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Developing Tank Information System and Evaluating the Performance of Tank Modernization Using Remote Sensing and GIS

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In India, there are around 120,000 small-scale tanks irrigating about 4.12 million ha. But these tanks gradually started showing signs of big damage to their potential utility because of heavy siltation, excessive pollution and encroachments. Only in mid 80's the consequence was realized by Govt and concept of rehabilitation was practiced. The objective of the present study was to develop a Tank Information System (TIS) and to evaluate the performance of the modernized tanks and to assess their improvement in production and livelihood standards of people. The study area selected was the Vengal tank located in the Thiruvallur district which is modernized under the IAMWARM project. Developing TIS involves the collection of various primary and secondary information regarding the Vengal tank and its command area. This information can be recorded and stored as different layers in GIS in the form of spatial and non-spatial data in digital form. GIS has the capability of integrating spatial and multi-layered information available in different formats. The cropping intensity is assessed using NDVI analysis and livelihood standard is assessed using PRA tools. The tank database was developed using the HTML and PHP as front end tools, MYSQL as back end for handling the attribute data and GIS maps. Object linking technique was used to link the GIS maps, access table and graphs with HTML and PHP. TIS is capable of generating outputs in the form of maps, tables and graphs that will help the irrigation engineers, agriculturalists, farmers and Government officials to monitor their performance of the tank at any place and time and take necessary steps to manage the resources effectively.

Key words: *Modernized, NDVI, IAMWARM, TIS,HTML,PHP*

1. Introduction

Water is the primary resource for agriculture. At present 80% of the people directly and indirectly depends on agro based activities. The efficient utilization of the water resource is necessary for increasing production. The major source for irrigation in Tamil Nadu is mostly by tank water (Ambler, 1994). In Tamil Nadu there are 39,202 tanks spread all over the state. Nearly 30,000 of tanks have been formed centuries ago. Tanks are low earthen bund which is constructed along slope of a valley or terrain to store the rain water. This stored water has been used widely in irrigation, drinking, industry, bathing, fisheries etc. But in recent decades it have been seen that the contribution of tanks to irrigation declined from about 40 percent (1955) to 25 percent (2000) in Tamil Nadu. This system gradually started showing signs of big damage to their potential utility because of heavy siltation, excessive pollution encroachments, poor maintenance, population pressure, break-down of traditional management institutions and development of tank irrigation. The government of Tamil Nadu observed the rapidly deterioration status of tank irrigation system and made efforts to modernize the tanks.

2. Need for the study

In recent years, Our Government has funded more money for the tank rehabilitation works, but there is no proper information system available for evaluating their performance. Through performance evaluation, we can manage the resources efficiently and increase the agricultural production, livelihood standards of people. The information provided should be interactive, easy to understand and readily accessible to the users. Through this tank information system, the concerned officials can view through the progress of the tank performance easily.

2.1 Objectives

To develop an Interactive Tank Information System using GIS and HTML and to evaluate the impact of the tank

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Hydrogeological Appraisal of Kharkhari Watershed, Nagpur District, Part of Central India With Special Reference To Groundwater Occurrence In Basaltic Terrain

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Present paper deals with the detailed hydrological studies of Kharkhari watershed, Vena river basin,Nagpur district,Maharashtra,India.The area is dominantly covered by the Deccan basalt lava flows of varying thickness and aquifer characteristics.Detailed well inventory of 16 open dug wells has been carried out for collecting the hydrogeological information regarding diameter and depth of the wells, pre-monsoon and post-monsoon water levels, lithology,depth of the weathered zone, thickness and nature of aquifer, seasonal groundwater level fluctuations etc.Accordingly depth to water level and pre-monsoon and post-monsoon water level maps has been prepaired.The average water level during pre-monsoon is 13 meter below ground level (bgl) and in post-monsoon season it is 8 meter bgl. Out of 16 open dug wells, 3 wells get dried in summer season due to inadequate depth and presence of compact massive basalt.Depth to water levels maps for both pre-monsoon and post-monsoon season indicate the groundwater movement towards South-West direction. The water level fluctuations are carefully studied and correlated with the zones of groundwater occurrence, within the watwershed. On the basis of water level fluctuation, entire watershed has been divided in to three zones i.e. 0-3 meter, 3-6 meter and > 6 meter. It is also observed that the area towards North of the watershed representing > 6 meter water level fluctuation is covered by hilly terrain and mostly composed of compact massive basalt.Area in the southern part of the watershed represents storage zone, with water level fluctuation between 3 to 6 meters, probably due to poorly fractured basalt and adequate withdrawl of groundwater for irrigation purpose.The water level fluctuation between 0 to 3 meter is represented by most of the area of the watershed,specially in the central part is probabily due to fractured, jointed, weathered and vesicular nature of the Deccan basalt lava flows.

