

CURRICULUM VITAE

PROF. ARKA JYOTI DAS

Assistant Professor (Grade-I)

Indian Institute of Technology (Indian School of Mines)

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AREA OF SPECIALISATION

Underground Mining Methods for Coal and Metalliferous Mines, Rock Mechanics, Computational Geomechanics, Numerical Simulation, Underground Instrumentation and Monitoring.

EDUCATIONAL QUALIFICATIONS

Year	Degree	Discipline	Institute	Marks
2022	Ph.D.	Rock Mechanics	Indian Institute of Technology (Indian School of Mines) Dhanbad	--
2014	M.Tech.	Mine Safety Engineering	Academy of Scientific and Innovative Research (AcSIR), New Delhi	9.61 out of 10 (Distinction)
2011	B.E.	Mining	Bengal Engineering and Science University, (Presently, IEST) Shibpur	81.66% (Hons.) (Rank 1 st) AIR 1 GATE (Mining), 2012
2007	Higher Secondary	Science	Ramakrishna Mission Vivekananda Vidyamandir, Malda (West Bengal Council of Higher Secondary Education)	82.85%
2005	Secondary		Ramakrishna Mission Vivekananda Vidyamandir, Malda (West Bengal Board of Secondary Education)	89.62%

EMPLOYMENT DETAILS

Post	Organisation	Pay Scale	Duration From	Duration To
Assistant Professor (Grade-I)	IIT(ISM), Dhanbad	Pay Band Rs. 37400-67000/-(PB-4, GP-8700/-) Level 13 (7th CPC)	11-12-2025	To date
Principal Scientist	CSIR-CIMFR, Dhanbad	Pay Band Rs. 37400-67000/-(PB-4, GP-8700/-) Level 13 (7th CPC)	12-04-2024	10-12-2025
Senior Scientist	CSIR-CIMFR, Dhanbad	Pay Band Rs. 15600-39100/-(PB-3, GP-7600/-) Level 12(7th CPC)	12-04-2020	11-04-2024
Scientist	CSIR-CIMFR, Dhanbad	Pay Band Rs. 15600-39100/-(PB-3, GP-6600/-) Level 11(7th CPC)	11-04-2016	11-04-2020
Research Scholar	IIT, Kharagpur	Rs. 25000/- (Consolidated)	29-12-2014	01-04-2016
Trainee Scientist	CSIR-CIMFR, Dhanbad	Rs. 34650/- (Consolidated)	05-09-2012	04-09-2014
Management Trainee	Coal India Limited	Pay Band Rs. 16,400-40,500/-	03-08-2011	06-07-2012

ACHIEVEMENTS/AWARDS

- **Young Associate Award** 2024 by the Indian National Academy of Engineering (INAE).
- **Young Engineer Award** 2022 by the Institution of Engineers (India).
- **Inder Mohan Thapar Research (IMTR) Award** by Indian Institute of Technology (Indian School of Mines) Dhanbad in recognition of excellence in research publication based on Impact factor of the scopus/SCI indexed journals during the calendar year 2020.
- Selected as an **Empanelled Evaluator and Advisor** for TEXMiN, IIT(ISM) Dhanbad.
- Invited as a **resource person by HRD, BCCL** for imparting training on "FUNCTIONAL SKILL PROGRAM FOR MINING" to the employees of Bharat Coking Coal Limited (BCCL).
- Member of the **Mining Engineering Division Board** of the Institution of Engineers (India).
- **1st prize of Dr. K. N. Sinha Award**, 2020 by CSIR-CIMFR CSIR-CIMFR for highest impact factor of papers published in SCI journals.
- **3rd prize for best poster** at the International Conference and Exhibition on Energy & Environment: Challenges & Opportunities, 2019.

- **Trainee Scientist fellowship** from CSIR, Govt. of India.
- **All India Rank 1st** in **GATE** (Mining), 2012.
- **Institutes' Medal for securing 1st rank** in 2011 Batch of Mining Engineering, Indian Institute of Engineering Science and Technology, Shibpur.
- **MGMI Shival Gold Medal** for excellent performance at graduation level.
- **MHRD fellowship** 2014, for pursuing Ph.D. at IIT, Kharagpur, by Govt. of India.
- Invitation to **judge the events at KHANAN '19**, an annual Tech. Festival at IIT(ISM), Dhanbad.
- **Guest Lecturer** in the National Annual Technological Festival known as INITIUM 2018, IEST, Shibpur.
- **Advisory Board member and panelist** for the one day national webinar on "Future of Mining Industries from Different View Point – Post COVID Scenario" organized at Kazi Nazrul Islam University, West Bengal.
- Appointed as **a Paper Setter for BE (Mining) and Diploma (Mining)** courses at Kazi Nazrul University, Asansol

EDITOR OF INTERNATIONAL JOURNALS/CONFERENCES

- Academic Editor of Shock and Vibration, Wiley.
- Academic Editor of Advances in Civil Engineering, Wiley.
- Editor of the proceedings of National Conference on Advances in Mining (AIM-2020), February 14-15, CSIR-CIMFR, Barwa Road, Dhanbad.

MEMBERSHIP OF PROFESSIONAL BODY/BODIES

Sl. No.	Name of the academic/professional bodies	Type of membership
1.	International Society for Rock Mechanics and Rock Engineering (ISRM)	Individual Member (Membership No.: 236/IND/2023-2032)
2.	Institution of Engineers (India)	Associate Member (Membership No.: AM184367-5)
3.	Mining Engineers' Association of India	Life Member (Membership No.: 5158/DHN)
4.	Mining, Geological and Metallurgical Institute of India	Life Member (Membership No.: LM 10928)
5.	Society for Mining, Metallurgy & Exploration	Professional Member

Summary of Publications

Sl. No.		
1.	Papers published in journals	Total 26 numbers (Q1: 14; Q2: 01; Q3: 03; Q4: 03; Other 05)
2.	Papers published in proceedings of conferences / symposia/ seminars	31

The list of publications is given in Annexure I.

