

1. The Impacts of Coal Mining on Environment and Health: Exploring the Role of Corporate Social Responsibility

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Abstract

Background: Mining of natural resources adversely affects the eco-system as a whole. Coal mining is essentially a destructive development activity where ecology suffers at the altar of economy. With the emerging economies in the various spheres of the globe and the alarming pace of industrialisation, coal mining carries an inherent curse to the global environment and sustainability. Thus, there is immense necessity to halt and concern for this very issue.

Aim of the study: The study has been incepted from the critical analysis of the environmental and health impacts of coal mining and the study further floats into the cause of concern yielding the importance of a corporate social responsibility amongst enterprises. In this light the present study is being conducted to address the environmental and health impact of coal mining and the importance of corporate social responsibility in a natural resource based enterprise for the attainment of sustainable development.

Methods and materials: The present study is based on secondary sources of research. It aims towards the collection of sporadic secondary writings. This writings will be collected from various literature, journals, magazine, published reports, articles, internet etc. This secondary information will help to visualize and to create a pre-mental image about the whole aspects of this study topic.

Conclusion: The impacts being hazardous, affects every facet of the natural and physical environment. Corporate Social Responsibility proves to be an eminent tool to nip in the bud and enable enterprises to adopt a mid way out for the attainment of sustainable growth.

Keywords: Mining, Health, Corporate Social Responsibility

Introduction

Mining of natural resources may well have been the second of humankind's earliest endeavours—granted that agriculture was the first (Vasantha, 2013). The two industries, mining and agriculture are the primary or basic industries of early civilization. Little has changed in the significance of these industries since the beginning of civilization (Rodiwal, 2015). Mining of stone and metal has been done since pre-historic times and has been integral and essential to mans' existence (Madigan, 1981). Digging into the earth's crust for extracting the minerals commonly known as mining operation, is the second most significant as well as oldest activity of the world after agriculture. Apparently, mining is as old as the bygone times of civilization (Khoshoo, 1984).

Valuable minerals or other geological materials are excavated from the earth's crust. Materials recovered by mining include metals, and minerals like iron, uranium, coal, diamonds, limestone, etc. Materials obtained from mining cannot be cultivated in agriculture or manufactured by human in a factory or laboratory (Costa, 2011). Broadly stating, mining usually any non-renewable resources are excavated. Modern mining processes ranges from exploration of ore bodies and thereafter assessing cost benefit proposition of a intended mine, followed by effective excavation of the required resource and in the final instance, reclamation of the land to prepare it for other uses once the mine is closed (Priyadarshi, 2012). It is inevitable to state that the environment is possibly adverse impacted by the mining operations during the mining operations as well as for years after closure of the mine.

In the study "The mineral sector and the national environmental policy" stated Operations, whether small or large-scale, are inherently disruptive to the environment (Mwandosya & Ndonde, 1994; 1996) pernicious repercussions can be witnessed for decades as a result of mining due to the generation of colossal quantities of waste (U.N.E.P. 1997). Environmental issues are particularly critical if the firm operates in an industry that produces large quantities of waste matter (Hart & Ahuja 1996; Walls et al. 2011; Walls et al. 2012). The environmental deterioration caused by mining occurs mainly as a result of inappropriate and unsustainable mining practices. Different stages of mining has immense undesirable impact on the various dimensions of human being's life who lives in the areas closer to their operation like on their natural environment, on their health and safety needs, on their social and cultural heritage etc (Moody & Panos, 1997; Akabzaa, 2000). As mentioned by Noronha

(Noronha, 2001) where operations are afresh or are concluding the social and environmental effects are widespread in the localities.

An inquisitive function has been played coal in the history of the Industrial Revolution. In the common parlance Industrial Revolution is all about coal, steam, iron, cotton mills, and railways. Coal was the essence of the Industrial Revolution as for the earlier generation of economic historians—T. S. Ashton (1948), Braudel, F (1981), Church, R (1986), J.H. Clapham (1926), Phyllis Deane (1965), Michael Flin (1984), and John Nef (1932).

Many external costs are inflicted on the surroundings and the people who live in the vicinity of Coal mines. While, few can be measured by estimates, others are complex to estimate. Evidently, Coal mining is disturbing and damaging to the environment.

