Shivam

2021-22

Water Crisis and Sustainable Management

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Shivam Book House (P) Ltd., Jaipur

require collaboration with governments, civil societies, corporate bodies, financial institutions and others. There is a need for change of mindset of the stakeholders as well. There are many success stories in India which draw upon our ancient traditional knowledge and wisdom. One such success story is from Rajasthan where the revival of Traditional Rainwater Harvesting (TRH) Structures (kundi, kui/beri, baori/ber, jhalara, nadi, toba, tanka, khadin, johad and anicut) occupies considerable importance in the policy framework. There is a true proverb in Hindi "Jal hai to Kal hai" which means if there is water then only our future is safe.

Presently, water can pose a serious challenge to sustainable development but managed efficiently and equitably, water can play a key enabling role in strengthening the resilience of social, economic and environmental systems in the light of rapid and unpredictable changes.The book **"Water Crisis and Sustainable Management"** covers the various aspects of water crisis and sustainable management issues like-water scarcity and its impact on society, global warming and water availability, water quality assessment, agricultural practices and water, environment education and awareness, sustainable water management, climate change, indigenous knowledge systems of water management, water and communities, water resource and development, water and health, water contamination and anthropogenic impact on water resource, etc.

I express my gratitude to the contributors, who have endeavoured to present up-to-date information on their area of expertise and have voluntarily shared valuable time and knowledge. We are certain that the information contained in this book will help those interested in the water resource conservation and their sustainable management for the benefit of human life and well-being. I am grateful to my friends and colleagues for their valuable suggestion, encouragement and support to make possible this book. I am also thankful to the entire team of **Shivam Book House (P) Ltd., Jaipur** for this nice publication. Finally, I express my deepest gratitude to my caring, loving, and supportive wife, Indira.

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An Assessment of Water Quality of Upper Kundalika River Basin, Raigad, Maharashtra

■ *Dr. H.D. Wagalgave**

■ *S.K. Pise***

Introduction

The earth has life because it has water. Water is the soul of nature its pollution will perish the world. It is a prime natural resource, a precious asset, a gift that is a basic human need, and is often called liquid god. It fills the mind with reverence for life bows down to its presence.

The earth is described as a wet planet and yet we are constantly cautioned that we are running out of water. The problem can be appreciated if we can pay attention to the budget of worlds water.

If the moisture in the atmosphere, rivers and lakes and the soil were not in the constant flux, there would not be enough water to meet all the demands that are shouldered by the miniscule amount available. Fortunately, the solar energy which drives the earth system constantly, recycles water and allows its reuse. It is interesting to note that the oceans are the source of almost all the water moving through the hydrologic cycle. The distribution of water moving

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through the hydrogical cycle. The distribution of water on land as controlled by the hydrologic cycle divides earth areas as being dry, moist or wet.

Objectives of the Study

The main objectives of this paper are to:

1. To find out the water sample locations of the study area and to prepare the location map.
2. To analysis the water quality of the sample location for potable purpose.

About Study Area

The latitudinal extent of the study area of Upper Kundalika basin is 18°20'North to 18°35'North and longitudinal extent is 73°40'Eastto 73°11'East. This area covered in the SOI toposheet no 47F/3, 47F/6 and 47F/7. The Upper Kundalika maintains fairly straight course in E - W direction up to Roha and then follows as SE-NW trend.

The Upper Kundalika is a small river flowing from the Hills of Sahyadri to the Arabian Sea. The distance of the Upper Kundalika basin is 42.5 km and total area covered by this watershed is 387.51 sqkm. This river originates to the West of at small town called Bhira in the Indian State of Maharashtra, 150 km south east of Bombay (Mumbai). The important towns located on the banks of Kundalika are Kolad, Korlai, Chaul, Roha and Salav. River Kundalika is fed by the excess water from Tata Power's Mulshi Dam Project on to a series of hydroelectric projects and dams, including Ravalje followed by Bhira and then Dholvan, where the water is released in the morning typically at 6 am. The gush of the water reaches Sutarwadi at 7:30 am and water rises at Kolad at 10:00 am. There exists a historical Trade Route called Savalya Ghat which descends down in Kundalika Valley from Tamhini Ghat Road. Beautifully carved staircases exist at some places & also 2 small water cisterns are encountered. On the bank of River Kundalika are many retreats and farm houses with

mango and watermelon as the chief fruit product and rice and as the chief farm produce as the soil is very rich in minerals a ample water via canals fed from River Kundalika's clean water 90% of Kundalika's water is consumed by industries, including THAL Project and many MIDC all across. This unfortunat resulted in pollution, especially due to Roha's Chemical Ind releasing a lot of effluents (chemical waste) in the river. On th are to use 9000 Quesecs of water by the upcoming Relian Essar's new projects in the Vile MIDC. This could kill the besides considerably reducing the river's downstream water le Kolad. The river will die a little more and become more plac shallower. The Kundalika's water are beginning to get affect "Save Kundalika Project" is being undertaken by "Eco Mantra I Awareness and Travel", a local sustainable and community to organisation that runs a unique eco camp on its bank at Kola