PUBLISHED BOOK / BOOK CHAPTER

- 1) Kumar, R., Mandal, P. K., **Das, A. J.**, Bhattacharjee, R., & Tewari, S. (2024). Design of Underground Structures Under Geotechnical Uncertainties. In Frontiers of Performability Engineering: In Honor of Prof. KB Misra. Singapore: Springer Nature Singapore, pp. 401-422.
- 2) **Das, A. J.**, Mandal, P. K. (2015). Underground extraction of Locked-Up coal: Numerical modelling based studies”, Lambert Academic Publishing, Germany, ISBN: 978-3-659-80250-8.
- 3) Proceedings of National Conference on Advances in Mining (AIM-2020): Editors: Prabhat Kumar Mandal, Ranjan Kumar, **Arka Jyoti Das** & Pradeep K Singh.

PATENTS

- 1) A device useful for supporting the underground mine side wall for highly dipping mine having pillars with acute angles corners. Patent No. 492987 (Granted).
- 2) A dust guard system for vehicles to reduce air-borne dust. Application no. 202411048167.

GRANT-IN-AID PROJECTS, INDUSTRY-SPONSORED AND CONSULTANCY PROJECTS

Total no. of Grant-in-Aid Govt. funded projects	8 (PI: 3; Co-PI: 1; Member: 4)
Total no. of Industry Sponsored Projects	18 (PI: 12; Member: 6)
Total no. of Consultancy Projects	46 (PI: 27; Member: 19)
✓ Complete list of projects is given in Annexure II.	

ENGINEERING CONTRIBUTIONS TO UNDERGROUND MINING

I have contributed in the field of theoretical and applied rock mechanics, computational geomechanics, numerical simulation, in-situ monitoring of rock mass, etc. The R&D efforts in the basic sciences of geomechanics help to solve various concomitant geotechnical problems of

underground excavation. The analytical and empirical formulae developed by me are helpful in deciphering the complex behaviour of different types of rock mass during underground excavation. Proficiency in 3-D numerical modelling by FDM, DEM and hybrid methods helps to design underground excavation, open pit slope, etc. which are being successfully applied by the mining industry. My R&D in the field of underground mining increases the recovery of coal, valuable non-renewable fossil fuel and precious metal ores vis-à-vis the safety of underground workplaces. Some significant contributions in the field of rock mechanics and rock engineering are as follows:

- **Development of the strength formulae for inclined coal pillars.**

Implementation: Several underground coal mines of CIL and SCCL, having inclined coal seams.

- **Development of a predictive model to estimate cut-out-distance (COD) for continuous miner (CM) operation in underground coal mines**

Implementation: Several underground coal mines of CIL and SCCL.

- **Design of methodology for simultaneous extraction of multiple coal seams at close vicinity (i.e. contiguous working)**

Implementation: Different underground mines where the coal seams are situated in close vicinity (within 9 m parting), e.g. Orient Colliery, MCL, Bhowra (North) Colliery, BCCL, etc.

- **Design of mechanised extraction of coal seams in high in-situ stress regime under massive strata**

Implementation: Churcha Mine (RO), SECL.

- **Design of mechanised extraction methodology of coal pillars below and adjacent to goaves by continuous miner technology.**

Implementation: Several underground coal mines like VK-7 Incline Mine, PVK-5 Incline Mine of SCCL; MIC, Jhanjra Project Colliery, ECL; etc.

- **Design of extraction methodology for low height (< 2m) coal seams by the continuous miner technology.**

Implementation: 3&4 Incline Mine, Jhanjra Project Colliery, ECL.

- **Design of extraction methodology for inclined coal seams by CM technology.**

Implementation: Shanthikhani Mine of SCCL.

- **Design of adequate support system for underground coal mines including breakerlines for mechanised extraction**

Implementation: Several underground coal mines of CIL and SCCL.

- **Analysis of failure characteristics and development of the effective width formula for rectangular pillars**

Implementation: Different highwall mining workings as well as underground coal mines

- **Development of the control strategies for multi-layered laminated shale roof strata**

Implementation: Bhelatand Amalgamated Colliery of Tata Steel Limited

- **Development of the design guidelines of coal pillars by stochastic approach**

Implemented: Different underground coal mines of CIL

- **Design of highwall mining for multi-seams working**

Implementation: Narayankuri Mine of ECL, West Bokaro Colliery of Tata Steel Limited, and Gare Palma IV/1 Coal Mine of Jindal Power Limited

- **Design of stopes, crown, rib and sill pillars for metal mines.**

Implementation: HZL, MOIL, IMFA, etc.

The details are given in Annexure III. [Engineering Contributions.pdf \(click here\)](#)

List of Publications

✓ **Papers published in Peer-Reviewed/SCI/SCIE/Scopus (Total no. 26)**

- 1) **Das, A. J.**, Mandal, P. K., Bhattacharjee, R., Tewari, S., Ghosh, N., & Kumar, R. (2025). Analysis of failure characteristics, 3D stress distribution and strength evaluation of rectangular and long coal pillars through analytical solution and numerical simulation with field validation. *Acta Geotechnica*, 1-26. **(SCIE/Q1/IF: 5.7)**
- 2) Sabapathy, R., Mandal, P. K., Paul, P. S., & **Das, A. J.** (2025). Evaluation of potentiality of coal bump hazard in underground coal mines through numerical modelling and binary logistic regression approach with field validation. *Bulletin of Engineering Geology and the Environment*, 84(6), 333. **(SCIE/Q1/IF: 4.2)**
- 3) Kolikipogu, N. R., Mandal, P. K., **Das, A. J.**, Tewari, S., Bhattacharjee, R., Porathur, J. L., & Jagapthal, V. K. (2025). Analytical and Numerical Modeling Approaches for Estimating the Optimum Line of Extraction in Continuous Miner Workings with Field Observations. *International Journal of Geomechanics*, 25(6), 04025098. **(SCIE/Q2/IF: 3.3)**
- 4) Gaurav, K., Kumar, R., Mandal, P. K., & **Das, A. J.** (2023). Evaluation of a novel pyramidal design of rock bolt bearing plate using analytical, experimental, and numerical methods. *Engineering Structures*, 297, 116998. **(SCIE/Q1/IF: 6.4)**
- 5) Kumar, R., Mandal, P. K., Ghosh, N., **Das, A. J.**, & Banerjee, G. (2023). Design of stable parallelepiped coal pillars considering geotechnical uncertainties. *Rock Mechanics and Rock Engineering*, 56, 6581–6602. **(SCIE/Q1/IF: 6.6)**
- 6) **Das, A. J.**, Mandal, P. K., Ghosh, N., Singh, A. P., Kumar, R., Tewari, S., & Bhattacharjee, R. (2023). Evaluation of energy accumulation, strain burst potential and stability of rock mass during underground extraction of a highly stressed coal seam under massive strata-a field study. *Engineering Geology*, 322, 107178. **(SCIE/Q1/IF: 8.4)**
- 7) Kumar, R., **Das, A. J.**, Mandal, P. K., Bhattacharjee, R. & Tewari, S. (2021). Probabilistic stability analysis of failed and stable cases of coal pillars. *International Journal of Rock Mechanics and Mining Sciences*, 144, 104810. **(SCI/Q1/IF: 7.5)**