Coal today lies at the very centre of the world predicament over the future of energy and the climate. Richard Heinberg and David Fridley in their article entitled “The End of Cheap Coal” in the scientific journal “*Nature*” where they mentioned about how world energy policy is formulated on a fallacy associated with availability of cheap coals for many years. The serious carbon issue has also highlighted by scientists like NASA’s James Hansen emphasize, is not oil but coal. Hansen argued for the expeditiously elimination of coal-fired plants and accompany of peak oil by peak coal in order to protect the earth from the tipping point of disastrous climate change. (Hansen, 2009). Coal abuse is still commonly a solution to energy scarcity as presented by the people having vested interests. Indeed few scholars like James Fallows in the latest issue of *Atlantic Magazine*, even promote the erroneous proposition that “clean coal” (an oxymoron) will save the earth from climate change (Fallows, 2010).

There are two methods through which coal is extracted first is underground mining and the second one is surface mining methods, irrespective the nature of mining its effect on environment and community is vital. The overburden (OB) are initially broken up via Surface mining methods explosives. Thereafter, for systematically drilling, large “dragline” shovels are then employed to remove these materials from the site, exposing the coal seam. For the transportation of mined coal to the operational plant area trucks are needed in large numbers. (World Coal Institute, 2009). A spectrum of detrimental environmental impacts follow this entire process. Thereby causing an

extensive ecological damage to enclosing areas. Because surface mines can range in size from several square kilometres to dozens of square kilometres, they require the clearing of large areas of forest. This directly threatens biodiversity and disrupts ecological processes such as nutrient cycling, which in turn affects downstream food webs. Serious social consequences on the movement of people, on people's health and the environments has a direct nexus with Coal Mining. Adverse spillovers, primarily in the form of air pollution, global warming from greenhouse gas (GHG) emissions, accidents, biodiversity impacts and water pollution are a result of Coal mining (Goldblatt *et al.*, 2002) irrespective of the nature of mining involved.

Objectives:

- ❖ To assess the impacts of coal mining on the environment?
- ❖ To assess the Health risk of people near coal mine area?
- ❖ Exploring the importance of corporate social responsibility in coal mining industries for the attainment of sustainable development.

Research questions:

- ❖ What are the impacts of coal mining on Land and Soil?
- ❖ What are the impacts of coal mining on aquatic bodies?
- ❖ What are the impacts of coal mining on air quality?
- ❖ What are the specific health related problems the people encountered near coal mine?
- ❖ How company should mitigate these challenges to help the local community members?

Methods and materials

It aims towards the collection of sporadic secondary writings. This writings will be collected from various literature, journals, magazine, published reports, articles, internet etc. This secondary information will help to visualize and to create a pre-mental image about the whole aspects of this study topic.

The environmental impacts of coal mining

Coal is the dirtiest of all fuels. Numerous toxic pollutants are released into the air, water and land from mining to coal cleaning, from transportation to electricity generation to disposal, coal. These

disrupt ecosystems and endanger human health. Some cause cancer, others damage the nervous and immune systems, and some impede reproduction and development (Keating, 2001).

Mining tends to make a notable impact on the environment the impacts varying in serving depending on whether the mine is working or abandoned, the mining methods used, and the geological conditions (Bell et al, 2001). Catastrophic damage is caused to landscapes and biological communities of the earth (Down & Stocks, 1977). Disturbance is caused to natural communities due to mining, presenting a very severe ailment for plant growth. Reduction in bio-diversity, pollution of water, land and air, soil erosion on a large scale, reduced forest cover are the serious environmental threats posed by the unscientific mining of minerals. (UNESCO, 1998). Further, the landscape around mining areas is consequential effects of waste rock dumps (Goretti, 1998).

In the 10th publication of Coal and the Environment, Stephen F. Greb, Cortland F. Eble, Douglas C. Peters and Alexander R. Papp provides an introduction to the major environmental concerns associated with coal mining and combustion, production, transportation, and use. Reckoning the type of mining, geology of the coal and overburden (OB) , topography of the landscape, and climate of the mining area , the environmental concerns associated with finding and mining coal differs. Regardless of the fact that these reverberations are pervasive to any large-scale excavation and construction; other impacts are more typical of coal mining.

The principal environmental concerns are:

- ❖ Physical disturbance of the landscape
- ❖ Subsidence and settlement
- ❖ Land stability
- ❖ Erosion, surface runoff, flooding, and sedimentation control
- ❖ Water quality and protection
- ❖ Coal mine fires
- ❖ Fugitive methane
- ❖ Public safety and disturbance issues and
- ❖ Miner's health and safety.

