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Environmental Science

EVALUATION OF WATER PURITY IN MANDAKINI RIVER AND STUDY OF ATMOSPHERIC ANALYSIS OF KEDARNATH VALLEY

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ABSTRACT **OBJECTIVE:** Environment has become a major issue of great concern in recent years. India has been traditionally vulnerable to natural disasters on account of its unique geo-climatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. The paper attempts to carry out a quantitative and qualitative analysis of Kedarnath to Rudraprayag water contain of different river which are collectively followed in Rudraprayag district, many parameter used to evaluate water quality such as physical parameters:-Turbidity, colour, taste & odour, temperature. Chemical parameters like suspended matter, pH value, conductivity, total hardness, alkalinity, acidity, total dissolved solids. Organic solids, inorganic solids examples are calcium, iron, fluride, chloride content, nitrogen content, presence of fats, greases, & oils, sulphides sulphates and H2S gas, dissolved oxygen, chemical oxygen demand (cod), bio-chemical oxygen demand (bod) and Biological parameters like plant count test, most probable number (M.P.N.) Test within the framework of Hazard Assessment. Vulnerability Assessment (estimate of the degree of loss or damage to property, population, environment, economic activities etc.) on the basis of chemically reported relevance which are shown that how water component may increase or decrease with relationship environmentally The paper shows that in case of Uttarakhand, the devastation and consequent collapse cannot be attributed to 'Act of God' alone. Political apathy, economic imprudence and poor environment management played an important role. These were further amplified by the inadequate state of preparedness, mitigation and response of various disaster management agencies during the crisis. It emerges that if the portends of the disaster, ominously evident all the time, not been repeatedly ignored, the aftermath of the tragedy, waiting to happen, could have been largely mitigated. This study is based on complementary relationship between natural disaster and tourism. Attention is focused on recent natural disaster 2013 that has occurred on Kedarnath in Utttarakhand.

KEYWORDS : Environment, Vulnerability Assessment, Kedarnath, disaster, Tilwada, Rudraprayag

1.0 INTRODUCTION:

Kedarnath is a town located in the Indian state of Uttarakhand and has gained importance because of Kedarnath Temple located at the latitude of 30.73 and the longitude of 79.06. The hallowed Hindu Chardham pilgrimage centers in the region viz Gangotri, Yamunotri, Kedarnath and Badrinath, are visited by thousands of devotees, especially during the months of May to September. An important Sikh Pilgrimage Centre Hemkund Sahib is also located in the region. Due to heavy floods, Gobind Ghat (the last common halt for Badrinath), Hemkund Sahib and Valley of Flowers suffered devastation. Entire villages and settlements such as Gaurikund and the market town of Ram Bada (a transition point to Kedarnath) were obliterated, while the market town of Sonprayag suffered heavy damage and loss of lives. Kedarnath is a holy pilgrimage site where Lord Shiva is worshiped. Kedarnath Dham comes in third place among four holy shrines in Uttarakhand. In Kedarnath, Lord Shiva's worship ranges from 6 months (May to October). Due to heavy snowfall during the winter the temple is closed and no one lives in Kedarnath. From six months (November to April), Palki of Lord Kedarnath has been shifted to one place near Guptakashi, named Ukhimath. Kedarnath Dham was located about 13 to 14 km from NH-107. Before the disaster of 2013 but the distance between Gaurikund and Kedarnath temple has been reduced to about 18-20 km due to the breakdown of the road after the disaster in 2013, from Kedarnath about 2.5 km away is Chobrabari Tal, from which the Mandakini River (located in Chobarbari Glacier, the name of this rhythm is called Chobrabari Tal). And the river mandakini flows from Kedarnath to Rudraprayag and mix with many many small supported rivers and finally meet the famous river known as Alaknanda.

Fig A: Origin of manadakini river

Fig B: River mandakini at Gaurikund

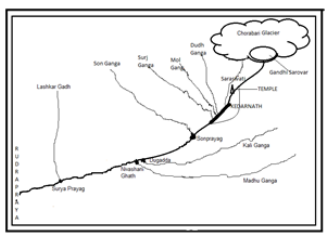

Fig C: Tributary of Mandakini River

Fig D: Mandakini River at Chorabar Glacier

1.1 CLIMATIC CONDITIONS OF KEDARNATH VALLEY:-

Meaning of climate is the change of the atmospheric stage on a long period to any place. Climate change occurs due to the heat balance of the atmosphere and rapid and sudden short-term or long-term changes in rainfall. Natural and man-made external factors & internal factors are responsible for climate change. India has tropical monsoon climate. Manson winds are completely reversed (180°) in their direction. There are four types of season in India.

