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Water net : A Network for Monitoring and Assessing Water Quality for Drinking and Irrigation Purposes

***[1]M Vineela, [2] Shreya Patthi, [3] Y Sai Srujana**

*[1] HOD & Associate Professor, Department of CSE, Bhoj Reddy Engineering College for Women, Hyderabad, India

*[2,3] Students, Department of CSE, Bhoj Reddy Engineering College for Women, Hyderabad, India

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ABSTRACT

India is rich in water resources, being endowed with a network of rivers and blessed with snow cover in the Himalayan range that can meet a variety of water requirements of the country. However, with the rapid increase in the population of the country and the need to meet the increasing demands of irrigation, human and industrial consumption, the available water resources in many parts of the country are getting depleted and the water quality has deteriorated. Indian rivers are polluted due to the discharge of untreated sewage and industrial effluents. The Central Pollution Control Board (CPCB) has established a network of monitoring stations on rivers across the country. The present network comprises of 870 stations in 26 States and 5 Union Territories spread over the country. The monitoring is done on monthly or quarterly basis in surface waters and on half yearly basis in case of ground water. The monitoring of water quality at 257 stations is being done on monthly basis, 393 stations on quarterly basis, 216 on half yearly basis and 4 stations on yearly basis. Presently the inland water quality-monitoring network is operated under a three-tier programme i.e. GEMS, Monitoring of Indian National Aquatic Resources System and Yamuna Action Plan. Water samples are being analysed for 28 parameters consisting of physico-chemical and bacteriological parameters for ambient water samples apart from the field observations. Besides this, 9 trace metals and 15 pesticides are analysed in selected samples. Bio-monitoring is also carried out on specific locations. In view of limited resources, limited numbers of organic pollution related parameters are chosen for frequent monitoring i.e. monthly or quarterly and major actions, other inorganic ions and micro pollutants are analysed once in a year to keep a track of water quality over large period of time. The water quality data are reported in Water Quality Statistics yearbooks. The grossly polluted rivers on specific stretches are Sabarmati, Godavari, Satluj, Yamuna, Cauvery, Ganga, Krishna, Tapi, Mahanadi and Brahmani whereas relatively clean rivers are Mahi, Narmada, Brahmaputra and Beas with respect to organic and bacterial pollution.

Keywords: Floods, India, Types, Causes, Distribution, Impact, Management.

I. INTRODUCTION

The geographical area of India is 3,287,590 sq km. The length of its Coastline is about 7500 km. The climate of India varies from tropical monsoon in south to temperate in north. Its terrain have upland plain (Deccan Plateau) in south, flat to rolling plain along the Ganges, deserts in west, Himalayas in north. India is enviably endowed in respect of water resources. The country is literally criss-crossed with rivers and blessed with high precipitation mainly due to the southwest monsoon, which accounts for 75% of the an-nual rainfall. There are thirteen major river basins (area more than 20,000 square kilome-tre) in the country, which occupy 82.4% of total drainage basins, contribute eighty five percent of total surface flow and house eighty percent of the country's population. Major river basins are Brahmaputra, Ganga (including Yamuna Sub Basin), Indus (including Satluj and Beas Sub Basin), Godavari, Krishna, Mahanadi, Narmada, Cauvery, Brahmini (including Baitarni Sub Basin), Tapi, Mahi, Pennar and Sabarmati. The classification of river basin based on catchment area is given in Table 1. There are few desert rivers, which flow for some distance and get lost in deserts. There are complete arid areas where evaporation equals rainfall and hence no surface-flow. The medium and minor river ba-sins are mainly in coastal area. On the east coast and part of Kerala State, the width of land between mountain and sea is about 100 km, and hence the riverine length is also about 100 km. whereas, the rivers in the west coast are much shorter as the width of the land between sea and mountains is less than 10 to 40 km. Yet, in spite of the nature’s bounty, paucity of water is an issue of national concern resulting in deterioration of water quality in aquatic resources.

All the major river basins are not perennial. Only four of the thirteen major basin posses areas of high rainfall, i.e. Brahmaputra, Ganga, Mahanadi and Brahamani having annual average discharge of a minimum of 0.47 million cubic meter per Km2, and they are perennial. Six basins (Krishna, Indus, Godavari, Narmada, Tapi and Subarnarekha) occupy the area of medium rainfall and have annual average discharge of a minimum of 0.26 million cubic meter per Km2, and the remaining four (Cauvery,Mahi, Sabarmati and Pennar) occupy the area of low rainfall and have annual average discharge between of 0.06 and 0.24 million cubic meter per Km2. Thus, many of the major river basins also go dry during summer leaving no available water for dilution of waste water discharged in them.

