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Rispana River- Responsible Factors of Water Pollution in Dehradun Valley

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Abstract:**The River that flows into the city of Dehradun is Rispana which furthermoves and joins the river Suswa which is the tributary of the Ganges. Rispana flows between the city of Dehradun and the pollution of the city flows through this river and reaches the Ganges. This river has come in the middle of the city due to increasing population and urbanization whereas earlier this river used to determine the eastern boundary of Dehradun city. Water is needed for the maintenance of life of plants and animals, for navigation, hydroelectric power and for disposal of sewage. For survival, man requires 1 kg of food, drink 2litres of water and 22 kg air to breathe daily. Supplies for fresh water also provide the aquatic organisms with dissolved oxygen and some essential minerals and nutrient making it indeed the most vital element for life. That is why most of our villages, towns and cities sprang up in the past near places where plentiful water was available in the form of lakes and rivers. History tells us that human civilizations perished or migrated to better locations in the absence or scarcity of water. In primitive ages the man used to live near the river. The greatest use of water was for irrigation and agricultural pursuits, while only the people consumed a small amount. The use of water for drinking and cooling was limited to the amount that people could easily take from the wells or the stream in their vessels. The management and conservation of water resources have become important issues. Water is by far the most important natural resource and an environmental medium, which is most susceptible to pollution. The most important contributors to pollution of water are sewage, oil, industrial and agricultural wastes. These can be divided as degradable and non-degradable. Degradable pollutants, mostly domestic sewage, can be rapidly decomposed by natural process. This research paper presenting the actual condition related to water pollution and responsible pollutants in Dehradun Valley**.

Index Terms:**Environment, Industries, Pollutants, Sewage, Water Pollution.**

I. Introduction

The river that flows into the city of Dehradun is the Rispana. Thisfurther moves and joins the river Suswa which is the tributary of the Ganges. Rispana flows between the city of Dehradun and the pollution of the city flows through this river and reaches in the Ganges River. This river has come in the middle of the city due to increasing population and urbanization whereas earlier this river used to determine the eastern boundary of Dehradun city. RispanaRiver is the most polluted river in Dehradun. Currently it is a dry river but during rainy season it gets water. During the winter and summer season, the dirty polluted water of the surrounding areas and industrial effluents flows into the river.

The most important contributors ofRispanariver pollution are sewage, oil, industrial and agricultural waste. These can be divided as degradable and non-degradable. Degradable pollutants, mostly domestic, sewage can be rapidly decomposed by natural process.Non-degradable pollutants (inorganic chemical such as salts, chlorides, metallic oxides, toxic and other

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waste producing material) are those substances in which there are no evolved natural treatment processes that can keep up with the rate of manmade input eco-system. These either do not degrade or degrade on very slowly in the natural environment.

Water pollution not only changes the physical properties of the water such as color, odour, turbidity, taste and temperature but also makes it acidic, alkaline or saline due to the presence of dissolved or suspended chemical substances.

Water pollution is caused due to physical, chemical and biological impurities in water. The standard of pollutants and main pollutant data of RispanaRiver in Dehradun Valley is given in table 1, 2, 3 and 4.

II. TYPES OF THE POLLUTION

The three types of water impurities in RispanaRiver in Dehradun Valley are:

A. Physical Impurities

It includes turbidity, trade, colour and odour. Suspended and colloidal matter causes turbidity. Colour is due to presence of mineralogical compounds such as iron oxide. Taste andodour are due to presence in water of organic matter dissolved during passage through the ground or from industrial work, microorganism such as algae growth.

B. Chemical Impurities

Chemical impurities are due to carbonates and bicarbonates of Calcium and Magnesium, sulfates and Chlorides of Calcium and Magnesium and Carbonates – Bicarbonates of Sodium, Nitrates Chloride and Fluorides of Sodium, Iron Oxide and Manganese. They will create turbidity hardness and alkalinity, bad taste and odour problem.

C. Bacteriological Impurities

Due to pathogenic bacteria, bacteriological impurities arise in water. Their presence is noted if E-Coli bacteria are present. So the bacteriological analysis involves some tests like – stands plate count and E-Coli test.

III. SOURCE OF POLLUTION

The source of water pollution in Dehradun Valley:

There are four primary sources of water pollution-

A. Urban
B. Industrial
C. Agriculture
D. Natural

A. The urban sources are of two types:

1) Controllable Source

Normally the sewerage system serves the business and commercial areas, the residential districts and industrial area. The extent to which this system serves the city and its surrounding sub-urban and industrial fringe is a measure of controllable source.