- Winter season (15 Dec to 15 March)
- Summer season (16 March to 15 Jun)
- Rainy season (16 Jun to 15 Sep)
- Autumn season (16 Sep to 14 Dec)

1.2 Geomorphologic:

Geomorphological Study of Uttarakhand in terms of its lithology, structure, basin geometry and other morphometric factors indicates that the area is in a young stage of evolution. The surface slopes are steep consisting mostly of fluvio-glacial (associated withglaciers,ice sheets, orice caps) or fluvial (associated withriversandstreamsand thedepositsandlandforms created by them) materials, which are mostly loose and unstable in nature. The Drainage Studies carried out using topographical maps, aerial photographs and satellite imageries indicate a migratory or shifting nature of the river systems. The river bed is full of large boulders and sediments. These rivers also have high sinuosity that causes aggradations on the concave end of the river and

degradation or toe erosion on the convex part of the river. It is pertinent to note that the erosive power of river with sediments is almost square of the erosive power without sediments. Erosion intensity can be categorized into five different zones i.e Very High, High, Moderate, Gentle and Very Gentle. Uttarakhand lies in High and Very High Erosion Intensity Zones.

2.0 Material and methods:

2.1 Water quality parameters

Water quality testing is an important part of the environment. When the quality of water gets spoiled, it does not affect the aquatic life but also affects the ecosystem surrounding it. Factors affecting water quality are physical, chemical or biological factors

2.1.1 Physical parameters:-

- turbidity
- Colour
- Taste & odour
- Temperature

2.1.2 Chemical parameters:-

- Suspended matter
- Ph value
- Conductivity
- Total hardness

2.2 METHODOLOGY OF WATER PARAMETERS

Colour: - Clean water/ fresh water are colorless. Colour of water see in naked eyes and determines the colour of water.

Odour: - Fresh water/clean water is odorless. And we feel the smell in water through our nose.

Taste: - Fresh water/clean water is tasteless. We examine the water taste with our tongue.

Turbidity: - By the way, we can see the large particle of dust in the water with our eyes but turbidity meter is used to see at micro particles in water.

Temperature: - By the way, by touching the water, we can know that the water is cold or hot. But "Thermometer" is used to determine the correct temperature of the water.

pH Value:- Determination of pH value of water in Electrometric methods. The electro meter is used to determine the pH value from the electro metric method. In this method, the electrode road is dipped in the water sample, so that the pH value of water show on the electro meter is inscribed.

Alkalinity: - Titration method is used to define the alkalinity in water. In this method take 100 ml of water sample in a conical flask and add mix indicator 2 to 3 drops in water sample then titration with H2SO4 0.02N.

Acidity: - Titration method is used to define the acidity in water. In this method take 100 ml of water sample in a conical flask and add Phenol Phthaline indicator 4 to 5 drops in water sample then titration with NaOH 0.02N, when water colour change in light pink.

Total Hardness: - Take 50 ml of water sample in a conical flask. Then add 1 to 2 ml buffer solution which pH of 10.0 to 10.1, and add Eriochrome Black T (EBT) indicator in water sample. And then, make titration with EDTA until the colour of the solution is not sky blue.

Total Dissolved Solids: - Take 100 ml of water sample in a beaker, then put the beaker in the Heat Air Oven. And set the temperature of Heat Air Oven are 103-105°C, and wait water sample to be completely dry. After the beaker has completely dry, let it cool down. Then weight the beaker.

Organic Solids: - Take 100 ml of water sample in a beaker, then put the beaker in the Heat Air Oven. And set the temperature of Heat Air Oven are 103-105°C, and wait water sample to be completely dry. After the beaker has completely dry, let it cool down. Then weight the beaker. After this, set "High Temperature Furnace" to 500-550 °C temperature then ignite residue in it for 1 hour. Let it cool down, then weight the beaker. And if weight loss is reduced by the weight of TDS, then the weight will be Organic Solids.

Inorganic Solids: - Take 100 ml of water sample in a beaker, then put the beaker in the Heat Air Oven. And set the temperature of Heat Air Oven are 103-105°C, and wait water sample to be completely dry. After the beaker has completely dry, let it cool down. Then weight the beaker. After this, set "High Temperature Furnace" to 500-550 °C temperature then ignite residue in it for 1 hour. Let it cool down, then weight the beaker.

