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River and Ground Water Quality Assessment using GIS

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ABSTRACT : Chemical contamination of river and groundwater is one of the most serious pollution problems, particularly in arid and semi-arid areas where typically there is a deficiency in water resources. Chemical pollutions and waste water pollutions in river and GW are not normally identified until some illness has affected the local population. In the recent years, India has been subjected to pollution attribute to industrial and domestic source of pollutant, owing to unethical practices and poor enforcement of environmental law and regulation. Most natural aquatic ecosystems are severely threatened by human mediated contamination because several industrial establishments are concentrated near river basin for obvious reasons. Such activities put high hydrological stress on existing groundwater by deteriorating its quality. It is with advent of industries and discharge of effluent in injection well, result of this pollutant has entered into the aquifer system. Considering the above facts, the effect of polluted river water on ground water is focused in present research work. This makes it very necessary to investigate level of concentration of physical, chemical water quality parameter of river and groundwater of selected wells along river basin. In this research review river and ground water contamination analysis using Artificial neural Network (ANN) Models, GIS, a hybrid fuzzy-stochastic risk assessment, of Adaptive Neural-Based Fuzzy Inference System (ANFIS), DRASTIC model, Newton– Raphson technique, Factor analysis (FA) and a factor analysis-multiple regression, mass transport model (MT3D) is discussed in brief. Surface and groundwater contamination with reference to the suitability for irrigation water has been attempted by various researcher., The distribution of concentrations of various parameters due to seepage from an surface river water in basaltic shallow and deep aquifer may be evaluated.

KEYWORDS: River water, Ground water, Ground water contamination, Domestic sewage, Industrial effluent, Quantum geographical information System (QGIS), Kham River, Aurangabad, Maharashtra, India

I INTRODUCTION

The groundwater velocity and migration of contaminant particles from sources was analyzed in the path line model. Total dissolved solids (TDS) concentration contours originating from sources in the mass transport model (MT3D) were computed by solving an advection-dispersion equation. The computed path lines and TDS concentration contours indicate likely migration of contaminant plume from pollutant sources to the French well during 365 days under two scenarios. The model results confirm the tracer injection studies carried out to know the likely migration of contaminants towards the French well. The modeling study emphasized the necessity of controlled release of surface water, (V.V.S. Gurunadha Rao 1998) (Mohammad N. Almasari 2008). The possibility of ground water contamination is due to the mixing up of toxic chemicals, fertilizers, waste disposed site and industrial sites. Hence monitoring of ground water quality has become indispensable. GIS not only facilitates data capture and processing but also serve as powerful computational tools that facilitate multi map integrations and helps to prepared water quality mapping. (Subramani S. Krishnan (2012), (Atiqur Rahman 2008) sensitivity of neuro-fuzzy models can be used to predict groundwater vulnerability in a spatial

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context by integrating GIS and neuro-fuzzy techniques. (B. Dixon 2003), DRASTIC is one of the widely used popular overlay index method to compute groundwater vulnerability index over the large geographical areas involving a variety of hydro geological settings. (Dhundi Raj Pathak 2009), The PDFs and a Monte Carlo simulation technique were used in this study for the evaluation of risk of groundwater contamination. It is possible to profile the contamination plumes, both vertically and horizontally by using Transient electromagnetic method (TEM) and 2D electrical resistivity tomography (2D ERT) by applying close to the waste water dump site to characterize the response of pollution plumes..(Mohamed Metwaly 2013), Experimental work on Groundwater contamination using irrigation water from the polluted Kuihe River, were conducted at the Hanwang hydrological field station, near Xuzhou City. As part of this study, a numerical model was developed on the basis of a mathematical equation with a finite-difference approximation. The model is capable of simulating nitrogen transformation processes during subsurface transport. Numerical simulations were conducted to estimate nitrogen species concentrations along a flow path during irrigation (Ling Liu ,2008), More than 80% of the city's groundwater is under medium to high vulnerability to surface water pollution which is the main cause of concern, (Atiqur Rahman 2008). Chemical fertilizers, organic manure and Domestic sewage represent the second-most important source influencing groundwater hydrochemistry (Sandow Mark Yidana 2011), Water quality is influenced by many factors such as flow rate, contaminant load, medium of transport, water levels, initial conditions and other site-specific parameters.

