Journal of Environmental Science & Engineering (JESE)

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Assessment of Particulate Matter Around Industrial Area of Mundra, Gujarat

RAHUL SINGH*, CHHAVI SOLANKI, DR. SUBINOY MONDAL

Abstract :

Ambient Air pollution is responsible for many health problems due to contaminated by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. The industrialization and urbanization may enhance the level of primary pollutants in ambient air particularly particulate matter by emission, transport, dispersion, chemical transformation and deposition. The dispersion of pollutant can be influenced by meteorological variables as well as land-use pattern of the area.

Coastal area of Mundra in Gujarat is the crucial power generating area in India, which contains coal-based mega thermal power plants. Selection of the sampling stations was done as per annual wind directions of the area. Trend of the air pollutant like PM_{10} and $PM_{2.5}$ concentration was observed from 2008 to 2015 in different seasons and area. Sampling had been performed as per CPCB guidelines while analysis was done according to Indian Standard Methods. The observations reveled that trend of these pollutant was initially increasing when the plant construction started due to construction related activities and then it showed decreasing pattern in the regression analysis. The changes of the ambient concentrations of particulate matter showed temporal and spatial variations at five sites around the study area.

Keyword : Ambient Air Quality, Particulate Pollutant, Meteorological, Industrial area and Mundra

1. Introduction

Pollution refers to the contamination of the earth's environment with materials that interfere with human health, quality of life or the natural functioning of the ecosystems. It occurs when the environment is contaminated by any chemical, physical or biological agent that modifies the natural characteristics of the atmosphere. Air quality monitoring is component of primary strategy in the pollution prevention and management program in India, which cover air pollutants such as particulate matter (PM), carbon monoxide (CO), sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and ozone (O_3) etc.

Ambient air pollutant is denigrated atmospheric pollutants, on account of its negative impact on air quality, atmospheric chemistry, and largely alteration in global climate (Pant and Harrison, 2012; Cesari et al., 2016; Jain et al., 2017; Goel et al., 2018). Particulate matter in ambient air causes the harmful impact in industrial areas on human that includes cardiovascular diseases, allergies, respiratory diseases, morbidity and premature deaths (Pope and Dockery, 2006; Li et al., 2009; Jain et al., 2017; Cesari et al., 2018). According to a report published for the year 2017 jointly by Indian Council of Medical Research (ICMR), Public Health Foundation of India (PHFI) and Ministry of Health and Family Welfare, air pollution causes 26% of premature deaths in India where solely $PM_{2.5}$ was accountable for around 12.4 lakh deaths (Balakrishnan et al., 2019).

The World Health Organization (WHO) published global air quality guidelines for ambient air quality for PM_{10} (WHO 1987, 2000a, b, 2006) with other pollutant. In India, for monitoring and control of various air pollutants, Central Pollution Control Board (CPCB) has developed the national ambient air quality standards (NAAQS).

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Impacts of Mining Activities on Land Environment using Object-Based Image Analysis : A Case Study of Malanjkhand, Madhya Pradesh, India

RITESH VIJAY*, JAYDIP DEY, VIKASH KUSHWAHA

Abstract

Remote sensing data provides information about inaccessible mining areas and changes of topography over the period that is crucial to monitor the environmental changes in a cost-effective way. The object based image analysis (OBIA) is an effective technique that integrates the spatial, spectral, and contextual information of satellite data compares to traditional analysis methods. A very few studies are performed using OBIA for land use land cover (LULC) assessment on mining activities. Therefore, the objective of the present study is to assess the change detection analysis of the land environment due to anthropogenic activities of mining from the year 1973 to 2020. This research work suggests additional afforestation in the study area to compensate for sparse forest degradation due to mining activities.

Keywords *:* Object-based image analysis, change detection, mining, afforestation.

1 Introduction

Mining industries are the backbone for the economy of developing countries throughout the world but at the same time, mining-related environmental problems are posing increasingly complicated challenges for any nation. The extraction of minerals from the earth's crust in the form of mining has an adverse effect on the local biotic community, physiography, and overall environment (**1, 2**). The mining activities always leave a disrupting mark on the natural environment, whether it is operating or closed (**3**). According to Padmanaban et al., (**2017**) (**4**) mining has several impacts on natural environment; it leads to the quality degradation of groundwater, disappearing of aquifers, deforestation etc. Padmanaban et al., (**2017**) (**4**) also claimed that soil movement, deforestation etc. is taking place in Germany due to extensive mining. It is reported by Kumar and Gorai (**2018**) (**5**) and Das et al., (**2021**) (**6**) that due to mining activity assess the changes in LULC category is a significant approach to measure the environmental degradation. In India mining sector is a key source of industrial activities and it is flourishing as this continent is enriched by diversified mineral resources. The existence of mineral deposits is very sensitive for forests and other natural resources (**6, 7**).