Key words: *Watershed, Drainage, Hydrogeology, Depth To Water Level.*

Introduction

The groundwater has become an important source of water for meeting the requirement of various sectors such as agriculture, industries as well as urbanization (CGWB,2010)[2].The water acts as a media for both chemical and biochemical reactions and also as an internal and external medium for living and non living things.According to one estimate, groundwater accounts for nearly 80% of the rural domestic water needs and 50% of the urban water needs in India.The groundwater hydrology is mainly concerned with the occurrence, distribution and movement of water below the surface of the Earth (Todd,1980)[16].The study area is dominantly covered by Deccan basalt lava flows.This formation gives rise to a complex low-storage weathered hard rock aquifer system and in the extensive rural areas out side command of major irrigation canals, it is vital to human survival and livelihood. Also the the total available storage of groundwater in deccan basaltic hard rock aquifer is strictly limited by their weathering characteristics and water bearing properties (Foster,et al.,2007)[6].The aim of this study incorporates hydrological aspects of the Kharkhari watershed, Vena river basin with special reference to the occurrence, distribution and movement of groundwater; seasonal groundwater level fluctuation and identification of the groundwater potential zones in basaltic hard rock terrain.

Study Area

The Kharkhari watershed is located 18 km. due West of Nagpur city, Maharashtra state, India.The total area of the watershed is approximately 22 Sq.km., comprising villages Wadi, Lawa, Deolimet, Wadhamna, Nagalwadi and Sangam. The area falls in Survey of India topographic map 55K/16 and having co-ordinates 78^{0}56'30"-78^{0}59'24"E and 21^{0}06'32"-21^{0}10'20" N (Fig.1). The Nagpur district,Maharshtra is famous for extremely hot temperature during the month of March to May which usually rises upto 46^{0}C and even more.The average annual rainfall of Nagpur city is 1242.20 mm (Jain, et al., 2012)[9].

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Assessment of Water Quality of Tributaries to Explore Environmental Flow Requirements of Vishwamitri River, India

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An environmental flow is the amount of water that is to be kept flowing down a river in order to maintain the river in a desired environmental class. Vishwamitri river is a seasonal river and highly affected by various anthropogenic activities from its source to sink. River remains almost dry at its upstream during pre-monsoon season and sometimes floods during monsoon. Various tributaries either flowing or trickling during the whole year govern the flow condition and overall water quality. This paper represents the assessment of water quality of various tributaries merging into Vishwamitri river. Various physical, chemical and biological parameters were evaluated for pre-monsoon, monsoon and post monsoon seasons. From the findings, it has been observed that tributaries merging before Vishwamitri river enter into Vadodara City at its upstream, are having more concentration of Dissolved Oxygen than other tributaries. Tributaries of Vishwamitri like Bahucharaji Kanns and drain collecting sewage from Parashuram Nagar slums are found with high BOD and COD values. Water quality of Bahucharaji kaans and Jambuva river is found odorous in all seasons. The average total coliforms counts reduced to limits of standard class 'B' (< 500 MPN/100 mL) in tributaries at upstream locations during post-monsoon season from limits of the class 'C' (< 5000 MPN/100 mL) during pre-monsoon season. Water quality of drain collecting sewage from Parashuram Nagar slums has been observed with higher counts of fecal coliforms during all seasons. Tributaries merging at the middle and downstream stretch of the river are observed slight yellow during various seasons. Most of the tributaries are found with concentration of Fe more than desirable limit. The values of zinc were also observed high in the tributaries merging at the downstream stretch of river. Concentration of various parameters like pH values, calcium, sulphate and nitrate has been found within desirable limits on various tributaries. To restore the Vishwamitri River in designated higher Ecological Management Class (EMC) by reducing Environmental flow requirements, the supplementary consistent release of flow of fresh water through tributaries can be the sustainable solution towards water resource management.Keywords:Water quality; tributaries; Pre-monsoon; monsoon; Post-monsoon; Vishwamitri river, Environmental Flow Requirements.