Annexure I: List of Publications (in Journals)

- 8) **Das, A. J.**, Paul, P. S., Mandal, P. K., Kumar, R., & Tewari, S. (2021). Investigation of failure mechanism of inclined coal pillars: numerical modelling and tensorial statistical analysis with field validations. *Rock Mechanics and Rock Engineering*. 54(6), 3263-3289. **(SCIE/Q1/IF: 6.6)**
- 9) Kumar, R., Mandal, P. K., Narayan, A., & **Das, A. J.** (2021). Evaluation of load transfer mechanism under axial loads in a novel coupler of dual height rock bolts. *International Journal of Mining Science and Technology*, 31(2), 225-232. **(SCIE/Q1/IF: 13.7)**
- 10) Tewari, S., Himanshu, V. K., Porathur, J. L., Bhattacharjee, R., **Das, A. J.**, & Mandal, P. K. (2020). Exploitation of mica deposits at Nellore mica belt, Andhra Pradesh, India. *Current Science*, 118(4), 593-602. **(SCIE/Q3/IF: 1.0)**
- 11) **Das, A. J.**, Mandal, P. K., Prakash, A., Roy, L. B., & Tewari, S. (2020). Underground extraction methodology of contiguous coal seams ensuring the safety of the parting and the surface structures. *Safety Science*, 121, 215-230. **(SCIE/Q1/IF: 5.4)**
- 12) **Das, A. J.**, Mandal, P. K., Paul, P. S., Sinha, R. K., & Tewari, S. (2019). Assessment of the Strength of Inclined Coal Pillars through Numerical Modelling based on the Ubiquitous Joint Model. *Rock Mechanics and Rock Engineering*, 52(10), 3691-3717. **(SCI/Q1/IF: 6.6)**
- 13) **Das, A. J.**, Mandal, P. K., Paul, P. S., & Sinha, R. K. (2019). Generalised analytical models for the strength of the inclined as well as the flat coal pillars using rock mass failure criterion. *Rock Mechanics and Rock Engineering*, 52(10), 3921-3946. **(SCI/Q1/IF: 6.6)**
- 14) Kushwaha, A., Tewari, S., Mandal, P. K., Bhattacharjee, R., **Das, A. J.**, Singh K. K. K. (2019) Stability evaluation of old and unapproachable underground mine workings below surface structures. *Journal of Geological Society of India*, 93, 351-359. **(SCI/Q3/IF: 1.5)**
- 15) **Das, A. J.**, Mandal, P. K., Sahu, S. P., Kushwaha, A., Bhattacharjee, R., & Tewari, S., (2018). Evaluation of the effect of fault on the stability of underground workings of coal mine through DEM and statistical analysis. *Journal of Geological Society of India*, 92, 732-742. **(SCI/Q3/IF: 1.5)**

Annexure I: List of Publications (in Journals)

- 16) Mandal, P. K., **Das, A. J.**, Kumar, N., Bhattacharjee, R., Tewari, S., & Kushwaha, A. (2018). Assessment of roof convergence during driving roadways in underground coal mines by continuous miner. *International Journal of Rock Mechanics and Mining Sciences*, 108, 169-178. **(SCI/Q1/IF: 7.5)**
- 17) **Das, A. J.**, Mandal, P. K., Bhattacharjee, R., Tiwari, S., Kushwaha, A., & Roy, L. B. (2017). Evaluation of stability of underground workings for exploitation of an inclined coal seam by the ubiquitous joint model. *International Journal of Rock Mechanics and Mining Sciences*, 93, 101-114. **(SCI/Q1/IF: 7.5)**
- 18) **Das, A. J.**, Mandal, P. K., Ghosh, C. N., & Sinha, A. (2017). Extraction of locked-up coal by strengthening of rib pillars with FRP—A comparative study through numerical modelling. *International Journal of Mining Science and Technology*, 27(2), 261-267.. **(SCIE/Q1/IF: 13.7)**
- 19) Sahu, S. P., Yadav, M., Rani, N., **Das, A. J.** (2018). Assessment of occupational health exposure to particulate matter around opencast coal mines, India: a case study. *Arabian Journal of Geosciences*, 11(14), 373-383. **(Q4)**
- 20) Sahu, S. P., Yadav, M., Pradhan, D. S., Rani, N., **Das, A. J.** (2018). Spatio-temporal variations of respirable particles at residential areas located in the vicinity of opencast coal projects, India: a case study. *Arabian Journal of Geosciences*, 11(10), 241-255. **(Q4)**
- 21) Sahu, S. P., Yadav, M., **Das, A. J.**, Prakash, A., Kumar A (2017). Multivariate statistical approach for assessment of subsidence in Jharia coalfields, India. *Arabian Journal of Geosciences*, 10, 191-201. **(Q4)**
- 22) Raja, S., Mandal, P. K., Paul, P. S., **Das, A. J.** (2018). Prediction of coal bump with respect to local mine stiffness and post-failure stiffness using numerical modelling. *Journal of Mines Metals & Fuels*, 66(6), 328-338. **(Scopus Index)**.
- 23) **Das, A. J.**, Mandal, P. K., Paul, P. S., Sinha, R. K. (2018). Strategies for underground extraction of the inclined coal seams by continuous miner. A Technical Publication of The Mining, Geological and Metallurgical Institute of India, 114, 1-12. **(Peer Reviewed)**

Annexure I: List of Publications (in Journals)