Replenishable ground water potential of the country, has been estimated by Ministry of Water Resources as 431 Km3 cubic kilometre per year. The potential available for irrigation is 360 Km3 per year and 16 percent is for drinking, industrial and other purpose.The figure for net draft of ground water considering the present utilisation indicates that substantial portion of total potential (about 68 percent) is still remaining untapped.

II. RELATED WORK

As water is the basic element and most villages have water wells as the only drinking water source motivated us to do this limited research within a small geographic area of the water wells of Kopiliq village of Skenderaj, in Kosovo. The municipality of Skenderaj is located in the central part of Drenica and extends to an area of 368 km2 . In the northern part is bordered by the municipality of Mitrovica, in the east with municipality of Vushtrri, southwest with Drenas and Klina, while in the west it is bordered by Municipality of Burim. This municipality extends over the geographic coordinates: 42°44'48 N and 20°47'10 E. The territory of the Skenderaj municipality has a hilly and mountainous configuration at an altitude of 500–700 m.

The relief is mild and is crisscrossed with small river valleys, dominated by the continental climate which is characterized by severe winters, dry summers with high temperatures and low precipitation but having rich flora and fauna. Average relative humidity according to seasons: in summer 62.5%, in spring 68.5%, in fall 72.6% and in winter 81.6%. Based on 1974 data the urban lands of Skenderaj municipality, generally are characterized by sandy, humus and smonitsa soils. Our research and monitoring area is the water of the wells of the village Kopiliq, which geographically lies in the south-western part of Skenderaj. The monitoring network includes five monitoring points (S1, S2, S3, S4 and S5), five water wells from which the families of this village are supplied. The monitoring network and coordinates of the five selected locations for this research have been presented in Figure 1 and Table 1.

Fig.1. Monitoring network in the research area

Sampling points	Geographic latitude N	Geographic longitude W	Height above sea level (m)
S_1	42°41'49.88"	20°42'11.85"	590
S_2	42°41'58.81"	20°42'23.95"	607
S_3	42°41'58.64"	20°42'23.21"	607
S_4	42°42'05.01"	20°42'32.07"	620
S_5	42°41'59.56"	20°42'41.63"	628

Table1. Monitoring points and their coordinates

The monitoring was done from 10–15 August 2017 as the water level in the monitored wells in this month is lower because of the high temperatures and scarce rainfall, which are characteristic of the summer season. The method of sampling, the quantity of the sample collected for determination of certain parameters, the mode of transport and the maximum time the sample can stand before performing chemical analysis was done according to the ISO methods [ISO 5667 – 2006, 2009, 2012]. Water quality control requires physico-chemical and microbiological analysis as well as adequate selection of quality parameters. Water quality assessment is not only relevant for the analysed parameters but also to the sampling method, storage during transport and prior to the analysis [WHO 2011]. The polyethylene containers with which the water samples were taken are suitable for the analysis of the most common physico-chemical parameters, while for microbiological analyses sterilized glass containers were used.

Samples were taken every day and the mean + SD values were presented in the Table 2. For determination of organoleptic parameters such as aroma, taste and colour, the examination of which is done through the sensory organs, we have applied the comparative and visual methods. For determination of the physico-chemical parameters, in the laboratory of analyses were implemented these methods: potentiometric – pH value and electrical conductivity; nefelometric –

turbidity, photometric – ammonia, nitrites and nitrates; volumetric (titration) – consumption of $KMnO_4$, chlorides, sulphates, free chlorine and hardness. In addition to the organoleptic and physico-chemical parameters, we have also analysed and presented the microbiological parameters. Samples were sent in the lab within the same day not exceeding 4°C while transport for microbiological analysis. Standard plate count (SPC) bac-teria at 37°C was done in petri plates which were incubated for 48 hours. The determination of the total number of living bacteria in 1 cm^3 of the sample taken for analysis was done after incubation. The total number of bacteria is less useful for detection of faecal contamination, after numbering all kinds of microbes that are able to develop at a temperature of 37°C. However, the continuous determination of the number of bacteria in the drinking water samples is very useful, as it is the first indicator of a contamination [FAWELL, STANDFIEL 2001]. In microbiology, the colony forming unit (CFU) is a unit used to evaluate the total number of bacteria or fungal cells in a sample.

III. PROPOSED SYSTEM

Nine sampling sites (site 1 to 9) in the Kufranja dam (KD) were examined during the summer and winter in the year 2019 (Figure 2).

