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An Environmental Information System and applications in Jharkhand "A case study of Spatial Modeling for Coal Mines Exploration through Multilevel Data Integration in CMPDIL".

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Abstract- Environmental Information System (ENVIS) is a Gateway on Environment Information, which aims to reach a wider spectrum of the society and strengthen the environmental management capacity in the country. It has launched a major initiative to expand the network and reach through involvement of additional institutions/organizations in Governments, academic, corporate and NGO sector and others as ENVIS centre. The project aims to focus at different subject areas, themes, local conditions, issues, information related to the environment through introduction of modern means of Information and Communication Technologies (ICTs). The Ministry has started this project under the World Bank assisted Environmental Management Capacity Building Technical Assistance Project since January 2002.

The Environmental Information System (ENVIS) is a project of the Ministry of Environment & Forest, Govt. of India to facilitate generation & dissemination of information on Environmental issues. The World Bank Project though has concluded but the Government of India has extended financial support. The State Government is desirous of using the facility to meet the objectives envisaged in the project.

CMPDI(Central Mines Planning and Designing Institute) has been regularly dealing with multi-dimensional environment complexities existing in coal and other mineral sector to make each project environmentally compatible.

CMPDI undertakes land use studies through satellite, airborne scanner, aerial photography and ground survey for the specific project as well as for urban and regional planning. Environmental audit and monitoring waste management and industrial / domestic effluent treatment are also carried out.

Index Terms- ENVIS,ITC,CMPDIL,DVC

I. Introduction

The **ENVIS** is the part of the Department of Forest & Environment; Govt. of Jharkhand has been setup with the subject area of State Environment Issues. The activities of the centre include:

- Establishing linkages with users/organisations
- Create and maintain databank on Environment Forests, Wildlife and Biodiversity.
- Launching of website in the subject area allotted with regional language interface and develop linkages with ENVIS centres .
- Information on queries to Departments, Organisations, Scientific Institutions etc.
- Building up inventory of information material
- Supply information to the ENVIS Programme
- Identify data gaps and knowledge gaps in the subject area and take action to fill the gaps.
- Collect reports & journals in the subject area for requisite database.

The Chhota Nagpur plateau is the richest mineral belt in India, and it is responsible for a significant share (by value) of the country's mineral yield. Jharkhand produces almost the entire national output of copper, kyanite (used in the manufacture of heat-resistant porcelain), pyrite (used to make sulfuric acid), and phosphate, as well as much of the output of bauxite (a source of aluminium), mica, kaolin and other clays, and iron ore. Most of these minerals are mined in the districts of East and West Singhbhum. Coal, however, accounts for the bulk of Jharkhand's mineral production. The principal coalfields, all in the Damodar River valley in eastern Jharkhand, supply most of the coking coal of India.

The Damodar Valley Corporation (DVC) is the most prominent multipurpose power project of Jharkhand. The corporation operates several thermal plants and hydroelectric dams not only in Jharkhand but also in neighbouring West Bengal; all the stations are networked within the DVC grid, which serves urban and rural areas in both states.

II. Minerals and Mines in Jharkhand

Jharkhand mines and minerals seem to be synonymous with the territory of Jharkhand. Jharkhand possesses a large reserve of mineral wealth within the territory: coal, iron ore, copper ore, bauxite, mica, graphite, kainite, sillimanite, limestone, etc. form an integral part of mining industry in Jharkhand.

