

Strategies, Enterprise Risk and Resource Management to Enhance Performance & Achieve Business Excellence in Coal Mining Industry

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Abstract

This paper highlights the importance of Strategic Enterprise Risk Management and Enterprise Resource Management to ensure Mine Safety, its monitoring and Risk Management along with optimum management of available resources to enhance organizational performance, profitability and ultimately to attain Business Excellence in Coal Mining Industry.

It stresses on need to develop a simple roadmap for development of Safety Management Plan, easily understandable by all concerned, aligned with the expectations of mine safety Legislation & mission / vision of the organization and gives an overview of occupational Health and Safety framework in India with special reference to coal mining activities and offers an insight to officers working in risk management department need to retool, re-equip and fully update themselves to meet the latest developments to shoulder entire responsibility of foolproof Emergency Preparedness & Response Systems for ensuring safety of men, machine and materials deployed therein.

Keywords: *Enterprise, Business Excellence, Coal Mining, Risk and Resource Management, Mines Safety, Monitoring, Consequence, probability, Risk Assessment, Mitigation Plan, Risk Rating, Roles & Responsibilities, Quality Control Deptt., Insignificant, minor, major, Catastrophe, Compliance, Resultant Risk, Strategic, Risk Identification, Operations, Risk Management Structure, Risk Analysis, Zero accident potential, Business Excellence, exposure, likelihood.*

1. Introduction

The text must be in English. Authors whose English language is not their own are certainly requested to have their manuscripts checked (or co-authored) by an English native speaker, for linguistic correctness before submission and in its final version, if changes had been made to the

initial version. The submitted typeset scripts of each contribution must be in their final form and of good appearance because they will be printed directly. The document you are reading is written in the format that should be used in your paper.

Coal Mining Scenario in India and across the Globe :

Coal Mining in India is a major economic activity which contributes significantly to the economy of India. Coal is regarded as the backbone of power generation in India. There is huge demand of power in India. Coal accounts for about 67% of the total energy consumption in India. India has the 4th largest reserves in the world and coal contributes 7% GDP growth among contribution by mining industry, in Indian economy. Exponential energy demand has to be met for national growth, development and welfare of the society as a whole.

Mine Safety & Monitoring :

Coal is stratified & carbonized remains of plant material at depth from earth surface under state of equilibrium which gets disrupted during extraction and strata movement like roof / side fall, subsidance, slope failures / land slides etc.

Mechanized extraction in U/G & Opencast mining gives rise to additional rise in accidents due to material handling & mining equipment, blasting, others mining related hazards like gas & coal dust explosion, oxygen deficiency, inundation, fires, moving parts of

machine, subsidence and health hazards due high pressure, temperature, noise, dust inadequate lighting, electric shock etc. Further unsafe Act, unsafe condition, human & instrumental error, lack of skill add to it.

Accident do not happen, they are caused. Indirect cost of accidents are 4 times of direct cost. Mine Safety Monitoring and Risk Management is a continuous process and is carried out to find causes of accidents/Risk/disaster and suggest remedial measures to reduce impact of risk/mishaps and to develop approximate health and Safety Management System.

Enterprise Resource Management :

Economy is generated by ability to face risk. 21st century will be dominated by leveraging new technologies as knowledge is power but know-how to deploy inputs is weapon in globalized and liberalized competitive market place.

Mistakes are costly-so costly that they can force out of business an organization once seen as industry leader and power house.

Management of risk and optimum management of enterprise resources helps alleviate mistakes and emphasizes on the roles and contributions of various resources as critical inputs for sustainable operations. It requires strategic thinking and strategies for effective implementation to attain the objectives implanting the objectives vision and mission of organization.

Strategic planning, Enterprise Risk and Enterprise Resource Management are all interlinked and interdependent on each other. Strategic planning is based on forecasting and optimum decision making from various alternatives available based on assessment of various risks which on organization is facing and likely to come across. Strategic planning for Enterprise Risk and Enterprise resource management not only integrates / strike balance between calculated Risk & Safety with productivity but are also be used as a very good tool for reduction of costs and value enhancement by way of allowing prioritization of allocation of scarce resources, application of controls at various stages thereby cutting costs, reducing wastages, encouraging high standards of Total Quality, adherence & compliance to legal and statutory requirements with work persons participative management techniques, health, safety, environment, protection & conservation with strict and techno-economical system development of the organization, resulting in increased profitability and wealth

of various stakeholders without jeopardizing employees and customer satisfaction along with good governance.

