii) के तहत वन भूमि के वानिकी मंजूरी का प्रस्ताव जमा किया जाता है। एफसी अधिनियम 1980 की धारा 2 (ii) के तहत जमा किए जाने वाले डायवर्जन प्रस्तावों के लिए लागत लाभ अनुपात (CBR), पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार के ही एक गाइड लाइन संख्या 7-69/2011-एफ सी के अनुसार परियोजना

प्रस्तावक / उपयोगकर्ता एजेंसी द्वारा अपने वन प्रस्ताव में संलग्न करती है। यह गाइड लाइन एफसी अधिनियम 1980 के प्रावधानों के अनुसार है जिसमें अधिनियम 1980 की धारा 2.6 सीबीआर के आकलन के लिए निर्देशित करता है। लागत लाभ अनुपात (CBR) कुल लागत (टीडीसी) व लाभ (टीएबी) का अनुपात है।

सुप्रीम कोर्ट ली रिट याचिका(सी), 1996 और एमओईएफसीसी, 2009 के अनुसार, एफसी अधिनियम, 1980 के तहत जमा करने वाले प्रस्तावों में वन भूमि अपयोजन के बदले में एनपीवी का प्रावधान है, जो कि पारिस्थितिकी तंत्र की वस्तुओं और सेवाओं के वैज्ञानिक मूल्यांकन के परिणाम के आधार पर निर्धारित किया जाता है। एनपीवी दरों में वृद्धि माननीय उच्चतम न्यायालय (उच्चतम न्यायालय के आदेश 2008) के निर्देश के अनुपालन में की गई थी।

एम.ओ.ई.एफ.सी.सी. के ज्ञापांक में एनपीवी में छूट की सीमाएं भी बताई गयी है। 1 हेक्टेयर तक वन भूमि के उपयोग के लिए कुछ प्रस्तावों यथा स्कूलों, अस्पतालों, गैर-व्यावसायिक प्रकृति के बच्चों के खेल के मैदान के लिए, ग्रामीण क्षेत्रों में सामुदायिक केंद्र बनाने के लिए, ओवरहेड टैंक, गांव के टैंक, भूमिगत पेयजल, सिंचाई और चार इंच व्यास तक पीएनजी पाइपलाइन बिछाने के लिए, ग्रामीण क्षेत्रों में बिजली वितरण करने वाली 22 केवी तक की लाइन के लिए एनपीवी की पूर्ण छूट दी गई है [], बशर्ते कि उसमें पेड़ों की कटाई न हो। साथ ही वैकल्पिक वन भूमि उपलब्ध नहीं हो, परियोजना गैर-वाणिज्यिक प्रकृति की हो और सरकार की योजना/गैर-योजना का हिस्सा हो। ये परियोजनाएं राष्ट्रीय उद्यान/अभयारण्य के बाहर भी हों। राष्ट्रीय उद्यानों/अभयारण्यों से गांवों को वैकल्पिक वन भूमि में पुनर्वास भी एनपीवी के दायरे में नहीं आता। वन क्षेत्र में नदी की तलहटी से बोल्टर/सिल्ट के संग्रह के लिए एनपीवी जमा करने से पूरी तरह छूट दी गई है, बशर्ते कि सम्बंधित क्षेत्र राष्ट्रीय उद्यान/अभयारण्य के बाहर हो। साथ ही उस क्षेत्र के लिए कोई खनन पट्टा स्वीकृत/हस्ताक्षरित न हो, बोल्टर/सिल्ट की बिक्री सहित सभी कार्य विभागीय रूप से या सरकारी उपक्रम के माध्यम से या आर्थिक विकास समिति या संयुक्त वन प्रबंधन समिति के माध्यम से की जाती हो और ये गतिविधि वनों के संरक्षण व रक्षण के लिए आवश्यक है साथ ही बिक्री की आय का उपयोग वनों के संरक्षण / रक्षण के लिए किया जाए। भूमिगत ऑप्टिकल फाइबर केबल बिछाने के प्रस्तावों में यदि प्रस्तावित वन भूमि राष्ट्रीय उद्यान/अभयारण्य से बाहर पड़ता है और उसमें पेड़ों की कटाई शामिल नहीं है, तो वैसे प्रस्तावों में एनपीवी भुगतान में पूर्ण छूट दी गई है। 1980 से पहले के अतिक्रमणों के नियमितीकरण और वन गांवों को राजस्व गांवों में परिवर्तित करने के लिए (जो कि MoEF&CC के द्वारा दिनांक 18.9.1990 को प्रकाशित दिशा निर्देश के अनुसार किया जा रहा हो) निर्देशित वन भूमि अपयोजन में भी एनपीवी भुगतान में पूर्ण छूट का प्रावधान है। साथ ही यदि भूमिगत खनन के लिए 3-डी सबसिडेंस प्रेडिक्शन मॉडल द्वारा अनुमानित भूतल तनाव 5 मिमी/मीटर से कम हो, तो एनपीवी का भुगतान करने से छूट दी गई है। रक्षा मंत्रालय के फील्ड फायरिंग रेंज (एफएफआर) के लिए यदि पेड़ों की कटाई शामिल नहीं है और वनों के विनाश की कोई संभावना नहीं है तो फील्ड फायरिंग रेंज के सुरक्षा क्षेत्र में आने वाले वन क्षेत्र के लिए भी एनपीवी के भुगतान की आवश्यकता नहीं है।

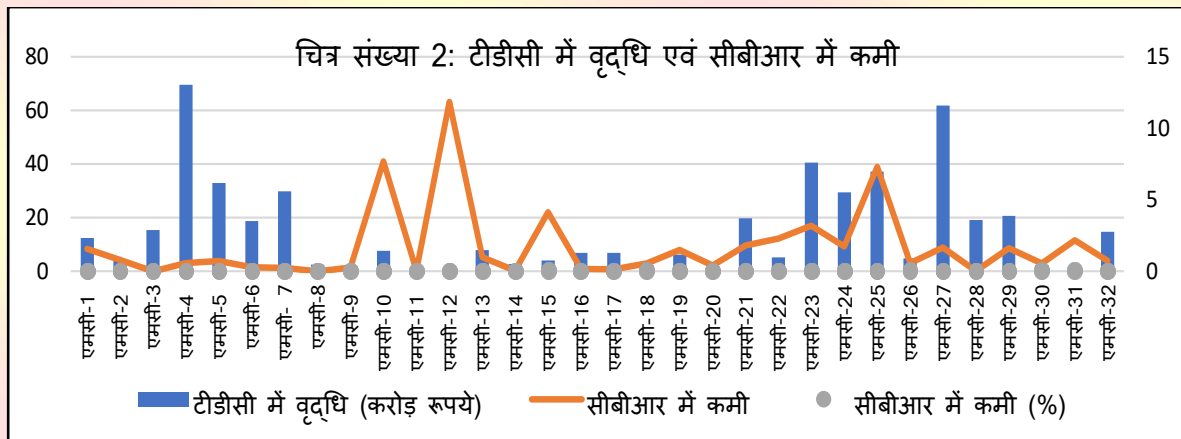
एनपीवी भुगतान करने से आंशिक छूट निम्न स्थितियों में दी गई है -

- भूमिगत खनन गतिविधियों के लिए 3-डी सबसिडेंस प्रेडिक्शन मॉडल के आधार द्वारा निकाले गए सतह तनाव यदि 5 से 20 मिमी/मीटर के बीच हो तो, एनपीवी के भुगतान में आंशिक छूट का प्रावधान है। यदि 3-डी

सबसिडेंस प्रेडिक्शन मॉडल द्वारा निकाला गया भूतल तनाव 5 मिमी से 10 मिमी / मी, 10 मिमी से 15 मिमी / मी, 15 मिमी से 20 मिमी / मी हो तो एन पी वी दर में क्रमशः 90%, 75% और 50% छूट का प्रावधान होगा।

- पवन ऊर्जा परियोजनाओं की सभी क्षमताओं की और 25 मेगावाट क्षमता तक की जलविद्युत परियोजनाओं में एनपीवी दर में 50% की छूट का प्रावधान है, बशर्ते पवन ऊर्जा परियोजनाओं में न्यूनतम वृक्षों की कटाई शामिल हो और जलविद्युत परियोजनाओं में प्रति हेक्टेयर 5 पेड़ से अधिक की कटाई शामिल न हो।
- प्रस्तावित जलाशय में नदी के तल का क्षेत्र, जो कि पूरे वर्ष स्थायी रूप से जलमग्न रहता है, पर एनपीवी दर में 50% छूट मिलती है।

• रक्षा मंत्रालय के फील्ड फायरिंग रेंज (FFR) के प्रभाव क्षेत्र में आने वाले वनों के लिए प्रस्तावों में जिसमें पेड़ों की कटाई शामिल नहीं हो और वन क्षेत्रों के विनाश की कोई संभावना नहीं हो, इसके लिए 80% छूट का प्रावधान है।



इस अध्ययन में सीबीआर पर एनपीवी में परिवर्तन के प्रभाव का विश्लेषण करने पर यह पाया गया कि एनपीवी में परिवर्तन का सीबीआर पर सीधा प्रभाव पड़ता है। सीबीआर में कमी एवं टी. डी. सी. में वृद्धि को चित्र संख्या 2 में चित्रित किया गया है। एनपीवी दर में 53% की वृद्धि होने के कारण अध्ययन क्षेत्र में टी.डी.सी. में 0.4 करोड़ रुपये से 69.59 करोड़ रुपये का इजाफा हुआ है। 11 खनन पारिसर के सीबीआर में 0-5% की कमी, 9 खनन पारिसर के सीबीआर में 5-10% की कमी एवं 12 खनन पारिसरों के सीबीआर में 10% से अधिक की कमी देखी गई। एनपीवी की दर में परिवर्तन पर सीबीआर गणना के लाभ घटक पर कोई प्रभाव नहीं पड़ता है। (संकलन: यह लेख एशियन माइनिंग कांग्रेस में प्रस्तुत, जिओमाइनटेक में प्रकाशित, माइनटेक में स्वीकृत के आधार पर है)

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BCCL ADOPTING NEW TECHNOLOGIES

BCCL was incorporated in January, 1972 to operate coking coal mines operating in the Jharia & Raniganj Coalfields, taken over by the Govt. of India on 16th Oct, 1971 to ensure planned development of the scarce coking coal resources in the country. In all, 398(214 coking and 184 non-coking) mines were nationalized and placed under the management of Bharat Coking Coal Ltd. (BCCL). BCCL reorganized the mines into 103 mines placed under 12 administrative areas and now 17 clusters of mines at present. BCCL has obtained Environmental clearances for 93.04 MTPA along with washeries (04 existing and 04 under installation). Its main operating area is Jharia coalfield (JCF) (273 sq km in area) with 32 sq km in Raniganj coalfield also. Since the inception, coal mining sector has been facing various challenges such as air pollution, burning of coal due to fire.

All mines of BCCL are mechanized or semi mechanised, BCCL has introduced new technology for better environment management in mining operation.

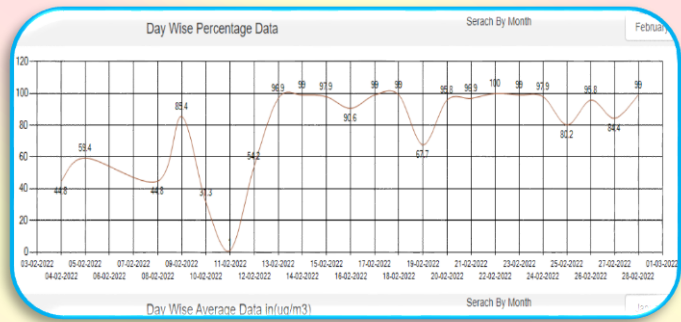
Ripper technology: it is a new technology to cut overburden and coal by Impact energy accumulation. Few mines of CIL have started issuing contract with this technology. Many mines of BCCL are in close proximity of habitation, to avoid any damage to existing infrastructure and loss of life, adoption of ripper is being considered in BCCL which ensures rock breaking without blasting.