Chloride: - Titration method is used to define the Chloride in water. In this method take 100 ml of water sample in a conical flask and add Potassium Chromate indicator 4 to 5 drops in water sample then titration with AgNO3, when colour changed light yellow to light orange

TABLE NO:-1 (According to IS Code 10500 – 2012 the range of Drinking Water value)

S. No.	Parameters	Unit	Acceptable limit	Permissible limit in the absence of alternate source
1	Colour	Hazen	5 max	15 max
2	Odour		Agreeable	Agreeable
3	Taste		Agreeable	Agreeable
4	Turbidity	NTU	1 max	5 max
5	pH value		6.50 to 8.5	No Relaxation
6	Total Hardness	mg/l	200 max	600 max
7	Iron	mg/l	0.3 max	No Relaxation
8	Chloride	mg/l	250 max	1000 max
9	Residual Free Chlorine	mg/l	0.2 min	1 min
10	Fluoride	mg/l	1.0 max	1.5 max
11	Total Dissolved Solids	mg/l	500 max	2000 max

NOTE:- Total Coli-form Organism per 100 ml (MPN) and E-coli in 100 ml are NIL in drinking water according to IS Code 1622 : 1981

TABLE NO:-2 (According to IS Code 456: 2000, RA 2005 the range of Construction Water value)

S. No.	Parameters	Unit	Requirement limit
1	Acidity (0.02N, NaOH)	ml/l	5 max
2	Alkalinity (0.02N, H2SO4)	ml/l	25 max
3	Chloride	ml/l	500/2000 max R.C.C/C.C
4	Sulphate	mg/l	400 max
5	Organic Solid	mg/l	200 max
6	Inorganic Solid	mg/l	3000 max
7	Total Suspended Solids	mg/l	2000 max
8	pH Value		Not less than 6.0

2.3 Climate change parameters

Climatic changes continue in this speed, glacier in the future will be reduced, which can cause water crisis in rivers. In the Kedarnath Dham before the year 2013 there was no one till November to April. But since the disaster in 2013, the re-construction work in Kedarnath is also going on in winter, as a result, the people of this area have been running around the year.

Below are some important factors affecting the environment:-

a) HUMIDITY
b) RAINFALL
c) TEMPERATURE
d) WINDSPEED

3.0 Result and Discussion:

The upper part of Kedarnath which is situated at Mandakini Valley of Rudraprayag district is glaciated with two glaciers i.e. Chaurabari and Companion The presence of U shaped valley as well as moraines indicates the past existence of glacier in this region. We are collect different sample from different river result intemperate in table no-3 and 4.

TABLE NO:-3 Test result of different parameter of water samples of different places examples, Gaurikund cold water, Gaurikund Hot water, Sonprayag, Dugadda, Kund.

S. NO	Parameter	Gaurikund	Gaurikund Hot water	Sonprayag	Dugadda	Kund
1.	pH (at 15.7 °C Temp.)	6.84	6.10	7.01	6.60	6.79
2.	Conductivity (at 15.7 °C Temp.)	249µs	2.79 ms	221 µs	263µs	290 µs
3.	Turbidity	0	0	0	1	1
4.	Colour	0 Hz	0 Hz	0 Hz	0 Hz	0 Hz
5.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
6.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
7.	Hardness	630 mg/l	3940mg/l	1360mg/l	2480mg/l	2200mg/l
8.	Acidity	0.9ml/l	14.1ml/l	1.2ml/l	0.5ml/l	0.2ml/l
9.	Total Alkalinity	3.9ml/l	59.3	11.6ml/l	5.0ml/l	5.0ml/l
10.	Chloride	8.508 mg/l	1.2mg/l	0.5mg/l	0.4mg/l	0.2mg/l
11.	TDS	711mg/l	192mg/l	650mg/l	816mg/l	986mg/l
12.	Organic Solids	395mg/l	147mg/l	470mg/l	590mg/l	601mg/l
13.	Inorganic Solids	316mg/l	45mg/l	180mg/l	226mg/l	385mg/l

Table No:-4 Test result of different parameter of water samples of different places examples, Rudraprayag and after Rudraprayag

S. NO	Parameter	Tilwada	Rudraprayag	After Rudraprayag
1.	pH (at 15.7 °C Temp.)	7.08	7.22	7.31
2.	Conductivity (at 15.7 °C Temp.)	288 µs	324 µs	341 µs
3.	Turbidity	1	1	1
4.	Colour	0 Hz	0 Hz	0 Hz
5.	Taste	Agreeable	Agreeable	Agreeable
6.	Odour	Agreeable	Agreeable	Agreeable
7.	Hardness	2480mg/l	4520mg/l	4520mg/l
8.	Acidity	0.2ml/l	0.2ml/l	0.3ml/l
9.	Total Alkalinity	6.0ml/l	6.2ml/l	5.4ml/l
10.	Chloride	0.2mg/l	0.4mg/l	0.3mg/l
11.	TDS	685mg/l	915mg/l	1169mg/l
12.	Organic Solids	470mg/l	603mg/l	801mg/l
13.	Inorganic Solids	215mg/l	312mg/l	368mg/l

3.1 Torrential rain:

The sharp rains in the adjoining areas near the place of Mandakini river had started from the evening of 14th June, due to which the water level of the Mandakini river and the tributaries of the river, rainy streams & drainage had increased and there was flood in the Mandakini river.