Increase in margin of profit by Strategic Enterprise Risk and optimum Resources Management facilitates the organization to fulfill its Endeavour not only to expand / diversify its business activities but also corporate social responsibilities and thus contribute to continuous improved corporate image in global market and capabilities to acquire maximum market share and contribute to socio-economical development of the country and thus, ultimately achieve the Business, Excellence while facing challenges of global competition.

Enterprise Risk Management is a new form of business intelligence: the critical link between strategic planning and performance management. Enterprise Risk Management needs to be a key element in strategic decisions. It is about how Enterprise Risk Management is integrated into business planning for example, resource allocation and investment decision. For company in risky business ERM is not just a necessity, its a competitive advantage. Strategic Enterprise Risk and Resource Management plays a significant role in work we do with communities and government where we operate. It derives a detailed framework that involves all political element and stakeholders. It is very robust program that affects the operational and strategic plans and lies to compliance; depending on degree of systemization and disciplined implementation.

2. Strategic Enterprise Risk Management :

Hazard: is a source of potential harm or a situation with a potential to cause loss.

Risk: It may be defined as ‘The chance of something happening that will have an impact upon objectives of the organization. It is measured in terms of consequences and probability i.e.

Risk = Consequences X Probability

Risk Rating = Consequences X Probability X Exposure.

Consequence:- It is outcome of an event/situation i.e. Positive/negative.

Probability:- It is likelihood of a specific outcome happening depending on exposure of that situation. Expressed as a number between 0 and 1 with ‘0’ indicating an impossible outcome and ‘1’ indicating an outcome is certain i.e. rare likely, less likely, possible, impossible but

here for ease of calculation purpose we take 1 to 5.

Risk identification:- It is the process of determining what can happen, why and how.

Risk Assessment:- It is a process that involves measurement of risks to determine priorities and to enable identification of appropriate level of risk treatment to mitigate it.

Risk Rating:- It is to categorize the level of risk such as severe, major, minor or extreme, high moderate & low.

Risk Management Structure & organization: - It is systematic application of management policies, procedures, practices, standard operating practices to the tasks of identifying, analyzing, assessing, treating and monitoring risk.

In Coal India, the risk management organization consists of formation of risk management committee, where one of the Senior most Board Member is the chairman of Risk Management Committee followed by two Directors of the Board(One independent director and other from the organization) as members of the apex risk management committee who have control on sub risks management committees of each subsidiaries.

In each subsidiary, the risk management committee consists of Chief Risk Officer (Chief General Manager- Safety & Conservation) as chairman of the committee with under whom each functional head of Subsidiary Head Quarter have to nominate one risk owner and other mitigation plan owner. Executive-In- Charge for non routine transaction is also nominated and similar framework is to be formed at each area level.

Risk Control:- Risk Control is the part of risk management, which involves the provision of policies, standards and procedures to eliminate, avoid or minimize adverse risk facing an enterprise.

Risk Management Process :

It is systematic and scientific process which helps to identify, prioritize, mitigate, monitor and report risk (as per ISO 31000 & COSO, AS4360). It aims to reduce likelihood and impact of mishaps of all kinds, Risk Management process includes :

- **Establish context :** Means to clearly defined the particular tasks, issue or situation and underlined risk that one is trying to resolve as part of risk management and activities.

- **Identifying / Assess Risk :** Risk assessment can be done using number of techniques, such as inspections, audit, task/activity or situation Analysis, brainstorming in work group, Quality circles, outcome of consumers meet & feedback from them.

- **Fault Tree Analysis :** A method of analysing possible causes of defined unwanted events, by starting with unwanted event, identifying possible causes, then analysing the factors to those causes etc until “root causes” have been identified.

- **Hazard and Operability Studies :** A systematic review of the consequences and likelihood of different process or system abnormalities, such as excessively high or low flow, pressure, temperature etc. It can be adapted to wide range of types of industry and operation. It is a foundation for machinery hazard identification(MHI) and potential human error identification(PHEI).

- **Work Risk Assessment and Control :** Which is a process for identifying potential production or maintenance incidence and losses and use a matrix approach to define risk levels from estimates of consequences and likelihood.

- **What if Analysis :** A method of examination of the consequences of a wide range of type of occurrences, drawn from a comprehensive checklist designed to suit the particular type of operation.