Highwall mining: it is a technology for cutting and loading of coal (without blasting) from highwall of the OCP for optimum recovery of coal with due regard to safety and conservation of coal. It Can be used where coal is blocked in batter of existing opencast mines and which have reached their final limit due to uneconomic stripping ratio or due to local constraints. Currently, Amalgamated Block II OCP has been using this technology. It enables safe recovery of coal without damaging surface and surface infrastructures.



New technology in Monitoring: Dhanbad has been listed as one of the Non-Attainment City in list of 102 cities and also falls under Critically Polluted Areas. Therefore, BCCL has also procured 40 PM10 analyser for real-time monitoring of pollution levels, out of which 35 are already connected with the JSPCB portal. Procurements of 4 CAQMS are in the final stages of tendering. CAQMS determine the PM10, PM2.5, SO2, NOx, NH4 levels in Ambient air on continuous basis based on advanced techniques prescribed by CPCB and





Dust suppressing technology: Installation of Overheard sprinklers is one of the novel initiatives to contribute for the environmental protection through minimising the dust spreading while transportation of coal by providing a water curtain. BCCL has procured 16 nos of water sprinklers with Mist system and commissioned by excavation department in last 03 years out of which 02 procured in 2021-22. 05 mobile fog cannon and 04 trolley mounted fog cannon procured in 2021-22. To cover mines, sidings and washeries, 40 nos of online PM10 Analyzers procured, out of which 36 are connected with State

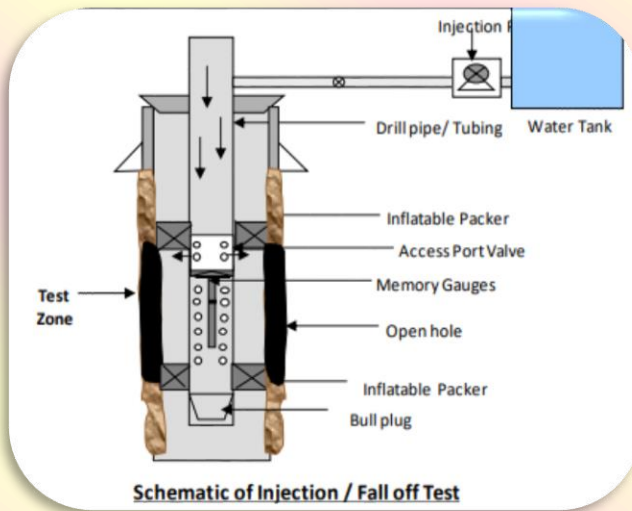


Effluent treatment plant: To Ensure segregation of liquid chemical waste at source and ensure pre-treatment or neutralisation prior to mixing with other effluent in accordance with the Water (Prevention and Control of Pollution) Act, 1974, ETP with capacity of 5KLD has been installed at Central Hospital, Dhanbad



Way forward in decarbonization:

BCCL, in Jharia block 1, has manifested a coal bed methane (CBM) project which has already been awarded and its exploration will commence shortly after necessary statutory clearances. Gas in Place = 25 BCM (Billion Cubic meter), Average production 1.3 MMSCMD (Million Metric Standard Cubic meter/Day).



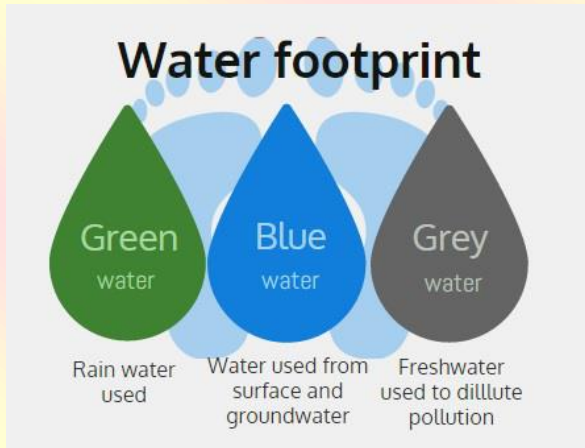
- BCCL's Plan to establish 285 MWp capacity by 2025-26 is underway. The changeover to solar energy generation will further support decarbonisation. Solar power requires 2 ha of land and generates 2146 MWh per annum considering 0.91 kg/kwh coal consumption. Solar panel of 1ha land can replace 976 t of coal. Considering carbon sequestration of 50 t/ha by plantation, the solar power plant establishment will contribute more in decarbonisation.



What is Water Footprint and why it should Be of Great Concern for the Entire World

What is water footprint?? Water footprint is the extent to which one, an institution, community or nation uses water or consumes water per day or on daily basis. Water footprint includes the amount of water used to grow the food we every time consume, produce the energy we use and for all the products in our daily life like books, music, house, car, furniture. The water footprint of any item, product or service is the sum of all the water that it has used or polluted in all stages of manufacturing till it's received by the consumer at the local or global market.

Now here are some shocking facts cum ground reality: - It is said that cumulatively, the water we use, both directly & indirectly, is nowhere less than 3000-3500 litres a day on an average. Average American family uses 300 gallons of water per day, just at home. Almost every item of our daily use requires water to be used at some stage of its production. The most easily understood indirect consumption of water comes from food. When we cook & eat rice, if asked how much water it contains, think about the embedded water content of rice. It is estimated that it takes around 2,688 litres of water to produce one kilo of polished rice in India. Almost 70 percent of the water we consume daily is indirectly as water embedded in products. Most jeans are produced in China and India where cotton is grown. India variety of jeans which needs more water than indigenous varieties. The Water Footprint Network estimates that India uses 22,500 litres of water to produce a kilo of cotton.



The Earth might seem like it has abundant water, but in fact less than 1% is available for human use. The rest is either salt-water found in oceans or frozen in the polar ice caps, or too inaccessible for practical usage. Oceans themselves hold 96.5% of all of earth's waters. While population and demand on freshwater resources are increasing every day, supply of water will always remain constant. The process of water cycle does continuously return water to Earth but it's not always returned to that same place, or in the same quantity & quality. The water footprint of meat from beef cattle (15400 cubic metre/ton as a global average) is much larger

than the footprints of meat from sheep (10400 cubic metre / ton), pig (6000 cubic metre/ton), goat (5500 cubic metre / ton) or chicken (4300 cubic metre/ton). The global average water footprint of chicken egg is 3300 cubic metre/ton, while the water footprint of cow milk amounts to 1000 cubic metre/ton.

अद्भिः सर्वाणि भूतानि जीवन्ति प्रभवन्ति च।
तस्मात् सर्वेषु दानेषु तयोदानं विशिष्यते॥ (महाभारत शान्तिपर्व दा० पा०)

[Translation: - On Earth every animal, organism or life forms earned its gift of life from water. Every life form fulfils & satisfies itself when gifted with water. Water has innumerable divine qualities and these qualities helps one to gain & satisfy even in afterlife. (The Shloka is from epic Mahabharata's Shantiparv chapter).]

No doubt - water is life, it's a life-giving force and 70% of our human body is water. Our blood is 92% water. A lot of fresh water sources are depleted or polluted every due to man-made Activities Both directly and indirectly via dumping of untreated sewage, industrial dumping, toxic leaking, oil leaks, pesticides-insecticides being washed away into the fresh water bodies, lakes or streams. No water means no life. Toxic water means poison for all life forms. In 2015, NASA's satellite data revealed that 21 of the world's 37 large aquifers are severely water-stressed. With growing populations, and increased demands from agriculture and industry, researchers indicated that this crisis is only likely to worsen. Even certain experts predict that World War - 3 will be fought on

the chief issue fresh water, its distribution and accumulation. "Disaster will strike India if governments do not heed the wake-up call. In India, the governments in combination with the corporate sector, are playing havoc with the five elements that constitute the earth, especially water. At the time of Independence, we had about 15 lakh water bodies spread across rural India, but since then, over 12 lakhs have been either encroached or polluted. The impact is being felt now with about 72% of aquifers drying up." said Magsaysay Awardee Rajendra Singh, who is also known as the 'Waterman of India'. So, its upto us to decide what kind of World we are leaving behind for our future generations. Research and investments should be done to develop better cutting-edge industrial & domestic waste recycling techniques, fresh-water conservation systems and intelligent sustainable use of water all across.

Gourab Mondal
Technician Apprentice RailTel Corporation of India Limited (RCIL)
Posted at Bharat Coking Coal Limited HQ

कोयला क्षेत्र

हम कोल खनिक, धरती की छाती चीड़ दिए।
बंद खदान को खुली खदान में बदल दिए।
धूलकण व कोलकण हवा में उड़ेल दिए।
संतुलित वातावरण, डगमगाने को मजबूर किए।
बृछ कटा वन उपवन उजड़ा और गई हरियाली।
कर्ज लिया उधार लिया, पर्यावरण हो गई खाली।
गड्ढा खोद पहाड़ बनाया हमने की मनमानी।
कोयला दे सम्मान दिया देश हुआ उजयाली।
आप बस एक कदम और बड़े नवनिर्मित पहाड़ हरियाली बने।
एक खनिक एक पेड़ लगे, पर्यावरण फिर बिहस पड़े।
वायु, प्राणवायु बने जल जीवन का आधार बने सदियों तक मानव का अंबार चले जड़ चेतन सब साथ चले।

महेश प्रसाद महतो
सब ऑर्डिनेट इंजीनियर(ई एन म)
एक के डब्ल्यू एम सी कतरास क्षेत्र बीसीसीएल

पेड़ का संरक्षण आवश्यक

सनातन संस्कृति में पेड़-पौधों की महत्त्व एवं पर्यावरण को ध्यान में रख वट, पीपल, बेल, तुलसी, आवला, शम्मी इत्यादि को ईश्वर तुल्य जान इन्हें पूजन पद्धति में शामिल कर संरक्षण देने की नियम रही है। पेड़ मानव जीवन, पर्यावरण और पारिस्थितिकी तत्व के लिए अत्यन्त महत्वपूर्ण है, जो इन बातों से पता चल जाता है। पेड़ प्रकृति का दिया अनुपम उपहार है।

1. पेड़ प्रकृति का दिया अनुपम उपहार है।
2. पेड़ हमें ईंधन, छाया, फल-फूल एवं औषधियाँ देता है।
3. औद्योगिकरण से उत्पन्न प्रदूषण से हानिकारक गैस को पेड़ ग्रहण कर बदले में शुद्ध प्राण वायु आक्सीजन देता है।
4. पशु-पक्षी का आहार और वसेरा पेड़-पौधा ही है।
5. तापमान को नियंत्रण करने में पेड़-पौधा सहयोग देती है।
6. पेड़ मिट्टी के कटाव और वहाव को रोकता है।
7. पेड़ पौधों की उपस्थिति वारिश में सहायक होती है। अनावृष्ट पर संतुलन बनाया जा सकता है।

औद्योगिकरण और विकास के नाम पेड़ की अंधाधुंध कटाई और बदले में वृक्षारोपण की नाम- मात्र खानापूर्ति करने से विराट असंतुलन पैदा कर मानवजीवन के लिए भयानक त्रासदी ला दी है। जिसका परिणाम धरती का तापमान में वृद्धि, बाढ़, अनावृष्ट देखने को मिल रही है।

कार्बन-डाइऑक्साइड और अन्य विषैली गैस को ग्रहण करनेवाली पेड़-पौधों की कटाई से ग्लोबल वार्मिंग आनेवाली पीढ़ी के लिए विकराल समस्या का इंतजार कर रही है। हिमखंड पिघल असमय बाढ़ का कारण नदियों में बन रही है। ओजोन परत का क्षय रोकने एवं अल्ट्रा-वायलेट किरणों से बचाने के लिए पेड़ हूँ कवच प्रदान करने का कारण बनाती है। यह मरुस्थली-करण को भी रोकता है।

