Prof. Dheeraj Kumar (https://youtu.be/bPYGg0wdmK0)

- **Professor (HAG)**, Department of Mining Engineering, IIT (ISM) Dhanbad
- **Dy. Director**, Indian Institute of Technology (ISM) Dhanbad
- **Project Director**, Mining Technology Innovation Hub, DST, GoI
- **Director**, TEXMiN Foundation, a Section 8 company of DST, focusing on Mining Technology Development and Incubation
- **Director**, ACIC IIT (ISM) Foundation, a Section 8 company of NITI Aayog, working on Community Innovation and Startup Ecosystems

- 22+ years' experience in Academic, Research & Consultancy, and Administration
- Founded the Technology Innovation Hub (TIH) in "Mining Technology" in the name of **TEXMiN** for developing technologies, innovation, and start-up ecosystems in mining and earth science domains with substantial contributions from both Govt. and Industries
- 20+ start-up companies in the Mining Technology domain are incubated in TEXMiN with substantial financial support. Most of the founders are from top-notch institutions, including IITs.
- A group of 25+ IIT Alumni are presently working under my mentorship in TEXMiN Technology Development, Innovation & Enerprenureship activities.
- 41 projects of Technology Development are presently executed in TEXMiN under my Guidance, out of which ten technologies are commercialised and used in coal and metal mines.
- Significant credentials in Mining and Construction industries, with R&D projects (ongoing and completed projects) and CoEs with Rs. 400 Million funded by CIL, MoM, MOC, DST, DoS, MoWR & MoE.
- Developed and commercialized Indigenous mining technologies for safe, smart, sustainable mines.
- Guided 22 PhD Scholars in Mine digitization, Automation, Remote Sensing, and GIS.
- Published 50+ Journal papers in SCI indexed Journals (WoS database)
- Completed 80+ Industrial projects worth Rs. 350 Million on Mine Digitization, Monitoring, and digitalization, including Orientation and Alignment of the longest road tunnel (Chenani – Nasri Road Tunnel) connecting Jammu with Srinagar.
- Organized 50+ Professional Development Programmes (PDP) of one week to 14 weeks and trained 700+ Mining Executives in Mine Digitization, Monitoring, and digitalization.
- Started M. Tech Geomatics program with an emphasis on applications of LIDAR, AI-based Image Processing, Drone, and Remote Sensing (Optical and Microwave).
- Coordinator and member at various committees constituted by the Govt. and Industry, namely, Coordinator, Satellite-Based IIRS Outreach Programmes on GIS, GPS & Remote Sensing, IIRS; Member of GISAcademia Council of India; Member of National Geodetic and Geospatial Consortium (NGGC), DST, Govt. of India, Coordinator, RESPOND program of SAC, ISRO, Jharkhand Cluster, etc.
- Operationalizing International Relations and Alumni Cell, Centre for Innovation, Incubation, Entrepreneurship, Centre for Societal Mission, and Media and Branding Cell.

1. Leadership

Position Held	Organization/Institute	Time Period
Dy. Director	Indian Institute of Technology (Indian School of Mines), Dhanbad	29.04.22- till date
Assisting Director in Academic and administrative work and in maintaining liaison with other institutions of higher learning and research, industrial undertakings, etc. Guiding innovation & entrepreneurship, international relations & alumni affairs, developing infrastructure and facilities, etc.		

Dean (Innovation, Incubation, and Entrepreneurship)	Indian Institute of Technology (Indian School of Mines), Dhanbad	19.06.2021 – 28.04.22

Major Achievements:

- **Incubated more than 50 start-ups in the areas of community innovations and mining technologies.**
- **Technology Innovation in Exploration & Mining Foundation (TEXMiN)**, a section 8 company under the National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS), Govt. of India at the Indian Institute of Technology (Indian School of Mines), Dhanbad
- **Atal Community Innovation Centre (ACIC) IIT (ISM) Foundation**, a section 8 company under the Atal Innovation Mission (AIM), NITI Aayog
- **SANDVIK Mine Automation Learning Centre (SMAC),** a mine automation center established by SANDVIK at IIT (ISM) Dhanbad with hardware and software for capacity building in digital mining technologies
- **Dassault Mining Technology Centre, a CoE established by Dassault Syststems with hardware and software** for 3D modeling, AR/VR training, Mine Planning, 3D rendering technologies for creating a realistic representation of mines for training, visualization, and remote operations purposes, design and simulation of mechanical, electromechanical, mechatronics, and robotic systems
- **Coal India Innovation and Incubation Centre (CII Centre),** to nurture early innovators to ideate in the mining technology and promote economically viable start-ups through pre-incubation and incubation
- **ESRI-TEXMiN Geospatial Centre, a COE established by ESRI** in the area of Remote Sensing for mining & exploration
- **Regional Centre of Geodesy,** a center sponsored by DST, GoI for promoting research and education in Geodesy & GNSS

Position Held	Organization/Institute	Time Period
Dean (International Relations & Alumni Affairs)	Indian Institute of Technology (Indian School of Mines), Dhanbad	21.05.2018- 18.06.2021

Major achievements:

- **Setting up innovation, incubation and entrepreneurship ecosystem**
- **Strengthening and linking the chapters globally:** 12 Indian and 4 overseas
- **Contributions from Alumni:** Rs. 12.76 Crores (11 Smart Classroom, 2 studios with NPTEL recording facilities, Tinkering and innovation Centre, IEF, etc.)
- **Alumni Database Creation**: 20000+ update records of Alumni (**Alumni Portal**: http://alumni.iitism.ac.in)
- **eStore collectibles merchandise portal**: https://iitism.campusmall.in
- **Establishment of Media and Branding Cell (MBC):** Quarterly Newsletters, LinkedIn, Facebook, Twitter handles, etc.
- **MSME Approved HI**: IIT (ISM) became a business incubator for MSME
- **Five Star rating to CIIE**: Best Incubation Centre in Eastern Region

- **Naresh Vashist Centre for Tinkering & Innovation** with the generous support of Rs. 8.20 Crores
- **Member of the prestigious Heritage Network** (19 leading Institutions).
- **IR portal with the online application process** (incoming and outgoing mobilities)
- **Significant increase in Duo India Fellowships, SHASTRI Mobility Programme, GIAN Courses**
- **Mitacs Globalink Research Internship:** 52 students (2018 and 19)
- **Collaborative International R&D Projects: 9**
- **MoUs with Foreign Universities**: **22**
- **Foreign Mobilities**: 12(Faculty), 50+ (Students)
- **Foreign Admissions**: Increased foreign mobility through ICCR, ASEAN, Govt. of Ethiopia, MHE Afghanistan, OVL Mozambique, and Sudan
- **Significant increase in Alumni sponsored Scholarships** (52), Academic Excellence Awards (8), Best teacher Award, and Best Innovator Award
- **KPMG World Ideation Challenge 2020 & Adobe Analytics Challenge 2020: Won by students of IIT (ISM)**
- **State and National level** School Innovation Challenge/BeingArtifex Skillathon - 2021
- Skill Development Programme: 500+ students of local villages
- **Free Coaching for Classes 9-12 and IIT-JEE**
- **Women Empowerment Programmes**