According to (Richards, 2002) the environmental impact caused by mining takes three main forms:

- ❖ **Land disturbance** that covers change of land use and land forms, visual impact of an open pit or waste dump and subsistence of the ground surface due to mining.
- ❖ **Destruction of habitat** including flora, fauna, natural watersheds and drainage pattern and of aquifer causing lowering of water table.
- ❖ **Adverse chemical impacts** of improperly treated wastes which cover air pollution due to dust and noxious fumes, water pollution due to surface run off from different areas of mines, waste sites, leakages from tailings dam etc., Sewage including acid mine drainage, related with many past and present coal and metalliferous mines as also noise and ground vibration due to blasting.

Impacts of coal mining on land and soil

The effects of mining on land are irreversible it is clear that the deep ecological transformations caused by mining cannot be undone using current reclamation and mitigation techniques (Palmer & Bernhardt, 2011). Regardless of the type of mining used for excavating coal, mining constantly effects in large land disturbance- e.g. large scale excavation, removal of top soil, dumping of solid wastes, cutting of roads, creation of derelict land etc (Singh, 2008). However in Open cast mine it has significant impact on land as compared to underground mine (Katoria, D. et al., 2013) in addition to that a surface mine decreases aggregate property values by between .34% and 1.7 %.(Merrell, 2011). Coal mining, particularly open-cast/surface mining is the main source of coal production today globally due to technological advancement and cost effectiveness. Open cast mining comparatively requires large volume of land acquisition than its alternative, underground mines which almost invariably leads to displacement of indigenous people/ population and not only stops here but results in Adverse environmental consequences of surface mining is land degradation arising from vegetation destruction (extensive deforestation), exposure of the soil to run-off and even burden spoils as well as dumps that have been confirmed as having harmful minerals and chemicals that pollute the soil environment (Lawal et al., 1981),large scale land disturbance, consuming of fertile agricultural land which may results in major crises in food production and food security. Although underground mining has significantly less impact than opencast mining on land, it causes stern damages to engineering structures such as highways, buildings, bridges and drainage besides interfering with ground water regime.

A blend of quality soil and different climatic parameters favours the growth of plants and agriculture which is considered to be the back-bone of the economy of any country. About twenty percent deforestation on a global scale, in developing countries may be accountable to mining (Bahrami et al., 2010). Ghosh (1990) while for India it is indicated that for every one million tons of coal extracted by surface mining methods damages a surface area of about 4 ha. Mining operations deteriorates considerable areas of land and substitutes existing ecosystem with undesirable waste materials in form of mine spoil dumps (Singh et al., 2007).

Top soil confine humus, an important food resource for plants, which increase biological activity, soil fertility and control the air and water content of soil and thereby determine the suitability of reclaimed sites for revegetation and its successful successional development (Wilson & Tilmen, 2002). It might be a very long time gap between the initial removal and final laying of the top soil cover in the reclaimed area to be the same. So the properties of stockpiled soil deteriorate and become biologically unproductive (Kundu & Ghose, 1997). Mining soil has high content of rock fragments in comparison to fine earth. These spoils are not suitable for both plant and microbial growth because of low organic matter content, unfavourable pH (Agrawal et al., 1993; Burghardt, 1993). Pederson et al., (1988) it can be noticed that, the nutrient status of overburden (OB) dumped soil is also an underlying constituent which curbs plant growth. The natural land topography, the drainage system and prevent natural succession of plant growth are affected by open cast project (OCP) excavation of coal deposits, which inter alia involves the removal of overlying soil and rock debris and their storage in overburden (OB) dumps (Bradshaw et al., 1980; De & Mitra 2002; Wali, 1987). In this context (Kundu, & Ghose, 1994) suggested that since topsoil is an essential component in abandoned mines for growth of vegetation and has to be preserved for post-mining land reclamation

Impacts of coal mining on water quality

Safe, affordable and accessible water is regarded as one of our planet's scarcest natural resources (lotz & Blignaut, 2011). Water scarcity could well become a fundamental development constraint in the future (DWAF, 2009). Dan Marokane, Eskom's chief commercial officer, cited that water is just as vital to the economy as coal. He accorded water as of high priority and said that every saved drop of water counts. (Engineering News, 2012). Coal mining has inevitable implications on local water

resources, both in terms of pollution and water usage. Groundwater is pumped out to dry the area being mined in both underground and surface mining (OCP). As a result: flows of groundwater and streams are impacted, water tables are lowered, ecosystems are damaged and entire regions are endangered. In some cases, water bodies have just disappeared (Green Peace International, 2008). The use of groundwater during the coal washing process leads to the further depletion of this resource (Greenpeace International, 2008).