II RESEARCH REVIEW

Lakshmi N. Reddi et al. (1997), has summarized the activities of the ASCE Environmental Engineering Division's Groundwater Quality Committee related to survey and classification of most commonly used ground water flow and contamination models. Results are presented from a survey of the committee combined with the similar surveys conducted by other private and government agencies. Fourteen of the commonly used models, identified in these surveys, were classified according to characteristics of usage (prediction, management, or parameter identification), function (flow, contaminant or energy transport), and simulation (domain representation, dimensionality, and solution technique). The surveys indicated the level of usage of models in the ground water industry and identified concerns in selection of models. In a companion paper to be published in the next edition of this periodical, guidance is provided to the practicing professionals on the evaluation and usage of these models.

V.V.S. Gurunadha Rao and S.K. Gupta (1998), had done analysis of Drinking water quality of supply wells, constructed in the Sabarmati river bed aquifer of Ahmadabad city using radial pipes and are known as French Collector wells. Contamination of groundwater from one of the French wells near Sabarmati Railway Bridge was noticed in 1992. The suspected pollution sources are Duff-nala of Shahibaug and two other sources from slum dwellings on either side of Sabarmati river. A combined groundwater flow, path lines and a mass transport model was constructed covering an area of 9 km² to analyze the capture zone of the French well under two different scenarios. Aquifer parameters of the river bed aquifer were available. Dry river bed condition was simulated under scenario I and controlled flow in the river bed was simulated under scenario. The groundwater velocity and migration of contaminant particles from sources was analyzed in the path line model. Total dissolved solids (TDS) concentration contours originating from sources in the mass transport model (MT3D) were computed by solving an advection-dispersion equation.

Jake Gusman, et al. (1999), has developed analytical model, known as RISK-N, to simulate nitrogen cycling in soils, and nitrate transport and fate in soils and ground water. The soil is separated into upper-root, lower-root, and intermediate-vadose zones, each with uniform properties. Transport in each soil zone is modeled on the basis of complete mixing. Transport in the aquifer, however, is modeled using a two-dimensional advection-dispersion transport equation. A simulation is made with a hypothetical corn plot, using meteorological, soil, hydrologic, and hydro geological data for the South Platte River region of north eastern Colorado. Sensitivity analyses are performed on model parameters. This study

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shows that the RISK-N model is capable of simulating nitrate leaching rates, as well as ground-water concentrations, that are consistent with those obtained by numerical models, while requiring fewer input variables.

B. Dixon (2003), has examined the sensitivity of neuro-fuzzy models used to predict groundwater vulnerability in a spatial context by integrating GIS and neuro-fuzzy techniques. The specific objectives of this study is to assess the sensitivity of neuro-fuzzy models in a spatial domain using GIS by varying (i) shape of the fuzzy sets, (ii) number of fuzzy sets, and (iii) learning and validation parameters (including rule weights). Here neuro-fuzzy models were developed using NEFCLASS-J software on a JAVA platform and were loosely integrated with a GIS. Four plausible parameters which are critical in transporting contaminants through the soil profile to the groundwater, included soil hydrologic group, depth of the soil profile, soil structure of the A horizon, and land use

Hakan Pekey et al. (2004), has collected Surface water samples from ten selected sites of the polluted Dil Deresi stream, during two field surveys, December 2001 and April 2002. All samples were analyzed using ICP-AES, and the concentrations of trace metals (Al, As, Ba, Cd, Co, Cr, Cu, Fe, Pb, Sn and Zn) were determined. The results were compared with national and international water quality guidelines, as well as literature values reported for similar rivers. He has used Factor analysis (FA) and a factor analysis-multiple regression (FA-MR) model for source apportionment and estimation of contributions from identified sources to the concentration of each parameter. By a varimax rotated factor analysis, four source types were identified as the paint industry; sewage, crustal and road traffic runoff for trace metals, explaining about 83% of the total variance. FA-MR results showed that predicted concentrations were calculated with uncertainties lower than 15%.