Position Held	Organization/Institute	Time Period
Assoc. Dean (Infrastructure)	Indian Institute of Technology (Indian School of Mines), Dhanbad	09-01-2018 – 20.05.2018

Major achievements:

- Operationalization of Central Library Building and 1000 capacity girl's hostel.
- Acquisition of 226.98 acres of land for the second campus.
- Plugging the unauthorized entry points to campus already existed in the periphery of the Institute
- Dedicated power supply from DVC (Hotline)

Other key Positions Held	Organization/Institute	Time Period
Convenor (Improvement Group) (A team of 25 persons comprising of Deans, HoDs, HoCs)	Indian Institute of Technology (Indian School of Mines), Dhanbad	20-10-2011 – 19.10.2017
• Formulating innovative strategies for improvement of existing systems and procedures to improve the quality of the deliverable and the pace of delivery and to usher in the spirit of innovation into the system • Suggesting possible improvements in the system and preparation of a roadmap for the implementation of new ideas as and when generated • Contributing significantly towards further growth of the Institute to make it at par with the leading institutes of the world (CRF, SAC, online Feedback Systems, MIS, CC, etc.)		
Co-Coordinator/Coordinator, TEQIP -II & III	Indian Institute of Technology (Indian School of Mines), Dhanbad	01-09-2011-19.07.2018
Chairman, Admissions	IBAT, KIIT University, Bhubaneswar	01.07.2004 – 09.08.2005
Head, Education & IT	Indian Institute for Production Management, L&T Kansbahal	01.04.2003-30.06.2004

2. Academic and R&D Contributions

- Developed capabilities in Geospatial Technologies in Mining and allied areas with support from ISRO (IIRS & NRSC) and IITs (IITK, IITR).
- Enriched mine surveying and geomatics laboratory with modern surveying instruments, software, and techniques with funding support from FIST, TEQIP, and other sponsored projects.
- Started M. Tech Geomatics program with an emphasis on applications of LIDAR, AI-based Image Processing, Drone, and Remote Sensing (Optical and Microwave).
- Taught UG and PG courses [Mine Surveying, Geospatial Technologies for Natural Resources, Computer-Aided Mine Planning & design]
- Rated with a good feedback score of 9 + out of 10 in UG courses (Class strength 100+).
- Organized Satellite-based Outreach Programmes on Geodesy, GNSS, and Remote Sensing jointly with IIRS Dehradun & IIT (ISM) Dhanbad and trained more than 500 students with certificates from IIRS.
- Coordinator and member at various committees constituted by the Govt. and Industry, namely, Coordinator, Satellite-Based IIRS Outreach Programmes on GIS, GPS & Remote Sensing, IIRS; Member of GISAcademia Council of India; Member of National Geodetic and Geospatial Consortium (NGGC), DST, Govt. of India, Coordinator, RESPOND program of SAC, ISRO, Jharkhand Cluster, etc.

(a) Intellectual Property (Publications/Design/Developments/Patents, etc.): Annexure – I&II

- Publications: 3 books, 81 papers (SCI & Scopus) (Annexure-II)
- PhD. Guidance: 22 (Annexure-I)
- M.Tech Guidance: 57
- Patent: 02

(b) R&D Projects: Annexure III

- Significant credentials in Mining and Construction industries, with R&D projects (ongoing and completed projects) with Rs. 3870.57 Lakh funded by CIL, MoM, MOC, DST, DoS, MoWR, MoE, Sandvik, Dassault Systems, etc.
- Developed and commercialized indigenous mining technologies for safe, smart, sustainable mines.

(c) Innovations and R&D Facilities: Annexure IV

- Founded the **Technology Innovation Hub (TIH)** in "Mining Technology" in the name of TEXMiN for developing technologies, innovation, and startup ecosystems in mining and earth science domains with substantial contributions from both Govt. and Industries
- 21 startup companies in the Mining Technology domain are incubated in TEXMiN with substantial financial support. Most of the founders are from top-notch institutions, including IITs.
- A group of 25+ IIT Alumni are presently working under my mentorship in TEXMiN Technology Development, Innovation & Enerprenureship activities.
- 38 projects of Technology Development are presently executed in TEXMiN under my Guidance, out of which 10 technologies are commercialized and used in coal and metal mines.
- **SANDVIK Mine Automation Learning Centre (SMAC),** an automation centre established with SANDVIK collaboration for academic, R&D and Capacity Building in Digital Mining Technologies
- **Dassault Mining Technology Centre, a CoE established in collaboration with Dassault Systems** for 3D mapping and monitoring, modelling, AR/VR training, Mine Planning, 3D rendering technologies for creating a realistic representation of mines for training, visualization and remote operations purposes, design, and simulation of mechanical, electromechanical, mechatronics, and robotic system.
- **The Coal India Innovation and Incubation Centre (CII Centre)** was established with collaboration from CIL to nurture early innovators to ideate in mining technology and

promote economically viable startups through pre-incubation and incubation.

- **ESRI- Geospatial Centre, a COE collaborating with ESRI** in Remote Sensing for mining and exploration.
- **Regional Centre of Geodesy is a centre sponsored by DST, GoI,** for promoting research and education in Geodesy & GNSS.

3. Sponsored Consultancy & Outreach Activities: Annexure V

- Completed 77 Industrial projects worth Rs. 3024 Lakhs on Mine Digitization, Monitoring, and digitalisation, including Orientation and Alignment of the longest road tunnel (Chenani – Nasri Road Tunnel) connecting Jammu with Srinagar.
- Organized 52 Professional Development Programmes (PDP) of one week to 14 weeks durations and trained 674 mining professionals.

4. Peer Recognition (National/International Honours, Awards, Prizes including honorary degree)

- Member, CII National Committee on Mining
- Member Taskforce, GIS Academia Council of India
- Advisory Council, Master Mentors Geo-enabling Indian Scholars (MMGEIS)
- Advisor, Society for Mining, Metallurgy, and Exploration (SME), USA
- Member, Central Empowered Committee (CEC) & Ore Assessment Committee (Constituted by Govt. of India)
- Member, PMMC, National Centre in Geodesy
- Member, National Geodetic and Geospatial Consortium (NGGC)
- SBI Best Researcher award (five consecutive terms, 2012-2017)
- "Hindustan Zinc Limited Award" by the Institution of Engineers (INDIA)
- "Meritorious Scholar" awards at IIT Kharagpur (three consecutive terms, 2001-2004)
- President, IEI, Dhanbad Section

5. Membership/Fellowship of National/International Professional Bodies

- Society for Mining, Metallurgy & Exploration, USA
- Australasian Institute of Mining and Metallurgy (AusIMM), Australia
- The Mining, Geological & Metallurgical Institute of India (MGMI)
- Geospatial World Forum