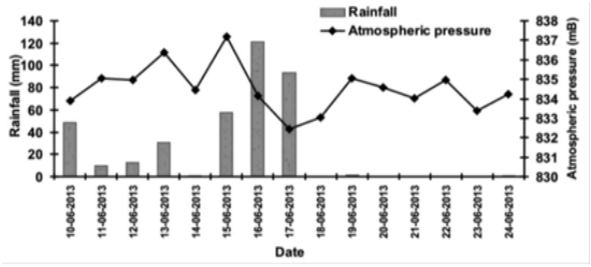

Fig. E Rainfall and atmospheric pressure recorded at Kopardhar observatory near Ghuttu (WIHG), which is approximately 50 km (aerial distance) from Kedarnath

3.2. Change in the environment of Kedarnath between 2009 to 2017:

a) HUMIDITY:-

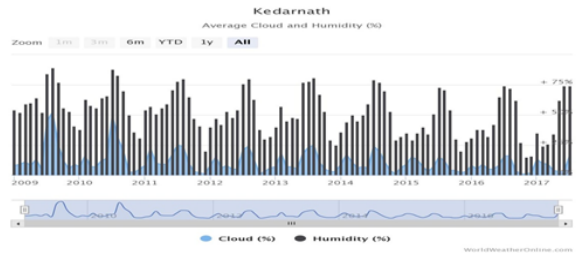

Fig. F Average Clouds and Humidity (%)

b) RAINFALL:-

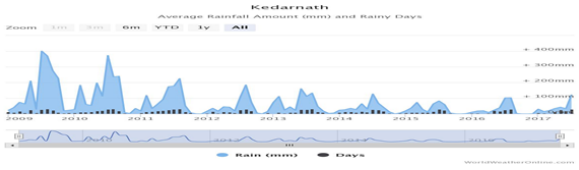

Fig. G Average Rainfall Amount (mm) and Rainy Days

c) TEMPERATURE

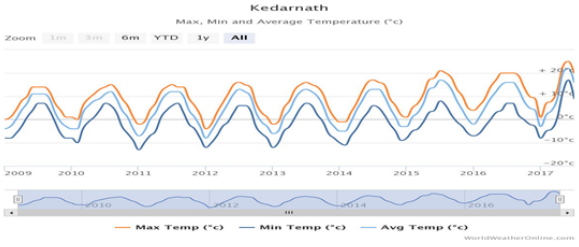

Fig. H Max., min. and average Temperature (°C)

d) WIND SPEED:-

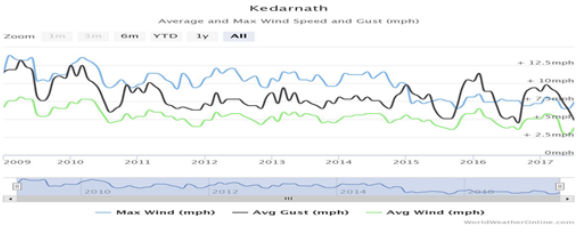

Fig. I Averages & max. Wind speed (mph)

4.0 DISCUSSION: It has been observed that huge rainfall drenched the area and suddenly exceeds the limit on 16th and 17th June which is one of the reasons for commencement of landslides and exploded flood in the region that has caused huge damage to lives and property in the Mandakini valley. According to the USAC report10, eighty per cent of the 14-km route between Gaurikund and Kedarnath has been damaged in the disaster. NASA satellite used high resolution (15m) remote sensing for post satellite imaginaries over the Kedarnath area. The high velocity of fragments due to high gradient slopes from Kedarnath to Rambara and Gaurikund led to colossal damage to infrastructure, lives and property in the downstream which created widespread damage. On the basis of experimental finding the result shown as table no 3 and 4 more variability of water content in the origin point to end of Mandakini that's mean survival of human being as well as animals may affect by water content.

5.0 CONCLUSION: "Procrastination is the foundation of all disasters." Although very little can be done to change the incidence or intensity of most natural phenomena, the society needs to play an important role in ensuring that natural events are not converted into disasters and their impacts are not increased manifold for

anthropogenic reasons. What unfolded in Uttarakhand was a human tragedy of abominable proportion. However, the truth is that the warnings and advisories regarding the impending disaster, issued by IMD, were ignored by the State. The loss of life, property and environment was exacerbated, to a large extent, due to the negligence and apathy of the administrative machinery, inadequate disaster management infrastructure and lackadaisical response of the Uttarakhand government. In contrast, on 8 hus, the key to effective disaster management lies in instituting efficacious vulnerability reduction measures and enhancing the response mechanism. So conclude the study has proven that its variability of water content as this water very nutritive value and other parameter show that all parameter under limit that's why the water of river Mandakini is good and free from impurity which are highly miserable for life for surviving.

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CONFLICT OF INTEREST: author has no conflict .

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