Effective sterilisation is caused in addition to the environmental impact of coal mining resulting in slumping of the land and acidification of soils, one of the most severe problems seems to be water pollution (Mc Carthey et al., 2009) show that pollution exceeds the quality limits for water for human consumption. Due to sagging and industrial usage without treatment, an appreciable level of dissolved solids such as Bicarbonates, Chlorides and Sulphur of Sodium Calcium, Magnesium, Iron and Manganese are inducted into water while passing through aquifuge and aquiclude which are made permeable (Wathern, 1988). This makes the water hard, unfit for drinking, as well as other impurities in a few selected mines of Jharia and Raniganj coalfields in India. Moreover, these pollution levels are still scaling up at an alarming rate. Also, the aesthetic appearance of streams and rivers are ruined by Coal mine in addition to wrecking the living organisms that inhabit them. This in turn reduces their self purification, power and makes streams unfit for domestic, industrial or agricultural use requiring surface water to be extensively treated (at very high costs) before they are suitable for such use (Kemp, 1967).

Impacts of coal mining on air quality

Limited research has been undertaken to study the impacts of air pollution from coal. However, current evidence suggests that the health impacts of air pollution are similar everywhere to those reported from developed countries. Millions of kilograms of pollutants are emitted into the atmosphere, with the potential to be a hazard to both health and the environment due to coalmines and coal-fired power stations thus attributing among the big polluters, (Curtin, 2010). According to the calculation of World Health Organization approximately 1 million people prematurely died in year 2008 worldwide due to pollution caused by coal particulates which is one-third of total premature deaths caused by air pollution. In 2011 the World Health Organization (WHO) compiled air quality data from 1,100 cities in 91 countries and found that dwelling in many urban areas are exposed to

persistently elevated levels of fine particle pollution. Transient emissions of particulate matter and gases including methane, sulphur dioxide, oxides of nitrogen and carbon monoxide contributes to the air pollution in mines. Dust is produced by most mining operations. Dust is produced by mining operations such are drilling, blasting, hauling, loading, transporting and crushing. The main air pollution problem in a mining area is due to the presence of particulates, which may be coal, soil or rock dust (Ghose & Majee, 2000). Air pollution problem are more severe in Opencast mining as compared to underground mining (Singh, 2008). The abundant source of fugitive dust has been identified is through Vehicular traffic on haul road and can contribute as much as 80 percent of total dust. Cowhered.et.al, (1979) It has been assessed that about the total dust released during journey time of dumper on unpaved haul road while 25 per cent for both dumping loading-unloading of dumper. The air and water quality is affected by trucks, rail and barges used to transport coal. Further, the environmental and health impacts from blowing coal dust, there is also the air pollution from the vehicles themselves (Keating, 2001). Many scientific studies have shown that raised levels of particulates result in increased illness and premature death from heart and lung disorders, such as asthma and bronchitis (US EPA, 2003).

The health risks associated with coal mining

Over half century ago the most commonly quoted definition of health is accepted as a formalized by the World Health Organization (WHO); “a complete state of physical, mental and social well-being, and not merely the absence of disease or infirmity.” Bircher (2005) defines health as “a dynamic state of well-being characterized by a physical and mental potential, which satisfies the demands of life commensurate with age, culture, and personal responsibility”, while Saracchi defines health as “a condition of well being, free of disease or infirmity, and a basic and universal human right”. Human activities and everyone social arrangements are a subsystem of the natural environment that are intrinsically hooked into the health of ecosystems. Human health is therefore embedded in and profoundly dependent on the natural environment (Health Canada, The Canadian Handbook on Health Impact Assessment, 1999). Public health researchers have identified environmental pollution as a major contributor to health inequities (Brulle & Pellow, 2006). Residents most likely to experience worse health or be exposed to greater health risks include people from disadvantaged social groups (such as poor, racial or ethnic minorities), women, or others discriminated against (Braveman, 2006), such as those living close to polluting industries. Residents’ discomfort about air pollution was also



expressed through a NSW Public Health Unit survey finding that air pollution and water pollution were considered to be the top two environmental health problems (Dalton, 2003). Rampant pollution and elevated levels of toxicity, mine tailings and mine disasters accounts for majority of the health problems in mining regions. The health and safety challenges not only varies based on the mineral extracted but also from the technology used, type of mining- open cast (OC) to underground - and the size of operations. Human health is also detrimentally affected due to surface mining. Ground water samples used for residential supply have been found to contain high levels of chemicals associated with coal mining such as sulphate, iron, manganese, and aluminium. In West Virginia, a rise in coal mining increases the sulphate levels in major watersheds within the area (Palmer & Bernhardt, 2011). Moreover, elevated levels of hazardous, atmospheric dust have been recorded near surface mining operations. As the rate of county-level coal production increases, so do the rates of chronic pulmonary disorders, hypertension, lung cancer, and chronic heart, lung, and kidney diseases (Palmer et al., 2010).