पेड़-पौधों की संवर्धन और संरक्षण में सनातन धर्म की विचार ही श्रेष्ठ है। वेद-उपनिषद में भी कहा गया है कि एक वृक्ष लगाने से एक यज्ञ के बराबर पुण्य मिलता है। वृक्षारोपण अति पुण्यदायी माना जाता है।

मानव प्रकृति का अत्यंत दोहन कर पर्यावरण व अन्य जीव-जंतु के लिए समस्या उत्पन्न कर दिया है। वन का क्षय अधिक होने के कारण हिंसक पशु का आश्रय छीन जाने से मानव वस्ती में देखने-सुनने की घटना आए दिन होती रहती है।

आने वाले समय एवं भावी पीढ़ी को एक स्वस्थ पर्यावरण देने के लिए हम दृढ़ संकल्प लें कि प्रत्येक मानव एक वृक्ष लगा उसे पोषित व संवर्धन करें। यह हम उत्तरादायित्व व कर्तव्य समझ श्रद्धा, विश्वास, प्रकृति के लिए प्रेम, समर्पण से ही सफलता पा सकते हैं।

तो आइए, हम सब अपने कर्तव्य पथ पर डट जाए।

राजीव कुमार, सहायक प्रबंधक(खनन)
नोर्थ - साऊथ तीसरा ओसीपी, लोदना क्षेत्र,

Climate Change Diplomacy in Mining Industry

Introduction

Minerals are valuable natural resources and their mining is an important segment of the Indian economy. The minerals constitute the essential raw materials for many basic industries and are a major resource for development. The wide availability of the minerals provides a base for the growth and development of the country.

India is endowed with huge mineral resources of fuel, metallic and non-metallic minerals including minor minerals. The country produces as many as 95 minerals, which includes 4 fuel, 10 metallic, 23 non-metallic, 3 atomic and 55 minor minerals (including building and other materials).

In order to mine out the mineral, large land surface is destroyed removing the biodiversity and settlement. Huge amount of waste is disposed around the mining land, the air and water also gets polluted due to mining activity. Apart from these the mining sector is extremely energy-intensive and one of the major emitters of greenhouse gases (GHG). Total CO₂ emissions vary across the industry, largely depending upon the type of resource mined as well as the design and nature of the mining process. It is widely recognised that available mineral deposits are increasingly deeper and of declining ore grade. This will lead to growing demands for water as well as more mine waste generation, thereby raising energy consumption, and increasing the industry's climate footprint. After the mineral is excavated, the mined-out-land should be reclaimed for some useful purpose like creating a large water-body, developing forestry, agriculture or tourism. The mining of minerals like Lithium for energy storage, Uranium and other energy minerals, will increase in future, due to transition policy of coal to green renewables. In this respect India also imports huge quantities of minerals from different countries to meet its internal demand. The climate change impacts may disrupt the supply chain management of the minerals that will affect the whole economy and social structure. It may be recalled that Indonesian flood (2020, 2021) has affected all the countries, importing coal from it. Similarly the flood in a highly productive coal mine Dipka, SECL also impacted the internal supply in 2019, severely. Similarly in 2021 many other coal mines in India were also affected by flash flood, creating coal crisis all over the country.

This write-up on “Climate Change Diplomacy in Mining Industry” will elaborate the requirement of a foreign policy to maintain a constant and climate resilient stable supply of minerals from different countries as well as from indigenous sources.

Climate diplomacy calls for preparing appropriate risk assessment and risk management strategies at a global strategic level. Mining Industry can play a very important role in this global or national platform.

Climate Change Risk of the Mining Industry

The Mining industry is vulnerable to climate change. Changing climatic and environmental conditions will have both direct and indirect impacts on the mining sector. It will affect the operational activities, as well as the supply chain management which will further increase energy costs. These climate change risks may affect the investor confidence.

The mining sector plays an important role in the economic development of the regions and the countries as a whole. Very less information exists to find out the links between climate change and natural resource development in the developing countries, which are more vulnerable to climatic shifts. For example the mines lying near the coast may get affected due to increasing sea levels due to climate change. Therefore climate change should be better understood and may be incorporated in policy and strategic decision making.

Huge quantities and many mineral resources come from underdeveloped and developing countries which do not have infrastructure for adaptation of climate change. Therefore vigorous measures should be taken to ensure that supply chains are climate-resilient.

The CO₂ Footprint of Mining

The mining industry is one of the major CO₂ and other GHG emitter. Every mining operations are energy intensive. The processes of overburden removal, drilling, blasting, water pumping, hauling/lifting of minerals and wastes from the mining site to beneficiation plants, crushing and sizing, mineral beneficiation, ventilation of underground mines, etc requires huge electrical energy from thermal and diesel power plants. It is estimated that 1.0 Million Tonnes of coal produced, requires 400Tonnes of explosives, and consumes 74,000 tonnes of diesel and electricity usage. Moreover the coal seam emits methane (CH₄) gas in huge quantity. Another report says that 1.0 Million Tonnes of base metal ore requires 200Tonnes of explosives, consumes 32,000 tonnes of diesel and electricity usage. The energy requirement will be increasingly more for deep seated minerals in future. Therefore the industry should aim at identifying the energy intensive activities and make efforts reducing the consumption of energy from conventional sources and further making a way forward by using green energy.

Vulnerability of the Mining Sector to Climate Change

Relatively meagre knowledge exists on how climate change may impact mining operations and the extractives sector. Mining industry runs in open air and exposed to all weather conditions. In extreme weathers like excessive rains, heat or cold the mining operations get affected. In the recent past we have noted many mines are flooded due to unexpected cyclones, disrupted routes and excessive rains leading to flash floods. It takes months to dewater the mines and recover the machineries. This recovery of mines back to normalcy is high energy intensive and a non-profitable operation. The mines lying near coastal region are also affected due to rising sea levels. The mines lying in Artic region, desert regions or in isolated places also faces such uncertainties in future planning. As the mining industry plays a very important role in socio-economic development of the region, such climate change impact may affect the whole region. A determined industry-wide approach to climate change adaptation will increase investor confidence and therefore, impact insurance dynamics across the mining sector over the long-term. The industry and the supply chain will become climate change resilient with suitable policy and planning.

Mining and Development

Any national development requires minerals like building materials, metals, non-metals, fuel minerals, etc. Infra-structure like railways, roads, dams, power plants, housing, etc all need iron and steel, aluminium, copper, cement, sand, stones which are excavated from mines.

The main energy minerals like coal, petrol, diesel are extracted from oil mines. Development without exploiting these natural resources is unthinkable. Manufacturing of solar panels and the storage batteries also requires various minerals that will further enhance mining requirement. About 12% of the GDP is contributed by this sector. Therefore, there must be a robust regulatory conditions to maintain and improve social and environmental standards in and around the mines. In the absence of these preconditions, the development of mining industries may bring in hydra-headed environmental, social and climate change issues at various stages of the mining lifecycle. This may influence future development pathways and at times becomes irreversible. The mining and environmental laws in India are very elaborate and following these legal requirements will certainly slow the climate risks. The mining companies should adopt energy efficient means to reduce the climate change impact.

Supply Chain Risks and Security of Supply

Highly producing countries depends of continuous and stable mineral supply either from internal sources or through imports. Any change in supply chain may cause social, economic and geopolitical disruptions. Climate change will quadruple the effect on supply chain risks. These risks include disruptions caused by extreme weathers as well as political and policy risks, such as export bans and tariffs to promote domestic supply.

Requirement of Modification of Foreign Mineral Policy

- *Climate-Resilient Essential Minerals Policies and Supply Chain Management Strategies*

India produces many minerals and on the other hand imports quite a large number due to the increasing demand in the internal market. It is important that the country's foreign policy may incorporate a climate diplomacy with other countries. Attention is required with respect to the supplying countries which are vulnerable to climate change. In the recent past it is seen how a war between only two countries (Russia and Ukraine) have affected the economy of the whole world. It can be imagined about the havoc that may be created by the Mother Nature also, due to climate change. A few examples are provided below stating the percentage of the essential minerals (world-wide) supplied by some countries.

**China: • Antimoni 87 %, • Coking Coal 51 %, • Fluorspar 56 %, • Gallium 69 %, • Germanium 59 %, • Indium 58 %, • Magnesite 69 %, • Magnesium 86 %, • Natural Graphite 69 %, • Phosphate Rock 38 %, • REE (Heavy) 99 %, • REE (Light) 87 %, • Silicon Metal 56 %, • Tungsten 85 %*

**Russia: Platinum Group Metals 27 %.*

**Kazakhstan: Chromium 20 %.*

**USA: Beryllium 90 % • Borates 30 %.*

**Middle-east Countries: Crude Oil 31%*

It is recommended that our foreign policy may also incorporate a climate-resilient minerals policy and plan for security of supply management, with various countries as per their climate change prediction on impacts.

- *Augment Social and Environmental Standards in the Mining Industry*

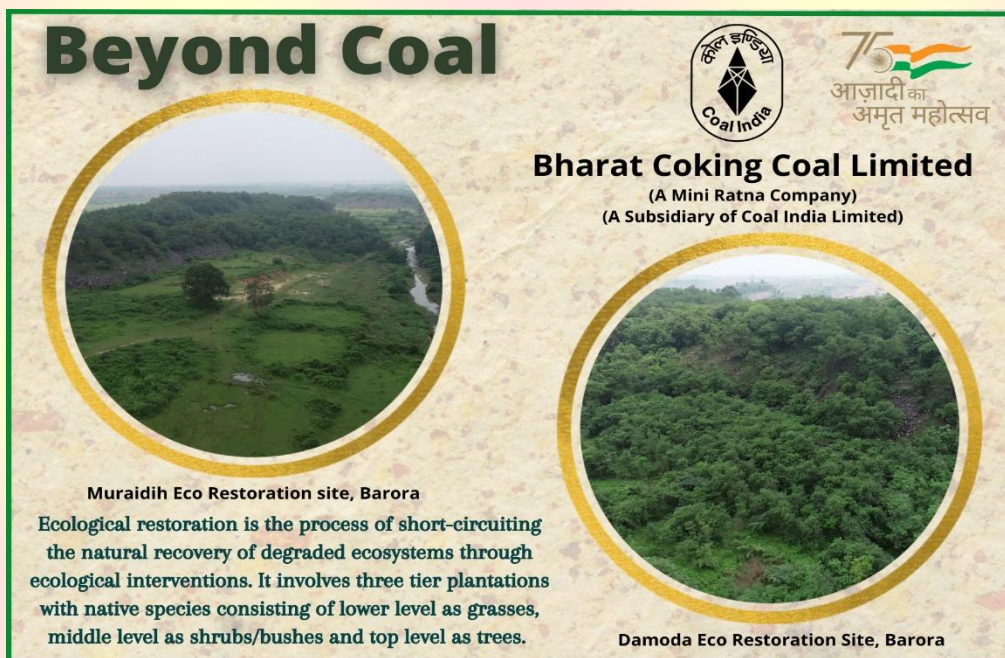
The importing countries may provide guidelines to the producing countries to improve the socio-economic standard of the mining areas and in the region, through climate change diplomacy. Implementation of ISO14001, ISO 45001, ISO 26000 may improve the environmental and social condition of the region and climate as a whole. If the countries operates to win the mineral resources and compete by lowering environmental and social standards, their security of supply will suffer as this will increase climate change risks and decrease resilience.

- **Promote National and Regional Dialogues on Responsible Mining**

The mining sector can contribute a lot to economic growth and development of the country– if responsibly managed. However, this development path is often accompanied by the risk of the resource depletion and conflicts with other sectors and population groups who feel that the negative impacts of mining far exceed its development impacts.