Key words : *Water quality, tributaries, pre-monsoon, monsoon, post-monsoon, Vishwamitri river, environmental flow requirements*

Introduction

The Vishwamitri River is a seasonal river which flows east to west between the Mahi and Narmada rivers in Gujarat. It is a major tributary of Dhadhar river which merges with Arabian Ocean near Khambhat. Vishwamitri watershed comprises of 9-mini-watersheds which cover a total area of about

1185 km^2 [10]. The River flows West through the city of Vadodara in middle of its 21.80 km stretch. River is also surrounded by solid waste dump sites, sewage treatment plants and recreational sites[7]. Various tributaries are getting merged into Vishwamitri at its upstream, middle and downstream stretches. In spite of the fact that, Vishwamitri is highly polluted due to sewage effluent disposal, industrial effluent disposal, landfill, slums, etc., but on the other hand usually the overall water quality of the river at various stretches is also governed by the water quality of tributaries merging into it[2]. These tributaries are getting affected by the release of discharges through various point and non-point sources of pollution throughout the year. Some of them remain dry during part of the year. These drain water deserves a prior treatment to protect river ecosystem from pollution[14]. The immediate maintenance and restoration of 'wholesomeness' of the water quality of Vishwamitri river must be considered as a mandate under the Water Act, 1974.

Environmental requirements are often defined as flow discharges of certain magnitude, timing, frequency and duration[16]. Recently in India, there is an increasing awareness of the need to reserve some water along a river to ensure the

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Water Quality in the Limestone Mining Areas of East Jaintia Hills District, Meghalaya, India

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Mining of limestone is going on in East Jaintia Hills District, Meghalaya for over a decade to supply raw material for manufacturing of cement by more than 8 cement plants. To know the status of water quality in the area, various physico-chemical parameters of water samples collected from five locations near limestone mines and cement plants. Study revealed that values of most parameters, such as EC, TH, sulphate and calcium exceed were analyzed the permissible limit in the vicinity of cement plants. However, values of these parameters were found within the permissible limit near the limestone mining sites, except for EC and sulphate. Using data of physico-chemical parameters, the water quality indices, such as NPI and WQI were also calculated to get an overall idea of the water quality. Based on NPI and WQI, it can be inferred that water quality has deteriorated near both the limestone mines and the cement plants. Water quality near mining sites was found in the category of 'poor' to 'very poor' whereas the water quality near cement plants was found in the category of 'unfit for human consumption'. Thus, it can be said that cement plants have contributed more towards water quality degradation rather than the limestone mining in East Jaintia Hills, Meghalaya.

Key words: *Water quality, limestone mining, NPI, WQI, Meghalaya*

Introduction

Mining of limestone rocks has started a decade ago in East Jaintia Hills District, Meghalaya to supply raw material for manufacturing of cement, which is a major source of revenue for the state. The limestone mining and cement manufacturing activities have generated employment opportunity to the people of the society. However, mining activities are known to pose environmental problems of various types[1-5] and thus limestone mining in Meghalaya is liable to affect various environmental components of the area including the water resources.

Meghalaya being a high rain fall area harbours a large number of streams flowing through the undulating topography. These streams are the source of water for local inhabitants who mainly utilize stream water for different purposes. Various anthropogenic activities including mining are known to affect the water resources in terms of their quantity and quality. Changes in water quality can be detected by observing the changes in values of various physical and chemical parameters which are influenced greatly either by geological formations or anthropogenic activities[6, 7]. Further, various indices developed to reflect the water quality give deeper insight and thus useful in detecting the overall quality of water. Some studies on water quality assessment in Meghalaya have been done in relation to coal and limestone mining[8-12]. However, studies on water quality in relation to limestone mining are limited.