Michael G. Sinkevich et al. (2005), has developed a tool that quantifiably estimates distributed ground water contamination risk in order to develop reliable, cost-effective ground water observation networks. The tool is based on a mechanistic model of chemical movement via preferential flow and uses land cover data, information about chemical properties, and modeled recharge to estimate the concentration of chemical reaching the ground water at each point in the landscape. The distributed risk assessment tool was tested by comparing the model-predicted risk with observed concentrations from 40 sampling wells in Cortland County, New York, for a atrazine (pesticide) and nitrate, the latter assumed to be an indicator of agricultural pollution.

Eddy El Tabacha et al. (2006), has illustrated the extent of a polluted zone after an accidental spill occurred in road transport is essential to assess the risk of water resources contamination and to design remediation plans. This paper presents a metamodel based on artificial neural networks (ANN) for estimating the depth of the contaminated zone and the volume of pollutant infiltration in the soil in a two layer soil (a silty cover layer protecting a chalky aquifer) after a pollutant discharge at the soil surface. The ANN database is generated using USEPA NAPL Simulator. For each case the extent of contamination is computed as a function of cover layer permeability and thickness, water table depth and soil surface-pollutant contact time.

Ramakar Jha et al. (2007), has collected total of 732 water quality and flow data sets are during March 1999 February 2000 from 22 sampling stations of the River Kali in India. River Kali is a highly polluted river in India and receives continuous inflow of untreated point source pollution from municipal and industrial wastes and nonpoint source pollution from agricultural areas. Newton-Raphson technique is used to optimize the model parameters during calibration and the performance of different models are evaluated using error estimation, viz. standard error and mean multiplicative error, and correlation statistics r^2 .

L.E. Besaw presents a subsurface characterization methodology that integrates multiple types of data using a modified counter propagation artificial neural network (ANN) to provide parameter estimates and delineate groundwater contamination at a leaking landfill. Apparent conductivity survey data and hydrochemistry data (i.e. heavy metals, BOD,

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chloride concentration, etc.) are used to estimate the extent of subsurface contamination at the Schuyler Falls Landfill, located in Clinton County NY. The results of this research illustrate the feasibility of combining principal component analysis (used to reduce data dimensionality) with the counter propagation ANN and traditional geo-statistical methods (kriging) to estimate subsurface contamination.

Sukha Ranjan Samadder and Chillara Subbarao (2007), had done study on regional impact of arsenic contamination in six administrative blocks of the central part of the Murshidabad district, West Bengal, India. In this area about 1,248,580 people are exposed to arsenic pollution out of which 388,316 people are exposed to arsenic concentrations above 0.05 mg/lit, the WHO maximum permissible level of arsenic in drinking water. The study estimates that 65% of the total area of the six blocks has arsenic concentrations below 0.05 mg/L, 26.12% of the area has arsenic concentrations above 0.05 mg/lit, and for the rest of the area no arsenic distribution data available

Manik Chandra Kundu et al. (2007), has made an inventory of nitrate (NO₃-N) enrichment in surface and groundwater systems in the Hooghly district of India owing to intensive farming with high fertilizer doses as a function of quantity of fertilizers use, soil characteristics, types of crop grown, depth of groundwater sampling and also N load in soil profiles. He has collected Water samples from different sources at 412 odd sites spread over in 17 blocks of the district along with representative soil profiles. On average, the study area had high clay and NO₃-N in soil profiles with an increasing and decreasing trends along depth, respectively. The NO₃-N content both in surface and groundwater varied from 0.01 µg/ml to 4.56 µg/ml, being well below the threshold limit of 10 µg/ml fixed by WHO for drinking purpose.