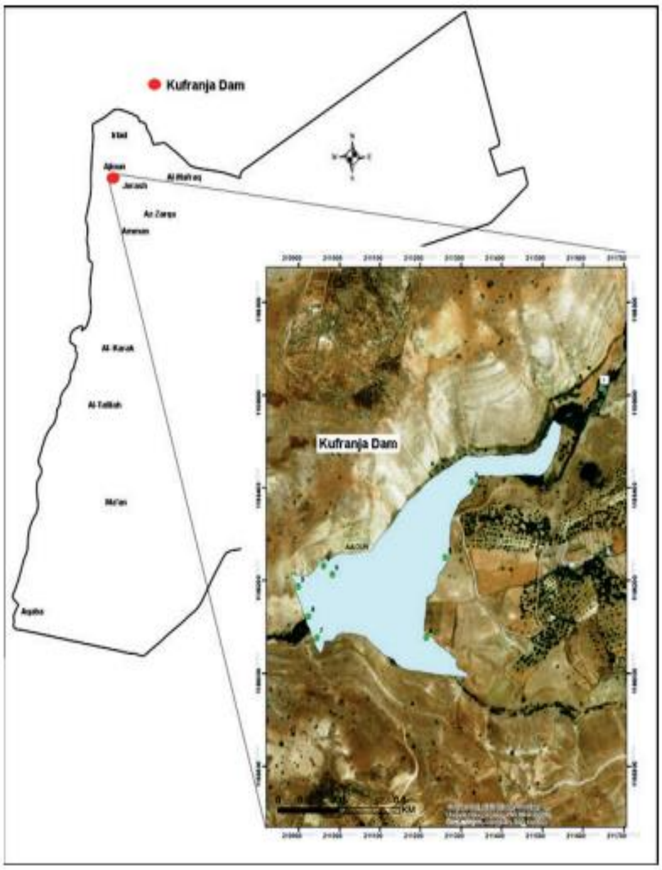

Figure 2. Location map of the study area

The sampling locations in this study were selected to represent, to some extent, the entire dam and can be accessed during the fieldwork easily and safely without risk. Some of the sites inside the dam were not selected as we could not access them easily due to the lack of facilities and equipment available inside the dam and that it is newly constructed. Moreover, the unselected sites are dangerous and have steep topography, especially those at the entrance and southern part of the dam. The samples were collected in polyethylene bottles from the surface water of KD using a PVC Niskin water sampler. The sampler, bottles, and water containers were fi rst rinsed with water (3 times) to reduce the possibility of any contamination; then, they were fi lled with the dam's water and stored in an icebox until they were transported to be analyzed in the laboratory.

Hydrogen ion concentration (pH), temperature (°C), and electrical conductivity (µs/cm) were determined in situ using portable meters (Table 2).

Test	Unit	Method	References
Temperature, DO, pH, EC	C°, mg/l, SU, µs/cm	Field meters	Multiparameter waterproof meter (Hanna instruments: HI98194)
Cations and anions	mg/l	Ion Chromatography (4110C)	(APHA et al., 2017)
Bicarbonate	mg/l	Titration Method (2320B)	(APHA et al., 2017)
Heavy metals	mg/l	ICP-OES Method	(APHA et al., 2017)

Table 2. Analytical and reference methods used for the physicochemical parameters and heavy metals in the water samples

The collected samples of the present study were laboratory analyzed for several chemical tests as follows: cations (Calcium – Ca, Magnesium - Mg, Sodium - Na, and Potassium – K); anions (bicarbonate – HCO3 , chloride – Cl, Nitrates – NO3, and sulfate – SO4); heavy metals (Iron – Fe, Manganese – Mn, Copper – Cu, Zinc – Zn, Cadmium – Cd, Molybdenum – Mo, and Mercury – Hg). Cations and anions excluded bicarbonate were analyzed using Ion Chromatography (instrument: DIONEX ICS-5000+ DP) equipped with the column (CS12A – 4×250) for cation tests; in addition, the column (AS14A – 4×250) was used for anions tests with a conductivity detector according to the Standard Methods for Examination of Water and Wastewater [APHA and others, 2017]. The bicarbonate test was carried out using the Titration method with the calibrated pH meter (sensodirect 150 Lovibond) [APHA, 2017] (Table 1). Heavy metal analyses were carried out using the ICP-OES method [APHA and others 2017] (instrument: QUANTIMA-Sequential-GBC); the samples were analyzed by ICP-OES with the following parameters: nebulizer fl ow 0.5 L/min and the wavelength 259.940 nm for Fe; 257.61 nm for Mn; 324.75 nm for Cu; 213.85 nm for Zn; 228.80 nm for Cd; 202.030 nm for Mo; 253.652 for Hg. The concentrations of Fe, Mn, Cu, and Zn were directly determined by the ICP-OES method. The Cd and Mo concentrations were determined by ICP-OES analysis after sample preconcentration 20 times for the Cd and 25 times for Mo analysis. Trace concentration of Hg was determined after sample preconcentration 10 times using hydride generation technique combined with ICP-OES in a continuous fl ow system of the acidifi ed samples and reductant to produce gaseous hydrides.