Dialogues, public consultations prior to decision-making, transparency, and early information can help to address some of these challenges. In India a statutory Public Hearing/Consultation is done before onset of mining as a part of Environmental Clearance. However, if the people are involved in the business process, environmental and social development and final mine closure there will be more transparency, public –private partnership and overall development of the region.

Prof. Biswajit Paul
Centre of Mining Environment, IIT(ISM), Dhanbad



Scope of Fly Ash Filling in Opencast Mines

As per the MINISTRY OF ENVIRONMENT, FOREST AND CLIMATE CHANGE NOTIFICATION, New Delhi, dated 31st December, 2021, **S.O. 5481(E)**, the following issues have been highlighted regarding the scope of fly ash filling in mines:

Responsibilities of thermal power plants to dispose fly ash and bottom ash

- (1) Every coal or lignite based thermal power plant (including captive or co-generating stations or both) shall be primarily responsible to ensure 100 per cent utilisation of ash (fly ash, and bottom ash) generated by it in an eco-friendly manner as given in sub-paragraph (2);
- (2) The ash generated from coal or lignite based thermal power plants shall be utilised only for the eco-friendly purposes, such as, filling of mine voids.

Every coal or lignite based thermal power plant shall be responsible to utilise 100 per cent ash (fly ash and bottom ash) generated during that year, however, in no case shall utilisation fall below 80 per cent in any year, and the thermal power plant shall achieve average ash utilisation of 100 per cent in a three years cycle the utilization of legacy ash shall be completed fully within ten years from the date of publication of this notification and will be over and above the utilisation targets prescribed for ash generation through current operations of that particular year

For the purpose of utilisation of ash

It shall be obligatory on all mines located within 300 kilometres radius of thermal power plant, to undertake backfilling of ash in mine voids or mixing of ash with external Overburden dumps, under Extended Producer Responsibility (EPR). All mine owners or operators (Government, Public and Private Sector) within three hundred kilometres (by road) from coal or lignite based thermal power plants, shall undertake measures to mix at least 25 per cent of ash on weight to weight basis of the materials used for external dump of overburden, backfilling or stowing of mine (running or abandoned as the case may be) as per the guidelines of the Director General of Mines Safety (DGMS):

Provided that such thermal power stations shall facilitate the availability of required quantity of ash by delivering ash free of cost and bearing the cost of transportation or cost or transportation arrangement decided on mutually agreed terms and mixing of ash with

overburden in mine voids and dumps shall be applicable for the overburden generated from the date of publication of this notification and the utilisation of ash in the said activities shall be carried out in accordance with guidelines laid down by the Central Pollution Control Board, Director General of Mines Safety and Indian Bureau of Mines.

As per notification, all mine owners are required to get mine closure plans (progressive and final) to accommodate ash in the mine voids and the concerned authority shall approve mine plans for disposal of ash in mine voids and mixing of ash with overburden dumps. However the disposal of ash in mines must comply with notification dated 07.01.2019. In the present notification, the onus for statutory clearances is shifted on mine operator that to within limited time period of 1 year considering mine safety & environmental hazards associated with densely populated areas such as Jharia Coal Field. exemption from application of this notification may be required.

Study works to be done:

The fly ash disposal will commence after the leachate characterization study and radio-tracer studies have satisfactory results certifying that fly ash disposal will not harm the surrounding environment including ground water in any way.

1. Ash Characterization & Leachability Study which will include Leachate characterization study and radio -tracer study for assessment of impact of disposal of fly ash on the surrounding environment on air, water, soil, flora & fauna. The parameters as per the table (Table-1) below is indicative of parameters against specific samples like ash leachability analysis, surface and ground water, soil and flora and fauna. Other impacts on air and water etc. will be as per standard impact assessment criteria including pre and post filling mine water quality including leachability of heavy metal.

2. Environmental Monitoring

A. Monitoring during Ash Disposal :

| Samples | Parameters to be analysed | Frequency |
|--------------|---|-----------------------------------|
| Ash Samples | Chemical Parameters(%): SiO ₂ , Al ₂ O ₃ , Fe ₂ O ₃ , K ₂ O, TiO ₂ , CaO, MgO, Na ₂ O, P ₂ O ₅ , SO ₃ Trace Elements (mg/kg, using TCLP Test): As, Ba, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Zn Radio-activity (Bq/kg): ²³⁸ U, ²³⁶ Ra, ²³² Th ²²⁸ Ra, ²³⁰ Pb, ⁴⁰ K, ¹³⁷ CS | Once before initiation and filing |
| Ash Leachate | Trace Elements (mg/kg, using TCLP Test): As, | Once in a year |

| | | |
|---------------------------|--|---|
| Analysis | Ba, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Zn | |
| Piezometer Water Samples | Chemical Parameters (mg/l, except, pH and EC): pH, EC, TDS, Total Alkalinity, Ca, Mg, Na, K, Cl, SO ₄ , NO ₃ , PO ₄ Trace Elements (mg/l): As, Ba, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Zn | Monthly |
| Mine Water Sample | Same as above | Monthly |
| Ground Water | Same as above | Twice a year – Pre monsoon and Post monsoon |
| Surface Water Samples | Same as above | Twice a year – Pre monsoon and Post monsoon |
| Soil Samples | Texture, type, pH & cation exchange capacity Trace Elements (mg/l): As, Ba, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Zn | Once a year |
| Survey of Flora and Fauna | <ul style="list-style-type: none"> • Listing of Flora (herbs, shrubs and trees) and Fauna (soil invertebrates and other animals) based on field observations and review of information available • Fauna Analysis of trace elements in plants (herbs shrubs and trees), the invertebrates • Analysis of trace elements in aquatic fauna from the mine void filled with fly ash. • Bio-accumulation and Bio-magnification | Once in 2 years |

B. Monitoring after Reclamation

| Samples | Parameters to be analysed | Frequency |
|---------------------------|--|---------------------------|
| Piezometer Water Samples | Chemical Parameters (mg/l, except, pH and EC): pH, EC, TDS, Total Alkalinity, Ca, Mg, Na, K, Cl, SO ₄ , NO ₃ , PO ₄ Trace Elements (mg/l): As, Ba, Cd, Co, Cr, Cu, F, Fe, Hg, Mn, Ni, Pb, Zn | Twice a year - Premonsoon |
| Ground Water | Same as above | Once a year - Premonsoon |
| Surface Water Samples | Same as above | Once a year - Premonsoon |
| Survey of Flora and Fauna | <ul style="list-style-type: none"> • Listing of Flora (herbs, shrubs and trees) and Fauna (soil invertebrates and other animals) based on field observations and review of information available • Fauna Analysis of trace elements in plants (herbs shrubs and trees), the invertebrates • Analysis of trace elements in aquatic fauna from the mine void filled with fly ash. • Bio-accumulation and Bio-magnification | Once in 5 years |

Dr. Santosh Kr. Behera, Scientist
CSIR-Central Institute of Mining and Fuel Research, Dhanbad

Compliances to be done by health care facility

Prerequisite

1. The Clinical Establishments (Registration and Regulation) Act, 2010 has been enacted by the Central Government to provide for registration and regulation of all clinical establishments in the country with a view to prescribe the minimum standards of facilities and services provided by Clinical Establishments. No clinical establishment can run unless it has been duly registered in accordance with the provisions of this Act. Every HCF shall obtain Certificate of Provisional Registration to work as Clinical Establishment under Section 15 of The Clinical Establishments (Registration and Regulation) Act, 2010 (Url: <http://clinicalestablishments.gov.in/AuthenticatedPages/Users/UserLogin.aspx>)
2. All Civil infrastructure must be established in HCF's like construction of Effluent Treatment Plant in Hospital etc. before applying for Statutory consents.

Statutory compliances

- **Consent to Operate**-For running the HCF, Consent to Operate (CTO) application has to be made JSPCB (Single window system i.e. advantage Jharkhand for new registration or Online consent management and monitoring system for already registered) for air and water under The Water (Prevention and Control of Pollution) Act, 1974 & The Air (Prevention and Control of Pollution) Act, 1981, however, CTO application has to be made for bedded facility only, hence not applicable for non-bedded HCF.
- **Bio Medical Waste Authorization**- for the generation, collection, reception, storage, transportation, treatment, processing, disposal or any other form of handling of Bio- Medical Waste (BMW) of HCF, application for Bio-Medical Waste Authorization has to be made in Online Consent Management and Monitoring System portal of Jharkhand State Pollution Control Board (JSPCB). The authorization shall be one time for non-bedded Health Care Facilities (HCFs). Fresh authorization is required if there is any change or variation in the activity.
- **Disposal facility**: Bio Medical waste generated in HCF should be disposed only with CBWTF (common bio-medical waste treatment facility) only except in exceptional cases like remote location and No occupier shall establish on-site treatment and disposal facility, if a CBWTF is available at a distance of 75 kilometre. (Agreement with authorised CBWTF is to be made for disposal of Bio Medical Waste). If a Healthcare facility has a pre-existing captive treatment and disposal facility prior to notification of BMW Rules, 2016, it is suggested that such HCFs shall stop operating captive facilities and become member of CBWTF, since operation of captive facility within HCF premises may have adverse effects on patients. However, in case a HCF wish to continue operation of its captive facility, they shall obtain necessary authorization from concerned SPCBs/PCCs. Bar- Code System for bags or containers containing bio-medical waste to be sent within or out the premises is to be established for disposal at CBWTF or captive treatment.
- **Forms to be filled for BMW**: Form –I (Accident Reporting), Form –II (Application for authorisation or renewal of authorisation-To be submitted by occupier of health care facility or common bio-medical waste treatment facility), Form –III (Authorisation- Authorisation for operating a facility for generation, collection, reception, treatment, storage, transport) & Form IV - Annual Report-To be submitted to the prescribed authority on or before 30th June every year for the period from January to December of the preceding year, by the occupier of health care facility (HCF) or common bio-medical waste treatment facility (CBWTF)
- **Monitoring**: To establish a system to review and monitor the activities related to bio-medical waste management, either through an existing committee or by forming a new committee and the Committee shall meet once in every six months and the record of the minutes of the meetings of this committee shall be submitted along with the annual report to the prescribed authority and the healthcare establishments having less than thirty beds shall designate a qualified person to review and monitor the activities relating to bio-medical waste management within that establishment and submit the annual report.

CONCEPT OF WINDBREAK AND VERTICAL GREENERY SYSTEM FOR DUST CONTROL IN A COAL MINES

Introduction:

Activities associated with coal mining such as drilling, blasting, loading, unloading, and haulage of materials result in the generation of dust. Loose materials lying on the road surface become airborne due to the action of wind or mechanical turbulence created by the moving vehicles. Coal and overburden dumps also contribute to fugitive dust due to wind erosion. In the case of a Thermal Power Plant or Cement Plant, the major dust generating sources are point sources, and engineering control systems such as Cyclone, ESP, Bag House Filter, etc. can be very well applied to achieve a control efficiency of over 90 %. Most of the dust generating sources in the case of coal mining are non-point sources such as haul roads (linear sources), coal dumps, overburden dumps, and open-pit (area sources). The engineering control system is not very effective for them as they are open to the air and subject to variation in atmospheric conditions. High wind velocity and hot dry atmospheric conditions cause an increase in fugitive dust generation at the source level. At the same time, high wind velocity and higher ambient temperature make the atmosphere unstable and result in higher dispersion of dust. During post-monsoon (October & November) and winter months (December to February), there is pressure for higher coal production to meet the target, and a corresponding increase in various activities associated with coal mining results in higher dust generation. During the post-monsoon and winter season, wind velocity and ambient temperature are lower than summer months resulting in lower dispersion of dust particulates and resulting in a higher concentration level of respirable (PM₁₀) and finer dust (PM_{2.5}) in ambient air. An increase in domestic coal burning during the same period also aggravates the problem. Due to the limitation of various control measures at the source level, it is proposed to introduce Windbreak (WB) and Vertical Greenery System (VGS) to reduce the generation of dust at the source level and arrest them after becoming airborne. WB reduces fugitive dust generation at the source level by reducing the wind speed whereas the VGS acts as a dust filter to remove the air-borne dust from moving in the downwind direction. Greenbelt/VGS is quite effective for ground-based sources during stable atmospheric conditions.