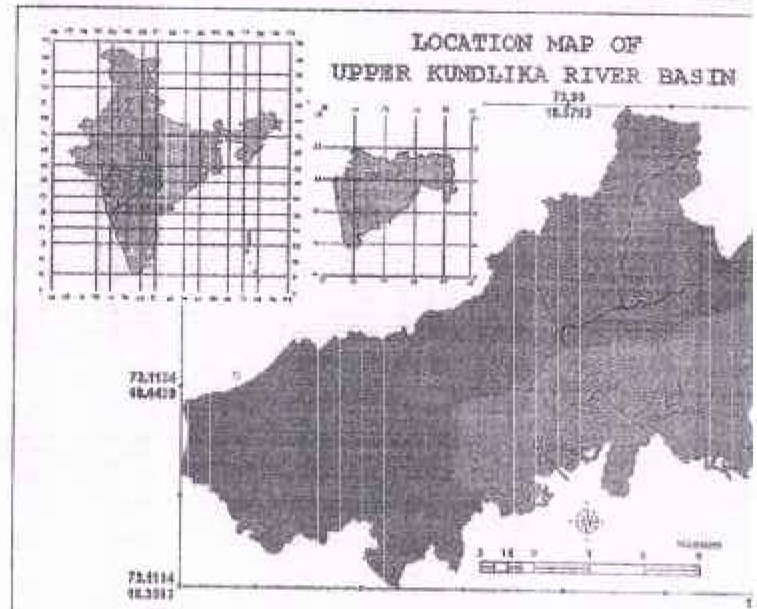

Fig. 1 : Database and Methodology

For the preparation of base map used Indian topographical sheets 1:50000, used GPS for detecting locations, water sample analysis in the laboratory and used surfer 9 software for the preparing water quality maps.

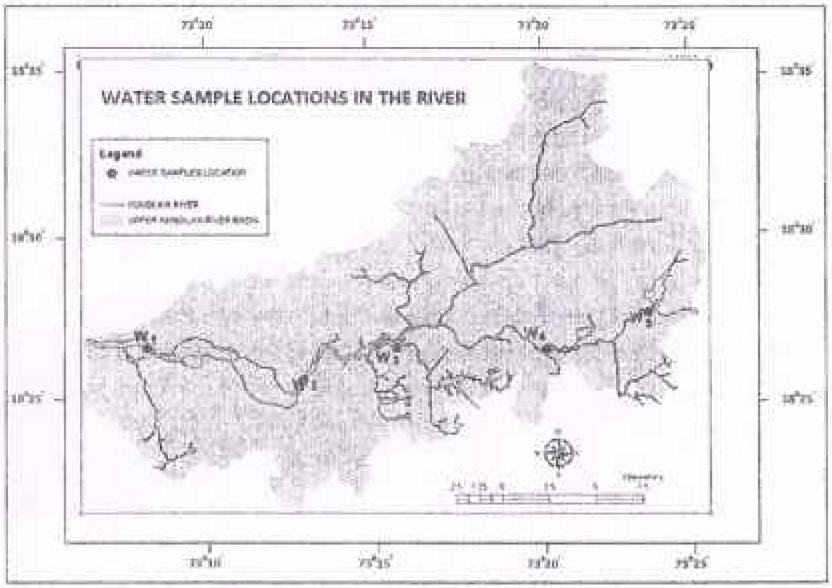

Fig. 2 : Water Sample Locations

Analysis of Water Samples

Sample No.	*Village*	*Latitude*	*Longitude*	*pH*	*Salinity (ppt)*	*TSS (Mg/l)*	*TDS (Mg/l)*	*E Coli Nos./ 100ml)*
w_1	Udadvane	18°26'362"	73°08'709"	6.48	0.025	14	50	30
w_2	Pui	18°25'439"	73°13'161"	6.59	0.025	08	48	03
w_3	Kamat	18°26'385"	73°15'769"	6.54	0.021	24	50	12
w_4	Saje	18°26'369"	73°20'107"	6.55	0.021	12	50	30
w_5	Bhira	18°27'432"	73°23'022"	7.32	0.025	10	52	190