- **Pareto Principles :** It was introduced by Dr. J.M. Juron (Noted for his work in Quality Management) an Italian economist. That majority of the wealth of the country is concentrated in the hands of few of the families. It helps to focus on important tasks, the one with potential to produce most benefits.

- **Other techniques** are Flowchart and Dependency Analysis, Inspection ,Audit &

Sampling, Questionnaires and checklist, SWOT and PESTLE Analysis, Delphi, Event Tree Analysis, Rapid Rankin, Failure Mode and Effects Critically Analysis, Failure Mode and Effects Analysis, Incident Investigation, Industry Benchmarking, Business Impact Analysis, Dependency Modelling, BPEST(Business, Political, Economic, Social, Technological) analysis, Statistical Inferences, Measures of Central Tendency and Dispersion.

Ex:- Majority of the sales revenues of company will come from a small proportion of the consumers.

- Majority of quality complaints about a product will result from a small proportion of the causes.

- Majority of the productivity loss will be caused by a small proportion of the causes.

- Most of the risk faced by an organization/enterprise will arrive from a few of the causes.

- Most of the effects/impacts are due to a few of the causes i.e. 80% problems/risks are due to only 20% of the causes.

- **Risk Assessment and Prioritization** : It involves assessing the relative priority of each risk to arrive at the key risks as ‘Risks That Matter’ (RTM). This involves considering the potential impact and likelihood of occurrences of the risks.

Likelihood	Consequences				
	Insignificant 1	Minor 2	Moderate 3	Major 4	Catastrophe 5
A(1)(Almost Certain)	M	H	E	E	E
B(2)Likely	M	H	H	E	E
C(3)(Moderate Possible)	L	M	H	E	E

D(4)(Unlikely/ Less likely)	L	L	M	H	E
E(5) (Rare) Conceivable but unlikely	L	L	M	H	H

Legend : E: Extreme Risk : Immediate Action Required, Risk Score.

H : High Risk : Senior Management Attention needed.

M : Moderate Risk : Management Responsibility must be specified.

L : Low Risk : Management by routine procedures.

Scale of Exposure : Continuous = 5

Frequent (daily) = 4

Seldom (weekly) = 3

Usual (Monthly) = 2

Occasional = 1

The next step in Enterprise Risk Management cycle : is to provide an estimate of resultant risk, in terms of consequences and likelihood. A risk grid matrix is used to provide a qualitative & quantitative measure of risk magnitude.

Using the equations the values can be used to calculate Risk score of risk evaluation and prioritization.

Risk Score = Consequence X Likelihood.

Risk Score = Consequence X Probability X Exposure.

Design of Risk Mitigation Plan : It Involves design, implementation of activities that manages risk to an acceptable level. After identification and prioritizing Risk; Design of Risk Mitigation plan is required for addressing (treatment) the Risks that matter (RTM), which includes development of mitigation controls and an action plan for implementing the mitigation control along with mitigation owner and his responsibilities with timeline, Risk Management plan has to reviewed and approved by the **Chief Risk Officer.**

Risk treatment is the selection and implementation of appropriate options for dealing with Risk. Typically, the

option comprises of:-

- **Acceptance**
- **Reduction**
- **Transfer**
- **On-going management**
- **Retain the risk (Residual Risk which may require financing)**

To design Risk Mitigation Plan (RMP), the concept of "Hierarchy of Control" helps to frame it.

- Remove/Eliminate.
- Substitute, substance, process, equipment, working/Substitution method.
- Engineering/isolation –Resign and separation.
- Administrative-Training Skill development, follow Standard Operating Procedure(SOP), DGMS circulars, do's don'ts systematize operation, strict adherence to coal mines act, rules, regulations, bye-laws
- Protection-Fire fighting, calibration of laboratory and rescue apparatus.
- Human Behavior, Compliance of directives Office, Memorandum of MOEF & CC,CCO, SPCB, CPCB etc. development of culture on business ethics.

Note : Sometimes combination of controls are applied, if one method of control is inadequate.

Financial impact of various risks need to be calculated for analysing and taking corrective action to reduce them.