IV. CONCLUSION

In this study five wells water of village Kopiliq used for drinking purpose were analyzed. From the results it could be concluded that the water quality regarding physico-chemical values are within the allowed values according to Directive 98/83/EC except for turbidity in well S2, TDS in well S5 and chlorides, nitrites and TDS in well S4. Microbiological analyses indicate that water hasn't undergone disinfection and all wells are contaminated with bacteria. Well water S4 is not allowed for drinking purposes nor irrigation without special pretreatment whereas it is an immediate necessity to disinfect water of all other wells before any domestic use. Stalls and sewerage network near water well S4 are the cause of contamination. Competent state institutions in Kosovo are required to draw up special projects for the distribution of the drinking water supply network, not only for the inhabitants of the village of Kopiliq, where pollution has been identified, but also for other rural residents in Kosovo because only in this way with a constant monitoring and care can be preserved and protected, not only clean water, but also the health of thousands of residents of Kosovo.

V. REFERENCES

[1]. Abu-Hilal A.H., Abualhaija M.M. 2010. Nutrients in water and sediments of King Talal Dam-Jordan. Jordan Journal of Biological Sciences, 147, 1–14.

[2]. Al-Harahsheh S.T., Al-Amoush H.R. 2010. Eutrophication Process in the Mujib Dam. Jordan Journal of Earth and Environmental Sciences, 3.

[3]. Al-Taani A.A. 2013. Seasonal variations in water quality of Al-Wehda Dam north of Jordan and water suitability for irrigation in summer. Arabian Journal of Geosciences, 6, 1131–1140.

[4]. APHA, AWWA, WEF. 2017. Standard Methods for the Examination of Water and Wastewater. Washington: American Public Health Association, American Water Works Association and the Water Environment Federation.

[5]. Ayers R.S., Westcot D.W. 1985. Water quality for agriculture. Rome, Italy: Food and Agriculture Organization of the United Nations.

[6]. Basnyat P., Teeter L., Lockaby B.G., Flynn K.M. 2000. Land use characteristics and water quality: a methodology for valuing of forested buffers. Environmental Management, 26, 153–161.

[7]. Bouslah S., Lakhdar D., Larbi H. 2017. Water quality index assessment of Koudiat Medouar Reservoir, northeast Algeria using weighted arithmetic index method. Journal of water and land development, 221–228.

[8]. Brown R., Mccleiland N., Deiniger R., O'Connor M. 1972. A water quality index-crossing the physical barrier. Proceedings of the International Conference on Water Pollution Research.

[9]. Chapman D.V. 1996. Water quality assessments: a guide to the use of biota, sediments and water in environmental monitoring: CRC Press.

[10]. C., Raziuddin M. 2002. Determination of water quality index (WQI) of a degraded river in Asanol Industrial area, Raniganj, Burdwan, West Bengal. Nature Environment and Pollution Technology, 2, 181–189.

[11]. A., Singh S. 2010. Evaluation of Ganga water for drinking purpose by water quality index at Rishikesh, Uttarakhand, India. Report and opinion, 2, 53–61.

[12]. R.M., Muntasir S.Y., Hossain M.M. 2012. Water quality index of water bodies along Faridpur-Barisal road in Bangladesh. Global Engineers and Technology Review, 2, 1–8.

[13]. Dagaonkar A., Saksena D. 1992. Physico-chemical and biological characterization of a temple tank Kailasagar, Gwalior, Madhya Pradesh. Journal of Hydrobiology, 8, 11–19.

[14]. Errahmani M., Hamaidi-Chergui F., Hamaidi M. 2015. Physico-chemical parameter variability relative to seasonal dynamics and community structure of plankton in the Boukourdane lake dam (Algeria). Applied ecology and environmental research, 13, 1121–1139.

[15]. Ewaid S.H., Abed S.A. 2017. Water quality index for Al-Gharraf river, southern Iraq. The Egyptian Journal of Aquatic Research, 43, 117–122.

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