It has been proved in many international health literatures that human lives residing near coal mines or coal fired power stations are exposed to the serious harmful health hazards. (Colagiuri et al., 2012). The report on the Hunter Region draw attention regarding the 'Health and Social Harms of Mining in Local Communities' through reviewing the 50 international peer reviewed studies related to the coal mining and combustion effects on health and society. It emphasizes a spectrum of detrimental health effects indicated from a wide range of countries. These effects range from excess deaths and increased rates of cancer, heart, lung and kidney disease and birth defects to minor respiratory complaints. (coal-health-report). Exposure to air pollution can make eyes water, irritate nose, mouth and throat, cause or worsen lung diseases like asthma, bronchitis and emphysema and can contribute to premature death of people with heart and lung disease Long-term epidemiological studies have repeatedly demonstrated that people living in areas with high fine particle concentrations have an increased risk of premature death compared to those in cleaner cities Krewski, D. et al., (2000). The risk of dying early from cardio-respiratory diseases and lung cancer is higher in more polluted areas (Pope et al., 2002). Lives might be shortened by one to two years on average Brunekreef (1997). Evidence from the United States indicates that coalmining communities in West Virginia had an increased risk for developing cardiopulmonary disease, chronic obstructive pulmonary disease (COPD), hypertension, other lung diseases and kidney disease (Hendryx, & Ahern, 2008). Mortality rates for these diseases

were higher in coalmining areas compared with non-mining areas of the region (Hendryx, 2009). The authors' ethnographic research in the Upper Hunter also gives a profound knowledge w.r.t residents' association of air pollution with a plethora of health challenges including asthma, heart disease, pneumoconiosis, respiratory complaints, cancers, skin complaints, headaches, breathing difficulties and mental health symptoms like stress, anxiety and depression (Albrecht et al., 2007; Connor et al., 2004).

The coal mining not only responsible for the polluting the environment and effects the health of the people living in nearby villages but also caused severe health hazards to the population engaged in coal exploration. With respect to life and health hazards, incomparable with any other profession, the occupation of a hard coal miner belongs among the most precarious jobs.

The most common, causing numerous cases of occupational diseases among miners include (Grzesik, & Sokal, (nd) & Schmidt, 2014):

- ❖ Dust with silica impurity, causing pulmonary disease like silicosis
- ❖ Excessive noise, leading to occupational hearing damage
- ❖ Mechanical vibration, resulting in the vibration disease
- ❖ Nitric oxides and other toxic chemical compounds in gases and explosive charge fumes, contributing to chronic bronchitis
- ❖ Micro-flora responsible for occupational skin diseases.
- ❖ Extraordinary physical load resulting in hyper-stress
- ❖ Risk of suffering from the status of psycho-physical burn-out.

Accidents and disasters is related to coal miners as a result to unpredicted rock mass movements, roof collapses, fires, massive breakouts of water, dust or gasses as well as other factors causing with direct health and life hazards.

Role of corporate social responsibility in coal mining industry

The chariot of development is driven by a spectrum of pros and cons. The pros are harmonised in the form of industrial amelioration, rise in the standard of livings amongst individuals, societal upliftment, etc. The cons as afore discussed to coal mining is affecting not only the physical

environment but also having an ill impact on the abstract environment viz. the social environment as a well. In the present turmoil, it has arose a cause of concern for the intellectual populi to strive a thought at attaining a development which goes hand in hand with the sustainability sphere. With the engagement of various schools of thoughts, the Corporate Social Responsibility (CSR) has evolved as an ideal gazette to attain an optimal development which gives due regards to the sustainability sphere. Corporate social responsibility is a stern effort to address various social challenges resulting wholly or in part by the corporation (Fitch, 1976).