The natural streams near the mining areas are seen to have deviated or found covered with rocks, gravels, pebbles and sand and the flow and quality of water seem getting affected. The streams which drain in the area near cement plants appear turbid and poor in water quality. However, scientific data on water quality is lacking and thus a clear picture is yet to emerge. Hence, we have studied the surface water quality near the limestone mining and cement plants in East Jaintia Hills District, Meghalaya.

Material and methods

Study area

Limestone is the second most important mineral resource extracted, after coal, in Meghalaya, India. It accounts for about 9% of the country's total limestone reserve [13]. The southern fringe of East Jaintia Hills District, Meghalaya has the richest deposits of limestone in the state. Extensive mining of limestone in the region started in the beginning of last decade to meet the requirements of cement manufacturing industries. Excavation of limestone rocks is being carried out at a large scale by adopting open cast mining using mechanical and semi-mechanical methods of mining. Both cement companies and local land owners are involved in the extraction of limestone. Limestone extraction area starts from Nongsning village in the north and goes south up to Lumshnong village. More cement plants are in the process of establishment and thus extraction of limestone is increasing day by day to fulfil the raw material requirements of these cement plants. Location map of the study area is given in **Fig 1**.

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Magnetic Field Effect of Three phase Double Circuit 220 *kV* Transmission line on Human Health

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Electricity being one of the most important part of our life which is used to power domestic as well as commercial appliance's, Industrial equipment's and many other devices making our life easier. Nowadays most of the offices & industries are equipped with state of the art electrical and electronic devices ranging from desktop computers to sophisticated manufacturing processes that are highly dependent on the continuous power supply. Electricity being generated at the generating stations in huge amount through fossil fuels, Renewable energy sources (RES). This electrical energy is transferred from generating stations to the demand centres through long distant transmission lines. Transmission of electrical energy is carried out at High Voltage (HV), Extra high voltage (EHV) and Ultra High Voltage (UHV) AC/DC transmission levels and gets consumed at domestic and commercial level. With the increasing voltage level in order to achieve bulk power transfer through these transmission lines the impact of such high voltage levels on Environment needed careful attention. Generation of magnetic fields form these transmission lines due to the load current flowing in the conductors within the vicinity of the humans can be dangerous and alarming to the heath related issues leading to ill mental conditions and leukaemia. The research is carried out to study the effect of these magnetic fields on the human health generated through a 220 kV Transmission line situated in the vicinity of Engineering college, Banswara to determine the occupational hazard arising due to a highly electromagnetic working Environment.

Keywords- *HV, EHV, UHV, Transmission line, Magnetic Field effect, Occupational Hazard.*

INTRODUCTION

Modernization with upgraded infrastructure made Indian power transmission system a huge power delivery network spreading all borders within the country for continuity of reliable power supply. As per the CEA report India has *425071 circuit-km's* of Power transmission lines including *220 kV, 400 kV, 765 kV, ± 500 kV (DC) and ± 800 kV (DC)* Transmission lines as on March 2020 [1]. The high voltage gradient on the conductors brought problem related to exposure form electromagnetic field (EMF) from power frequency voltage level [3,5]. EMF Exposure that is invisible and produced by AC transmission lines as *Electric fields* which are produced by the Voltage gradient on the conductor surface and *Magnetic fields* which are produced due to changing load current on conductors, within vicinity of the mankind was observed from a long time. Magnetic field basically the energy reservoir with the energy density of $e = B^2 / 2\mu_o$ (*Joules/* m^3) [3] known to influence human body tissues. These Power Frequency alternating Magnetic Fields induces flow of weak electric currents in the body due to electrical conductivity of tissues (about *0.1* to *0.2 Siemen/meter*) [3]. Magnetic field exposure of above *3 milli- Gauss(mG)* may be considered harmful [8-9] to the Human health as per World health organisation (WHO). Adverse effects may lead to ill human health and can pose health Hazards [8,11-12] such as cancer, Lymphoma, Brain damage etc.