- **Roles and Responsibilities :**

Everyone in an entity has some responsibility for enterprise risk management. The Chief Executive Officer is ultimately responsible and assumed the ownership. Other managers support the entity's risk management philosophy, promote compliance with its risk appetite, and manage risks within their spheres of responsibility consistent with risk tolerances. Other entity personnel are responsible for executing enterprise risk management in accordance with the established directives and protocols. The board of directors provide important oversight to enterprise risk management, and is aware of and concurs with the entity's risk appetite. A number of external parties, such as customers, vendors, business partners of joint ventures, if any, external auditors, regulators and financial analysts often provide information useful in effecting enterprise risk management, but they are not responsible for effectiveness of, nor are they a part of, the entity's enterprise risk management.

- **Documentation, Recording and Reporting :**

Proper documentation and record keeping of various activities of risk management

Should be done from 1st establishing context, stages of Risk Identification to last stage of Risk Mitigation Plan; employee/customer complaints, feedback/suggestion on various organizational matters risk and resource matters should be implemented and monitored to enable further successful review at frequent intervals and take preventive and corrective action time to time towards attaining organizational goals keeping in view the vision, mission of the organization and attain business survival and excellence in coal mining industry and meet all stakeholders requirements and ultimately ensure national growth.

- **Risk Monitoring and Reporting :**

- Review the effectiveness of risk mitigation for the **Risks That Matters(RTM)**. Key tasks are as follows.
 - ▶ Review RTMs and effectiveness of their mitigation plans.
 - ▶ Determine and operationalize corrective action where applicable, and
 - ▶ Provide an overall Risk Management rating for the RTMs in the Risk Reporting.
- Provide risk reports to the CRO (Chief Risk Officer); the key tasks are as follows:
 - ▶ Prepare and approve the risk reporting pack for CRO's office;
 - ▶ Present the results of Risk Management to CRO office.

Suggested actions that might be taken as a result of foresaid reports depends on position and roll of the parties involved i.e. Board of Directors, Senior Management, Other Entity Personnel, Regulators, Professional Organization and Educators.

(III) Statutory Requirement of Safety, Monitoring & Enterprise Risk & Resource

Management :

Enterprise : It is an entity i.e. a project/activity that involves many people and that is often difficult/risky, formed to attend certain sets of objectives.

Example : **Coal India Limited, Maharatna** public sector undertaking and world largest producer of coal accounts for 81.9 % of India's total coal production having following mission and vision and management

policy, also adopts risk and resource management as a tool for development of appropriate health and safety system and optimum utilization of enterprise resources, cost reduction by way of proper waste management techniques to enhance productivity and profitability of the organization, ultimately to achieve business excellence in competitive and volatile global business environment along with its corporate social responsibilities to empower India and enable life's.

Mission: To produce and market the planned quantity of coal and coal products efficiently and economically in an eco-friendly manner with due regard to safety, conservation and quality.

Vision: To emerge as a global player in the primary energy sector committed to provide energy security to the country by attaining environmentally & socially sustainable growth through best practices from mine to market.

Management Policy :

- Assured quality of coal supplies
- Optimum utilization of available resources.
- Compliance to requirements of coal sector.
- Continual improvement in our system performance.
- Compliance of legal and other subscribed obligations.
- Prevention of environmental pollution.
- Promoting environmental consciousness among all concerned.
- Carrying out activities regarding corporate social responsibilities.

Statutory Requirements:

- a) Clause 49 of (SEBI/CFD/DIL/CG/1/2504/12/10 dated 29/12/2004 & 2014 that as per corporate governance, the top 100 listed companies by way of market capitalization made it mandatory that enterprise risk management should be carried out at stipulated interval and report should be submitted after compliance without fail. The listing Agreement of securities and Exchange Board of India mandates :
 - Annexure I (IV) (C) : The company shall lay down procedures to inform Board Members about the risk assessment and minimization procedures. This procedure shall be periodically reviewed to ensure that executive management control risks

through a properly defined framework.