Various scholars and practioneers have attempted to derive a proper definition of CSR as aforementioned and as opined by the World Business Council for Sustainable Development in (1999), The dedication of business to contribute to sustainable economic development along with to ameliorate the quality of life of employees working with them, their families, the local community and society at large. Sir Geoffrey Chandler stated that while there is no comprehensive definition of corporate social responsibility drives towards transparent business practices that are based on ethical values, compliance with legal requirements, and respect for people, communities, and the environment. In short, Apart from making profits, companies are responsible for the impact of their activities on people and planet. Nevertheless, the concrete efforts have been able to propagate the idea of CSR yet the concern still escapes notice towards having a participatory CSR policy, which would engulf the beneficiaries of the CSR policy.

Why companies should contribute more and more in CSR?

In different forms, managing risk is what constitutes social responsibility. Mining companies are engaged in corporate social responsibility to enhance their chances of economic success. There are risks in being involved with local settlements, but there are greater risks in ignoring the environmental and social impacts of mining. In this globalised world, failure to exhibit corporate social responsibility practices may be a greater financial risk than spending on optimizing benefits and downplay negative impacts. The impacts on the society, in particular on the local community inhabiting the mining project area on individual health and community well being, as well as the inability to regenerate destroyed ecosystems due to severe environmental degradation is a matter of concern that is why the role of CSR in any mining, however in terms of coal its role is very crucial because of its externalities.

How coal companies should mitigate these problems through their CSR initiatives?

The proposed mining activity should contain an road map for minimizing the adverse environmental effects which may include the restoration of the mining area. These important aspects to be considered under the CSR initiatives should begin in the pre-operational phase and should be included in the plan as are categorized and mentioned below:

Pre-operational phase (Goswami, S. 2015):

- ❖ Vegetation barriers should be raised along the contours of undulating terrains to prevent soil erosion and for arresting the mine wash.
- ❖ Steps should be taken to construct check dams, either of rubble or brushwood, across small gullies and streams on the ore body to contain the soil wash. By means of vegetation, check dams shall be settled.
- ❖ The banks of streams in the mining areas should be intensively vegetated to prevent the discharge of sediments or coal dust, into the streams.

Operational phase (Goswami, S. 2015):

- ❖ For opencast mines, screens or banks of soil and overburden shall be constructed in the peripheral area.
- ❖ Vegetation barriers shall also be constructed along the periphery of a mining area on either side of the mine or service roads and between other locations. The benefits include preservation of top-soil, the reducing of harmful visual impacts, noise-baffling, dust suppression, etc.
- ❖ Cleansing of vegetation should be restricted to the minimum necessary for mining operations and planned in advance.

Post-operational phase:

Once the mining operations are over, the land should be reclaimed for productive uses through waste land management few such measures as suggested by (Murugesam, 2018) are as under:

- ❖ Afforestation: Through growing the forest over the cultivable wasteland.
- ❖ Reforestation: Growing the forest again can checks water-logging, soil erosion and increases the productivity of the land.

- ❖ Providing surface cover: The easiest way to protect the land surface from soil erosion is of leave crop residue on the land after harvesting.
- ❖ Changing Ground Topography on Downhill's: Running water erodes the hill soil and carries the soil along with it. This can be minimized by following alternation in ground topography.
- ❖ Terracing: In this arrangement, the earth is shaped in the form of leveled terraces to hold soil and water. The terrace edges are ingrained with such plant species which fix the soil.
- ❖ Ecological Succession: This refers to the natural development or redevelopment of an ecosystem which helps in reclaiming the minerally deficient soil of wasteland.
- ❖ For effective developmental planning for wastelands, correct assessment is needed, which is being taken up by various land use development boards and organizations across the globe using new technologies like remote sensing and geographic information system techniques. It is being firmly opined that wastelands should be mapped at fairly large-scale. In addition to mapping, a comprehensive road map should be developed for reclamation of wastelands with appropriate care to other resource information. Apart from these organizing conferences, seminars, workshops, study tours etc for the farmers.

Conclusion

From the above mentioned discussions it may be concluded that coal mining adversely affects the eco-system as a whole. Coal mining is essentially a destructive development activity where ecology suffers at the altar of economy. With the emerging economies in the various spheres of the globe and the alarming pace of industrialisation, coal mining carries an inherent curse to the global environment and sustainability. Thus, there is immense necessity to halt and concern for this very issue. The impacts being hazardous, affects every facet of the natural and physical environment. Corporate Social Responsibility can prove to be an eminent tool to nip in the bud and enable enterprises to adopt a mid way out for the attainment of sustainable growth.

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