Annexure I: List of Doctoral Dissertations in the last five years

S.No.	Title	Scholar
1.	Characterization of Land Subsidence Phenomena in Jharia Coalfield, India Using Differential Interferometric SAR Techniques	Shailaja Thapa
2.	Investigation into the Effect of Re-Vegetation on Mechanical Stability of Waste, Sub-Grade and Fines Dumps in a Surface Iron Ore Mine	Vibhash Ranjan
3.	An Interoperability Model for Bio-resource Distributed Database using Data Science	Priyanka Singh
4.	Vegetation Biophysical Parameters Retrieval using RISAT-1 Hybrid Polarimetric SAR data	Thota Sivasankar
5.	Development of Design Norms For Rib/Snook During Mechanised Depillaring By Continuous Miner	Ashok Kumar
6.	Development of a Methodology for Detection, Monitoring, and Analysis of Mining Induced Subsidence using Spaceborne SAR Interferometry Techniques	Soyeb Alam
7.	Assessment and Prediction of Mining and Coal Fire-Induced Surface Land Subsidence In Jharia Coalfield Using Modified Psinsar And Gnss Techniques	Sunil Kumar
8.	Detection and Assessment of Spatio-Temporal Dynamics of Jharia Coalfield Fire using Satellite-based Multi-Temporal Night-Time Thermal Imaging	Narendra Singh
9.	Assessment of surface deformation in National Capital Regions (NCR) due to ground water depletion using geodetic technique and spaceborne SAR	Kapil Kumar Malik
10.	Design and Development of Smart Tracking and IoT Enabled Monitoring System for Underground Coal Mines	Shankhajit Mitra
11.	Retrieval of Soil moisture Using Hybrid polarimetric RISAT-1SAR data	Pavan Kumar Sharma
12.	Analyses on surface subsidence due to underground mining operations in the Singhbhum shear zone using an integrated approach of PSInSAR and Data Science techniques	S. G. Ishwar
13.	Design and Development of IOT based Information and Communication System for Smart Goaf Edge Support System in Underground Coal Mines	Ankit Singh
14.	An Assessment of Groundwater Depletion and Land Subsidence in North-West India by Spaceborne Geophysical, SAR Interferometry, and Ground-based Observations	Pranshu Pranjal
15.	Time series spaceborne wide-swath thermal infrared data analysis and algorithm development for coal fire induced thermal anomaly detection in parts of the Gondwana Coalfields of India	Ritesh Mujawdiya
16.	An Assessment of the Effect of Spatial Information on Fuzzy based Classifiers	Shilpa Suman
17.	Seismically Induced Hazard Assessment and Prediction in Indo Gangetic Piedmont Alluvial Region using Geospatial Analysis and Mapping	Abhishek Rawat

Annexure II: Publications (2015 onwards)

SCI

1. J. Pandey, **D. Kumar**, N. K. Mohalik, R. K. Mishra, A. Khalkho, & V. K. Singh (2015), Investigation of the Role of Fire Retardants in Preventing Spontaneous Heating of Coal and Controlling Coal Mine Fires, Fire Technology, https://doi.org/10.1007/s10694-012-0302, 51(2):227-245.
2. Chatterjee, R.S. Singh, K.B. Thapa Shailaja & **Kumar D**. (2015). The present status of subsiding land vulnerable to roof collapse in the Jharia Coalfield, India, as obtained from shorter temporal baseline C-band DInSAR by smaller spatial subset unwrapped phase profiling, International Journal of Remote Sensing, https://doi.org/10.1080/2150704X.2015.1126376, (37)1:176–190.
3. Ranjan, V. Sen, P. **Kumar, D.** and Sarsawat, A. (2015). A review on dump slope stabilization by revegetation with reference to indigenous plant. Ecol Process 4, 14 (2015). https://doi.org/10.1186/s13717-015-0041-1.
4. Pandey, J. **Kumar, D.** Singh, V. K. Mohalik, N. K. (2016). Environmental and socio-economical impacts of fire in Jharia coalfield: An appraisal, Current Science, 110 (9):1639-1650.
5. Ishwar, S. G. and **Kumar, D.** (2016). Application of DInSAR in mine surface subsidence monitoring and prediction, Current Science Journal, Vol. 112, No.1:46-51.
6. S. K. Chaudhary, **D. Kumar** & M. K. Jain (2016): Performance analysis of hyperspherical color sharpening method for IRS satellite images, Imaging Science Journal, https://doi.org/10.1080/13682199.2016.1190898, 64(6):01-08.
7. Ranjan, V., Sen, P., **Kumar, D.** Sarsawat, A. (2017). Enhancement of Mechanical Stability of waste dump slope through establishing vegetation in a surface iron ore mine. Environ Earth Sci. https://doi.org/10.1007/s12665-016-6350-6, (2017) 76: 35.
8. Ranjan, V., Sen, P., **Kumar, D.** et al. (2017) Enhancement of mechanical stability of waste dump slope through establishing vegetation in a surface iron ore mine. J Min Sci 53, 377–388 (2017). https://doi.org/10.1134/S106273911702226X.
9. Ram, S. **Kumar, D.** Singh, A.K. Kumar, A. and Singh R. (2017), Field and numerical modelling studies for an efficient placement of roof bolts as breaker line support, International Journal of Rock Mechanics & Mining Sciences, https://doi.org/10.1016/j.ijrmms.2017.01.013, (93):152–162.
10. Chatterjee, R.S. **Kumar D.** Singh, N. Thapa, S. and Sharma, D. (2017). Retrieval of land surface temperature (LST) from landsat TM6 and TIRS data by single channel radiative transfer algorithm using satellite and ground-based inputs, International Journal of Applied Earth Observation and Geoinformation, https://doi.org/10.1016/j.jag.2017.02.017, (58):264–277.
11. Ishwar, S. G. and **Kumar, D.** (2017). Mine Surface Subsidence Monitoring due to Impacts of Underground Mining Using Persistent Scatterer Interferometry, The Imaging Science Journal, https://doi.org/10.1080/13682199.2017.1303957 , 65(3): 151-161.
12. Pandey, J. **Kumar, D.** and Singh, V. K. (2017). Temporal transition analysis of coal mine fire of Jharia coalfield, India, using Landsat satellite imageries, Environ Earth Sci., https://doi.org/10.1007/s12665-017-6765-8, 76:439.
13. Alam, Md. S. **Kumar, D.** Sharma, V. and Chaudhary, S. K. (2018). Land Surface Deformation Parameter Estimation Using Persistent Scatterer Interferometry approach in an Underground Metal Mine Environment, The Imaging Science Journal, https://doi.org/10.1080/13682199.2018.1450701 66(5):289-302.
14. Kumar, A. **Kumar, D.** Verma, A. K. Singh, A. K. Ram, S. and Kumar, R. (2018). Influence of Overlying Roof Strata on Rib Design in Mechanized Depillaring, Journal of the Geological Society of India, https://doi.org/10.1007/s12594-018-0860-7, March 2018, 91(3): 341-347.
15. Singh, A. **Kumar, D.** and Hotgel, J. (2018). IoT Based information and communication system for enhancing underground mines safety and productivity: Genesis, taxonomy and open issues, Ad Hoc Networks 78 (2018) 115–129, https://doi.org/10.1016/j.adhoc.2018.06.008.