- Annexure I (IV) (F): As part of directors report or as an addition thereto, a management discussion and analysis report should form part of the Annual Report to the shareholders.
- b) As per Companies Act 2013:-
 - Under section 134 (3) (n) (Report by Board of Directors) will include a statement indicating development and implementation of risk management policy for the company, including identification therein of various elements of risk, if any, which in the opinion of the Board may threaten the existence of the company.
 - Under Section 177(Evaluation by Audit Committee): Evaluation of internal financial control and risk management system of the company.
- c) Compliance of 9th conference on Safety in Mines and ILO Convention No.155
- d) DGMS Circular-Tech 13/2002 i.e. requirement of safety management system etc.
- e) To adhere and comply the target/observation/objectives stipulated by ISO 9000 & ISO 14001 certification agency.
- f) National policy on safety, health and the environment (HSE) at work place declared on 20th February 2009.
- g) Recommendation in Aug-2004 of the Treadway Commission Committee of sponsoring organizations (COSO) issued its Enterprise Risk Management framework both to satisfy/evaluate their internal control needs and to move towards a fuller risk management process.
- h) Occupational Safety and Health (OSH) Legislation including Mines Act-1952 and rules & regulations framed thereunder to provide health, safety and well being of persons employed in mines. The Act regulates the working conditions and environment in mines with a view to make work more human and to provide for measures to prevent accidents & occupational diseases and requires provision of some basic amenities to mine workers.

Objectives :

- Determine risk profile of the organization.

- Cost Benefit Analysis.
- Better Management of uncertainties impacting organizational performance.
- Safeguard companies, values and stakeholder interest.
- Strategic & Contingency Planning and optimum Decision Making.
- To attain Zero Accident Potential, Zero Quality Tolerance, Zero Defect Assurance, Total Quality Management, Reduce Environmental Pollution by application of clean coal technologies etc.
- Aligning risk appetite and strategy.
- Enhancing risk response decisions.
- Reducing operational surprises and losses.
- Identifying and managing multiple and cross-enterprise risks.
- Seizing opportunities.
- Improving deployment of capital.
- To ensure reliability and compliance with laws and regulations within the entity's control to achieve the set objectives i.e. strategic, operational, reporting and compliance.
- Failure to understand the core business principle/expertise.
- Unrelated, diversification and investments before complete acquisition such as land for the projects and socio-political litigations.
- Lack of vision and inability to foresee problems/risks.
- Poor discipline and control mechanism and analytical information system, loading the firm with heavy debts.
- Companies sticking with old obsolete strategies and technology.
- Improper change management as per change in global business environment.
- Unhappy employees (Permanent and Contractual) due to disputes resulting contract failures and false implication of officers in cases and subjected to punishment.
- False projection of target and quality of coal in project reports compared to what is actual.
- Forceful transfer/application of technology to Indian Mines from foreign instead of customization of equipment with existing mining, geology and project specific requirements.
- Planning not merging with operations practically.
- Failure in updating the employees' knowledge, skills and imparting jobs specific training at frequent intervals.
- Failure in appreciation of innovation, research & development and boosting moral of employees and their recognition.
- Customer's unsatisfaction and failure of timely settlement of their grievances.
- Improper project related forecasting and ensuring reliability and feasibility incorrect & untimely decision, planning, organizing, implementation and optimum utilization of enterprise resources and cost control techniques.
- Incorrect flow of information and market survey & organizational system failures.
- Incompetent work force and delegation of powers, accountability and responsibility.
- Poor industrial relations and human resource development.

Limitations :

- While enterprise risk management provides important benefits, limitations exist. In addition to factors discussed above, limitations result from the realities that human judgment in decision making can be faulty, decisions on responding to risk and establishing controls need to consider the relative costs and benefits, breakdowns can occur because of human failures such as simple errors or mistakes, controls can be circumvented by collusion of two or more people, and management has the ability to override enterprise risk management decisions. These limitations preclude a board and management from having absolute assurance as to achievement of the entity's objectives.

In addition to this other limitations are :

- Time consuming & continuous process and not once-off activity.
- Site specific system development.
- Educated experienced and self motivated cross functional team needed.

Reasons for failure of Enterprise :

(IV) Example of Risk Identification, Risk Measurement, Risk Ranking and Risk

Categorization for Enterprise Risk Management:

Risk Identification:

1) Major Elements Responsible for Risk :

- Introduction of narrow grade bands/slabs width i.e. GCV (Gross Calorific Value) concept in place of earlier (UHV) Head Value Concept and contamination of coal during extraction from mines having thin shale bands and frequent geological disturbances.

2) Sub Elements/Causes of Risk :

- Earlier UHV basis grading system has broadband width/slab varying from 600 to 1100 Kcal/kg compared to existing narrow/small band width/slab i.e. in newly introduced GCV concept varying only by 300 Kcal/kg between each band i.e. G9 grade has GCV band of exceeding 4600 Kcal/kg and not exceeding 4900 Kcal/kg.