- 24) **Das, A. J.**, Mandal, P. K., Kumbhakar, D., Mishra, P. K. (2014). Effects of rib pillars at higher depth of working: a numerical modelling based study. Mining Engineers Journal, 16, (02), 23-30. **(Peer Reviewed)**
- 25) **Das, A. J.**, Mandal, P. K., Ghosh, C. N., Sinha, A., (2014). An attempt to develop a technology for extraction of locked-up coal from underground mines using artificial pillars, The Indian Mining and Engineering Journal, 53(5), 18-25. **(Peer Reviewed)**
- 26) **Das, A. J.** (2013). Determination of status of opencast mines in Kenda area, ECL-whether these are abandoned or disused, a case study, Mining Engineers Journal, 15(3), 20-27. **(Peer Reviewed)**

Annexure I: List of Book/Book Chapter

✓ List of Book/Book Chapter

- 1) Kumar, R., Mandal, P. K., **Das, A. J.**, Bhattacharjee, R., & Tewari, S. (2024). Design of Underground Structures Under Geotechnical Uncertainties. In *Frontiers of Performability Engineering: In Honor of Prof. KB Misra*. Singapore: Springer Nature Singapore, pp. 401-422.
- 2) **Das, A. J.**, Mandal, P. K. (2015). *Underground extraction of Locked-Up coal: Numerical modelling based studies*”, Lambert Academic Publishing, Germany, ISBN: 978-3-659-80250-8.
- 3) *Proceedings of National Conference on Advances in Mining (AIM-2020)*: Editors: Prabhat Kumar Mandal, Ranjan Kumar, **Arka Jyoti Das** & Pradeep K Singh.

Annexure I: List of Publications (in proceedings of conferences / symposia/ seminars)

✓ **Papers published in proceedings of conferences / symposia/ seminars (Total no. 31)**

- 1) **Das, A. J.**, Mandal, P. K., Ghosh, N., Tewari, S., Bhattacharjee, R., Kumar, R., & Roy, L. B. (2025). Geotechnical challenges and suitable methodology for highwall mining of coal seams with less than 3 metre parting. In Innovative and Responsible Mining for Inclusive Growth: Proceedings, 11th Asian Mining Congress, Kolkata, West Bengal, India, October 30–31, 2025, pp. 135-154.
- 2) Giri, A., **Das, A. J.**, Paul, P. S., & Murari, R. (2025). Importance of Detailed Geological and Geotechnical Domains in Underground Metal Mine Stope Design. In Innovative and Responsible Mining for Inclusive Growth: Proceedings, 11th Asian Mining Congress, Kolkata, West Bengal, India, October 30–31, 2025, pp. 123-134.
- 3) Mandal, P. K., Ghosh, N., **Das, A. J.**, Kumar, R., Bhattacharjee, R., & Tewari, S. (2025, October). Underground Coal Mines: Assessment, Challenges and Remedial Approaches. In Innovative and Responsible Mining for Inclusive Growth: Proceedings, 11th Asian Mining Congress, Kolkata, West Bengal, India, October 30–31, 2025, pp. 235-254.
- 4) **Das, A. J.**, Mandal P. K., Bhattacharjee R., Tewari S., Ghosh N., Kumar R. (2025) Design approaches for enhancing coal recovery in highwall mining using paste fill technology. In Proc. National Seminar on Technological Advancements for Sustainable Mining and Exploration, Jointly organised by MGMI, Dhanbad Chapter and CSIR-CIMFR, Dhanbad, 31st January to 1st February 2025 CSIR-CIMFR, Dhanbad, pp. 201-221.
- 5) Mandal, P. K., Ghosh, N., Bhattacharjee, R. M., Sinha, R. K., **Das, A. J.**, Kumar, R., Bhattacharjee, R., Tewari, S. (2024). A study on the behaviour of coal pillars at greater depths in Indian geomining conditions. In Proc. All India Seminar on Current Trends of Sustainable Underground Mining Organized by ISM Alumni Association Kolkata Chapter Biswa Bangla Convention Centre, New Town, Kolkata, 29th and 30th November 2024, 9p.
- 6) Bhagat, N. K., Singh, R. K., Mishra, A. K. & **Das, A. J.** (2024). Benefits of Directional Controlled Blasting Technique for Stabilization of Problematic Rock-Cut Slopes of Konkan Railway. In Proceedings of the 2nd International Conference on Geotechnical Issues in Energy, Infrastructure and Disaster Management (ICGEID), January 18-20, 2024, pp. 355-376.

Annexure I: List of Publications (in proceedings of conferences / symposia/ seminars)

- 7) **Das, A. J.**, Mandal, P. K., Ghosh, N., Tewari, S., Bhattacharjee, R. (2023). Design of extraction methodology for highwall mining under multi-seams conditions - a case study. In Souvenir & Supplementary Volume of 10th Asian Mining Congress, Kolkata, 6-9 November, 2023, pp. 45-55.
- 8) Kumbhakar, S., **Das, A. J.**, Rao, N. K., Verma, C. P., Mandal, P. K. (2023). Stability assessment of overburden dump on black cotton soil bench: a numerical modelling approach. In Souvenir & Supplementary Volume of 10th Asian Mining Congress, Kolkata, 6-9 November, 2023, pp. 98-106.
- 9) Mandal, P. K., Bhattacharjee, R., Ghosh, N., Singh, A. P., Tewari, S., **Das, A. J.** (2023). Bridging Efficiency and Safety: A Case Study of Extraction of Thick Coal Seam Having Low Incubation Period Using Continuous Miner. In Proc. 10th Asian Mining Congress, Kolkata, 6-9 November, 2023, pp. 110-129.
- 10) Ghosh, N., Tewari, S., Bhattacharjee, R., **Das, A. J.**, Mishra, P. K., Mandal, P. K. (2023). A study on the effects of horizontal stress anisotropy on stability of galleries in deep underground coal mines. In Souvenir & Supplementary Volume of 10th Asian Mining Congress, Kolkata, 6-9 November, 2023, pp. 137-145.
- 11) **Das, A. J.**, Mandal, P. K., Kumar, R. (2023). Design of underground structures and support systems for extraction of inclined coal seam. In Proc. 15th ISRM Congress 2023 & 72nd Geomechanics Colloquium, Sulzberg, Austria, 9-14 October, 2023, pp.141-146.
- 12) Bhattacharjee R., Tewari S., **Das A. J.**, Singh A. P., Mandal P. K. (2022). Geotechnical considerations and numerical modeling approach for preparation of strata control and monitoring plan (SCAMP) for highly stressed depillaring panel in underground coal mines-a case study. In Proc. 9th Asian Mining Congress, Kolkata, 4-7 April, 2022 pp. 272-286.
- 13) Kumar, R., Mandal, P. K., **Das, A. J.**, Jagapthal, V. K., Kumar, G., Bhattacharjee, R., Tewari, S. (2022). Optimum combination of long and short tendons for stable roadways intersections in coal mines. In Proc. 9th Asian Mining Congress, Kolkata, 4-7 April, 2022, pp. 255-262.
- 14) Mandal, P. K., **Das, A. J.**, Kumar, R., Tewari, S., Bhattacharjee, R. (2022). Strata control considerations to ensure safety of underground workplace during extraction of inclined coal seam. In Proc. 9th Asian Mining Congress, Kolkata, 4-7 April, 2022, pp. 235-242.