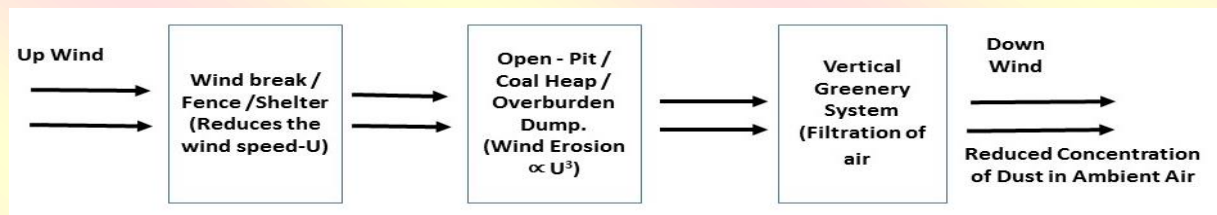


Fig. 1: Concept of Windbreak and Vertical Greenery System

Wind Break:

A windbreak is also known as a wind fence or wind shelter. It can reduce wind speed to a greater extent. The generation of dust due to wind erosion is proportional to wind speed cubed. Suppose a coal dump is contributing about 2000 kg of dust per month without the presence of windbreak around it. After providing a suitable wind fence, the wind velocity reduces to half of the original value, the same dump will generate about 250 kg per month of fugitive dust. It will result in a reduction in the wastage of coal as fugitive dust. It will also help in improvement in ambient air quality.

For the design of the layout of the windbreak, the following factors are required to keep in mind:

- (i) The height of the fence.
- (ii) The height of the materials to be sheltered.

- (iii) Wind conditions (prevailing wind speed & direction).
- (iv) Construction materials to be used for a windbreak.

Application of windbreak at a railway siding is shown as under:



Fig. 2: Windbreak around a railway siding

Vertical Greenery System (VGS):

Plants growing directly on or with the support of a plant guiding structure are called a vertical greenery system (VGS). It's the outcome of vertical greening with plants rooted in the ground, in the wall material itself, or in the modular panels that connect to the building's portico to cover it with plants. Woody or herbaceous climbers, algae, lichens, and small shrubs are commonly used in the green portico. These plants can be planted directly in the ground, in pots, planter boxes, or in other structures that will help the plants to fix themselves. Plants having an APTI (Air Pollution Tolerance Index) greater than 17 can be utilized to generate VGS. The air pollution tolerance index (APTI) is based on ascorbic acid, relative water content, total chlorophyll, and leaf extract pH. These are the four main biochemical features of leaves. The formula was used to calculate APTI, which is an empirical number for a plant's tolerance threshold to air pollution. The formula for calculating



Fig. 3: Vertical Greenery

$$\text{APTI is } \text{APTI} = \{[A (T+P)]+R\}/10$$

Where,

A is Ascorbic acid in mg/g

T is total chlorophyll in mg/g

P is the pH of the extract from the leaf,

R is the water content of the leaf extract



Ipomoea cairica



Antigonon leptopus



Clerodendrum splendens



Thunbergia grandiflora

Quisqualis indica

Aristolochia elegans

Fig. 4: Photographs of the identified creeper species



Vernonia laevis

Petreavolubilis

Adenocalymma comosum

Fig. 5: Photographs of the identified creeper species

Use of Low-Cost Materials for Design of VGS:

Nylon net tied to bamboo poles can be effectively used as a low-cost option for the development of VGS in the coal mining areas where the chances of theft of steel structures exist.

Conclusion:

Due to the limitation of various control measures at the source level, it has been proposed to introduce Windbreak (WB) and Vertical Greenery System (VGS) to reduce the generation of dust at the source level and arrest them after becoming airborne. WB reduces fugitive dust generation at the source level by reducing the wind speed whereas the VGS acts as a dust filter to remove the air-borne dust from moving in the downwind direction.



Fig.6: Photograph of Nylon Net used as support for developing VGS

[Note: The present paper is an Extract of the paper already published in the Minetech, CMPDI]

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SOURCE APPORTIONMENT STUDY AT BCCL

Urban air pollution is a notable concern across the world. Inferring to the rapid rates of industrialization and urbanization in Indian cities, polluted air quality is considered a key factor in crumbling the quality of life with an adverse effect on the human being. Hence air quality gained a significant role in recent decades since it is worsened by emission from major pollutants including particulate matter (PM₁₀ and PM_{2.5}), NO₂, SO₂ and O₃ were found to exceed the national ambient air quality standard limits.

Particulate pollution is a major concern in the field of air pollution. The particulate matter in the air result from dispersion of dust from industrial (mining and non-mining) and allied activities, transportation, local vehicular movement and domestic fuel (Coal, wood-burning etc.) burning. Assessment of the air quality can provide useful insight for the development of the air quality management plan. The database developed on air quality also helps the regulatory agency identify the locations where natural resources and human health could be at risk. Various sources contribute to high particular matter concentration in the Jharia region: vehicles, mining activities, re-suspended dust, fugitive emissions, fuel oils, household LPG. The percentage contribution of these factors in the ambient depends exclusively on a particular region's economic activities. To improve the existing ambient air quality, the major sources of PM emissions first need to be identified.

BCCL conducted Source apportionment study of ambient air particulate matter in the Jharia coalfields region to quantify the various sources of PM emissions and suggest an effective environmental management plan through through National Environmental Engineering Research Institute (NEERI), Nagpur. The report is shared with the state pollution control board so that coordinated efforts can be made for minimizing the pollution level.

As per the report, the coal mining industry actually contributes to

- 6-8% of pm₁₀ (particulate matter smaller than 10 microns) and
- 5-7% of pm_{2.5} (particulate matter smaller than 2.5 microns) levels only.

The receptor modelling (CMB) results (Figure 4.3) revealed that the transport sector and domestic combustion are the predominant emission sources contributing to the receptor levels. During the summer season, the contribution of the transport sector was found maximum in both PM₁₀ (23%) and PM_{2.5} (30%) followed by the contribution of domestic combustion (17% and 23% for PM₁₀ & PM_{2.5} respectively). While in the winter season, the contribution of domestic combustion outruns the contribution of the transport sector. During the winter season, domestic combustion has contributed 22% (PM₁₀) and 28% (PM_{2.5}) whereas the transport sector has contributed 16% (PM₁₀) and 21% (PM_{2.5}) of the total emission. After transport sector and domestic combustion, Industrial emission (12% of PM₁₀ emission) and Road Resuspension (12% of PM₁₀ emission) followed by Coal mining activity and secondary inorganic aerosol formation (both 8%) are contributing majorly to PM₁₀ emission at receptor during the summer season. In PM_{2.5} source contribution, secondary inorganic aerosol formation contributed majorly (16% & 15% in summer and winter seasons respectively) after domestic combustion and transport sector. Secondary inorganic aerosol formation from precursors (SO₂ and NO₂) enhances the pollution burden over the vicinity. Biomass burning, the presence of metal traces (Fe, Al, Mn, Zn, Cr etc.) from vehicular or industrial emission play a key role to neutralise the

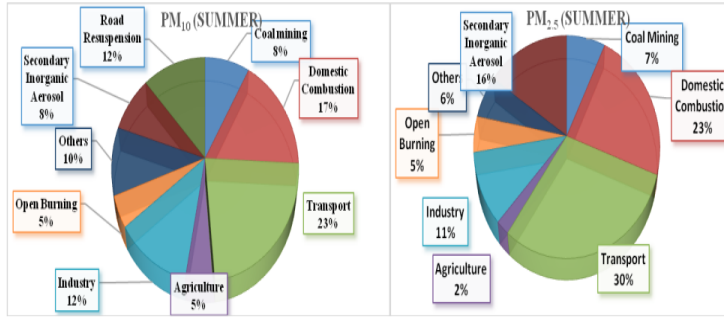


Figure 4.2: Source contribution at receptor locations of PM₁₀ and PM_{2.5} in summer

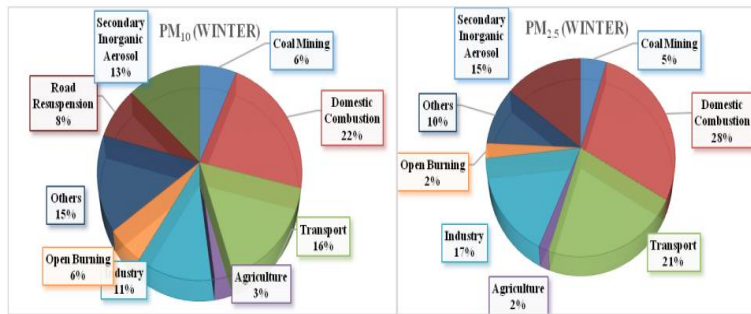


Figure 4.3: Source contribution at receptor locations of PM₁₀ and PM_{2.5} in winter

oxides of nitrogen and sulphur and thus raises the amount of secondary inorganic aerosols in the atmosphere. Industrial activity contributed 12% and 11% of total PM₁₀ load in summer and winter respectively but in the case of finer dust (PM_{2.5}), it contributed 17% in the winter season at the receptor level. This may be due to the calm winter conditions that allow finer dust (PM_{2.5}) to settle near to ground than that of summer conditions that allow more turbulence mixing in the atmosphere.

Road re-suspension of dust contributes significantly in PM₁₀ load at receptor both in summer (12%) and in winter (8%). As these are larger and heavier particles, they contribute to PM₁₀ fraction and are not found in PM_{2.5} fraction at the receptor. After the contribution of the industrial sector, coal-mining activity contributed around 8% and 6% of the total PM₁₀ receptor dust load during summer and winter respectively. In the case of PM_{2.5} dust load at the receptor, coal-mining activity contributed 7% and 5% during summer and winter respectively. From the results and analysis of receptor modelling, it can be summarised that mitigation and abatement of the emissions from domestic combustion and transport sector alone may reduce receptor dust load by 40% (approx.)



Figure 2.3: (a) and (b) represents emission load from various sectors over JCF region for PM₁₀ and PM_{2.5} respectively

NEERI Nagpur has provided various recommendation for improvement of Air Quality for all the stakeholders in and around Jharia Coal fields. Adequate dust control measures should be in place, like mechanized sweeping, water sprinkling or mist spraying systems on the haul roads and at loading sites. Long-range misting or fogging canons are also should be in place. The project proponent might consider installing conveyor systems for transporting the coal from the coal handling plant to the railway siding or to the nearest thermal power plant (if feasible). A sufficient number of plants should be planted around the mine pit to arrest the movement of

particulate matter or dust into the surrounding areas The local authority should stress sustainable

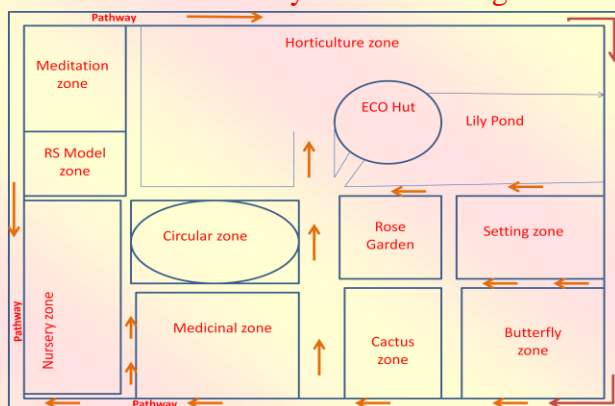
and affordable public transport keeping clean air goals in mind. Frequent (time to time) arrangement of campaign/awareness programmes for lawmakers, stakeholders, health professionals, academicians to brainstorm about the future scenario and importance of clean air.