3) Resultant Risks & Risk Measurement

- Increase in events of grade slippage as per bands/slab causing frequent customers complaints/grievances.
- **Blocking of huge sales revenue of the company with customers e.g. if there is grade slippage in case of power sector/FSA customer from G9 (RS.1320/T) to G11(Rs.970/T) grade, then loss per ton to be incurred by mining company/credit note raised by customer will be rupees Rs.350/T. Suppose in a XYZ area, AAP target of production and dispatch is 1000000 T/Annum then the project will incurred a loss of 35 Crore/year. Thus having a negative financial impact on the organization which in turn has overall negative impact on profitability and growth of the organization and other related elements.**
- Increased litigation matters due to failure to supply agree and declared grade of coal to customers.
- Shifting customers to new market places resulting in poor dispatches due to poor customer satisfaction.
- Further degradation of quality of coal in stocks

due to seasonal changes, atmospheric exposure and fires etc in term affecting profitability of the organization and stake holders value.

- Negative impact on market image of the organization.
- Non compliance of office memorandum of MOEF & CC and Central/State Pollution Control Board and Coal Controller Organization directives stating production and supply of coal having less than 34% ash content to power houses.
- Raising of credit notes in crore of rupees by customer.
- Reducing project revenue of the organization on pretext of stone compensation and over sizing.

4) Risk Ranking and Risk Categorization:

- As per the parameters :
Consequences = 4
Probability = 4
Exposure = 3

Therefore, **Risk score = 48**

As per this risk score the **Risk Ranking is = High Risk.**

Risk Category: Strategic Risk, Operational Risk and Financial Risk.

5) Risk Mitigation Plan :

Treatment and control mechanism :

- Substitute the GCV concept with earlier UHV concept or increase in range/width of bands in GCV concept as far as practicable. (**Substitution**)
- Selective Blasting and Mining (**Engineering/Isolation**)
- Introduction of mechanization after proper project review and planning i.e. surface miner deployment.
- Installation of Online Ash Analyzer with sorter to separate coal having less than 34% Ash Content from that of having more than 34% Ash content.
- Regular shale/stone picking and crusher maintenance.
- Imparting training for skill improvement of supervisors and machine operators.
- Transparency in delivery order allotment and adhere to business ethics during dispatches of coal and sampling as per FSA/BIS Standards (**Administration and Human behavior**)

Procedure and Action Plan :

- C.C.O/Ministry of coal/Coal Company/Coal Customers initiative needed to make policy decision after grade reassessment exercise for seams of various mines and review FSA following principle of “BIG RANGE-BIG QUALITY-BIGGER SAVINGS”
- Quality Control Procedures and Circulars.
- Conducting quality control drives/workshop/seminar/surprise inspection/quality talk on grade improvement.
- Inviting suggestions from employees, customers and stakeholders.
- Project review on base of grade reassessment and physio - mechanical studies for change of technology, method of mining etc.
- Revising sale price of coal as per grade and adding washing cost if coal is send to washery.
- Scheduled maintenance of crusher to increase availability.
- Insensitive scheme for quality production.
- Digitalization and system development by launching web portal and apps for edge of doing business with customers.
- Formation of ‘Sampark Group’ for with interaction with customer, benchmarking and branding of coal product.

Responsibility :

- CCO, Ministry of Coal, CIL and Subsidiary i.e.(WCL) management, operations level management, GM(QC), GM(S&M), ISO, Internal Auditors, Front line supervisors, blasting crew and machine operators, GM(System), GM(Excav), GM(P&P), GM(Production) and IR, ASM, Manager (E&M), VTO, GM(HRD)

Time Frame & Review Frequency:

- Once in a quarter i.e. (3 Months) and daily for operational elements.

(V) Type of Major Risk in Coal Mining Industry:

By its very nature, coal mining operations are fraught with various risks.