Annexure I: List of Publications (in proceedings of conferences / symposia/ seminars)

- 15) Kumar, R., Mandal, P. K., **Das, A. J.**, Gaurav, K., Bhattacharjee, R., Tewari, S. (2021). Minimizing uncertainties in roof rock reinforcement design for stable mine roadways. In Proc. International Conference on Maintenance and Intelligent Asset Management (ICMIAM), Ballarat, Australia, 2021, pp. 1-5.
doi: 10.1109/ICMIAM54662.2021.9715222.
- 16) **Das, A. J.**, Mandal, P. K., Tewari, S. Bhattacharjee, R., Kumar, R. (2020). Issues and approaches for the underground extraction of the inclined coal seams. In Proc. National Conference on Advances in Mining (AIM-2020), 14-15 February, 2020, CSIR-CIMFR, Barwa Road, Dhanbad, pp. 24-31.
- 17) Mandal, P. K., **Das, A. J.**, Kumar, R., Bhattacharjee, R., Tewari, S., Singh, A. P., Kumar, L., Singh, S. K. (2020). Geotechnical issues for underground extraction of coal by continuous miner in India-some case studies. In Proc. National Conference on Advances in Mining (AIM-2020), 14-15 February, 2020, CSIR-CIMFR, Barwa Road, Dhanbad, pp. 496-510.
- 18) Mandal, P. K., **Das, A. J.**, Bhattacharjee, R., Singh, S. K. (2019). Geotechnical issues for underground extraction of coal by continuous miner in India-some case studies. In Proc. 8th Asian Mining Congress, 5-9 November, 2019, Kolkata, India, pp. 277-286.
- 19) Mandal, P. K., **Das, A. J.**, Tewari, S., Bhattacharjee, R., Kumar, L., Singh, P. K. (2019). Stability evaluation and safe designing of barriers against rivers in an opencast working - a case study. In Proc. International Congress on Rock Mechanics and Rock Engineering, 13-18 September, 2019, Foz da Iguassu (Iguassu City), Brazil, pp.784-792.
- 20) **Das, A. J.**, Prakash A., Mandal, P. K., Tewari, S. (2019). Design of extraction methodology of contiguous coal seams under surface structures. In Proc. International Conference And Exhibition On Energy & Environment : Challenges & Opportunities- ENCO 2019, 20-22 February, 2019, New Delhi, India, pp. 808-818.
- 21) Mandal, P. K., Singh S. K., Singh R., **Das, A. J.**, Singh A. P., Mishra P. K. (2018). Design of extraction methodology for depillaring of a coal seam by continuous miner under weak strata - A case study. In Proc. conference on National Seminar on Technological Advancement and Emerging Mining Methods (TAEMM 2018), 24th - 25th August, 2018, CSIR-CIMFR, Dhanbad, pp. 161-176.

Annexure I: List of Publications (in proceedings of conferences / symposia/ seminars)

- 22) **Das, A. J.**, Mandal, P. K., Paul, P. S., Sinha R. K., Tewari, S. (2018). Rock mechanics considerations for mechanised extraction of an inclined coal seam. In Proc. National Conference on Recent Challenges in Mining Industry (RCMI - 2018), 28th April, 2018, CSIR-CIMFR, Dhanbad, India, pp. 121-130.
- 23) **Das, A. J.**, Mandal, P. K., Paul, P. S., Sinha, R. K., Kushwaha, A., Tewari S. (2017). Effect of the strata inclination during underground extraction of the inclined coal seams. In: Proc. 7th Asian Mining Congress, Kolkata, India, 8-10 November, 2017, pp. 223-238.
- 24) Ghosh C. N., Behera S. K., Mandal P. K., Prashant, Mandal P. K., **Das A. J.**, Singh P. K., (2017). Development of technology for extraction of locked up coal using artificial pillars. In: Proc. International Conference on NexGen Technologies for Mining and Fuel Industries (NxGnMiFu-2017), 15-18 February, New Delhi, India, pp. 417-424.
- 25) **Das A. J.**, Mandal P. K., Kushwaha, A. (2017). Effect of Fault on the Stability of Workings during Underground Extraction of Coal. In: Proc. International Conference on NexGen Technologies for Mining and Fuel Industries (NxGnMiFu-2017), 15-18 Feb., New Delhi, India, pp. 155-164.
- 26) Mandal, P. K., **Das, A. J.**, Kushwaha A. (2017). Planning of strata control study programme during depillaring. In: Proc. International Conference on Deep Excavation, Energy Resource and Production (DEEP16), 24-26 January, IIT Kharagpur, India, 16p.
- 27) Mandal, P. K., **Das, A. J.** (2016). Optimal extraction of coal from developed pillars locked-up under different surface/sub-surface structures. In: Proc. 35th International Conference on Ground Control in Mining, 26-28 July, 2016, Morgantown WV, pp. 132.139.
- 28) Mandal, P. K., **Das, A. J.**, Misra, P. K., Roy, L. B. (2016). Design of extraction methodology for semi-mechanised depillaring of an inclined coal seam. In: Proc. 6th Asian Mining Congress, 23-27 February, Kolkata, India, pp. 131- 142.
- 29) **Das, A. J.**, Mandal, P. K. (2016). Improvement of recovery percentage of locked-up coal by strengthening the rib pillars. In: Proc. 6th Asian Mining Congress, 23-27 February, 2016, Kolkata, India, pp 143-152.