To monitor and assess the land use and land cover (LULC), zonation, and mapping of degraded land by mining operation in the form of infrastructure, mining pits, sedimentation, etc, geospatial technology is a proven and advanced technique. This technique is helpful to measure the dynamics of migration of human settlements and its effects on the natural environment (**8**). Remote sensing data are popular world widely because of its large areal coverage, availability of temporal data, and low cost as compare with the conventional method. (**9**). There is a wide and successive use of Remote Sensing data in the field of mining to assess the exploration of minerals and modeling (**10, 11**). As per Lamb (2000) **(12),** it has been reported that the geospatial technique has a significant contribution to managing the environmental issues that are created by operational mining activities. To assess the impact of mining on land environment hyper-spectral, multispectral satellite images, and photographs collected through the aerial medium are using tremendously in this decade (**13, 14, 15**).

To perform the LULC, there is a strong relevance of satellite data, as it provides different aspects like spatial, spectral, and contextual information about an object or area. Based on the historical image analysis it is possible to assess

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Groundwater quality analysis using open source software and statistical tools

POONAM PRASAD, INDRANI GUPTA AND RAKESH KUMAR

Abstract :

In India, Groundwater (GW) is heavily exploited for domestic, agricultural and industrial activities, which has resulted in its steady depletion and further deterioration in its water quality. Manual analysis usually takes longer time for public access. Thus, there is a need to develop a system to collate and upload that data from national monitoring stations, so that the general public are aware of conformity of quality of available water with the national water quality standards at anytime from anywhere. Groundwater Quality Index (GWQI) which categorizes "excellent water" to "water unsuitable for drinking" helps the general public to suitably treat the water before consumption. In this study, an attempt has been made by the authors to develop a system in open source software viz., Apache, PHP and MySQL tools to analyze the GW quality. The software system gives the quality of the well individually and yearly trend of Water Quality Index (WQI). Analysis of data for the year 2007 to 2011 reveal that out of 367 talukas in Maharashtra, only 10% of the talukas have water quality within permissible limits. Nitrate levels exceed BIS permissible limits in 70% of the talukas in Maharashtra. Fluoride levels were above permissible limits in 38% of the talukas spread over 27 districts. TDS levels were higher than the standard in 34% of the talukas. Huge data collected by different authorities over the period 2007 to 2011 showed that 23% of the samples are excellent, 54% good, 20% poor, 2% very poor and 1% is unsuitable for human consumption

Keyword : *Ground Water, Software, PHP, MySQL, Apache, WQI*

1. Introduction

Large quantity of Groundwater(GW) is being abstracted for domestic, industrial and irrigation purposes all over the world (Xiao et al., 2014). Demand for water is increasing rapidly due to population rise, growing intensification of agriculture and rapid industrialization. GW quality depend on many features which include the minerals of the region, land use, source of recharge, quantity of rainfall, and anthropogenic activities (Gurunadha Rao et al., 2013). Anthropogenic sources of contamination include untreated waste from septic tanks; toxic chemicals from leakage of underground tanks, improper disposal of waste on land, unsecured garbage dumping grounds which include household toxic substances like thermometers, batteries, tube lights, bulbs, etc. Agricultural sources of GW contamination include pesticides, fertilizers, herbicides, animal waste etc. These have caused the worsening of GW quality during the past decades.

GW quality is regularly examined by the Central Ground Water Board (CGWB), Groundwater Survey and Development Agency (GSDA), and Maharashtra Pollution Control Board (MPCB) in 367 talukas of Maharashtra. Data are available for about 4000 stations annually or bi-annually and for only 500 stations on a monthly basis. The sampling objective is the determination of physicochemical parameters of GW *in order to determine the* suitability of the water for drinking and domestic activities. The map of the study area is shown in **Fig. 1**.