The vehicular sector in cities has been seen to be a major source of gaseous and fine particulate matter. The action plan for this sector would need a combination of efforts: Vehicle inspection and maintenance: Enforce mandatory checks and repairs for vehicles. Improved public transport: Encourage a shift from private passenger vehicles to public transport. Set up a mechanism of Inspection and Maintenance programme for all vehicles in the district through RTO with automated system assessment. The Inspection & Maintenance (I & M) centre shall also test all vehicles for their inbuilt emission tests. All commercial vehicles should be phased out after 8 years of age or subjected to two years extension after rigorous I&M tests. All private vehicles should be subjected to proper assessment and fitness tests through I&M centres. All autos and buses shall also be subjected to I&M tests. Dhanbad city does not have a designated place for truck parking and maintenance related activities. A separate designated place should be allocated to prevent illegal parking and repair shops on the roads and kerbside. Dhanbad city does not have a designated place for Auto-rickshaw. A separate designated place should provide to prevent traffic congestion and control vehicle emission. Major haul trucks with heavy loads should not pass through the main city. The plan being made should be implemented in the next 1-1.5 years. Overloading is a common phenomenon in the region resulting in poor road quality. This can be avoided through online checking when vehicles leave industries with a guarantee that the vehicle is not carrying more material than its designated loads.

Area sources are mainly domestic sources of fuel (coal, wood, kerosene, LPG) burning, trash/MSW combustion, bakeries, hotels/restaurants etc. and re-suspension of dust. Based on the survey and assessment, the following recommendations emerge: 1. Construction and demolition of buildings in the urban area give high local dust contribution resulting health problems. These practices need to follow compliance guidelines to reduce emissions. Road and pavement should be well constructed to suppress road dust. The standard specifications and code of practice for road construction should be followed and implemented as per the Indian Road Congress (IRC) guidelines or international standard guidelines. Strategically placed green cover in urban and semi-urban areas can help to improve local air quality. Manage agricultural residues, including strict enforcement of bans on open burning. Strictly enforce bans on the open burning of household waste. Use clean fuels – electricity, natural gas, liquefied petroleum gas (LPG) in cities, and LPG and advanced biomass cooking and heating stoves in rural areas; substitution of coal by briquettes. Use incentives to improve the energy efficiency of household appliances, buildings, lighting, heating and cooling; encourage roof-top solar installations Promote the use of electric vehicles. Encourage centralized waste collection with source separation and treatment, including gas utilization. There is a substantial population that also uses available coal. These houses could be given a combination of improved chulla or free/subsidised power for cooking purposes. Hotels and dhabas need to be educated and compulsorily asked to use LPG for its cooking purposes. The trash and MSW burning is very common. Some of the places contain a mix of plastics and thermocol. The combustion of these materials is very harmful to human health. Coal depot pollution is due to open storage and unregulated buying, selling and transportation. These coal depots are responsible for nearby air pollution peaks. However, the contribution of the same need to be assessed.

Panchwati Ecopark, Koylanagar, BCCL – The Vernacular Space to Visit.

BCCL Panchwati Ecopark, Koylanagar is one of the finest examples of ecological restoration and biological reclamation, based on a degraded land and now converted into a lush green park with various facilities and which rich floral diversity. A place to rejuvenate and be with nature developed by Environment Department BCCL. Filled with more than 200 different species of grasses, herbs, shrubs and trees of both native as well exotic type is a great combination of horticulture and eco-restoration. The students of DSMU & RU, Ranchi took the rigorous and challenging task of naming (scientific nomenclature) of almost all the flora present at the Ecopark. The Identification of various species of plants and trees has been done by AI based Google Lens.



Zone wise taxonomy is tabulated hereunder:

I. ECOHUT

a. Hanging plants

| S.no | Common name | Botanical name | No. |
|------|--|---------------------------|-----|
| 1 | Bone setter plant | Cissus quadrangularis | 2 |
| 2 | Creeping inchplant (Turtle vine) | Callisia repens | 3 |
| 3 | Inchplant | Tradescantia zebrina | 1 |
| 4 | Purple heart | Tradescantia pallida. | 2 |
| 5 | Spider plant | Chlorophytum comosum | 3 |
| | Cotton candy fern | Nephrolepis exaltata | |
| 6 | Creeping charlie | Pilea nummulariifolia | 1 |
| 7 | Fern | Nephrolepis cordifolia | 2 |
| 8 | Monarch fern | Phymatosorus scolopendria | 1 |
| 9 | | Syngonium podophyllum | 1 |
| 10 | Arrowhead plant | Yucca aloifolia | 1 |
| 11 | Dagger plant | Tradescantia spathacea | 1 |
| 12 | Moses in the cradle plant (Oyster plant) | Syngonium podophyllum | 1 |
| 13 | Arrowhead plout (Different colour). | | 2 |

b. Pot plants

| S.no | Common name | Botanical name | No. |
|------|--------------------------|---------------------------|-----|
| 1 | Pineapple dracanea | Dracanea purple compacta | 2 |
| 2 | Purslane | Portulaca oleracea | 4 |
| 3 | Monarch fern | Phymatosorus scolopendria | 1 |
| 4 | Banyan tree | Ficus altissima | 2 |
| 5 | Arrowhead plant | Syngonium podophyllum | 1 |
| 6 | Gully fern | Preumatopteris pennigera | 1 |
| 7 | Purple heart | Tradescantia pallida | 1 |
| 8 | Creeping inchplant | Callisia repens | 1 |
| 9 | Dumbcane | Dieffenbachia seguine | 1 |
| 10 | Peepal tree (sacred fig) | Ficus religiosa | 1 |
| 11 | Holy Basil (Tulsi) | Ocimum tenuiflorum | 1 |

II. MEDICINAL ZONE

| S.no | Common name | Botanical name | No. |
|------|---------------|-------------------------|-----|
| 1 | Sjambok pod | Cassia abbreviata | 4 |
| 2 | Snake plant | Dracaena trifasciata | 30 |
| 3 | Life plant | Kalanchoe pinnata | 42 |
| 4 | Tulsi | Ocimum tenuiflorum | 32 |
| 5 | Curry tree | Murraya koenigii | 11 |
| 6 | Touch me not | Mimosa pudica | - |
| 7 | Aloevera | Aloe barbadensis miller | 14 |
| 8 | Shell ginger. | Alpinia zerumbet | - |
| 9 | Galangal | Alpinia conchigera | - |
| 10 | Mandrinette | Hibiscus fragillis | 5 |
| 11 | Henna | Lawsonia inermis | 8 |
| 12 | Lemon grass | Cymbopogon citratus | - |
| 13 | Sago palm | Cycas pectinata | 1 |
| 14 | Indian bael | Aegle marmelos | 7 |
| 15 | Tej patta | Cinnamomum tamala | 2 |
| 16 | Jamun | Syzygium cumini | 7 |
| 17 | Amla | Phyllanthus emblica | 12 |
| 18 | . Lemon | Citrus limon | 8 |
| 19 | Ajwain | Coleus amboinicus | 6 |
| 20 | . Karanj tree | Milletia pinnata | 17 |
| 21 | Sindwar tree | Vitex negundo | 7 |
| 22 | Patharchur | Coleus barbatus | - |
| 23 | Chhatni tree | Alstonia scholaris | 1 |
| 24 | Nagfani | Opuntia cacti | - |
| 25 | Neem | Azadirachta indica | 5 |
| 26 | Kachnar tree | Bauhinia purpurea | 6 |
| 27 | Umbrella tree | Schefflera actinophylla | 1 |

III. SITTING + HORTICULTURE ZONE

| S.no | Common name | Botanical name | No. |
|------|--------------------------|---------------------|-----|
| 1 | Amla (Indian gooseberry) | Phyllanthus emblica | 2 |
| 2 | Lemon tree | Citrus limon | 2 |
| 3 | Guava tree | Psidium guajava | 6 |
| 4 | Mango tree | Mangifera indica | 4 |
| 5 | Indian bael | Aegle marmelos | 5 |
| 6 | Papaya | Carica papaya | 1 |

IV. CIRCULAR GARDEN

| S.no | Common name | Botanical name | No. |
|-----------------------|--|--|-----|
| 1 | Garden croton | Codiaeum variegatum | 40 |
| 2 | Ming Aralia | Polyscias fruticosa | 67 |
| 3 | Tasmania flax-lily | Dianella tasmanica | - |
| 4 | Arrowhead plant | Syngonium podophyllum | 41 |
| 5 | Song of India plant | Dracena reflexa | 75 |
| 6 | Chinese croton | Excoecaria cochinchinensis | 52 |
| 7 | a) Striped barbados lily b) Garden croton | Hippeastrum striatum Codiaceum variegatum | 20 |
| 8 | Jasmine shrub | Jasminum officinale | 31 |
| 9 | Peace lily | Spathiphyllum wallisii | 21 |
| 10 | Traveller's palm tree | Ravenala madagascariensis | - |
| 11 | | Hedera helix | 2 |
| Outside circle | | | |
| 11 | Common ivy | Phoenix dactylifera | 1 |
| 12 | Date palm | Eucalyptus globulus labill | 4 |
| 13 | Eucalyptus | Hibiscus rosa-sinensis | 2 |
| 14 | Arhul | | 1 |

V. SITTING ZONE

| S. no | Common name | Botanical name | No. |
|-------|--------------------------|-------------------------|-----|
| 1 | Amrud | Psidium sp. | 3 |
| 2 | Kachnar tree | Bauhinia variegata | 3 |
| 3 | Rose | Rosa sp. | 46 |
| 4 | Money plant | Epipremnum aureum | 2 |
| 5 | Areca palm | Dypsis lutescens | 7 |
| 6 | Corn cane plant | Dracaena massangeana | 1 |
| 7 | Sago palm | Cycas revoluta | 1 |
| 8 | Hibiscus | Hibiscus rosa-sinensis | 1 |
| 9 | Australian umbrella tree | Schefflera actinophylla | 40 |
| 10 | Karaveera | Nerium zindicum | 1 |
| 11 | Guava | Psidium guajava | 2 |

Hanging pots in the pole (Sitting zone)

| S.no | Common name | Botanical name | No. |
|------|-----------------|-----------------------|-----|
| 1 | Arrowhead plant | Syngonium podophyllum | 1 |
| 2 | Spider plant | Chlorophytum comosum | 1 |
| 3 | Aparajita | Clitoria ternatea | 1 |
| 4 | Purple heart | Tradescantia pallida | 1 |
| 5 | Rosemary | Salvia rosmarinus | 1 |
| 6 | Spineless yucca | Yucca gigantea | 1 |

VI. MEDITATION ZONE

| S.no | Common name | Botanical name | No. |
|-------|--------------------|--------------------|-----|
| 1 | Crown-of-thorns | Euphorbia milli | 11 |
| 2 | Mauritius hemp | Furcraea foetida | 24 |
| 3 | Verschaffelt agave | Agave potatorum | 4 |
| 4 | Bunny ears cactus | Opuntia microdasys | 4 |
| 5 | Mottled spurge | Euphorbia lactea | - |
| Model | Guava | Psidium guajava | 3 |

IX. BAMBOO FENCING

| S.no | Common name | Botanical name | No. |
|------|-----------------|------------------|-----|
| 1 | Oldham's bamboo | Bambusa oldhamii | 43 |