Annexure I: List of Publications (in proceedings of conferences / symposia/ seminars)

- 30) Mandal, P. K., **Das, A. J.**, Ghosh, C. N., Sinha A. (2014). Extraction of locked-up coal by artificial pillars - An attempt for development of a technology. In: Proc. 5th Asian Mining Congress, 13-15 February, Kolkata, India, 9p.
- 31) Mandal, P. K., **Das, A. J.**, Kumbhakar, D., Mishra, P. K. (2013). Extraction of coal pillars at higher depth- A numerical modelling based study. In: Proc. International Conference on Coal and Energy- Technological Advances and Future Challenges, 15-17 December, Kolkata, India, pp. 83-96.

ANNEXURE II

LIST OF THE GRANT-IN-AID/INDUSTRY SPONSORED/CONSULTANCY PROJECTS

Govt. Funded Projects at IIT(ISM), Dhanbad				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
1.	Development of Innovative Extraction Method for Safer Extraction of Coal Seam by Underground Method with Higher Productivity and Percentage of Extraction using Continuous Mining System	CIL R&D Board	131.37	Project Investigator
Govt. Funded Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
1.	Design of underground coal pillars by stochastic approach considering randomness and spatial variation of rock mass strength	SERB, Govt. of India	30.25	Project Investigator
2.	Development of tandem approach for paste fill technology and extraction methodology by Continuous Miner (CM) for Shampur B Colliery Mugma Area, ECL	Coal India Limited R&D Board	130.0	Project Leader
3.	Roof rock reinforcement system (R3S) for mine roadways intersection under varying geomining conditions as FBR under 4M theme of CSIR	CSIR, India	122.72	Co-Project Investigator
4.	Design and stability of pillars/array of pillars for different mining methods in coal mine workings	Coal India Limited R&D Board	253.71	Member
5.	Development of empirical methodology for design of crown pillar during transition from opencast to underground mining for Indian mines	Ministry of Mines, Govt. of India	37.89	Member
6.	Development of digital mine using Internet of Things (IoT)	Ministry of Electronics and Information Technology, Govt. of India	222.30	Member

Annexure II: Detailed List of Projects

7.	Development of a technology for optimal extraction of locked-up coal from underground mines using artificial pillars acronym as DeCoalArt (A 12th Five Year Plan Network Project)	CSIR, India	1897.52	Member
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Industry Sponsored Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
1.	Instrumentation and strata monitoring during stoping operation at Rampura Agucha underground mine, HZL (SSP/761/2023-24)	Hindustan Zinc Limited (HZL)	44.84	Project Leader
2.	Strata monitoring of stopes, strata condition and rock mechanics study in Banwas block of Khetri mines of Hindustan Copper Limited of Banwas project of SMSL (SSP/736/2023-24)	SMS Limited	21.24	
3.	Strata monitoring of stopes, strata condition and rock mechanics study in Banwas block of Khetri mines of Hindustan Copper Limited of Banwas project of SMS Limited. (SSP/569/2021-22)	SMS Limited	23.60	Project Leader
4.	Instrumentation and strata monitoring during drivage of two inclines, interconnection and one inset in seam IV & III at Bicharpur underground coal mines, Shahdol, MP (SSP/341/2018-19)	Gainwell Commosales Private Limited (GCPL)	14.87	Project Leader
5.	Instrumentation plan and strata monitoring during extraction of pillars in the proposed CMP-11 panel [subpanels CMP-11A(1), CMP-11A(2) and CMP-11A(3) using continuous miner technology at VK-7 Incline, Kothagudem area, SCCL (SSP/371/2019-20)	Singareni Collieries Company Limited (SCCL)	24.60	Project Leader
6.	Instrumentation and strata monitoring of low high continuous miner projects at Jhanjra 3&4 mine in seam RVII and RVIIA of Jhanjra project colliery, ECL (SSP/382/2018-19)	Gainwell Commosales Private Limited (GCPL)	25.96	Project Leader
7.	Instrumentation and strata monitoring during stoping at Rampura Agucha Underground Mine, HZL (SSP/428/2019-20)	Hindustan Zinc Limited (HZL)	41.30	Project Leader
8.	Instrumentation and strata monitoring of low height continuous miner projects at Jhanjra 3 & 4 mine in seam VII and VIIA of Jhanjra project colliery, ECL (SSP/282/2017-18)	Gainwell Commosales Private Limited (GCPL)	23.60	Project Leader
9.	Scientific study on strata monitoring of development workings in Salarjung seam at Shanthikhani Mine with Continuous miner	Singareni Collieries Company	8.86	Project Leader

Industry Sponsored Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
	technology, Mandamarri Area, SCCL (SSP/199/2017-18)	Limited (SCCL)		
10.	Instrumentation plan and strata monitoring during extraction of pillars in the proposed CMP-10 panel [sub panels CMP-10A(1), CMP-10A(2), CMP-10A(3)] using Continuous miner technology at VK-7 Incline, Kothagudem area, SCCL. (SSP/234/2017-18)	Singareni Collieries Company Limited (SCCL)	24.78	Project Leader
11.	Instrumentation and strata monitoring of low height continuous miner projects at Jhanjra 3&4 mine in RVIIA and RVII seams of Jhanjra Project Colliery, ECL. (SSP/485/2020-21)	Gainwell Commosales Private Limited (GCPL)	28.56	Project Leader
12.	Instrumentation and strata monitoring of low height continuous miner project at Jhanjra 3&4 mine in seam RVII and RVIIA of Jhanjra project colliery, ECL. (SSP/561/2021-22)	Gainwell Commosales Private Limited (GCPL)	31.41	Project Leader
13.	Instrumentation and strata monitoring of continuous miner working during development/depillaring operation in RVI seam at MIC, Jhanjra Colliery, ECL. (SSP/461/2019-20)	Gainwell Commosales Private Limited (GCPL)	12.98	Member
14.	Instrumentation and strata monitoring of continuous miner working during development/depillaring operation in R-VI seam at Kumardih-B Mine, ECL (SSP/626/2021-22)	Gainwell Commosales Private Limited (GCPL)	15.22	Member
15.	Instrumentation and strata monitoring of Continuous miner working during development/depillaring operation at MIC, Jhanjra Project colliery, ECL (SSP/627/2021-22)	Gainwell Commosales Private Limited (GCPL)	15.70	Member
16.	Instrumentation and strata monitoring of continuous miner working during development/depillaring operation at MIC, Jhanjra project colliery, ECL (SSP/549/2020-21)	Gainwell Commosales Private Limited (GCPL)	13.37	Member
17.	Instrumentation and strata monitoring during drivage of two inclines, interconnections and one inset in seam IV and III at Bicharpur underground coal mine, Shahdol, MP (SSP/510/2020-21)	Gainwell Commosales Private Limited (GCPL)	10.90	Member