The discharge of huge amounts of municipal and household wastes into Rispana River and canals is one of the major sources of pollution of our water bodies. Most sewerage systems mainly contain human and animal wastes. However, the amounts and types of other kind of refuse from modern living are continuously increasing, some of which pose processing problems, for example the synthetic detergents. Now complex compounds such as cleaners and water based paints also find their way into it. Sewage, garbage and organic materials dumped into the bodies kill the fish because of reduction in oxygen concentration.

Being rich in organic substances, sewage provides nutrition for various decomposer bacteria and fungi. The decomposition products of sewage, detergents and fertilizers, nitrate and ammonium compounds promote the growth and reproduction of algae and result in the formation of algal blooms. These large algal masses decay and cause deoxygeneration of water. Most of the epidemics of big cities are caused through water borne diseases search a typhoid, cholera, dysentery and jaundice. Enhancement of bacterial, viral and other parasitic population in polluted waters endanger human health.

2) Uncontrollable Source

All urban wastes that reach the stream other than through the organized sewerage system and treatment work are uncontrollable source. This constitutes a great contribution of stream pollution. The uncontrollable source is usually intermittent, associated with the occurrence of rainfall.

B. Industrial Source

The industrial source is divided into two parts, thefirst part is connected to community system and the second part deals with independent private system.

Today industry contributes more water pollution than do house hold users. The major industrial pollution is the chemicals, primary metals, paper and food industries. Wastes from

industries such as pulp mill, sugar mill (near doiwala), leather mill, chemical fertilizer plants, limestone industries contain mostly complex organic compounds. These are emptied directly into natural water base.

The effluents from industries are resistant to breakdown. They result in disastrous consequences upon the existing eco-system.Rapid industrial development is responsible for the numerical decline of macrophytes, which constitute an important constituent of aquatic eco-system. Chemically polluted water either damages the growth of crops or changes the aquatic vegetation due to artificial nutrients, and is totally unfit for livestock to drink. Cyanides, acid alkalis and other industrial wastes affect the inhabitants of river upto several kilometer – downstream.

C. *The Agriculture Sources*

Agricultural practices such as crop and livestock production are sources of pollution, also chemical fertilizers, pesticides and herbicides are of increasing significance as a source of pollution. The rapidly increasing use of inorganic fertilizers, especially the readily subtle nitrogenous salts, has led to nutrient enrichment of many of our water bodies. This kind of agricultural drainage encourages algal growths and contaminates drinking water particularly with nitrates.

D. *The Natural Sources*

The natural sources are storm, wash, seepage from ground water, swamp drainage and aquatic life of the stream. Natural rain water has an approximate pH of 5.6. However, during the last ten year report from Dehradun Valley has indicated that rain water has much higher acidity. This is brought about by strong acid produced from industrial pollutants such as sulfuric acid formed from Sulfur Di Oxide and Nitric Acid from Nitrogen Oxides, and probably Hidrofluoric Acid from floride. These acidic gases travel long distances. Some of these pollutants over the city ascend sky words and then travel down through precipitation as rain, dew and snow.

IV. WATER QUALITY CRITERIA

Water quality criteria specify a concentration of constituents in water which, if not exceeded, are expected to result in an aquatic ecosystem suitable for higher use of water (train, 1979). The criteria varies with the nature of the use, such as, drinking water for human and animals, irrigation, industry, aquatic life. For instance, brackish water (with TDS of, say, 1000mgl^{-1})which is not suitable for drinking by human, can be safely given to a camel. The WorldHealthOrganization (WHO) has prescribed norms for the quality of potable (i.e. drinkable) water. Some countries have adopted more stringent criteria than those of WHO, whereas many developing countries have reconciled themselves to less stringent criteria because of operational difficulties (for instance, the permissible fluoride content of water in Tanzania is 8mg l^{-1} as against the international norms of less than 2 mg l^{-1}.

V. DRINKING WATER STANDARD

Dissolved solids (for chloride and sulphate) should not exceed 250 mg l^{-1}. Hardness (in terms of concentration of mg l^{-1} of CaCO3) has not been proven a health hazard, but hard water (with more than 150 mg l^{-1} of CaCO3) needs to be softened by line treatment or ion exchange. Safe drinking water intake is taken as less than 1% in terms of most sensitive animal tested. It should be emphasized that the long terms 'no effects' levels of most of the pesticides are not precisely known.