- i) **Hazardous/safety risks:**
 - Accidents & disasters and injuries due to various mining operations, unsafe condition, unsafe act,

human failure, equipment failure, roof fall, side fall, explosion, inundation, fires, over confidence, pollution and health risk, slide of over burden and coal benches, subsidence etc.

ii) Operational Risks:

- Security risk, supply chain and logistic, political and social risk, industrial relation and trading environment, technology, environmental, change management, failure in retention of great employees, access to energy and input cost, productivity, vendor management, market and credit risk, change in customers requirement, capital project execution, terrorism.

iii) Financial Risk :

- Insurance and taxation, historic liabilities, investment in joint venture, assess and cost of capital, accounting and reporting standard, capital structure, liquidity and credit/cash flow, coal price and foreign exchange/currency exposure, fixed assets, CAPEX decision, Internal Control, frauds etc.

iv) Strategic Risk :

- Social license to operate, competition risk and reputational risk, CSR, Public Perception, Company strategy, vision and objectives, government policy and regulatory enforcement, sharing the benefit, reserve and resources risk, assess to infrastructure, industry structure, margin-protection and profitability, organizational culture(ethics/moral/corruption risk)

v) Support system Risk :

- IT infrastructure and application, software viruses, hacking of data, business continuity and disaster recovery, information security.

vi) Project Risk :

- Project planning and execution, resource availability.

vii) Compliance Risk :

- Legal, safety and security risk, properties and concessions, standard business conducts, corporate governance, statutory and government regulations and fines/penalty for violation.

viii) Risk due to change in strategic leadership and improper change management:

ix) Risk due to poor managerial economics and research.

(VI) BENEFITS:

The benefits of applying risk management are:

- Identification of the key risks associated with particular activities related to quality coal production.
- A more structured basis for planning and decision-making.
- Improved ability for identifying opportunities and grasping the benefits that flow from those opportunities i.e. from mine to market w.r.t. coal quality.
- A means of demonstrating duty of care and effective Corporate Governance. Greater openness and transparency of decision-making and customers satisfaction and retaining and increasing inflow of customer in competitive global environment.
- Improved visibility of the ongoing management process.
- Improved delivery/dispatch of coal at cheaper of landed cost to customers.
- Enhanced emergency and contingency planning and face challenges of global market.
- Reduction in insurance/credit notes on pretext of stone and grade slippage and freight demurrages/premiums for the organization.
- Proper risk management will lead to improved performance in key areas of health, safety and environmental damage, asset loss/damage, production disruption, and legal liability, productivity, sales and marketing of coal as there will be timely inflow of cash due to assured Quality sale of coal.
- Better documentation of risks and acceptable strategies for dealing with those risks.
- Enhanced "corporate memory" and corporate image.
- Suggesting remedial measures and precautionary steps to reduce and attempt to attain ZTL (**Zero Tolerable Limit**) w.r.t. coal quality or **Zero Defect in Quality(ZDQ)** of coal i.e. 100% grade materialization and achieve goal of ISO objectives to ensure customer satisfaction.
- Increase production and productivity and quality of coal and ensure customer satisfaction.
- Increase efficiency and profitability of organization.
- Reduces direct and indirect cost due to decrease in compensation/credit notes received from customer etc. and minimizes losses and wastage of resources.
- Improves morale of work persons and creates self motivated workforce and reduces percentage of absenteeism and good monetary status of organization to promote incentive

Schemes and welfare facilities and R&D inputs for further betterment.

- Enhances overall performance and confidence in work persons and create comfortable, harmonious, rich work environment.
- Establishes standardized and documented work procedures with commitment to produce and dispatch declared and agreed coal supply as per FSA.
- Assignment of well defined responsibility and accountability for coal quality among mine employees and increased awareness.
- Adherence and compliance to statutory requirements i.e. MOEE & CC and pollution control boards; CCO, ISO and coal ministry.
- Contributes to growth of National economy and well being of society as a whole.
- Improves image of organization and assist in obtaining major share of market and fulfill stakeholders implicit needs and face challenges of global competitions.
- Promotes harmonious industrial relations and minimizes grievances and public interest litigations.

VII) Enterprise Resources Management :

Business Enterprises requires different kinds of resources as vital inputs for their successful operations. In the era of increasingly globalized, competitive business environment, adequate appreciation of the roles played by various resources and the efforts to be made for their optimum deployment and utilization pose challenging tasks before the enterprise manager.

Enterprise Resource Management is a generic concept of business management and administration through the composite process involved in acquisition, deployment and utilization of various available resources in optimum proportions. Efficient and effective utilization of deployed resources pose challenging tasks before the enterprise management and key functionaries, since fulfillment of these tasks at a reasonable/acceptable level are also critical in successfully running the Enterprise in a viable and sustainable regime.