16. Alam, M.S., **Kumar, D**., Chatterjee, R.S. et al. (2018). Assessment of Land Surface Subsidence Due to Underground Metal Mining Using Integrated Spaceborne Repeat-Pass Differential Interferometric Synthetic Aperture Radar (DInSAR) Technique and Ground-Based Observations, Journal of the Indian Society of Remote Sensing (2018) 46 (10): 1569-1580. https://doi.org/10.1007/s12524-018-0810-2.
17. Singh, P., Saran, S., **Kumar, D**. et al. (2018). Species Mapping Using Citizen Science Approach Through IBIN Portal: Use Case in Foothills of Himalaya, Journal of the Indian Society of Remote Sensing (2018), 46 (10):1725-1737. https://doi.org/10.1007/s12524-018-0833-8.
18. Malik, K. **Kumar, D**. and Perisssin, D. (2018). Assessment of subsidence in Delhi NCR due to groundwater depletion using TerraSAR-X and persistent scatterers interferometry, The Imaging Science Journal, (2018), 67 (1): 1-7, https://doi.org/10.1080/13682199.2018.1540166.
19. Thota Sivasankar, **Dheeraj Kumar**, Hari Shanker Srivastava & Parul Patel (2019): Wheat leaf area index retrieval using RISAT-1 hybrid polarized SAR data, Geocarto International, https://doi.org/10.1080/10106049.2019.1566404.
20. Sharma, P.K. **Kumar, D.** Srivastava, H.S. Patel, P. and Sivasankar, S (2019). Soil moisture retrieval under wheat crop using RISAT-1 hybrid Polarimetric SAR data, Journal of Agrometeorology,21(1): 58-62.
21. Kumar, A. **Kumar, D.** Singh, A. K., Ram, S. Kumar, R. Gautam, A. Singh, R., and Singh, A. K. (2019). Roof sagging limit in an early warning system for safe coal pillar extraction, International Journal of Rock Mechanics & Mining Sciences 123 (2019) 104131:1-10.
22. Shankar, V. **Kumar, D**. and Subrahmanyam, D. (2019). Impact and Severity of Deep Excavations on Stress Tensors in Mining, Journal of Mining Science 55(2):6, DOI: 10.15372/FTPRPI20190205 (Q3: Geosciences)
23. Ritesh Mujawdiya, Rajat S. Chatterjee, **Dheeraj Kumar**, and Narendra Singh (2019). Detection of bad data images in long-term MODIS land surface temperature image time series using statistical outlier detection methods," Journal of Applied Remote Sensing 13(4), 048504 (9 December 2019). https://doi.org/10.1117/1.JRS.13.048504.
24. Narendra Singh, R.S. Chatterjee, **Dheeraj Kumar**, D.C. Panigrahi & Ritesh Mujawdiya (2020). Retrieval of precise land surface temperature from ASTER night-time thermal infrared data by split-window algorithm for improved coal fire detection in Jharia Coalfield, India, Geocarto International, DOI: 10.1080/10106049.2020.1753820.
25. Sunil Kumar, **Dheeraj Kumar**, Sumit Kumar Chaudhary, Narendra Singh, and Kapil Kumar Malik (2020). Land subsidence mapping and monitoring using modified persistent scatterer interferometric synthetic aperture radar in Jharia Coalfield, India, J. Earth Syst. Sci. (2020)129:146, Indian Academy of Sciences https://doi.org/10.1007/s12040-020-01413-0.
26. Ritesh Mujawdiya, R. S. Chatterjee & **Dheeraj Kumar** (2020): MODIS land surface temperature time series decomposition for detecting and characterizing temporal intensity variations of coal fire-induced thermal anomalies in Jharia coalfield, India, Geocarto International, DOI: 10.1080/10106049.2020.1818853 (Q1: Geosciences)
27. Arun Kumar Singh, Ashok Kumar, **Dheeraj Kumar**, Rajendra Singh, Sahendra Ram, Rakesh Kumar & Amit Kumar Singh (2020). Coal pillar extraction under weak roof. Mining, Metallurgy & Exploration, 2020, Vol. 37(5), Pages 1451-1459. doi: /10.1007/s42461-020-00277-8.
28. Singh, A.K., Kumar, A., **Kumar, D.** (2021). Field and Simulation Studies for Mechanised Depillaring below Incompetent Geological Formations of an Indian Coal Mine. J Geol Soc India 97, 405–415 (2021). https://doi.org/10.1007/s12594-021-1698-y.
29. Mohammad Soyeb Alam, **Dheeraj Kumar** & R. S. Chatterjee (2021): Improving the capability of integrated DInSAR and PSI approach for better detection, monitoring, and analysis of land surface deformation in an underground mining environment, Geocarto International, DOI:10.1080/10106049.2020.1864028.
30. Kadiyan, N., Chatterjee, R.S., Pranjal, P. **Kumar, D.** (2021). Assessment of groundwater depletion–induced land subsidence and characterization of damaging cracks on houses: a case study in Mohali-Chandigarh area, India. Bull Eng Geol Environ. https://doi.org/10.1007/s10064-021-02111-x.
31. Kumar, S., Agarwal, A., Villuri, V.G.K. **Kumar, D** (2021) Constructed wetland management in urban catchments for mitigating floods. Stoch Environ Res Risk Assess (2021). https://doi.org/10.1007/s00477-021-02004-1.

32. Sharma, P., Kumar, A., Shams, N. et al. Parametric study to design competent irregular-shaped remnants in mechanised depillaring. Arab J Geosci 14, 247 (2021). https://doi.org/10.1007/s12517-021-06555-z.

33. Narendra Singh; R.S. Chatterjee; **Dheeraj Kumar**; D.C. Panigrahi (2021). Spatio-temporal variation and propagation direction of coal fire in Jharia Coalfield, India by satellite-based multi-temporal night-time Land surface temperature imaging. International Journal of Mining Science and Technology. https://doi.org/10.1016/j.ijmst.2021.07.002.

34. Suman, S., **Kumar, D.** & Kumar, A. Study the Effect of Convolutional Local Information-Based Fuzzy c-Means Classifiers with Different Distance Measures (2021). J Indian Soc Remote Sens 49, 1561–1568 (2021). https://doi.org/10.1007/s12524-021-01333-6.

35. Kapil Malik, **Dheeraj Kumar**, Daniele Perissin, Biswajeet Pradhan (2021), Estimation of ground subsidence of New Delhi, India using and Multi-sensor Radar data, Advances in Space Research, ISSN 0273-1177, https://doi.org/10.1016/j.asr.2021.08.032.

36. Kumar, A. **Kumar, D.** Singh, A. K., Ram, S. Kumar, R. (2021). Development of an empirical model for strength estimation of irregular-shaped-heightened-rib/snook for mechanized depillaring, International Journal of Rock Mechanics & Mining Sciences 148 (2021) https://doi.org/10.1016/j.ijrmms.2021.104969.