The federal Drinking Water Standards, prescribed by the US Environmental Protection in 1988 has two categories : 1- ***Primary Standards*** dealing with microbial, turbidity, inorganic and organic chemical contaminants which are expressed in terms of the Maximum Contaminant Level (MCL) which should not be exceeded and 2- ***Secondary Standards*** dealing with parameters like pH, TDS etc. whose recommended levels is indicated. It may be noted that pesticides such as 'endrin'is banned in the USA because of the damage that they cause to human health and environment, though it continues to be utilized in the developing countries due to being cheap and potent.

Table I. Federal primary drinking water standard (U.S.F.P.A.)

Contaminant	**Maximum Contaminant Level**
pH	6.5-8.5
Alkalinity	20-200 mg/l
Hardness	60mg/l
Chloride	250 mg/l
Sulphate	250 mg/l
Phosphate	0.15ppm
Nitrate	10 mg/l
Sodium	20mg/l
Potassium	>3000 mg
Dissolved Oxygen	6 mg/l
Chemical Oxygen Demand	250 mg/l
Biochemical Oxygen Demand	2 mg/l
Zinc (Zn)	5.0 mg/l
Magnesia (Mn)	0.05 mg/l
Fluoride (Fe)	4.0 mg/l
Copper (Cu)	1.0 mg/l
Chromium(Cr)	0.1 mg/l
Lead (Pb)	0.05 mg/l
Cadmium (Cd)	0.05 mg/l
Total Coliform CFU/100ml	1 / 100 ml
Source : Geo environment And Introduction by U. Aswathanarayana, P 79-80, CPCB, New Delhi and Others	

Internet Sources

VI. SAFETY MEASURES

Measures to minimize of pollution

1. Slums should be shifted from the river Rispana.
2. City waste should not be dumped in the river.
3. City's dirty water should not be allowed to enter theRispana River.
4. Plantation along the river bank.
5. Rain water should be collected and flowed into the river throughout the year.
6. All possible steps should be taken to prevent the discharge of toxic effluents into surface water bodies and ground water aquifers. The technique and ways of reusing the waste water should be thought over.
7. Effluents generated should be treated to confirm the standards laid down by the central and state boards for prevention and control of water pollution before discharge.
8. Standard waste water treatment methods should be incorporated for neutralisation and removal of solids. The technique includes lime treatment followed by oxidation process to convert ferrous to ferric iron, neutralisation with soda ash, caustic soda and anhydrous ammonia, reverse osmosis, ion exchange, electro dialysis, ozone oxidation, desulfating, sulfide iron removal and microbiological iron removal.

CONCLUSION

Till 50 years ago, clean water flowed in the river Rispana. The bad effects of the actions taken during removal of the limestone from the hills of Mussoorie was that the streams flowing with the river Rispana, dried up. Slums settled on the bank of the river, capturing its banks and turning it into a drain. Industrial and urban polluted water of Dehradun city started being released into the river. As a result, it became highly polluted and this process has been going on for many years. Many programs were conducted to clean it on paper but nothing has happened at the ground level even today.

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Table II. water quality of Rispana river in Dehradun valley Inorganic parameters in mg/l)

Sampling Location	**pH**	**Alkalinity**	**Hardness**	**Chloride**	**Sulphate**	**Phosphate**	**Nitrate**	**Sodium**	**Potessium**
Near Rajpur	7.2	210	1549	7.2	63	4.13	0.3	5.6	0.6
Near Welhams Boy School	9.3	280	266	35	6	0.21	0.1	6.7	2.1
Source : NEERI Data (Summer)									

Table III.Wwater quality of Rispanariver in Dehradun valley (Heavy metals, mg/l)

Sampling Location	**Zn**	**Mn**	**Fe**	**Cu**	**Cr**	**Pb**	**Cd**
Near Rajpur	0.01	0.23	0.28	0.02	0.07	ND	0.02
Near Welhams Boy School	1.27	1.14	2.6	0.9	1.23	1.78	0.07
Source : NEERI Data (Summer)							

Tabel IV. Water quality of Rispanariver in Dehradun valley (Demand Parameter in mg/l)

Sampling Location	**Dissolved Oxygen**	**Chemical Oxygen Demand**	**Bio-chemical Oxygen Demand**
Near Rajpur	8.2	3	< 1
Near Welhams Boy School	8.5	34.5	7.9
Source : NEERI Data (Summer)			