Annexure II: Detailed List of Projects

Industry Sponsored Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
18.	Monitoring of strata behaviour during development of LCCM at Rani Atari underground mine Chirimiri Area, SECL (SSP/190/2017-18)	South Eastern Coalfields Limited (SECL)	9.13	Member

Consultancy Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
1.	Advice on instrumentation and strata monitoring during stoping and review of underhand mining at Rampura Agucha underground mine, HZL (CNP/5213/ 2023-24)	Hindustan Zinc Limited (HZL)	23.83	Project Leader
2.	Advice for the stability of pillars and design of support system for trunk roadways and gate roadways in XV Seam at Moonidih Project, BCCL (CNP/5197/2023-24)	INDU-SCCL-CORUM Consortium	37.5	Project Leader
3.	Advice/feasibility study of the extraction of individual seams V, VI, and VII through highwall mining technology in designated panel -F in PCP-3 area of West Bokaro mine of M/S Tata Steel Ltd. (CNP/5108/2021-22)	Tata Steel Limited	12.15	Project Leader
4.	Advice for the introduction of highwall mining technology in RVIII Bottom seam and RVII Top seam at Narayankuri OCP of Mahabir (R) Colliery, Kunustoria Area, ECL. (CNP/5090/2021-22)	Gainwell Commosales Private Limited (GCPL)	16.52	Project Leader
5.	Advice on scientific study for feasibility of extraction of developed pillars in the proposed CMP-11 panel [consisting subpanels CMP-11A(1), CMP-11A(2), CMP-11A(3)] in King seam below caved goaf and barrier of Top seam by CM technology at VK-7 Incline, SCCL (CNP/4824/2019-20)	Singareni Collieries Company Limited (SCCL)	18.76	Project Leader
6.	Advice for strata monitoring instrumentation and preparation of instrumentation plan for K2 panel of R-V seam at Khottadih Colliery, ECL (CNP/4866/2019-20)	Eastern Coalfields Limited (ECL)	4.72	Project Leader
7.	Advice for Design of Extraction Methodology for Development and Depillaring Workings of King Seam at PVK-5 Incline Mine, SCCL for the Designated CM Project Area of Gainwell Commosales Private Limited (CNP/4873/2019-20)	Gainwell Commosales Private Limited (GCPL)	35.99	Project Leader
8.	Advice on feasibility of underground mining of marble with suitable cross-section of gallery	D. K. Trivedi & Sons	11.74	Project Leader

Consultancy Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
	opening and pillars at Zarivav Marble mine Ambaji Gujrat (CNP/4890/2019-20)			
9.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the development of XI seam of Jamadoba Colliery, Tata Steel Limited (CNP/4894/2018-19)	Tata Steel Limited	6.78	Project Leader
10.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the development of VIII seam of 6&7 pits Bhutgoria Amalgamated Colliery, Tata Steel Limited (CNP/4908/2019-20)	Tata Steel Limited	6.78	Project Leader
11.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the depillaring of two panels at Jamadoba Colliery Tata Steel Limited (CNP/4912/2019-20)	Tata Steel Limited	15.93	Project Leader
12.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the depillaring of three panels at Bhelatand Amalgamated Colliery, Tata Steel Limited (CNP/4913/2019-20)	Tata Steel Limited	23.89	Project Leader
13.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the development of XII Seam of Bhelatand Amalgamated Colliery, Tata Steel Limited (CNP/4914/2019-20)	Tata Steel Limited	6.78	Project Leader
14.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for depillaring one panel at Digwadih Colliery Tata Steel Limited (CNP/4915/2019-20)	Tata Steel Limited	7.96	Project Leader
15.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the development of VIII seam of Digwadih Colliery Tata Steel Limited (CNP/4916/2019-20)	Tata Steel Limited	6.78	Project Leader
16.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for depillaring of one panel at 6&7 pits, Bhutgoria Amalgamated Colliery Tata Steel Limited (CNP/4917/2019-20)	Tata Steel Limited	7.96	Project Leader
17.	Advice on mining/geotechnical sequence during stoping at Rampura Agucha Underground Mine,	Hindustan Zinc Limited (HZL)	24.78	Project Leader

Consultancy Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
	HZL (CNP/4924/2019-20)			
18.	Advice on study for depillaring of 124LW panel by Continuous Miner (CM) Technology in the East Block of Churcha Mine (RO), Baikunthpur Area, SECL (CNP/4928/2019-20)	GMMCO	23.60	Project Leader
19.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the development of one panel at Sijua Colliery, Tata Steel Limited (CNP/4936/2019-20)	Tata Steel Limited	6.78	Project Leader
20.	Advice on regional stability while extracting Longwall (14 to 17) block including sequence of extraction in XIV seam at Jitpur colliery of SAIL (CNP/4686/2018-19).	Steel Authority of India Limited (SAIL)	5.00	Project Leader
21.	Assessment of support requirement for development of RVII and RVIIA seam by LHCM at 3&4 incline of Jhanjra project colliery, ECL and recommendations thereof. (CNP/4719/2018-19)	Gainwell Commosales Private Limited (GCPL)	12.39	Project Leader
22.	Advice on scientific study for feasibility of extraction of dev. Pillars in the proposed CMP-10 panel [consisting sub panels CMP-10A(1), CMP-10A(2), CMP-10A(3)] in King seam below caved goaf and barrier of top seam by Continuous miner technology at VK7 Incline, Kothagudem area, SCCL. (CNP/4620/2017-18)	Singareni Collieries Company Limited (SCCL)	16.52	Project Leader
23.	Scientific study to assess and design of barrier against Pussai River to avoid chances of sliding down of barrier along interface with Gopinathpur Colliery, ECL. (CNP/4509/2016-17)	Eastern Coalfields Limited (ECL)	14.95	Project Leader
24.	Advice for design of extraction methodology for development and depillaring of Sector-F of R-VII and R-VIIA seams using Low Height Continuous miner at 3&4 Incline, Jhanjra Project Colliery, ECL (CNP/4996/2020-21)	Gainwell Commosales Private Limited (GCPL)	6.78	Project Leader
25.	Technical evaluation of safe and sustainable underground operation of Gare Palma IV/5 coal mine of M/s Hindalco Industries Limited, Raigarh (CG) (CNP/4987/2020-21)	Hindalco Industries Limited	5.31	Project Leader