37. Mitra S.;Kumar D.;Chaulya S.K.;Kumar C. (2022) Prediction of Strata Monitoring System in Underground Coal Mines Using IoT. Journal of the Geological Society of India, **Volume** 98, **Year** 2022, **Pages** 232-236, DOI:10.1007/s12594-022-1963-8

38. Kumar S.;Agarwal A.;Ganapathy A.;Villuri V.G.K.;Pasupuleti S.;Kumar D.;Kaushal D.R.;Gosain A.K.;Sivakumar B. (2022), Impact of climate change on stormwater drainage in urban areas, Stochastic Environmental Research and Risk Assessment, **Volume** 36, **Year** 2022, **Pages** 77-96, DOI:10.1007/s00477-021-02105-x

39. Kumar, S. **Kumar, D**. Donta, P.K. Amgoth, T. (2022). Land subsidence prediction using recurrent neural networks. Stochastic Environmental Research and Risk Assessment, DOI:10.1007/s00477-021-02138-2.

40. Pranjal P. Kadiyan N. Chatterjee R.S. **Kumar D**. Sati M.S. (2021). Interpreting land subsidence impacts due to groundwater depletion using remote sensing-based GRACE gravity anomaly and DInSAR technique: a study on north-western parts of India. Environmental Earth Sciences, Volume 80, DOI:10.1007/s12665-021-09905-y.

41. Rawat, A., **Kumar, D**., Chatterjee, R.S. et al. A GIS-based liquefaction susceptibility mapping utilising the morphotectonic analysis to highlight potential hazard zones in the East Ganga plain. Environ Earth Sci 81, 358 (2022). https://doi.org/10.1007/s12665-022-10468-9

42. Rawat, A., **Kumar, D**., Chatterjee, R.S. Seismic hazard assessment in Indo-Gangetic plain due to Nepal earthquake 2015 considering PGA, Taru Journal of Sustainable Technologies and Computing ISSN xxxx-xxxx (Print), ISSN xxxx-xxxx (Online) Vol. 1 No. 1 (January 2019), pp. 1–7 https://doi.org/10.47974/TJSTC.005.2019.v01i01

43. Abhishek Rawat, **Dheeraj Kumar**, R. S. Chatterjee & Harsh Kumar (2022) Reconstruction of liquefaction damage scenario in Northern Bihar during 1934 and 1988 earthquake using geospatial methods, Geomatics, Natural Hazards and Risk, 13:1, 2560-2578, DOI: 10.1080/19475705.2022.2122591, https://doi.org/10.1080/19475705.2022.2122591

44. Kumar, A. **Kumar, D**. Ram, S. Singh, A. K., Kumar, R. Gorain, S. (2022). Development of design norms for rib/snook during mechanised depillaring by continuous miner, International Journal of Rock Mechanics & Mining Sciences Accepted (Q1: Geosciences)

45. Narayan Kayet, Khanindra Pathak, C.P. Singh, V.M. Chowdary, BimalK. Bhattacharya, Dheeraj Kumar, Subodh Kumar, Ibrahim Shaik (2022) Vegetation health conditions assessment and mapping using AVIRIS-NG hyperspectral and field spectroscopy data for -environmental impact assessment in coal mining sites, Ecotoxicology and Environmental Safety, **Volume** 239, **Year** 2022, DOI:10.1016/j.ecoenv.2022.113650

46. Suman, S.; **Kumar, D**.; Kumar, A (2022). Fuzzy Based Convolutional Noise Clustering Classifier to Handle the Noise and Heterogeneity in Image Classification. Mathematics 2022, 10, 4056. https:// doi.org/10.3390/math10214056.

47. Shilpa Suman, **Dheeraj Kumar**, Anil Kumar (2022). Study the Effect of MRF Model on Fuzzy c Means Classifiers with Different Parameters and Distance Measures, Journal of the Indian Society of Remote Sensing (July 2022) 50(7):1177–1189 https://doi.org/10.1007/s12524-022-01521-y .

48. R.S. Chatterjee, Shravanee Singha, Ashish Aggarwal, Vimanyu Sharma, Pranshu Pranjal, Anuradha Anushika, P.K. Jain, A. Nagar, D.S. Mitra, D. Kumar, N.R. Patel, P. Chauhan (2203). Reconnaissance to characterisation of land subsidence due to groundwater overdraft and oil extraction in and around Mehsana City, Gujarat, India by long-term hybrid differential interferometric SAR technique, Journal of Hydrology, https://doi.org/10.1016/j.jhydrol.2023.130441

49. Pranjal P.; Chatterjee R.S.; Kumar D.; Dwivedi S.; Jally S.K.; Kumar B. (2023) Satellite gravity observation and hydrological modelling-based integrated groundwater storage change in Northwestern India, Journal of Hydroinformatics, **Volume** 25, **Year** 2023, **Pages** 226-242,DOI:10.2166/hydro.2023.072

50. Ritesh Mujawdiya, R. S. Chatterjee & Dheeraj Kumar (2023): A time series decomposition approach to detect coal fires in parts of the Gondwana coalfields of India from VIIRS data, Journal of Spatial Science, DOI: 10.1080/14498596.2023.2183431

51. Vivek Singh, Purnendu Sardar, Sukha Ranjan Samadder, Dheeraj Kumar, Vasant Govind K. Villuri (2023), Predicting the future landscape of Dhanbad District: an analysis of land-use change and urban sprawl through cloud computing and neural networks, Environment, Development, and Sustainability https://doi.org/10.1007/s10668-023-03998-0

52. Piyush Singh, V.M.S.R. Murthy, Dheeraj Kumar and Simit Raval (2024). A Comprehensive Review On the Application of Drone, Virtual Reality, And Augmented Reality With Their Application In Dragline Excavation Monitoring In Surface Mines, GEOMATICS, NATURAL HAZARDS AND RISK2024, VOL. 15, NO. 1, 2327399https://doi.org/10.1080/19475705.2024.2327399

53. Piyush Singh, V.M.S.R. Murthy, Dheeraj Kumar and Simit Raval (2024). Enhancing Dragline Operations Supervision through Computer Vision: Real-time Height Measurement of Dragline Spoil Piles Dump using YOLO, Geomatics, Natural Hazards and Risk 2024, VOL. 15, NO. 1, 2322492 https://doi.org/10.1080/19475705.2024.2322492

54. Pranjal, P., Kumar, D., Soni, A. et al. (2024) Assessment of groundwater level using satellite-based hydrological parameters in North-West India: A deep learning approach. Earth Sci Inform. https://doi.org/10.1007/s12145-024-01263-0

55. Vikram, S; Kumar, Dheeraj; and Subrahmanyam, DS (2024) "Difficulties of hydrofracturing in sandstone – experimental study," Journal of Sustainable Mining: Vol. 23: Iss. 2, Article 6. Available at: https://doi.org/10.46873/2300-3960.1413

56. Mohammad Soyeb Alam, Dheeraj Kumar & Gajendra K. Vishwakarma A (2024) Review on Advances in Persistent Scatterer Interferometry and Proposing a Novel Method for Phase Optimization of Distributed Scatterers Pixels, Journal of Engineering Mathematics, 145:20 https://doi.org/10.1007/s10665-024-10354-2