An estimate of the major mines and minerals of Jharkhand are as follows:

District	Important Minerals in Jharkhand	Other Minerals
Deoghar, Dhanbad.	Coal	Fire Clay,Silver.
Garwa.	Coal	Dolomite.
Bokaro.	Coal	-
Godda.	Coal	-
Hazaribagh.	Coal	Fire-Clay, Feldspar, Mica, Lime stone, Stone-chips.
Dumka.	Coal	-
Sahibganj.	-	Silica Sand, Kaolin, Stone chips.
Giridih.	Coal	Mica.
Latehar, Lohardaga.	Bauxite	-
Gumla.	Bauxite	-
Palamau.	Iron Ore	Fire Clay, Graphite, Dolomite, Feldspar, Limestone, Manganese.
Ranchi.	-	Lime stone, Kaolin
Jamtara, Kodarma.	-	Mica, Stone-chips.
East Singhbhum.	Uranium, Copper	Quartzite, Kaolin, Gold, Silver, Fire Clay, Steatite.
West Singhbhum.	Iron Ore	Dolomite, Limestone, Manganese, Kyanite.
Sarikela Kharswan, Simdega.	-	Stone chips.
Pakur.	-	Stone-chips.

III. Environmental Studies of Mined Out Area

CMPDI has a well equipped environmental laboratory to undertake the entire spectrum of environmental studies.

Services Offered:

SERVICES	FIELDS IMPLEMENED
Base line data generation	Meteorological data Land use plan Air quality - ambient & work zone Water quality Noise measurement Soil sampling & analysis Flora and fauna studies
Environmental impact assessment	Land degradation Impact on flora and fauna Air, water and noise pollution Social impact
Environmental Management Plan	Land reclamation plan Air, water & noise abatement measures Green belt development
Rehabilitation & resettlement plan	Subsidence prediction studies and management Ecological restoration
Environmental Monitoring and Audit	
Biological Reclamation Studies	
Thematic Mapping	through Satellite and Air- borne

	Scanning
multifaceted Major Environmental Project Implemented	
Mining Project (EIA)	Gevra, Jayant, Piparwar Coal Open cast Moonidih, Chasnalla Underground Coal Mine Pyrite Mine, Amjhor, Rare Earth Mine, Kudiraimozhi Gypsum Mines, Rajasthan
Beneficiation Project (EIA)	Rajrappa, Kalinga Coal beneficiation plants Mineral Separation Plant, Kudiraimozhi
Thermal Project (EIA)	Kathara Captive Thermal Power Plant
Coalfield wise Study (EIA)	North Karanpura, East Bokaro, Ib Valley
Sanitation Project	Rajrappa Sewerage Scheme
Effluent Treatment Plant	Ledo Acid Mine Water Treatment Plant Rajrappa Mine Water Treatment Plant Kathara Washery Effluent Treatment Plant
Water Supply Scheme	Singrauli & Talcher Coalfield Water Supply Scheme
Bio-reclamation Project	
Survey & Exploration **Microptic Theodolite with EDM**	North seeking GYRO with Theodolite
Total Workstation	GPS and GIS Geophysical loggers Seismographs Daedalus AADS 1268 ATM Scanner Gravimeters & Magnetometers Drilling Rigs (Rotary, DTH, Coring) Resistivity Meters, etc. Borehole deviation unit Aquifer testing equipment Mine Laboratory Facilities for Uniaxial compressive strength Tensile strength Shears strength Young's modulus and poisson's ratio
Bulk density	Proto dyakonov index, Impact strength index, Point load index and cone indenter index Triaxial compressive strength, cohesion and angle of internal friction Slake durability index Cerchar index of abrasivity
Environmental Laboratory Facilities for Air Analysis	Suspended Particulate Matter Oxides of Sulphur (SOx)