pH in Water

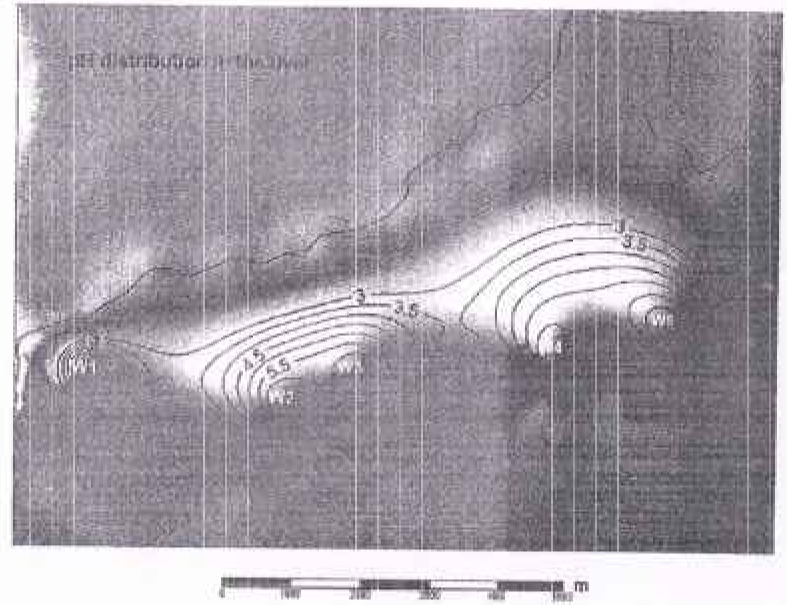

Fig. 3

pH is a measure of the acidic or basic (alkaline) nature of a solution. The concentration of the hydrogen ion [H+] activity in a solution determines the pH. Mathematically this is expressed as:

$$pH = -\log[H+]$$

The pH value is the negative power to which 10 must be raised to equal the hydrogen ion concentration.

Environmental Impact

A pH range of 6.0 to 9.0 appears to provide protection for the life of freshwater fish and bottom dwelling invertebrate's **pH.** A pH test measures the alkalinity or acidity of water. A pH of 7 is neutral, below 7 is acidic and above 7 is basic or alkaline. Acid rain, from auto exhaust or other pollutants, causes a drop in the pH. Pollution from acci[illegible]ntal spills, agricultural runoff and sewer overflows can

also change the pH. Buffering capacity is water's ability to resist changes in pH, and is critical to the survival of aquatic life. The limestone soils of Central Texas act to neutralize these acids and often result in a more basic pH. While young fish and insect larvae are sensitive to a low pH (acid), extreme values on either end of the scale can be lethal to most organisms. Expected levels: 6.5 to 9.0, In the Upper Kundalika water basin the pH value is lowest in Udadvane (6.48) and highest in nearby Bhira (7.32) pH values are within the range of permissible limit of drinking water. Kamat, Pui, and Saje the water is acidic and at Bhira the water is alkaline.

Salinity in Water

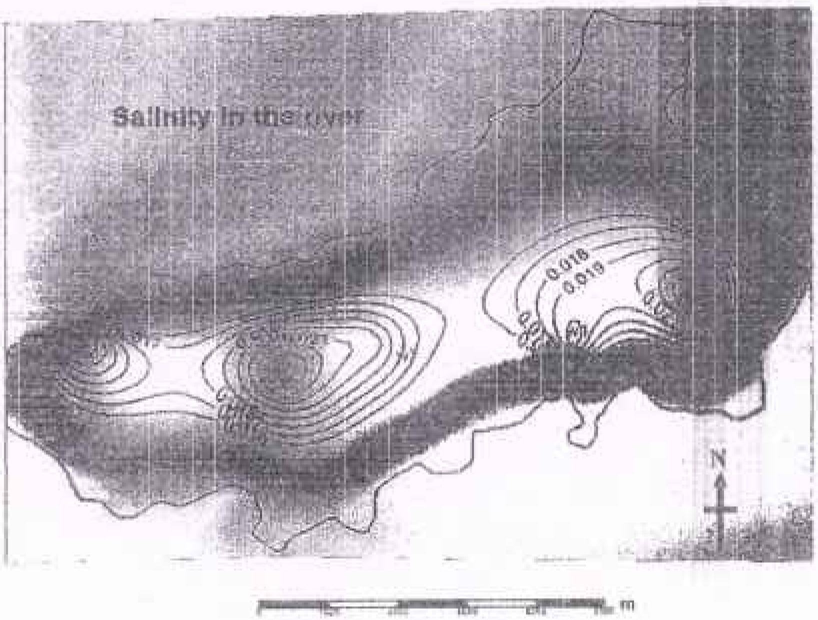

Fig. 4

The most significant off-site impact of dry land salinity is the salinization of previously fresh rivers. This affects the quality of water for drinking and irrigation with serious economic, social and