.Mohammad N. Almasari and M. S. Ghabayen (2008) has made analysis of nitrate concentration distribution in Gaza coastal aquifer (GCA), It is almost only source of fresh water to over 1.5 million residents where it is utilized extensively to satisfy agricultural, domestic, and industrial water demands.. In this study he analyzes nitrate concentration distribution for the GCA at different levels such as land use classes and sampling depth. Nitrate concentration data from 1990 and from 2000 to 2004 were compiled and assembled into a single composite database. A geographic information system was used to assess the spatial and temporal variability of nitrate occurrences in the aquifer. Results show that the first quartile of nitrate concentration for the years 1990 and 2000–2004 exceeds the MCL. In addition, the analyses demonstrated a generally increasing trend in groundwater nitrate concentration. The areas with the most elevated nitrate concentrations are areas characterized by heavy agricultural activities and urban areas. Elevated nitrate concentrations in the GCA indicate anthropogenic contamination source,

Raj Mohan Singh (2008) had made study on impact of use of herbicides, pesticides, and other chemicals in agricultural fields on the concentration of different parameters in streams water which severely affects the health of human and environment. The transport of chemical pollutants into river or streams is not straight forward but complex function of applied chemicals and land use patterns in a given river or stream basin. The factors responsible for transport of chemicals may be considered as inputs and chemical concentration measurements in streams as outputs. Each of these inputs and outputs may contain measurement errors. Present work uses characteristics of fuzzy sets to address uncertainties in inputs by incorporating overlapping membership functions for each of inputs even for limited data availability situations. The fuzzy c-means (FCM) algorithm is used for the optimization of membership functions of fuzzy rule based models for the estimation of diffuse pollution concentration in streams. The general methodology for estimate of diffuse pollution in streams is presented.

Atiqur Rahman (2008) has evaluated groundwater vulnerable zones in shallow aquifers in Aligarh and its surrounding areas, which is one of the fastest growing big cities of north India, using the DRASTIC model in a Geographical Information System (GIS) environment. This model is based on the seven data layers that provide the input to the modeling. It corresponds to the initials of seven layers i.e. Depth of water, net Recharge, Aquifer media, Soil media, Topography, Impact of vadose zone and hydraulic Conductivity. ILWIS 3.0 (Integrated Land and Water Information

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System) and Arc view 3.2a GIS software were used to find out the water vulnerable zones in shallow aquifers. The study shows that more than 80% of the city's groundwater is under medium to high vulnerability to water pollution which is the main cause of concern for nearly 0.8 million people living in Aligarh.

Dhundi Raj Pathak and Akira Hiratsuka (2009) has highlighted, DRASTIC is one of the widely used popular overlay index method to compute groundwater vulnerability index over the large geographical areas involving a variety of hydro geological settings. DRASTIC method uses linear model to calculate vulnerability index and factors that pertinent to the groundwater vulnerability should be divided into ranges to employ rating value to each range. This system is unable to demonstrate a continuous output of vulnerability index from the easiest to be polluted to the most difficult to be polluted that is fuzzy nature of the groundwater vulnerability to contamination. In this paper, integrated GIS based fuzzy pattern recognition model is developed to generate the continuous vulnerability function benefiting from the same input parameters of DRASTIC method. Moreover, vulnerability variation resulting from fuzzy and DRASTIC model with respect to any single input variable, making other parameters constant, is computed taking the characteristics of selected hydro geological settings to compare the output of fuzzy model with DRASTIC index.