	Oxides of Nitrogen (NOx) Carbon Monoxide (CO) Total Hydro Carbon (CHn) Total Dust (Settlabb) Carbon Dioxide
Water Analysis	Physical parameter - pH, Colour, Temp, Turbidity Suspended solids, dissolved solids, etc. Chemical and Biological
Soil Analysis	Physical and Chemical
Noise	Noise intensity survey Leq Value of Noise Frequency analysis Noise intensity prediction
Coal Preparation & Utilization Laboratory Facilities for Sub sampling and sample preparation	Crushing of ROM Coal to different sizes Screening of Coal at various sizes Pulverisation Grinding by Ball Mill/Rod Mill Washability (Float & Sink) Test Proximate Analysis Ultimate Analysis Calorific Value Determination of sulphur Ash Fusion Temperature
Determination of characteristics of fine coal	Froth flotation Filtration Sedimentation pH Size analysis by weight sieving
Determination of shattering, pulverising & abrasion characteristics of coal	Drop shatter test Abrasion test Hardgrove grindability index Typical drum tumbler test
Determination of caking characteristics of coal	Caking index Swelling index Gray King Assay (L.T.) coke type
Petrographic Analyses	Reflectance measurement
Maceral analysis	Analysis of visible minerals in coal
Other Laboratory Facilities for	Non-destructive testing of mine winders, cage suspension gears, heavy earth moving machines Development & repair of electronic control cards for HEMM, Washery equipment etc.

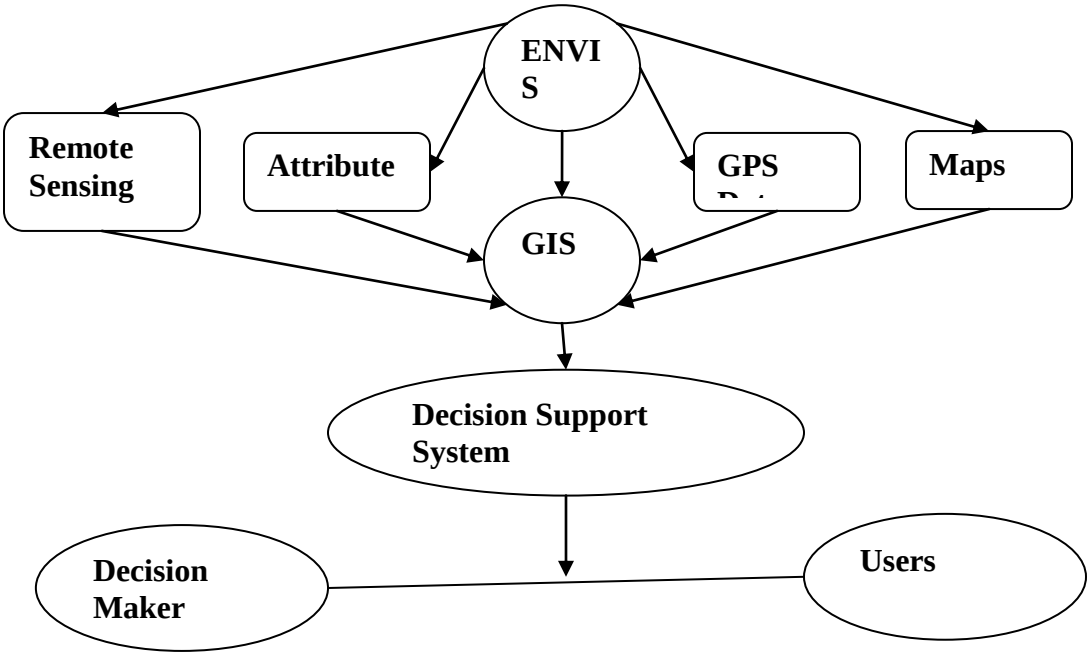
IV. Drilling Camps of CMPDIL

CMPDI has completed over 500 coal exploration projects in India in all types of terrain and geological set-up. This has resulted in providing 80 billion tonnes of coal. CMPDI has expanded its activities to Manganese, Iron Ore and Rock Phosphate. Exploration has also been carried out in Tanzania.