57. Silvia Dutta, Manish Kumar Jain, Dheeraj Kumar (2024) Evaluation of soil heavy metals in Raniganj open-cast coal mines in India: Spatial distribution, Positive Matrix Factorization and Monte Carlo Simulation, Process Safety and Environmental Protection, https://doi.org/10.1016/j.psep.2024.12.039

58. Sanjay Kumar Singh, Dheeraj Kumar (2024) Optimizing coal mine planning and design for sustainable development in the context of mass exploitation of coal deposits, https://doi.org/10.1016/j.heliyon.2024.e28524

59. Pandey J.; Kumar D.; Chaudhary S.K.; Khalkho A.; Pandey J.K (2024) Detection of Surface and Sub-surface Coal Mine Fire of Jharia Coalfields using Remotely Sensed and Ground Thermal Data, Journal of Mining and Environment, **Volume** 15, **Year** 2024, **Pages** 1-19, DOI:10.22044/jme.2023.12620.2293

SCOPUS

1. Kumar, D and Das, S. K. (2002), Estimation of Weak Floor Strata Properties and Their Influence on Floor Bearing Strength through Physical Modelling Technique, Journal of the Institution of Engineers (India), Vol. 82: 48-51 (SCOPUS).
2. Mukhopadhyay. S. K. and Kumar D. (2004), Why Longwall in India has not succeeded as in another Developing Country like China, Journal of The Institution of Engineers (India), Vol 84, Feb 2004: 43 –55 (SCOPUS).
3. Kumar, D and Das, S. K. (2005), An Experimental Study of the Parameters influencing Ultimate Bearing Strength of Weak Floor Strata, Geotechnical and geological journal, 2005, Volume 23, Issue 1 :1-15 (SCOPUS)
4. Kumar, D. and Das. S. K. (2004), Floor Bearing Characteristics of Jointed and Layered Rock Foundation, Electronic Journal of Geotechnical Engineering , EJGE, www.ejge.com, Vol. 9 – 2004 (SCOPUS)
5. Kumar, D. Behera, P.K. and Singh, U. K. (2002), Shotcreting in Rock Excavation and its Adhesion Strength, Electronic Journal of Geotechnical Engineering, EJGE, www.ejge.com, Vol. 7 – 2002 (SCOPUS)
6. Kumar D.(2010), Emerging Trends in Information & Communication technology in Mine Safety and Disaster Management, Journal of Coal Science & Engg (China), Vol.16 No.3:277–283 (SCOPUS).
7. Kumar Atul, Kumar, D. Singh, U. K. and Gupta, P.S. (2010), Development of an Automated System for Continuous Monitoring of Powered Roof Support in Longwall Panel, Journal of Coal Science & Engg (China), ISSN 1006-9097, Vol.16 No.4:337-340 (SCOPUS).
8. Kumar Atul, Kumar, D. Singh, U. K. and Gupta, P.S. (2011), Optimizing Fibre Optics for Coal Mine Automation, International Journal of Control and Automation, 2005-4297,Vol.4, No.3:19-30 (SCOPUS).
9. Malladi, S.V.V.N and Kumar D. (2012), BPNN and ANFIS Models for Prediction of Floor Bearing Characteristics of Weak Rock Foundations, Recent Advances in Information Technology, 10.1109/RAIT.2012.6194453, IEEE Explore, 2012:398 – 403 (SCOPUS).
10. Yadav, P. S. Pal, N. Kumar, D. and Krishna, S. V. (2015). LEDs Lighting Arrangements for Underground Mines, TELKOMNIKA Indonesian Journal of Electrical Engineering, Vol. 15, No. 1:14 19 (SCOPUS)
11. Pandey, J. Kumar, D. and Singh, V. K. (2015). Detection and Monitoring of Coal Mine Fire in Jharia Coal Field (JCF): An Integrated Approach on Old Problem, International Journal of Earth Sciences and Engineering, Vol. 08, No. 05: 256-258 (SCOPUS).
12. Kumar, D. (2015). Mining, Mineral and Sustainable Development, Journal of Mines, Metals & Fuels, Vol. 63, No. 9:251-259 and 274 (SCOPUS)
13. Kumar, D. Kumar, S. and Chaudhary, S.K. (2015). Land Use /Land Cover Change Analysis and Prediction in Jharia Coalfield using Remote Sensing Technique, International Journal of Earth Sciences and Engineering, Vol. 08, No. 06:2670-2677 (SCOPUS).
14. Ranjan, V. Sen, P. Kumar, D. and Sarsawat, A. (2016). Reclamation and rehabilitation of waste dump by eco-restoration techniques at Thakurani iron ore mines in Odisha, Int. J. Mining and Mineral Engineering, Vol. 7, No. 3:253-264 (SCOPUS).
15. Kumar D (2016). Application of Modern Tools and Techniques for Mine Safety & Disaster Management, J. Inst. Eng. India Ser. D (Springer), 97(1):77–85 (SCOPUS).
16. Shailaja Thapa, R. S. Chatterjee, K. B. Singh, Dheeraj Kumar (2016), LAND SUBSIDENCE MONITORING USING PS-InSAR TECHNIQUE FOR L-BAND SAR DATA The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Vol. XLI-B7:995 –997(SCOPUS).
17. Alam, S. Kumar, D. and Upreti, V. (2017) Investigation into land surface deformation due to hard rock underground metal mining using differential interferometric synthetic aperture radar (D- InSAR) technique, Journal of Mines, Metals & Fuels, Vol. 65, No. 1:251-259 and 274 (SCOPUS)
18. Ranjan, V. Sen, P. and Kumar, D. (2017). Dump Slope Stabilization through Re-vegetation in Iron Ore Mines in Bonai Iron Ore Range A Review, Int. J. Mining and Mineral Engineering, Vol. 8, No. 4: 334-351, 10.1504/IJMME.2017.087972 (SCOPUS).
19. Ranjan, V. Sen, P. Kumar, D. and Saraswat, A. (2017). Efficacy of different vegetation methods for stabilization of iron ore fines dump in a surface iron ore mine, Journal of Mines, Metals & Fuels, Vol. 65, No. 6:362-366 (SCOPUS).