1.1 Magnetic Fields from electrical Devices and appliances:

Magnetic fields can originate from electrical appliances [5,9] such as Xerox machines, computers, Fluorescent lights, Video display Terminals such as used in offices, color Television, Air conditioners, Celling fans, battery chargers, drills, power saws, washing machines, Irons, Sewing machines, Blender, mixer, coffee maker, Microwave oven etc. These Magnetic fields are often much stronger [8] which are produced due to both high and low frequency devices.

Workers may be exposed to some or many of these devices at the occupation, Government office workers may be exposed to magnetic fields due to the Xerox machines and computers form *08:00 AM* to *05:00 PM* with a mean *9.1 milli-Gauss(mG)* of radiation [8].

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Rice Straw as Bi-product for Industry

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Rice is a chief food crop grown around the world. Rice straw is a byproduct left in the field after harvesting of the rice crop. Farmers around the world tend to burn the crop residue in the field itself mainly to prepare for the field for the next crop. The chief reasons for this waste of bio resource are lack of knowledge and technology for a better use of this biomass. Rice straw can profitably be used as bio-fuel, organic compost, mulch, mushroom and other crop cultivation.

Keywords: *Rice, Bi-Product, Harvesting, Bio-Waste*

Introduction

Rice is a primary food crop in terms of total production. It is a major staple food and the third most important grain crop in the world following wheat and corn. Asia contributes to about 90% of the total manufacturing and consumption.

1.1. Rice straw as a byproduct

Related to rice production is a corresponding annual production of huge portions of rice straw at harvest. China is the world's largest producer of rice straw (FAO, 2014). In the process of harvesting the rice, the straw is removed with the rice grains. If it is harvested manually, it is piled in the field and if it is harvested using combine machines, it is spread out in the field. Ratio of straw to paddy depends at the variety of rice, strategies of planting, harvesting and straw accumulating [Hrynchuk,1998]. Approximately, 800 to 1,000 million tons per year of rice straw is produced round the world. Asia contributes to about 600 to 800 million tons of rice straw. The straw biomass production will continue to increase with more area being brought under rice cultivation and shorter turnaround time required for intensified rice cropping.

Rice straw consists of cellulose and hemicelluloses along with a small amount of protein. Rice straw has high C: N ratio. Therefore, unlike wheat and barley it's far resistant to microbial decomposition.

2. Open field burning of rice straw

The usual method of removing the rice straw from the field involves the practice of open-field burning. Open field burning of rice biomass is the most inexpensive and quickest way to ready the fields for the subsequent cultivation season. Open subject burning is common in all the conventional rice growing countries. Straw burning is particularly practiced because crop rotations do now not permit sufficient time for straw decomposition [Silalertruksa & Gheewala, 2013; MADA, 2010]. This practice quickly prepares the field for sowing of the successive crop and controls disease infestation for next crops by clearing the soil of pests, destroys the weed seeds, rat infestation and pathogenic microbial spores. It practically ends the life cycle of diseases and existing pests in the field [1]. There is no doubt that burning reduces the efforts and expenses involved in preparing the field for the following cropping season [Silalertruksa & Gheewala, 2013; Rosmiza, 2012; MADA, 2010].

The exercise of open-field straw burning has increased dramatically during the last decade due large area being added under rice cultivation and intensive agriculture with quick growing variety becoming the norm.

3. Impact of straw burning

The extensive straw biomass burning causes seasonal air pollution and resultant health hazards. It is a well known fact that open field burning of agricultural residues produces black smoke and deteriorates the quality of air. Open burning releases harmful gases and pollutants affecting local weather and surroundings. According to a report of Intergovernmental Panel on Climate Exchange crop residue burning contributes substantially to production of GHGs (CH4, CO, NOx and N2O), which contribute to global warming wherein CO and O3 are indirect greenhouse gases (GHGs) [2]. Straw burning also produces particulate matter and dust causing the development of haze enveloping the entire local vicinity. The opaque particle cloud might also have an effect on regional climate through the scattering or absorption of radiation [3]. These dangerous releases from straw burning affect the surroundings and are one of the elements of global warming.

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