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WATER CONTAMINATION: A HAVOC FOR HUMAN CIVILISATION

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ABSTRACT :

In ancient cultures water represented the very essence of life and it has played an imported role in the history of countries, religion, mythology, art and in many religions the soul cleanses through holy water.With the supersonic speed of Industrialisation & Urbanisation, Our life 'water' is being contaminated every day making Human Civilisation vulnerable to its existence in near future.This paper strives to study the effects of water contamination

KEYWORDS : *water,contamination,Industrialisation,Havoc,Human.*

INTRODUCTION

Water is a transparent, odorless, colorless liquid. Water used for the drinking purpose is known as potable water, which must be sparklingly clear, odourless, neither hard nor too soft and free from bacteria and impurities. Salty water often fails in quenching the thirst, hence must satisfy all the physical and chemical quantity criteria for human consumption. Water on the other hand used to feed boilers, for washing and many other non-domestic and industrial purposes, is called

as non□potable water. Potable water has the concentration of all elements and ions in the defined range. Thus, potable water cannot harm the consumer and is free from pathogenic agents and harmful chemical substances and is pleasant in taste and usable for domestic purposes. If any parameter is in unlimited concentration in water than it may cause disease and such water is known as impure water and it should not be used for drinking purpose. Quantity of water on earth is nearly constant and it keeps circulating between ocean, atmosphere, and land through a cycle that is called hydrological cycle. There are at least three factors on which groundwater occurrence depend are hydraulic properties of the geological formations, geological framework and climate. The occurrence, distribution, movement and composition of ground waters are intricately linked to the structure and nature of the geological formations. The earths water resource known as a hydrosphere is consisting of oceans, ice and snow in the polar and other regions, mountain glaciers, lakes streams, rivers, swamps, water in surface soils and in underground strata. Although the two-third of our planet's surface (70.84%) is covered by water in the form of ocean and sea, since the ocean and sea water is saline in nature (97%), only 2.6% is available as fresh water. Out of this 2.6% about 69% is trapped in glaciers and polar icebergs, 30% is occur as groundwater and 1% is available in the form of fresh water in rivers, lakes and ponds suitable for human consumption.

IMPORTANCE OF WATER-

Water is the symbol of life and an essential unique universal solvent needed living organism without it life is not possible on this planet. It acts as a media for chemical and biological metabolic reactions and also acts as an internal and external medium for several organisms. It is the most common, vital and the most precious resource on earth that providing luxuries and comfort in addition to full fill all the basic needs of human being without it neither life nor any development is possible. As a source of life for human being, plants and other forms of life, it cannot be replaced by any other solvent

POLLUTION IN WATER

Unjudicious and uncontrolled explorations of water bring the change in the physical, chemical, biological quality of the water due to that water becomes unfit for drinking and other domestic uses. Human activities can change the natural composition of ground water through the disposal of chemicals and microbial matter at the land surface and into soils, or through injection of wastes directly into ground water and water get polluted. Groundwater pollution is defined as an undesirable change in natural groundwater quality resulting quality due to addition of solid, liquid or a gaseous waste and physical, chemical or biological agents or addition of sewage or industrial effluents. Hydrological connectivity between groundwater and the land surface provides the opportunity for the contamination of groundwater and a subsequent reduction in water quality. The signs of water pollution are bad taste of drinking water, offensive odours from water bodies, unchecked growth of aquatic weeds in water, decrease in number of fish in fresh water, oil and grease floating in water surfaces. These factors disturb the normal uses of water for Mpublic water supply, recreation and aesthetics, aquatic organisms and wild life, agriculture and industry. Water pollution is mainly caused by natural processes and anthropogenic processes. Water pollution can be classified into four categories - physical, chemical, biological and physiological pollution of water.

Physical Pollution of Water

It brings about changes in water with regard to its colour, odour, density, taste, turbidity and thermal properties etc.

Colour-Colour change may affect the penetration of sunlight inhibiting plant and animal metabolism.

Turbidity-Turbidity in water mainly arises from colloidal matter, fine suspended particles and soil erosion.

Taste and Odour-Unpleasant earthy or musty taste and odour are produced by industrial effluents containing Fe, Mn, free chlorine, phenols and aquatic actionomycetes.

Chemical Pollution of Water

The chemical pollution of water causes changes in acidity, alkalinity or pH and dissolved oxygen. It may be caused either by organic pollutants or inorganic pollutants or by both. The organic pollutants can be biodegradable or non biodegradable.

Biological Pollution of Water

Bacterial pollution in water is caused by the excretory products of man, animals and birds. The main pollutants belong to coliform group and certain subgroups, faecal streptococci and miscellaneous organisms. Biological pollution is also brought about by bacteria, viruses, algae, diatoms like protozoa, rotifers, crustaceans and plant toxins.

WATER QUALITY STANDARDS

Parameter	Acceptable limit	Permissible limit
Colour	5	15
Odour	Agreeable	Agreeable
Taste	Unobjectionable	Unobjectionable
pH	6.5-8.5	No Relaxation
Temperature	NG	NG
Turbidity	1	5
EC	1500	3000
TDS	500	2000
Fluoride	1	1.5
Chloride	250	1000
Sulphate	200	400
Nitrate	45	No
Total Alkanility	200	600
Total Hardness	200	600
Magnesium	30	100
Calcium	75	200
Sodium	NG	NG
Pottasium	NG	NG
Iron	0.3	1.0
Zinc	5	15
Cadmium	0.003	0.01
Copper	0.05	1.5
Arsenic	0.01	0.05
Lead	0.05	No Relaxation
DO	NG	NG
BOD	NG	NG
COD	NG	NG
Carbonate	NG	NG
Bicarbonate	500	NG