20. Alam, S. Kumar, D. and Upreti, V. (2018) Generation and Validation of Cartosat – 1 DEM for Northern Aravali Range of Hillocks, Rajsthan, Journal of Mines, Metals & Fuels, Vol. 66, No. 1:48- (SCOPUS)
21. Thota Sivasankar,Dheeraj Kumar,Hari Shanker Srivastava and Parul Patel,"Advances in Radar Remote Sensing of Agricultural Crops: A Review," International Journal on Advanced Science, Engineering and Information Technology, vol. 8, no. 4, pp. 1126-1137, 2018. [Online]. Available: http://dx.doi.org/10.18517/ijaseit.8.4.5797.
22. Malik, K. and Kumar, D. (2018) High Resolution Interferometric Digital Elevation Model Generation and Validation. Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci., XLII-5, 755–756, https://doi.org/10.5194/isprs-archives-XLII-5-755-2018, 2018
23. Chatterjee, R.S. Pranjal, P. Jally, S. Kumar, B. Dadhwal, V. K. Srivastav, S. K. Kumar, D. (2019) Potential groundwater recharge in north-western India vs spaceborne GRACE gravity anomaly based monsoonal groundwater storage change for evaluation of groundwater potential and sustainability, Groundwater for Sustainable Development 10 (2020) 100307: 1-14, https://doi.org/10.1016/j.gsd.2019.100307.
24. Mitra S.;Chaulya S.K.;Kumar D.;Soni A. (2023) An Approach for Implementation of IoT Enables Smart Environmental Monitoring and Strata Monitoring System for Underground Coal Mines, Springer Proceedings in Earth and Environmental Sciences, **Volume** Part F1608, **Year** 2023, **Pages** 165-179DOI:10.1007/978-3-031-46966-4_14
25. Mitra S.; Kumar D.; Chaulya S.K.; Kumar C.Performance analysis using IoT based underground miner's tracking and wireless voice communication system (2022) journal of Mines, Metals and Fuels, **Volume** 70, **Year** 2022, **Pages** 75-82

Annexure III: R&D projects in the last five years

S.No.	Project No.	Title	Date of Start	Funding Agency	Value (Rs. Lakh)
1.	CIL(11)/2019-2020/655/ME	Development and Field Trial of 500 T Capacity SAGES-III for Use with Continuous Miners (Phase-III)	23.04.2019	CIL	396.69
2.	NVF/2019-2020/695/CIIE	Tinkering and Innovation Laboratory	12.02.2020	NVF (Naresh Vashisht Foundation)	810
3.	DST(SERB)(TIH)(256)/2020-2021/712	Technologies for Mining under National Mission on Interdisciplinary Cyber-Physical Systems (NM-ICPS)	03.03.2020	DST (SERB)	11000
4.	SAIL(4)/2020-2021/728/ME	Assessment of change detection due to mining activities at the iron ore mines of SAIL at a scale of cadastral using Deep Learning Neural Networks technique	20.06.2020	SAIL	91.5
5.	SAIL(6)/2021-2022/802/ME	Scientific study for preparation of Computer Aided 3-D Model of Ground Level of Tasra Open Cast Project, SAIL-Collieries Division	27.03.2021	SAIL	11.06
6.	HCL/2022-2023/985/MNE	Scientific Study of Subsidence at Surda Mining Lease, Kendadih Mining Lease, and Rakha Mining Lease	08.02.2023	HCL	88.50
7.	DST(SERB)(382)/2022-2023/995/MNE	Slope Instability Severity (SIS) Assessment at the Coalfield Level using Integration of Innovative Spaceborne InSAR and Relevant Data for Enhanced Slope Failure Predictions	01.03.2023	DST (SERB)	56.94
8.	DST(NRDMS)(385)/2023-2024/1000/MNE	Regional Centre for Geodesy	31.03.2022	DST (NRDMS)	141
9.	DSF/2022/11158	Hyperspectral Image Processing and Analysis for exploration in Mining Industry	07.12.22	Dassult Systemes	31.75
10.	BCCL/2023-2024/1010/MNE	Detection and Monitoring of Longwall Subsidence of Moonidih Colliery, BCCL, using Spaceborne SAR Interferometry (InSAR) Techniques	11.05.2023	BCCL	39.90
11.	CIL(CoE)/2024-2025/06/TEXMiN	IMiN - Centre of Excellence for Mining 4.0 at TEXMiN at IIT(ISM) Dhanbad campus	18.06.24	CIL	6745

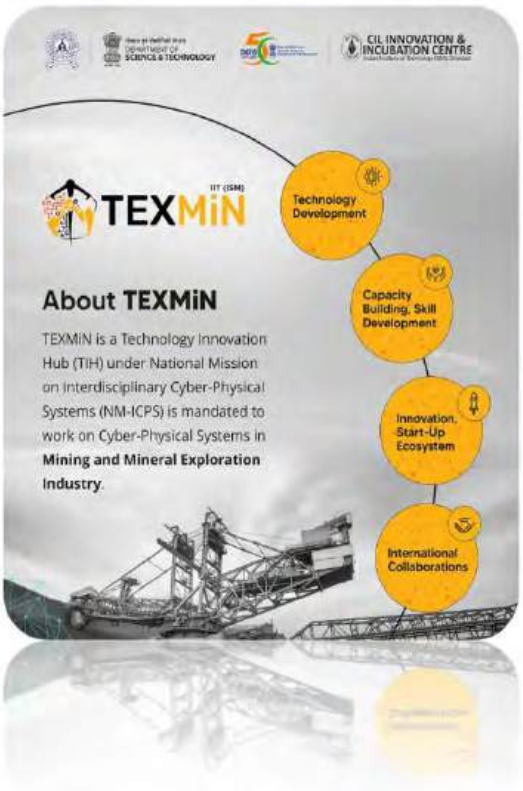
Major Technology developed and commercialized in the last five years (Showcased in IIT R&D Fair)

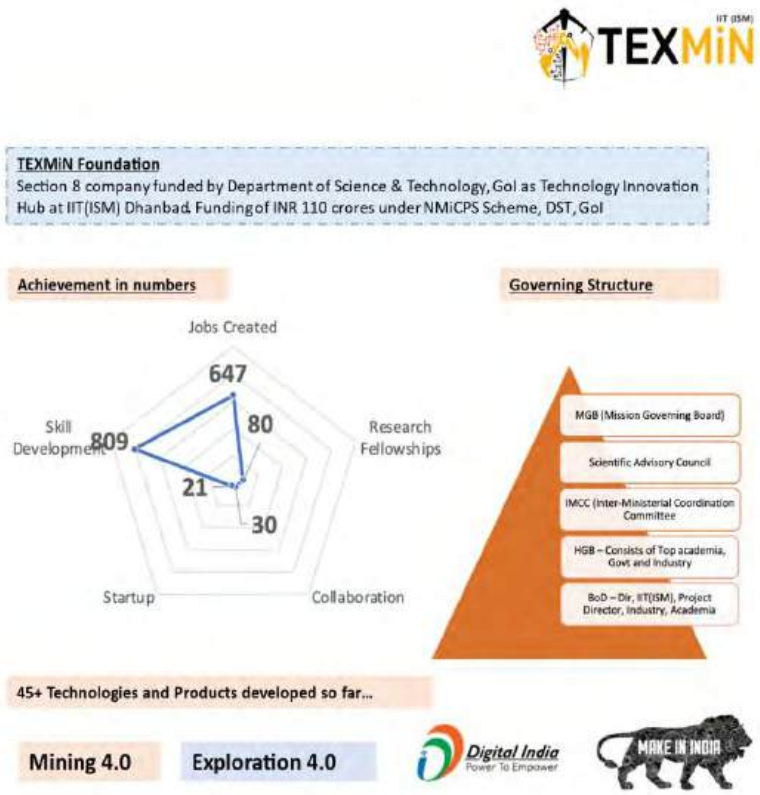
- Designed, developed, and commercialized a lightweight, medium-duty 2X200t capacity SAGES with a remote radio-controlled and digital display system **(Commercialized)**

(*An IIT (ISM) breakthrough in the mission of Make in India – Design and Development of Automated Roof Support System "SAGES" for SAFE, PRODUCTIVE, and ECONOMIC extraction of locked coals from underground mines. SAGES is unique in terms of its patented design of base to slide inside the undercarriage and hence cheaper, light in weight, and compact.*)

- Designed and developed, heavy-duty 500t SAGES with remote radio-controlled and digital display system to be used with Continuous Miner for depilaring operation in underground coal mines.