K. Dhakyanika (2010) had made investigation "to study the effect of pollution in River Krishni on the quality of groundwater abstracted through shallow and deep hand pumps placed in the close vicinity of River Krishni". One such affected Village Chanedna Maal was selected for the study. Water samples were analyzed in terms of physical, chemical and bacteriological water quality parameters. Range of values of conductivity (1040–2770 $\mu\text{S}/\text{cm}$), TOC (27.79–1365.1 mg/lit), UV absorbance at 254 nm (0.281–10.34 cm^{-1}), color (1510–5200 CU), and COD (15.82–1062 mg/lit) indicated presence of significant amount of pollutant organics in the river water, total coliform (16×10^2 – 46×10^6 MPN/100ml) and fecal coliform (16×10^2 – 24×10^6 MPN/100ml). In case of deeper India Mark-II hand pumps conductivity was found to range from 443–755 $\mu\text{S}/\text{cm}$, TOC (0.226–9.284 mg/lit), UV absorbance (0.0–0.118 cm^{-1}), colour (0.0–119 CU), COD (9.0–113 mg/lit) and MPN (0.0– 93×10^1 /100ml). While in case of shallower hand pumps conductivity (441–1609 $\mu\text{S}/\text{cm}$), TOC (0.015–68.82 mg/lit), UV absorbance (0.0–1.094 cm^{-1}), colour (4.0–560 CU), COD (9.72–163 mg/lit) and MPN (0.0– 15×10^2 /100 ml). Hand pumps abstracting water from shallow and deep unconfined aquifers have been found to deliver polluted water in terms of color, organics and coliform bacteria. As the hand pumps are the only source of water supply in Village Chandena Maal, pollution of the groundwater has adversely affected the day to day life of its 3000 residents.

Nosrat Aghazadeh (2010) has evaluated the quality of groundwater in study area of Oshnavieh plain is part of the West Azarban province, which is located; 100 km south of Urmia City, north western of Iran, and its groundwater resources are developed for water supply and irrigation purposes, for this study he has collected 31 groundwater samples and analyzed for various parameters. Physical and chemical parameters of groundwater such as electrical conductivity, pH, total dissolved solids, Na, K, Ca, Mg, Cl, HCO_3 , CO_3 , SO_4 , NO_3 , NH_3 , PO_4 , Fe, F were determined. Chemical index like percentage of sodium, sodium adsorption ratio, and residual sodium carbonated, permeability index (PI) and chloro alkaline indices were calculated. Based on the analytical results, groundwater in the area is generally fresh and hard to very hard. The abundance of the major ions is as follows: $\text{HCO}_3 > \text{SO}_4 > \text{Cl}$ and $\text{Ca} > \text{Mg} > \text{Na} > \text{K}$. The dominant hydro-chemical facieses of groundwater is Ca- HCO_3 and Ca-Mg- HCO_3 type. According to Gibbs diagrams samples fall in the rock dominance field and the chemical quality of groundwater is related to the lithology of the area.

Paras R. Pujari et al. (2010), has undertaken study to investigate the impact of on-site sanitation on quality of groundwater sources in two mega cities namely Indore and Kolkata which are situated in two different geological settings. The parameters for the studies are distance of groundwater source from place of sanitation, effect of summer and monsoon seasons, local hydro-geological conditions, and physico-chemical parameters. NO_3 and fecal coliform concentrations are considered as main indexes of pollution in water. Out of many conclusions which can be made from this studies, one major

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conclusion is about the influence of onsite sanitation on groundwater quality is minimal in Kolkata, whereas it is significant in Indore. This difference is due to the difference in hydro geological parameters of these two cities, Kolkata being on alluvium quaternary and Indore being on Deccan trap of Cretaceous to Paleogene age.

Natarajan Venkat Kumar et al. (2010), has stated that monitoring groundwater quality by cost effective techniques is important as the aquifers are vulnerable to contamination due to point sources and non point sources. He has used Artificial neural Network (ANN) Models to predict water parameters from a few known parameters. The sample data from 112 hand pumps and hand operated tube well water samples used for drinking purposes by the local population was used. The ANN model features a back propagation algorithm and neuron members were determined for optimization of the model architecture by trial and error method. The model simulations show that the optimum network of 4-50-50-6 has mean error of 0.023% on complete data was utilized.