VII. BUTTERFLY ZONE

| S.no | Indian bael | Aegle marmelos | 5 |
|------|-----------------|----------------------------|----|
| 1 | Guava | Psidium guajava | 6 |
| 2 | Lemon | Citrus limon | 1 |
| 3 | Peepal | Ficus religiosa | 1 |
| 4 | Mango | Mangifera indica | 4 |
| 5 | Camel foot tree | Bauhinia purpurea | 1 |
| 6 | Snake plant | Dracaena trifasciata | 44 |
| 7 | Lemon grass | Cymbopogon sp. | 60 |
| 8 | Jackfruit | Artocarpus heterophyllus | 1 |
| 9 | Neem | Azadirachta indica | 2 |
| 10 | Chikoo | Manilkara zapota sapodilla | 1 |
| 11 | Mango | Mangifera indica | 2 |
| 12 | Moneyplant | Epipremnum aureum | 1 |
| 13 | Jackfruit | Artocarpus heterophyllus | 1 |
| 14 | Neem | Azadirachta indica | 1 |
| 15 | Eucalyptus | Eucalyptus | 2 |

VII. CACTUS ZONE

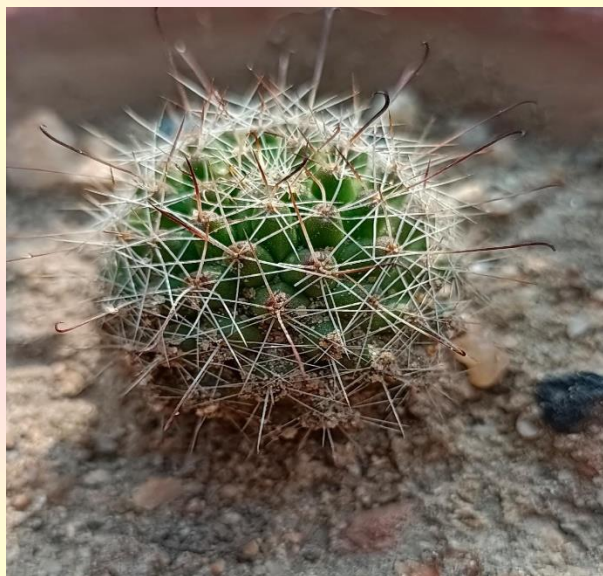
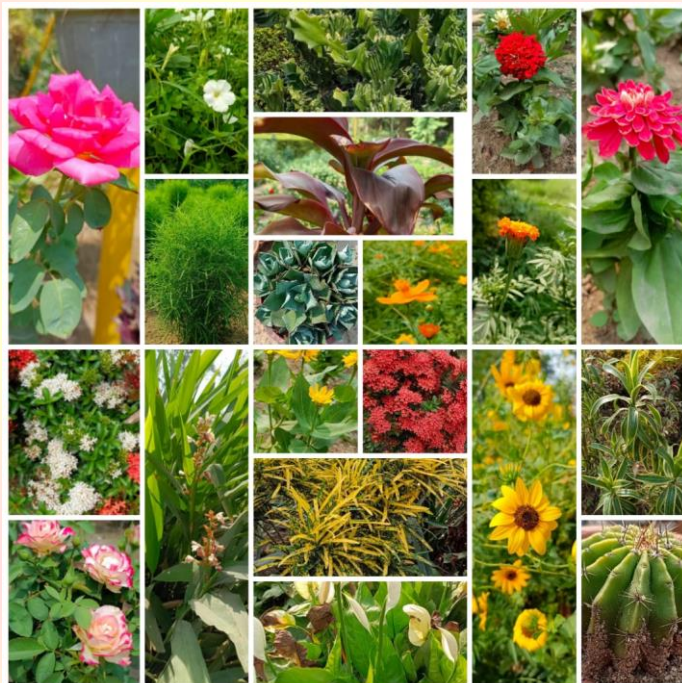
| S.no | Common name | Botanical name | No. |
|------|---------------------|-------------------------|-----|
| 1 | Peruvian apple | Cereus repandus | 9 |
| 2 | Barbary fig | Opuntia ficus-indica | 27 |
| 3 | Cowhorn agave | Agave bovicornuta | 6 |
| 4 | Snake plant | Dracaena trifasciata | 85 |
| 5 | Sago palm | Cycas revoluta | 1 |
| 6 | Florist Kalanchoe | Kalanchoe blossfeldiana | 2 |
| 7 | Pencil cactus | Euphorbia truncalli | 12 |
| 8 | Tiger fern | Nephrolepis exaltata | 1 |
| 9 | Spider plant | Chlorophytum comosum | 1 |
| 10 | Moses in the cradle | Tradescantia spathaceae | 1 |
| 11 | Spineless Yucca | Yucca gigantea | 1 |
| 12 | Hechtia | Hechtia glauca | 1 |
| 13 | Veld grape | Cissus quadrangularis | 1 |
| 14 | Teak | Tectona grandis | 2 |
| 15 | Neem | Azadirachta indica | 1 |

VIII. LILY POND

| S.no | Common name | Botanical name | No. |
|------|---------------------|------------------------|-----|
| 1 | Willow | Salix miyabaena | - |
| 2 | Shoeblack plant | Hibiscus rosa | 12 |
| 3 | Moses in the cradle | Tradescantia spathacea | 100 |
| 4 | Purple heart | Tradescantia pallida | 5 |
| 5 | Bottlebrushes | Callistemon acuminatus | 1 |
| 6 | Fig | Ficus racemosa | 4 |
| 7 | Jasmine tree | Holarrhena pubescens | 1 |
| 8 | Dumar tree | Ficus racemosa | 4 |

Along the Boundary

| S.no | Common name | Botanical name | No. of trees |
|------|---------------|-------------------|--------------|
| 1 | Teak | Tectona grandis | 5 |
| 2 | Yellow cassia | Senna siamea | 4 |
| 3 | Kachnar | Bauhinia purpurea | 5 |
| 4 | Acacia | Acacia sp. | 3 |
| 5 | Red Maple | Acer rubrum | 4 |
| 6 | Eucalyptus | Eucalyptus sp. | 2 |



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Ranchi University**



धरती का सुलगता मन..!!

पडयंत्र रचा किसने,, धरा पर हुआ प्रकोप
वृक्ष जड़ से उखड़ रहे,, रहे हम नन्हें पौधे रोप
जल रहा जंगल सारा,, हरियाली हो रही लोप।।

आखिर कब तक
सहेगी धरती दर्द!

इन उन्मादों का
कहीं खुल न जाये त्रिनेत्र उसके
और जल न जाये ये वन उपवन,,
कहीं आ न जाये प्रलय
कहीं खो न जाए हरियाली
कहीं खो न जाओ मानव तुम इस पृथ्वी से!!
प्लास्टिक के थैले में
घुल रहे हैं वजूद उसके
ऐ मानव!
सुलग रहे हैं सारे कानून
धरती के सीने में!!

मौन है वह,, तुम्हारी विलुप्तता तक चुप है वो
चेत जाओ वरना,, धरती लोप हो जायेगी!!

करबद्ध खड़ा है अब भी वो
करता है विनय निवेदन
डाली डाली पत्ता पत्ता
मेरा तुझको अर्पण
फूल फल अब दे नहीं सकता
न ही फलों से लदेगी डाली
न पक्षियों का कलरव होगा
न होगी छायादार वादी
इसलिए
हे मानव!
स्वयं के जीवन की खातिर
तू कर वृक्षारोपण!!
हर उपवन का हो संरक्षण....।

रिंकू दुबे, राजभाषा विभाग



CMD, BCCL receiving the second prize for Environment Management in Coal India



Environment Department, BCCL representing in Vigyan Sarwatra Pujiyate in CIMFR



Presentation given by Sri Kumar Ranjeev, HoD(Env) in city level conference on clean air

भाषा और जैव विविधता में सह संबंध

युवाल नोआ हरारी की प्रसिद्ध पुस्तक सेपियंस: मानव जाति का संक्षिप्त इतिहास में मानव की उत्पत्ति के विषय में पढ़ने से ज्ञात हुआ कि करीब 2 लाख साल पहले आधुनिक होमो सेपियंस की उत्पत्ति हुई। करीब एक लाख साल पहले मनुष्यों की आबादी करीब एक लाख थी और वे मुख्यतः अफ्रीकी देशों में सीमित थी। करीब 70-80 हजार साल पहले अंतिम हिमयुग के दौरान मनुष्यों ने अफ्रीका से पलायन शुरू किया। समुद्र का जलस्तर बढ़ने पर संभवतः वे लाल सागर को पार कर अरब में पहुंच गए।

यहां से वे संपूर्ण एशिया में पहुंच गए। सबसे पहले वे दक्षिण एशिया में पहुंचे और 60-70 हजार साल पहले पूर्वी एशिया में पहुंच गए। कालांतर में दक्षिणपूर्व एशिया और ऑस्ट्रेलिया में पहुंचने में वे कामयाब रहे। बाद में दुनिया भर के महाद्वीपों में उनकी पहुंच हो गई। इस पलायन से पहले अफ्रीका में रहते हुए इन मानवों ने बहुत से औजार, खुद को सजाना, समुद्र से खाना खोजना आदि सीख लिया था। माना जाता है कि यही वह समय रहा हो जब भाषा, कला और संस्कृति विकसित हुई। पलायन के दौरान वे इन्हें साथ लेकर गए। दुनियाभर में छोटे-छोटे समूहों में फैलने बाद इनका तेजी से विकास हुआ जिससे भाषायी और सांस्कृतिक विविधता समूचे विश्व में फैल गई।

धीरे-धीरे भाषा मानव जीवन में सर्वाधिक महत्वपूर्ण बन गयी। भाषा की ही वजह से मनुष्य और अन्य जीव जंतुओं में स्पष्ट अंतर हुआ। हजारों वर्षों के ज्ञात मानव इतिहास में मनुष्य के साथ ही उसकी भाषाओं का भी विकास हुआ। इस विकास क्रम में मनुष्य की संपूर्ण प्रगति, ज्ञान और अनुभवों को भाषा के ही माध्यम से दर्ज किया गया है। जैसे-जैसे मानव का विकास होता गया, वैसे-वैसे ही पृथ्वी पर जैव विविधता भी बढ़ती गयी। मनुष्य ने अपने अनुकूल व्यवस्थाएं अच्छे जैव-विविधता वाले क्षेत्रों में ही पायीं। जैव विविधता का तात्पर्य ही है पौधों, जीव-जंतुओं में पाई जाने वाली अलग-अलग प्रकार की विशेषताएं। हमें आज जो जैव विविधता दिखायी देती है, उसे अरबों वर्षों के विकास और परिवर्तन ने आकार दिया है। इसमें सबसे छोटे बैक्टीरिया से लेकर विशालतम वृक्ष, विशालतम जानवर या मनुष्य भी सम्मिलित है।

अगर मानव विज्ञान के परिप्रेक्ष्य में विश्व के भौगोलिक एटलस का अध्ययन किया जाए तो यह देखना बड़ा ही रोचक हो जाता है कि विश्व में उन्हीं क्षेत्रों में सर्वाधिक भाषाएं प्रयोग की जाती हैं, जहाँ भरपूर जैव विविधता है। इस संबंध में भाषा विज्ञानी कहते हैं कि यह महज एक संयोग नहीं है, बल्कि भाषाओं और जैव विविधता में आश्चर्यजनक समानता है। विभिन्न अध्ययनों से यह साबित हुआ है कि जब भाषा के अस्तित्व पर संकट आता है तो उस क्षेत्र की जैव विविधता भी खतरे में पड़ जाती है। इसके साथ ही यह भी देखा गया है कि यदि किसी क्षेत्र की भाषा समृद्ध होती है तो वहाँ की जैव विविधता भी बढ़ती है। अतः दोनों का उत्थान और पतन साथ-साथ ही होता है। जैव विविधता से परिपूर्ण क्षेत्रों में भाषायी विविधता भी सबसे अधिक पाई जाती है।