Researchers have suggested several approaches for evaluation of GW quality. One approach is a simple comparison of monitored values with local standards (Debels et al., 2005) which do not evaluate the cumulative effect of the parameters. Several researchers have developed a Water Quality Index (WQI) using linear methods for determination of suitability of water for human consumption (NSF 1974,

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Influence of Arbuscular Mycorrhizal Fungi and *Rhizobium* on the Growth and Physiology of lentil (*Lens culinaris*) with special amelioration of Sewage Sludge

MUDASSARA HASAN[1+] AND FAUZIA NAUSHIN[2]

Pulses are an intrinsic part of average Indian sustenance. It is rich in proteins and develops a tripartite relationship with *Rhizobium* and arbuscular mycorrhizal fungi. Sewage sludge emanates from the treatment of wastewater that contains nitrogen, phosphorous and valuable organic matter, which makes it useful as a source of fertilizer or an organic soil improver. A field study was carried out to find the interactive effects of arbuscular mycorrhizal fungi (*Glomus bagyarajii*), root nodule bacteria (*Rhizobium* species) and sewage sludge on the growth and biochemical attributes of lentil. The experiment was conducted in earthen pots filled with soil and manure in the ratio of 3:1 with three replicates each. Lentil plants were inoculated with *G.bagyarajii, Rhizobium* and 20% sewage sludge alone or in combinations. After 60 days, plant length, fresh and dry weight, chlorophyll, carotenoid and proline content were determined. Inoculation of *G.bagyarajii, Rhizobium* and sewage sludge in combinations of either two microbes or all three were found to be more effective in improving plant growth and biochemical attributes than individual applications.

Keywords : Sewage sludge*, Rhizobium, Glomus bagyarajii,* lentil

1. Introduction

India is known as the *'house of pulses' because* of the availability of different pulses and their ancientness in this region. It is the world's most immense native land of vegetarian people and the chief pulse producing country worldwide (Ali and Gupta, 2012). Lentil *(Lens culinaris* L.) is India's vital *rabi* pulse crop with high nutritional and medicinal value. Hence, it is necessary to increase its production rate to satisfy the growing demands of society, which the application of fertilizers can do.

Even though sewage sludge was considered an unwanted product, recycling and reusing essential nutrients of the sludge as soil stimulants and improving the physical and chemical characteristics of soils in various land areas proved beneficial (Seleiman et al., 2020; Raheem et al., 2018; Clarke and Cummins, 2015). However, sludge tends to concentrate on several metals. Metals like Zn, Cu, Fe and Co are valuable micronutrients to flora and fauna. In contrast, metals like Cd, Hg and Pb have no known vital functions and are lethal in higher amounts (Zorpas et al., 2021). The critical problem in the terrestrial application of sewage sludge as a soil amendment is the possible accumulation of these heavy metals in crops, which will shift upwards to the food chain, ultimately causing severe health issues for humans (Rai et al., 2019). One way to limit the amount of these heavy metals reaching the plant is by using microbial organisms that play an important role in determining the uptake of heavy metals from sludge into the pulse crop.

Pulses form a triple mutual relationship with *Rhizobium* and arbuscular mycorrhizal fungi (AMF). The relationship accompanied by *Rhizobium* demands atmospheric nitrogen fixation that enriches both crop and soil with nitrogen. Annually 175×106 tonnes of nitrogen have been obtained worldwide (FAO, 1983). The importance of arbuscular mycorrhizal fungi in improving plant growth through better uptake of nutrients by plants, particularly phosphorus, is well studied, and the results were supported by many researchers (Xie et al., 2019; Tavarini et al., 2018). Thereby, AMF helps in the growth and longevity of the flora within its native habitat (Ibijbijen et al., 1996). Their potential for rising development

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Biodiversity Augmentation on Village Community Degraded Land using Eco-Rejuvenation Technology

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Abstract :

Desertification has become one of the potential future challenges as the degraded landscape cover surges worldwide affecting the rural agricultural economy. Community degraded land areas can be exploited for sustainable socio-economic and ecosystem development. There are several approaches and case-studies on the restoration of degraded land areas. An important goal of biodiversity augmentation on wasteland is to accelerate natural succession and biotic control over bio-geochemical fluxes within the degraded ecosystem. Eco-Rejuvenation Technology (ERT) can revive a degraded ecosystem to its near original state within a few years. The present review deals with the available literature on reclamation of rural degraded land areas to ameliorate biological productivity and soil fertility. After rejuvenation, the whole restored ecosystem needs to be sustainable. We also highlight a successful case study of restoring a rural community degraded land.