Jae-Yeol Cheong (2011) has made study on the nitrate of groundwater in the Gimpo agricultural area, South Korea, was characterized by means of nitrate concentration, nitrogen-isotope analysis, and the risk assessment of nitrogen. The groundwater belonging to Ca-(Cl, NO₃) and Na (Cl, NO₃) types displayed a higher average NO₃ - concentration (79.4 mg/lit), exceeding the Korean drinking water standard (44.3 mg/lit NO₃). The relationship between d18O-NO₃ - values and d15N- NO₃ values revealed that nearly all groundwater samples with d-15 N-NO₃ of 7.57 to 13.5% were affected by nitrate from manure/sewage as well as microbial nitrification and negligible denitrification.

Sandow Mark Yidana (2011), has demonstrated the application of multivariate analysis to the understanding of regional hydro-chemical processes in a tropical setting. Sequential Q-mode hierarchical cluster analysis (HCA) and factor analysis were used jointly with geographic information systems (GIS) and conventional graphical methods to determine spatial groundwater types in Ghana, and the spatial variation of the major sources of hydro chemical change in groundwater in Ghana. This study finds that two major groundwater types exist in the country: the Na-Cl groundwater types, which dominate the coastal aquifers where groundwater salinity is high and Na-K-HCO₃ groundwater types, which dominate aquifers farther inland.

Sayed Farhad Mousavi and Mohammad Javad Amiri (2011) has understood that high nitrate concentration in groundwater is a major problem in agricultural areas in Iran. He has investigated Nitrate pollution in groundwater of the particular regions in Isfahan province. The objective of his study was to evaluate the performance of Adaptive Neural-Based Fuzzy Inference System (ANFIS) for estimating the nitrate concentration. In this research, he has selected 175 observation wells and nitrate, potassium, magnesium, sodium, chloride, bicarbonate, sulphate, calcium and hardness were determined in groundwater samples for five consecutive months. Electrical conductivity (EC) and pH were also measured and the sodium absorption ratio (SAR) was calculated.

Subramani S. Krishnan and P.K. Kumaresan (2012), states that GIS not only facilitates data capture and processing but also serve as powerful computational tools that facilitate multi map integrations. In this study ground water quality analysis was carried out for Coonoor Taluk in Nilgiris District water samples were collected all around the taluk the strategically analyzed results are presented in a GIS based water quality mapping.

N. S. Elangovan and Dharmendirakumar (2012), has analyzed Groundwater quality in Chennai city along the Cooum river, during the pre-monsoon (June-July) and post-monsoon (Dec-Jan) for three years, from 2009 to 2011. Groundwater samples were collected from 20 bore wells on either side of the river. The analysis focused on the determination of seven specific water quality parameters, namely, pH, EC, TDS, BOD, COD, Na and Pb, using standard procedures. The statistical analysis, like the mean and standard deviation, coefficient of variance, and correlation, and multi linear regression analysis of the obtained data were carried out.

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Mohamed Metwaly (2013) has studied Al-Quwiyyia region, It is an example of an area where the groundwater is contaminated as a result of infiltration of waste water in low-lying areas adjacent to inhabited zones. Such contamination poses significant environmental threats for the surrounding environment and groundwater. Surface observations and spatial distribution of contamination observed in the shallow aquifer indicate that the main contamination sources were from sewage as well as from waste water dumping. However, the main source of water supply for the whole area is groundwater abstracted from the relatively shallow aquifer. Therefore, the transient electromagnetic method (TEM) and 2D electrical resistivity tomography (2D ERT) have been applied close to the waste water dump site to characterize the response of pollution plumes. Both of these geoelectrical techniques are sensitive to electrical conductivity as well as to other physical properties, which are greatly influenced by the polluted groundwater. Therefore, it is possible to profile the contamination plumes, both vertically and horizontally.