ऑस्ट्रेलिया के पास स्थित पपुआ न्यू गिनी दुनिया का सर्वाधिक जैव विविधता वाला क्षेत्र है। यहाँ पर दुनिया में सबसे अधिक 840 भाषाएं पाई जाती हैं। पपुआ न्यू गिनी करीब 4.62 लाख वर्ग किलोमीटर में फैला ऐसा देश है जिसके आधे से अधिक हिस्से (2.78 लाख वर्ग किलोमीटर) में केवल वर्षा वन हैं। यहाँ वर्ष में 1,000-10,000 मिलीमीटर तक बारिश होती है। अगर भारत से इसकी तुलना की जाए तो राजस्थान और छत्तीसगढ़ से संयुक्त क्षेत्रफल (4.77 लाख वर्ग किलोमीटर) से भी कम और विश्व के एक प्रतिशत क्षेत्रफल वाले इस देश में दुनिया की पांच प्रतिशत जैव विविधता है।

भाषाओं और जैव विविधता के संबंध को समझने के लिए मानव विज्ञानी और भाषा विज्ञानी इस पर तीन अलग-अलग दृष्टिकोण से विचार करते हैं और तीन दृष्टिकोण है- जैव विविधता, सांस्कृतिक विविधता और भाषायी विविधता। भाषा, संस्कृति और पर्यावरण एक-दूसरे से घनिष्ठ रूप से जुड़े हुए हैं, पिछले लगभग 80 हजार वर्षों में प्रकृति और स्थानीय पर्यावरण के संपर्क में आकर ही हजारों संस्कृतियां और भाषाएं विकसित हुई हैं। प्रसिद्ध

मानव विज्ञानी माफ़ी स्पष्ट तौर पर मानती हैं कि जिस प्रकार मनुष्य अपने अस्तित्व के लिए जैव विविधता और पारिस्थितिक तंत्र पर निर्भर है, उसी प्रकार जैव विविधता और पारिस्थितिक तंत्र भी अपने अस्तित्व के लिए मनुष्य के क्रियाकलापों पर आश्रित हैं। हर जगह स्थानीय पर्यावरण लोगों को जिंदा रखता और बदले में लोग भी भाषा में संरक्षित अपने परंपरागत ज्ञान, मूल्यों और व्यवहार से पर्यावरण को जीवित रखते हैं। यह परस्पर निर्भरता अब भी मुख्य रूप से देसज लोगों व समुदायों में दृष्टिगोचर होती है। पर्यावरण से अस्तित्व जुड़ा होने के कारण ही उनके मन पर्यावरण के प्रति गहरी श्रद्धा होती है और पर्यावरण के विभिन्न तत्वों उनके लिए पूजनीय होते हैं। यही वजह है कि भारतीय संस्कृति में प्रकृति की पूजा विभिन्न रूपों में की जाती है।

धरती पर जीवन को बनाए रखने के लिए हमें जैव विविधता और सांस्कृतिक विविधता दोनों की जरूरत है। अमेरिका जर्नल ऑफ इंडीजीनस स्टडीज में 2016 में प्रकाशित एक रिपोर्ट के मुताबिक जैव विविधता और भाषा के नुकसान के साथ ही स्थानीय ज्ञान भी क्षीण हो जाता है। स्थानीय ज्ञान में प्रकृति को बचाने, मौसम संबंधी ज्ञान आदि परंपरागत रूप में एक पीढ़ी से दूसरी पीढ़ी में स्थानांतरित होता रहता है। भाषा लुप्त होने से परंपरागत ज्ञान स्थानांतरित नहीं हो पाता है और परिणामस्वरूप यह पर्यावरण पर भारी पड़ता है।

जीवविज्ञानी मानते हैं कि धरती से जीवन बड़े पैमाने पर खत्म हो रहा है। इसका प्रमाण है जीवों की विलुप्त होती जातियां। विलुप्ति का मौजूदा संकट प्राकृतिक नहीं बल्कि मनुष्य की देन है। माफ़ी स्पष्ट करती हैं, “संकट जीवों तक सीमित नहीं है। इसके साथ एक और व्यापक विलुप्ति हो रही है और वह विलुप्ति है संस्कृतियों और भाषाओं की।” इसी कारण दुनियाभर के भाषाविज्ञानी पिछले कुछ दशकों से इन विलुप्तियों पर चिंताएं जाहिर कर रहे हैं।

विश्व पर्यावरण दिवस 2022 की थीम "Only One Earth" यानी केवल एक पृथ्वी है। इस थीम के आधार पर 'प्रकृति के साथ सद्भाव में रहना' पर ध्यान केंद्रित किया जा रहा है। प्रकृति के साथ सद्भाव में रहने के लिए प्रकृति का संरक्षण यानि कि पर्यावरण का संरक्षण बहुत आवश्यक है। पर्यावरण के सही रूप में संरक्षण के लिए देशज ज्ञान और पारंपरिक मूल्यों के समझ की बहुत आवश्यकता है और यह सब केवल अपनी भाषाओं के माध्यम से ही सीखा जा सकता है। अतः पर्यावरण के संरक्षण के लिए भाषाओं का संरक्षण भी बहुत आवश्यक है।



दिलीप कुमार सिंह
प्रबंधक (राजभाषा)
भारत कोकिंग कोल लिमिटेड धनबाद

ECO- MINING TOURISM - BCCL's INITIATIVE TO ENABLE PEOPLE EXPERIENCE THE LIFE OF MINER

Dhanbad has become one of the industrial districts in India and is known all over the world because of the rich coalfields and other natural resources. It is also known as the coal capital of India, is an epitome of rapid development and modernization. It is known for its coal reserves and urbanization. This coal city of Jharkhand has been ranked as 96th growing city in the world. At present it has perfect connectivity with all major cities through rail and road. In fact Dhanbad railway station is most famous for its huge revenue generation and that is the result of numerous industrial establi Mining activities in Jharia Coalfield (JCF) started more than 100 years back and it has been extensively exploited in the pre-nationalization era, resulting in large scale degradation of the coalfield which has manifested in haphazard infrastructure development, depletion of green belt and overall ecological and environmental imbalances.

When BCCL took over the region was highly degraded and affected with fire and unstable areas, prone to subsidence. After nationalization of the coal mines in 1972-73, BCCL has been making all efforts to mine the coal resource under all possible means compatible to a clean and safe environment in the region. On account of multi-seam regime of the coalfield the reclamation process has become a challenge.

BCCL recognizes importance of environment management and has taken corrective steps since nationalization and developing better environment management system. In mining sector, BCCL contribution in introduction of Ecological restoration is well recognized.

Along with establishment of the natural forests over the degraded mined out areas and OB dumps through biological reclamation/ecological restoration, BCCL has also been developing eco-parks over some degraded mined out areas and OB dumps sites, with an aim to connect with the local communities residing nearby the mining areas of BCCL; transform the image of the company among the stakeholders, and provide a suitable place to the people for recreation and rejuvenation. Some of the eco-parks are Gokul Eco-cultural Park at NT-ST-JG, Lodna; Vrindavan Eco-park, GKKC, Kusunda; Parasnath Udhyan, AKWMC, Katras; Netaji Subhash Chandra Bose Eco-park, Kuya, Bastacolla; and Govardan Eco-park, Bera, Bastacolla Area.

The development of eco-parks is a step taken towards the eco-mining tourism in the Coal mining areas.

Taking a step towards bridging the gap between the people and nature, BCCL has started an initiative named "Eco- Mining Tourism" for facilitating the people to come closer to the nature and also experiencing the dark life of miners responsible behind the strengthening and brightening India.

Generally people don't think of coal mines as places to be visited. However this perception of people is being changed by the BCCL enabling people to have a glimpse into the lives of coal miners while showcasing the mining activities with due consideration of safety. The establishment of eco parks at ecological restoration sites of different areas of BCCL are part of efforts to showcase the steps being taken up by BCCL in order to minimize the environmental impact of coal mining operations.

People can visit the depths of underground mines for gaining the experience of miners working in the lap of nature and also watch the operations at the open-cast mine from a distance (view point).

BCCL is promoting ecotourism in order to make a bridge between development (coal mining) and nature, protect environment, generate income and employment opportunities for local communities, and conserve biodiversity. Through ecotourism, BCCL aims to volunteer the honorable prime minister's "Swachh Bharat Abhiyan" program by encouraging environmental consciousness among visitors and locals by giving them an opportunity to have direct contact with their natural environment & BCCL is turning its "waste" into "wealth" by adopting ER approach.

Since 2016-17, BCCL has been promoting the Eco-mining tourism in its mines and ecological restoration sites /Eco-Parks for showcasing the mining activities and ecological restoration sites /Eco-Parks. Every year various schools, colleges and professional institutes have been visiting these eco-restoration sites and eco-parks to know about the mining and the suitable method to restore these degraded lands into natural vegetation of the region.



In the year 2021-22, Eco-mining tourism visits of various schools/ institutions are being organized. Students and faculty of PK Roy Memorial College, Dhanbad; Birsa Institute of Technology, Sindri visited eco restoration sites/eco parks at Parasnath Udhyan, Katras and Gokul Eco-cultural Park, Lodna, respectively in December 2021.

Further, in view of prevailing Covid 19 protocol, virtual eco-mining tours of students from Dhanbad Public School & DAV Koylanagar were arranged by BCCL to eco-restoration/eco-parks for enhancing their knowledge about mining and reclamation works being done in BCCL.



Eco-tourism of Birsa Institute of Technology, Sindri to Gokul Eco-cultural Park BCCL



Eco-tourism of PK Roy Memorial College, Dhanbad to Parasnath Udhyan, BCCL

Basic Terminology in Environment

Air Quality Index (AQI) - A nationally uniform index for reporting and forecasting daily air quality. It is used to report on the four most common ambient air pollutants: ground-level ozone, particle pollution (PM₁₀ and PM_{2.5}), carbon monoxide (CO), and sulphur dioxide (SO₂).

Ambient air: Refers to the surrounding air. Often used interchangeably with "outdoor air."

Bioaccumulation: The retention and concentration of a substance by an organism during a given time.

Biodiversity: The Sum total of all plants, animals and microorganisms represent the biodiversity of an ecosystem.

Bio magnification: is also known as bio amplification; in this, the concentration of the toxicants increases at the successive trophic levels.

Biochemical oxygen demand (BOD): is the amount of dissolved oxygen (DO) needed (i.e. demanded) by aerobic biological organisms to break down organic material present in a given water sample at certain temperature over a specific time period. The BOD value is most commonly expressed in milligrams of oxygen consumed per litre of sample during 5 days of incubation at 20 °C and is often used as a surrogate of the degree of organic pollution of water.

Conservation: Judicious use of natural resources (both living and non-living) so as to prevent them from being lost, wasted or extinct.

Ecological restoration: is the process of assisting the recovery of an ecosystem that has been degraded, damaged, or destroyed.

EIA: Analysis of the effects caused by the development projects on the environment is Environmental Impact Assessment (EIA).

Food chain: The food chain is a sequential succession of creatures in which nutrients and energy are transmitted from one to the next. This happens when one animal eats another. It starts with the producer organism, moves down the chain, and finishes with the decomposer organism.

Greenhouse effect: a warming of Earth's surface and troposphere (the lowest layer of the atmosphere) caused by the presence of certain other gases (greenhouse gases) like water vapour, carbon dioxide, methane etc.,

NAAQS: The National Ambient Air Quality Standards are limits set on levels of ambient air pollution.

PM10- : Particulate matter with diameters generally larger than 2.5 micrometres (µm) and smaller than, or equal to, 10 µm in diameter.

PM2.5 : Particulate matter that are generally 2.5 µm in diameter or smaller.

Primary pollutants and secondary pollutants: Primary pollutants are substances that are directly emitted into the atmosphere from sources. Secondary air pollutants are those that are produced in the air by the interaction of two or more primary air pollutant.

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एक मिनी रत्न कंपनी

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