environmental consequences for both rural and urban communities. High levels of salts may affect the taste of drinking water. Chloride in particular has a low taste threshold. Sodium and magnesium sulfate levels in drinking water may produce a laxative effect and reduce the suitability of a water supply for grazing animals. The Upper Kundalika River maintains its salinity as per the above result. Above result states that w1, w2, w3, w4, w5 water samples are the found salinity in between 0.021 to 0.025. It maintains standard structure of salinity level which is given below.

Water Salinity

Fresh Water	*Brackish Water*	*Saline Water*	*Brine*
< 0.05%	0.05 - 3%	3 - 5%	> 5%
< 0.5 ‰	0.5 - 30 ‰	30 - 50 ‰	> 50 ‰

TSS in Water

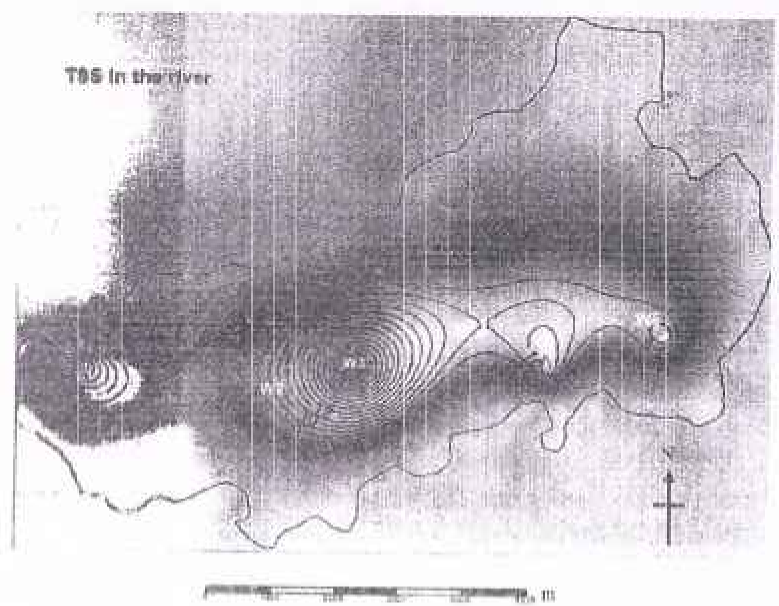

Fig. 5

A total suspended solid (TSS) is a water quality parameter used for assessing the quality of wastewater after treatment in a wastewater treatment plant. It is listed as a conventional pollutant in the U.S. Clean Water Act. This parameter was at one time called non-filterable residue (NFR), a term that refers to the identical measurement: the dry-weight of particles trapped by a filter, typically of a specified pore size. However, the term "non-filterable" suffered from an odd (for science) condition of usage: in some circles (Oceanography, for example) "filterable" meant the material retained on a filter, so non-filterable would be the water and particulates that passed through the filter.

In the Upper Kundalika River TSS concentration less than 20 mg/l is found at Udadvane, Puigaon, Saje, and Bhira it means water is pure. At Kamat TSS value is 24 it means this water is sparsely cloudy. Water with TSS levels between 40 and 80 mg/l tends to appear cloudy, while water with concentrations over 150 mg/l usually appears dirty. The nature of the particles that comprise the suspended solids may cause these numbers to vary.

TDS in the River Water

A total dissolved solid (TDS) is a measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular (colloidal sol) suspended form. Generally, the operational definition is that the solids must be small enough to survive filtration through a filter with two-micrometer (nominal size or smaller) pores. Total dissolved solids are normally discussed only for freshwater systems, as salinity includes some of the ions constituting the definition of TDS. The principal application of TDS is in the study of water quality for streams, rivers and lakes, although TDS is not generally considered a primary pollutant (e.g. it is not deemed to be associated with health effects) it is used as an indication of aesthetic characteristics of drinking water and as an aggregate indicator of the presence of a broad array of chemical contaminants. Basin models are used to more comprehensively