Sudhakar M. Rao et al. (2013), has done Geochemical studies are performed to examine the impact of leachate infiltration from on-site sewage disposal systems on the groundwater chemistry in Mulbagal town, Kolar District, Karnataka State, India. The leachate infiltration imposed nitrate concentrations ranging from 4 mg/lit to 388 mg/lit in the groundwater samples; it was observed that 79% of the samples exhibited nitrate concentrations in excess of drinking water permissible limit (45 mg/L)

Hariprasad N. V (2013) states that this paper is a collection and compilation of the research papers pertaining to the heavy metal contents in irrigation water used for agricultural purpose. The uptake of heavy metal by plants through contaminated soil gets accumulated and is a potential threat to animal and human health. The heavy metals in water bodies damage the aquatic organisms and fishes. Excess use of fertilizers and pesticides in agricultural activities to enhance productivity due to rapid population increase and development of technology threaten the groundwater and surface water on a large scale. This shows there is an obvious risk for human in the future. The pesticides used in crop cultivation should be free from heavy metals. Hence this study concentrates on effects of heavy metals present in irrigation water.

Agale M. C. and (2013) has done assessment of Ground water quality of Sugar industry from Dahiwad village, It is utilized for drinking and domestic purposes, hence it is need to assess the quality of ground water. The effluents of ground water in the vicinity of a sugar industry in Dahiwad Dist- Dhule, Maharashtra, were studied during Jan. to Oct. 2008, from water. In this study the different parameters of ground water was studied from sugar industry. The Parameters like DO, hardness, alkalinity, Magnesium, Nitrate, Phosphate, Chloride, Sulphate, PH, were estimated to assess the impact of effluents on ground water. The results revealed that there was a significant variation in same parameters. The PH 7 to 8.5 mg/l, Hardness 300 to 500 mg/l, Nitrates 35 to 55 mg/l, Phosphate 0.13 to 1.5mg/l, Magnesium 30 to 50 mg/l., Chloride 250 to 340 mg/l.

Gholamreza Asadollahfardi et al. (2013), has analyzed the significance of the Sodium Adsorption Ratio (SAR) for growing plants, its prediction is essential for water quality management for irrigation. The SAR prediction in Chelghazy River in Kurdistan, northwest of Iran, using an Artificial Neural Network (ANN) was studied. He applied the Multilayer Perception (MLP) of the ANN to average monthly data, which was collected by the water authority of the Kurdistan province for the period of 1998-2009. The input parameters of the MLP network was pH, discharge, sulfate, sodium, calcium, chloride, magnesium and bicarbonate, and output was predictive of the SAR.

Zhaoming Wang (2014), has examined the Concentrations of the heavy metals Cu, Ni, Pb, Zn, Cd, and Cr in surface water and sediment from the Luan River in China,. With a decline in Cu and Ni concentration found in surface water at downstream stations. This finding suggests that water currents are a major explanatory factor in heavy metal contamination. The abundance of Cr, Pb, and Cd observed in the middle reaches of the river indicates heavy metal contamination in local areas, although there was an obvious decrease in concentrations in the water downstream of the Daheiting Reservoir. The significant rising trend in Cu, Pb, and Ni seen the sediment farther away from the river also suggests that anthropogenic activities contribute to heavy metal pollution Sediments were therefore used as environmental

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indicators, with sediment assessment was conducted using the geo-accumulation index (Igeo) and the potential ecological risk index (RI).

III CONCLUSION

In this research review river and ground water contamination analysis using Artificial neural Network (ANN) Models, GIS, a hybrid fuzzy-stochastic risk assessment, of Adaptive Neural-Based Fuzzy Inference System (ANFIS), DRASTIC model, Newton– Raphson technique, Factor analysis (FA) and a factor analysis-multiple regression, mass transport model (MT3D) is discussed in brief. Surface and groundwater contamination with reference to the suitability for irrigation water has been attempted by various researcher., The distribution of concentrations of various parameters due to seepage from an surface river water in basaltic shallow and deep aquifer may be evaluated.

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