Annually, CMPDI carries out about 200,000 metres of drilling spread over six States in India through 23 drilling camps.

i. Specialized Services offered in Exploration
ii. Satellite and Air-borne Remote Sensing
iii. High Resolution Shallow Seismic (HRSS) Reflection
iv. Seismic Refraction
v. In-seam Seismic Survey
vi. Hydro-geological Assessment, Reserve Assessment, Modelling and Documentation
vii. Coal Petrography Study for characterisation and classification of Coal and Lignite
viii. Geological Structure and Geo-technical Mapping
ix. Drilling - Coring and Non-coring
x. Hydrogeological Assessment
xi. Water budgeting and management
xii. Groundwater budgeting and management
xiii. Waterwell drilling, development and construction
xiv. Acquifer testing
xv. Water supply for rural and urban population
xvi. Mine inflow study
xvii. Coal Chemical Analysis
xviii. Resource Assessment, Modelling and Documentation
xix. Geological Structure and Geo-technical management

How ENVIS Works?



INVENTORY OF GEOLOGICAL RESOURCE OF INDIAN COAL
(As on 01.04.2009) (Resource in million tonne)

Type of Coal	Depth	Proved	Indicated	Inferred (Exploration)	Inferred (Mapping)	Total
1	2	3	4	5	6	7

JHARKHAND

01. RANIGANJ COALFIELD

Medium Coking	0-300	220.00	8.87	0.00	228.87
	300-600	49.23	8.30	0.00	57.53
Total Medium Coking		269.23	17.17	0.00	286.40
Semi Coking	0-300	51.40	0.00	0.00	51.40
	300-600	0.00	40.00	0.00	40.00
Total Semi Coking		51.40	40.00	0.00	91.40
Non Coking	0-300	1111.53	89.32	29.55	1230.40
	300-600	106.03	320.07	2.00	428.10
Total NonCoking		1217.56	409.39	31.55	1658.50
TOTAL FOR RANIGANJ		1538.19	466.56	31.55	2036.30

02.JHARIA COALFIELD

Prime Coking	0-600	4039.41	4.01	0.00	4043.42
	600-1200	574.94	694.70	0.00	1269.64
Total Prime Coking		4614.35	698.71	0.00	5313.06
Medium Coking	0-600	4064.18	2.82	0.00	4067.00
	600-1200	296.30	1800.70	0.00	2097.00
Total Medium Coking		4360.48	1803.52	0.00	6164.00
Non Coking	0-600	5606.74	495.26	0.00	6102.00
	600-1200	496.00	1355.00	0.00	1851.00
Total Non Coking		6102.74	1850.26	0.00	7953.00
TOTAL FOR JHARIA		15077.57	4352.49	0.00	19430.06

03. EAST BOKARO COALFIELD

Medium Coking	0-300	2607.20	1269.94	18.71	3895.85
	300-600	384.67	1203.06	58.53	1646.26
	600-1200	255.93	1332.60	786.08	2374.61
Total Medium Coking		3247.80	3805.60	863.32	7916.72
Non Coking	0-300	95.17	56.81	0.00	151.98
	300-600	8.90	5.69	0.00	14.59
Total Non Coking		104.07	62.50	0.00	166.57

iii) Priority area selection for biodiversity conservation using GIS.

V. BIODIVERSITY CHARACTERISATION

It is the best measure of influence of human being on nature. It is important as it provides stability to ecosystem and supplies vital requirement of human being, i.e. water and oxygen there are threat to biodiversity through resource over – exploitation, pollution, climate change etc. Department of Space has taken a project of biodiversity characterisation at landscape level using remote sensing and GIS. This project is being executed at different parts of the country. The project ENVIS

i) preparation of biome/ecological details zone map using satellite remote sensing data incorporating topographic details
ii) landscape characterisation to identify disturbance gradients using GIS

VI. CONCLUSION

ENVIS is the project dealing with both Spatial and Non spatial information .It includes various disciplines such as Geological Information system (GIS), Remote Sensing, Global Positioning System, Digital Cartography, Database management System etc. It is very reliable and Comprehensive information System. Flow of information in real time to the decision makers and availability of analytical tools to weigh pros and cons of a particular measure, before implementing, are also equally important. It helps in creating spatial information system. These information systems can be good interface tools between providers (government) and recipients of services. Such an interface helps reducing the distance between those who are

governing and those who are governing and those who are governed through the use of various information systems.

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