NG=Not given

BIS Drinking Water Standard (IS: 10500-2012)

Parameter		WHO	ICMR
pH	Desirable Limit	7 – 8.5	7 – 8.5
	Max. per limit	6.5 – 9.2	6.5 – 9.2
Fluoride	Desirable Limit	0.7	1
	Max. per limit	1.5	1.5
TDS	Desirable Limit	500	500
	Max. per limit	1500	1500
Chloride	Desirable Limit	200	200
	Max. per limit	600	1000
Nitrate	Desirable Limit	45	20
	Max. per limit	-	50
Turbidity	Desirable Limit	5 NTU	5 NTU
	Max. per limit	25 NTU	25 NTU
Sulphate	Desirable Limit	200	200
	Max. per limit	400	400
Sodium	Desirable Limit	200	-
	Max. per limit	250	-
Calcium	Desirable Limit	75	75
	Max. per limit	200	200
Magnesium	Desirable Limit	30	50
	Max. per limit	150	150
Total Hardness	Desirable Limit	300	300
	Max. per limit	500	600
Potassium	Desirable Limit	10	-
	Max. per limit	-	-
Bicarbonate	Desirable Limit	500	500
	Max. per limit	-	-
Arsenic	Desirable Limit	0.01	0.05
	Max. per limit	NR	NR
Iron	Desirable Limit	0.3	0.1
	Max. per limit	1.0	1.0

WHO and ICMR Drinking Water Standard, 2012

PHYSICO-CHEMICAL INDICATORS FOR WATER QUALITY

Colour

Water used for drinking purposes should be free of colour, objectionable, odours and turbidity. Pure water is colourless but water in nature is often coloured by foreign substance. Water having colour partly due to suspended matter, is said to have apparent colour. Colour contributed by dissolved solid which remains after removal of suspended matters, is known as the true colour. The presence of organic matter, Iron and Mangnese may impart colour in groundwater. Iron oxide causes reddish water and Manganese Oxide causes brown or blackish water.

Temperature

The temperature of groundwater largely depends on atmospheric temperature, terrestrial heat, exothermic and endothermic reactions in rocks, infiltration of surface water, insulation thermal conductivity of rocks, rate of movement of groundwater and interface of men on the groundwater regime. The depth of the source of a groundwater could be gauged from the temperature of the water. Unlike surface water temperature, the groundwater temperature is less affected by seasonal changes in atmospheric temperature. Normally, the temperature of groundwater is 5.2°C higher than the mean annual air temperature and it increases with depth due to earth geothermal gradient which is about 1°C for every 40 meter depth. The increase in groundwater temperature enhances the solubility of various minerals in greater extent. The geothermal gradient is also useful in delineating the recharge and discharge zones. It is greater in discharge area than in recharge area.

Taste and Odour

The taste and odour of groundwater is mainly due to the presence of foreign matter such as organic compounds, inorganic salts or dissolved gases in groundwater. Odour estimation determines whether the water is of acceptable quality and also the presence of pollution. If the water contains hydrogen sulphide, it imparts the rotten-egg smell. Gases and some organic compounds and minerals may give unpleasant taste and odour to groundwater.

Electrical Conductivity (EC)

In most groundwater almost all major and minor dissolved chemical elements occur in ionic form, with cations and anion charged ions. Therefore, groundwater can be looked at as an electrolyte solution. Normally in fresh water having total soluble salt less then 10000 mg/ litre, the EC is related by TDS by a factor of 0.64. This factor is, however depended upon the nature and concentration of various ions and in fact, varies from 0.54 to 0.96. The higher values of EC generally associated with the water higher in sulphate concentration.

Conductivity is used as an indicator of the abundance of dissolved inorganic species or total concentration of ions.

CHEMICAL PARAMETERS

Type of Elements	Constitutes
Major (1.0-1000 mg/L)	Sodium, Calsium, Magnesium, Bicarbonate, Sulphate, Chloride
Minor (0.01-10 mg/L)	Potasium, Iron, Carbonate, Nitrate, Fluoride
Trace (0.0001-0.1 mg/L)	Arsenic, Cadmium, Chromium, Cobalt, Copper, Lead, Zinc, Mangnese, Nickel, Molybdenum, Phosphate
Trace (less than 0.001 mg/L)	Berylium, Bismuth, Silver, Tin, Radium, Scandium, Gold, Gallium, Cerium, Cesium, Platinum

Major, Minor and Trace eliments of ground water

Ground water naturally contains a number of different dissolved inorganic constituents the major cations are

pH

Bicarbonate (HCO_3^-) and Carbonate (CO_3^{-2})

Total Hardness (TH)

Nitrate (NO_3^-)

Fluoride (F^-)

Calcium (Ca)

Sodium (Na)

Cadmium (Cd)

Lead (Pb)

Arsenic (As)

Copper (Cu)

Zinc (Zn)

Iron (Fe)

CONCLUSION-

Presently 70 % surface water and 30 % ground water is utilized for agriculture, industrial, domestic demands and as drinking water. About 10 % of the rural and urban populations of country do not have access to regular safe drinking water and most of them depend on unsafe drinking water sources to meet their daily needs. Shortages of water in cities and villages affecting the lives of people as well as the environment around them and meet the shortages large volumes of water being collected and transported over great distances by tankers and pipelines.

In recent times, the demand for water has increased many folds due to increased domestic and industrial needs. The development of water resources is not a goal by itself, but a means to reach the socio-economic objectives of production, income, employment and quality of life. Therefore, water resources development should be considered in the wider context. In addition to the anthropogenic pollution of groundwater, the contamination due to geogenic sources such as arsenic, fluoride, and iron as well as salinity problems in coastal and inland areas are the major quality issues in India.

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