Annexure IV: R&D and innovation facilities developed





Annexure V: Consultancy and Outreach Programmes in the last five years

a) Consultancy Projects

Sl No.	Consultancy No.	Title	Client	Value (Rs.)
1	CONS/7207/2023-24	Scientific Study of various survey measurements at HEMM patches of BCCL	BCCL	7,12,42,500
	CONS/7178/2023-24	Slope Monitoring Study of South Kaliapani Chromite Mine and Sukrangi Chromite Mine of Odisha Mining Corporation Ltd.	OMC	53,10,000
	CONS/7190/2023-24	Mine Closure Audit of the Mines of Jharia Division	Tata Steel Ltd.	34,10,200
2	CONS/7065/2022-23	Scientific Study for OGL and Different Survey works of Kerandari Coal Mining Project	M/s NTPC, Kerandari	4,35,33,428.00
3	CONS/6097/2021-2022	Geofencing & georeferencing of the lease pillars and preparation of digital georeferenced map & generation of Geo-referenced shape files and 3D modelling of iron ore stacks within the lease area along western part of the lease boundary at Vijaya II Mines	Tata Steel Ltd.	60,79,950.00
4	CONS/6091/2021-2022	Scientific Study for 3D advanced different survey work of ChattiBariatu Coal Mining Project, NTPC	NTPC, SSC-Coal Mining, Ranchi	72,35,996.00
5	CONS/6017/2020-2021	Scientific study for annual reconciliation survey for the Earthwork estimation at PBCMP, NTPC	National Thermal Power Corporation Ltd.	20,06,000.00
6	CONS/5042/2019-2020	Correlation Survey at newly sunk return shaft at Moonidih XV seam, Dhanbad.	Indu SCCL CGME Consortium	3,54,000.00
7	CONS/3916/2018-2019	Identification & demarcation of area under Rakha mining lease (Total 785.091 hectares) by cadastral survey and preparation of digital geo-referenced map & and generation of Geo-referenced shape files by DGPS Survey of that area.	Hindustan Copper Ltd.	28,12,500.00
8	CONS/4050/2018-2019	Geo-referenced Boundary coordinating for Sand Mining Lease Areas at Chasnalla and Jitpur as required by Ministry of Coal, Govt. of India.	SAIL	2,95,000.00
9	CONS/3917/2018-2019	Identification & demarcation of area under kendadih Mining Lease (Total 1139.6 hectares) by cadastral survey and preparation of digital geo-referenced map & generation of Geo-referenced shape files by DGPS Survey of that area.	Hindustan Copper Ltd.	15,00,000.00
10	CONS/3515/2017-2018	Geo-referencing of Approved land use and reclamation plan of Begunia UG Coal Mining Project SAIL into WGS 84 Coordinates and preparation of Shape file.	SAIL	5,17,500.00
11	CONS/3516/2017-2018	OBR Measurement at Bhanora West Opencast Mine of Sripur Area and Gourandih OC Mine of Salanpur Area, ECL	ECL	4,50,000.00
12	CONS/3555/2017-2018	Geo-referencing of Cadastral map showing lease hold area, forest area and forest land diversion area within the lease of Rajbar E & D Coal Mine, TVNL into WGS 84 Coordinates.	Tenughat Vidyut Nigam Ltd.	11,27,000.00
13	CONS/3497/2017-2018	Preparation of Technical Feasibility report for the IInd phase expansion plan of Khetri Copper Mine for (a) extending the mine from 0 ML to (-1) 300 ML (b) if, the mine is to be extended from 0 ML to (-1) 180 ML.	Khetri Copper Mine and Kolihan Copper Mine Khetri	20,70,000.00

14	CONS/6055/2021-2022	3-D subsidence prediction model for Kenda, Rakha and Surda mines of HCL	Hindustan Copper Ltd.	33,04,000.00
15	CONS/7001/2021-2022	Subsidence Study of Khetri Copper Mine and Kolihan Copper Mine, Hindustan Copper Limited (HCL), Khetri Copper Complex (KCC), Rajasthan	Hindustan Copper Limited (HCL), Khetri Copper Complex (KCC)	97,94,000.00
16	CONS/3833/2018-2019	3D Subsidence Modelling for Prediction of Surface	Jaduguda Mines, UCIL	10,92,500.00
17	CONS/4054/2018-2019	Preparation of Land use Land cover (LULC) Satellite map using LISS-IV data sets (as per availability) and Preparation of high-resolution satellite map obtained from fusion of CARTOSAT-2 & LISS-IV datasets on the scale of Cadastral map of Iron Ore Mines of SAIL.	SAIL	11,80,000.00
18	CONS/3701/2017-2018	Geo-referencing of Plans showing Lease Boundary, Boundary and Pit Boundary of Tasra and Chasnalla Collieries	SAIL	2,87,500.00
19	CONS/3804/2017-2018	Off-campus course on Surface and underground Metal Mining-some Advanced Aspects for the Executives of Infosys Ltd.	Infosys Ltd.	8,09,480.00

b) Outreach Programmes/EDPs

Sl No.	EDP No.	Title	Client	Sanctioned Amount with GST(Rs.)
1	EDP/7112/2023-24	Six Week Intensive Course on "Advances in Mine Surveying Technology"	CIL & its Subsidiaries	1,24,56,080.00
2	EDP/7017/2022-23	Advances in Mine Surveying Techniques	CIL & its Subsidiaries	67, 61 ,839.00
3	EDP/5051/2019-2020	Modern Mine Surveying Techniques.	Hindustan Zinc, Ltd.	16,99,200.00
4	EDP/5045/2019-2020	Informal Learning Opportunity for the Officials of the Ministry of Mines & Petroleum (Afghanistan).	Australian High Commission, New Delhi	17,41,500.00
5	EDP/5090/2019-2020	2nd National symposium on Developing Indo-Australian Collaboration for Sustainable Mining in India	RMIT university and CSIRO Australia (Under the Aus	11,54,318.00
6	EDP/5023/2019-2020	AI Master Analyst Programme	Various industries	6,86,000.00
7	EDP/3903/2018-2019	Six weeks Intensive Course on Advances in Mine Surveying Technology.	CIL	27,00,000.00
8	EDP/3496/2017-2018	Six-week Course on Advances in Mine Surveying Technology.	ECL	32,50,000.00

9	EDP/3733/2017-2018	Application of Modern Surveying Technniques (Total station, GNSS, Remote Sensing & GIS)	Govt. of Jharkhand	4,50,000.00
10	EDP/4087/2018-2019	Informal Learning Opportunity for the Ministry of Mines & Petroleum (Afghanistan) officials.	Scope Global Pty Ltd.	17,36,960.00