Consultancy Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
26.	Advice for depillaring of 15 East Panel by Continuous Miner Technology in East block of Churcha Mine (RO), Baikunthpur Area, SECL (CNP/4978/20-21)	GMMCO	23.60	Project Leader
27.	Advice for the preparation and formulation of Strata Control and Monitoring Plan (SCAMP) as per Reg. 123 of CMR 2017 of Hirakund Bundia Mine, Orient Area, MCL. (CNP/4976/2020-21)	Mahanadi Coalfields Limited (MCL)	38.99	Project Leader
28.	Advice for method of depillaring operation for three panels B-15, B-16 and B-17 of RVI seam using continuous miner at Khottadih Colliery, ECL (CNP/5154/2022-23)	CMTAPL	23.6	Member
29.	Advice for the depillaring of 27L, East panel by SDL in the Seam-II (Khond Seam), Pandavpara Mine, SECL (CNP/5153/2022-23)	SECL	14.16	Member
30.	Advice for assessment of cavability and estimation of support resistance required for longwall mining in sector A of RVI seam at Jhanjra project colliery, ECL (CNP/5152/2022-23)	CMSPL	14.16	Member
31.	Advice on technical feasibility of change in direction for depillaring of B14B panel by deployment of Continuous Miner in RVI seam at Khottadih Colliery, ECL (TSP/0152/2022-23)	CMTAPL	2.54	Member
32.	Scientific study for development and depillaring of 95 LE panel with CM technology in the East Block of Churcha Mine (RO), Baikunthpur Area, SECL (CNP/5137/2022-23)	GMMCO	30.68	Member
33.	Advice on technical feasibility of change in direction for depillaring of B14 A panel by deployment of CM in RVI seam at Khottadih colliery, ECL (TSP/0142/2022-23)	CMTAPL	2.54	Member
34.	Scientific study for depillaring of 87L West panel by continuous miner (CM) technology in the East Block of Churcha Mine (RO), Baikunthpur Area SECL (CNP/5111/2021-22)	GMMCO	25.96	Member
35.	Advice for depillaring of the 97L East panel by continuous Miner Technology in the East Block	GMMCO	23.60	Member

Consultancy Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
	of Churcha Mine (RO), Baikunthpur Area, SECL (CNP/5019/2020-21)			
36.	Advice for the development/widening and heightening and depillaring by deployment of Continuous Miner in Seam I (Top) at Gayatri Underground Mine, SECL (CNP/5088/2021-22)	Gainwell Commosales Private Limited (GCPL)	34.81	Member
37.	Advice for the depillaring of 101L West panel by Continuous Miner Technology in the East Block of Churcha Mine (RO), Baikunthpur Area, SECL (CNP/5067/2021-22)	GMMCO	23.60	Member
38.	Advice on the feasibility of development and depillaring of RVI and RIV seams using Continuous Miner (CM) at Kumardihi "B" Mine ECL for the CM project of Gainwell Commosales Private Limited (CNP/5017/2020-21)	Gainwell Commosales Private Limited (GCPL)	55.46	Member
39.	Advice for the depillaring of 108L West panel by continuous miner technology in the East Block of Churcha mine (RO), Baikunthpur area, SECL (CNP/5045/2020-21)	GMMCO	23.60	Member
40.	Advice for the depillaring of 114L West Panel by Continuous Miner Technology in the East Block of Churcha Mine (RO), Baikunthpur Area, SECL (CNP/5014/2020-21)	GMMCO	23.60	Member
41.	Advice for preparation of Strata Control and Monitoring Plan (SCAMP) for the depillaring of two panels at Sijua Colliery, Tata Steel Limited (CNP/4935/2019-20)	Tata Steel Limited	15.93	Member
42.	Advice on strata monitoring data and establishment of cut-out distance in CM panel of Salarjung seam at Shantikhani Mine, Mandamari Area, SCCL (CNP/4553/2017-18)	Singareni Collieries Company Limited (SCCL)	8.05	Member
43.	Advice on scientific study for extraction of thick seam as well as suitable method for systematic liquidation of area standing on pillars at Orient Mine no. I & II, MCL.(CNP/4528/2017-18)	Mahanadi Coalfields Limited (MCL)	16.51	Member
44.	Scientific study to liquidate (Development and	Singareni	13.80	Member

Annexure II: Detailed List of Projects

Consultancy Projects at CSIR-CIMFR				
Sl. No.	Title of Project	Funding Agency	Project Cost in INR (Lakh)	Role
	Depillaring) the Salarjung seam in different patches (Area 1 & 1A) at Shantikhani mine with CM technology, Mandamari area, SCCL. (CNP/4418/2016-17)	Collieries Company Limited (SCCL)		
45.	Scientific study for auditing of Ground Control Management Plan (GCMP of Kayad mine of M/s HZL. (CNP/4398/2016-17)	Hindustan Zinc Limited (HZL)	26.75	Member
46.	Scientific study for ascertaining the thickness of crown pillar below 85mRL upto -39mRL at different levels with stope height of 50m at Mahagiri mines (Chromite) in Sukinda Valley of M/s IMFA. (CNP/4474/2016-17)	Indian Metals & Ferro Alloys Limited (IMFA)	19.95	Member