While the primary objective of a business enterprise is to earn a reasonable returns on the capital deployed, to be realized through generation of saleable products and services, adequate attention is also needed to manage effectively and utilized optimally the available resources as well as the assets generated out of it, since these resources and assets form the very foundation of the enterprise operating structures. Degraded/deteriorated resources and assets will surely lead to the weakening of this structure and may cause sickness and eventual collapse.

There are large of cases of such failure due to mismanagement/inefficient management of available

resources, in spite of good market prospects and standing. Implementation of tools and technique of risk management and optimum utilization of enterprise resources in a way becomes one of the important focal attributes of total quality management and business excellence processes towards attaining business effectiveness across the entire organization by producing best and acceptable results.

Thus, implementation of risk management tools and techniques and management of enterprise resources is a structured and disciplined approach aligning strategy, process, people, technology, resources and knowledge with purpose of evaluating and managing the uncertainties, the enterprise faces as it creates values.

Economy is generated by ability to face risk.

21st century will be dominated by leveraging new technologies as knowledge is power but know-how to deploy inputs is weapon in globalized and liberalized competitive market place.

Mistakes are costly – so costly that they can force out of business an organization once seen as industry leader and power house.

Management of risk and optimum management of enterprise resources helps alleviate mistakes and emphasizes on the roles and contributions of various resources as critical inputs for sustainable operations. It requires strategic thinking and strategies for effective implementation to attain the objectives implanting the vision and mission of organization.

VIII) Various methods of Enterprise Resource Management:

- Resource categorization, planning and deployment
- Mechanization, Automation & proper person at proper place at proper time.
- Technological development, innovation & research and use of modern management tools and techniques
- Strategic leadership and change management.
- Organizational knowledge development and reorganization of structure
- Corruption risk mitigation policy
- Maximizing use of natural resources.
- Successful mobilization and full capacity utilization of industrial resources.
- Budgetary and inventory control
- Application of IT tools, TQM, CPM, PERT, Time and Motions study and other methods of productivity improvement such as maintenance schedule, simplifying complex material handling circuits.
- Waste Management & Asset Management and Marketing Strategy

- Ergonomics and Resource Reengineering strategies etc.

IX) Analysis and Interpretation :

'**Risk Assessment and Risk Management**', is the essential element of **Total Quality Management (TQM)** and also contributes greatly towards achieving the objectives of the organization by assisting, managers to manage risk and not being managed by risk or react to risk.

Management of safety issues based on assessment of risk not only integrates safety with productivity but also can be used as a very good tool for reduction of cost. The system stands on the premises that all risks need not be eliminated and different control measures can be adopted for different levels of risks. The key here is to aim for ALARA (as low as reasonably achievable), which eventually depends on cost considerations. The system allows prioritization of allocation of scarce resources thereby cutting costs and reducing wastages. This assumes great importance in the current Indian scenario.

The other merits of the system are it is created by mine operators themselves through considerable brainstorming. This approach lets the mine operators feel the ownership of the system, something that is not cast upon them by the experts, government agencies for outsiders, hence chances of successful implementation is much more. In this system grey areas are minimized, responsibilities for actions are pinpointed and scopes for auditing and improvement are always present.

Thus, Risk and Resource Management is necessary for practicing mining engineers to control risk effectively and ensure mining operations economically and profitably by using basic techniques and methods of risk and resource management.

X) Conclusion :

The underlying premise of enterprise risk and resource management is that every entity exists to provide value for its stakeholders. All entities face uncertainty, and the challenge for management is to determine how much uncertainty to accept as it strives to grow stakeholder value. Uncertainty presents both risk and opportunity, with the potential to erode or enhance value. Enterprise risk and resource management enables management to effectively deal with uncertainty and associated risk and opportunity, enhancing the capacity to build value.

These capabilities inherent in enterprise risk and resource management helps management achieve the entity's performance and profitability targets and prevent loss of resources. Enterprise risk management helps ensure effective reporting and compliance with laws and regulations, and helps avoid damage to the entity's

reputation and associated consequences. In sum, enterprise risk and resource management helps an entity get to where it wants to go and avoid pitfalls and surprises along the way.

Thus **Managing Risk and Resources optimally** will always remain, besides other critical factors, a central focus for **overall Enterprise Management** for producing best / acceptable results and achieve the set goals and objectives and ultimately attain **Business Excellences in Coal Mining Industry**.

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