Keywords : Eco Rejuvenation Technology, Rural development, Biodiversity, Degraded land, Reclamation

1. Introduction

Land degradation has been acknowledged as a threat to the global food security and agricultural productivity. For instance, in developing countries like India, barren land occupies nearly 20.16% of the geographical area (Kiran et al. 2009). It is projected that rural agricultural lands lose their productive capacity due to increased nutrient runoff and pollution (Zanon et al. 2020). Studies on the relationship between human activity and land use change with respect to the ecosystem and environment have recently drawn global attention (Wang et al. 2018). The links between land use sustainability and rural revitalization need to be explored for efficient utilization and management of the degraded land areas (Liu, 2018). Fall in productive capacity of soil leads to temporary or permanent barrenness of a land. In rural landscapes, the major reasons for decline in land productivity due to human activities are loss/change in vegetation pattern, biomass and nutrient content (Qu et al. 2020). For instance, the Himalayan Hokersar wetland's biodiversity significantly decreased by change in the community structure of macrophytes, which created a significant impact in the rural and semi-urban socio-economic conditions (Khan et al. 2004). In tropical and arid zones, due to climate change and pollution, arability of lands decrease, which in turn affects the rural agriculture. Drought, soil nutrient runoff, erosion, urbanization and contamination are the major factors linked with decline in soil microbial diversity and fertility (Xie and Zyl, 2020). Land degradation also affects the groundwater efficiency. For instance, land degradation by nutrient depletion or soil erosion can diminish the water productivity and quality in the affected area (Bossio et al. 2010). Generally, arid wasteland areas are being utilised for non-farming commercial and productive purposes like solar energy plants (Mishra, 2020). But increased degradation of fertile lands has emerged as a global concern. Degradation of rural agricultural land areas causes farmers to choose non-farming jobs, which impacts the rural socio-economic structure (Singh et al. 2020b). Rural land degradation can be economically linked

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Enhancement of Biodiversity through Ecological Parks on Urban Wasteland

SRINIDHI SRIDHARAN[1,2], MOHAN MANU T[2], KUMAR MUNESH[2], ROSHAN D KAWARE[2] AND LAL SINGH[1,2*]

Abstract :

Local biodiversity has tremendous significance on the regional culture and socio-economy, and these ecosystem benefits in cities are being threatened due to pollution and growing urbanization. Due to increasing industrialization and urban migration, native biodiversity in cities are being susceptible to the impacts of anthropogenic activities. The development of urban eco-parks can aid in mitigating local climate change along with conserving species diversity. However, field studies on how urban ecological parks can help mitigate climate change and air pollution are still scarce, especially in developing countries. Planned vegetation that provides greenery and constitutes native flora can be an efficient planning strategy in sustainable urban development. The present paper addresses the implementation and application of urban ecological parks to conserve local biodiversity and ameliorate the environment.

Keywords : *Biodiversity, Ecological park, Climate change, Urban planning, Sustainable development*

1. Introduction

Rapid industrialization and urbanization have led to a substantial decline in environmental quality, which is apparent in most cities of the world (Nazrollahi et al. 2020). Due to anthropogenic disturbance, the natural characteristics of soil and water have changed (Dong-sheng and Yu-juan, 2003; Wang et al. 2018). Recently, insistence for sustainable development that does not affect the environment has been set forth by legislation and policy (Gangwar et al. 2020). Urban eco-parks have become the symbol of sustainable urban planning and development (Razzaghian et al. 2012). Urban eco-parks are connected ecological landscapes in a city that enhance wildlife and human aesthetics and reduce watering maintenance (Refaat, 2014). The development of open green spaces in cities has been planned and implemented for decades (Chiesura, 2004; Uusikartano et al. 2021). The concept of ecological parks (eco-parks) is different from urban forestry, as the latter refers to the management of urban forests or community ecosystems (Konijnendijk et al. 2006). Urban eco-parks involve the establishment of greenery in busy cities, which enhances vegetation density in densely populated urban areas. Vegetation can enhance the overall biodiversity of the area (Jia et al. 2020). But if these green spaces could ameliorate the urban soil, water, or air quality, they could emerge as a successful strategy for maintaining a balance between economy and environment. Restoration, succession, and remediation of the environment in urban ecosystems should be the ultimate goal of ecological parks (Xie et al. 2020). Therefore, scientific approach is needed for developing structure plans to create and maintain urban parks based on the local interpretation of recreational behaviour and greenery (Oguz, 2000).

1.1 Ecological parks

The concept of urban green spaces started with the construction of industrial eco-parks to reduce trade-offs between economic efficiency and ecological integrity (Chang

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