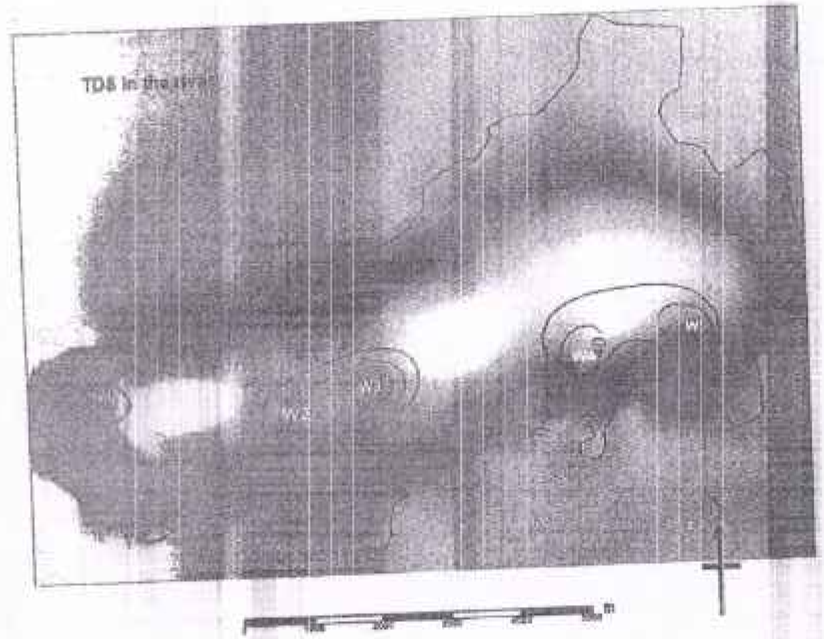

Fig. 6

evaluate total dissolved solids within a catchment basin and dynamically along various stream reaches.

Water can be classified by the amount of TDS per liter:

- Fresh water < 1000 mg/L TDS
- Brackish water 1000 to 10,000 mg/L TDS
- Saline water 10,000 to 30,000 mg/L TDS
- Brine > 30,000 mg/L TDS

While a TDS of 5,000 mg/L is the minimum threshold for a water to be considered brine, the typical range is 30,000 to 100,000 mg/. As per this classified ranges in the region of Upper Kundalika, it has been found that the TDS values in between 48 mg/L to 52 mg/L at different segments of the river. The present river water is potable to human beings.

Distribution of *E. Coli* in the Water

Escherichia Coli

E. coli is a fecal coli form bacterium that comes from human and animal waste. The Environmental Protection Agency uses *E. coli* measurements to determine whether fresh water is safe for recreation. Disease-causing bacteria, viruses and protozoans may be present in water that has elevated levels of *E. coli*. Levels of *E.* coli can increase during flooding. *E.* coli is measured in number of colony forming units. The EPA water quality standard for *E.* coli bacteria is 394 colony forming units per 100 mL.

E. Coli in the River

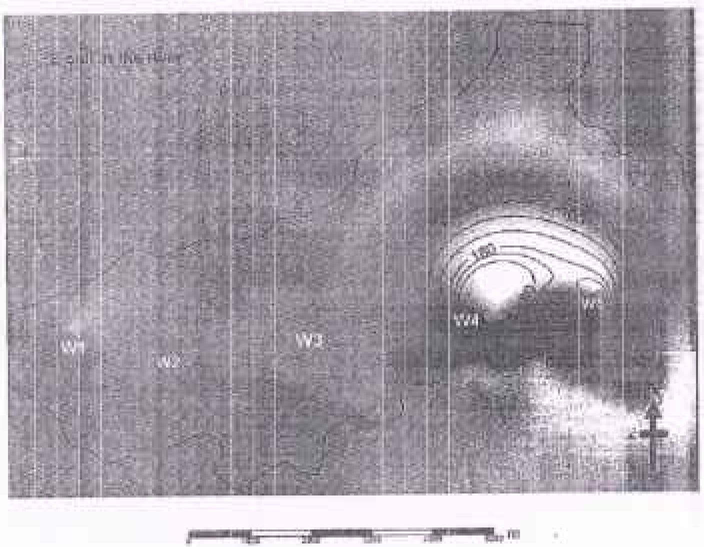

Fig. 7

As per the WHO norms *E. coli* in the drinking water is nil but in the river water at Udadvane *E. coli* is 30Nos/100ml, at Pui *E. coli* is 3 Nos/100ml, at Kamat 12Nos/100ml, at Saje *E. coli* is 30 Nos/100ml, and at Bhira *E. coli* is 190 Nos/100ml.

Conclusion of the Study

In the upper part of the the parameters like ph, salinity, TSS, TDS, are found normally means this water is permissible for drinking in human beings. There are some variations in *E. coli* but the water is also permissible for human beings.

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