Introduction
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India is a vast country with diverse climate, topography, soil types of land and land use patterns. These diverse conditions with varied combinations pose a variety of hydrological variations in different regions. It is endowed with bountiful water resources which were considered abundant but because of increasing demand of it for various purposes namely irrigation, drinking, fish production and domestic power (Thermal and Hydro) industrial and other uses, its scarcity is becoming apparent which shall get more pronounced with increasing population.

Rivers contains a tiny fraction of the world’s fresh waters rivers and lakes with a total mass of $0.3 \times 10^{20}$g make up only about 0.002%, of total mass of Hydrosphere (Drever, 1982). Yet they are a vital component of the hydrological cycle, amouny transpots $32-37 \text{Km}^3/\text{yr}$ of water to the world’s ocean most of the precipitation falls in a river basin returns directly to the atmosphere by evaporation and plant transpiration. Some water may reach stream channels by overland flow.

Water is the most important natural resource and a prime need for the living being because without water various living mechanical, Bio-chemical and physiological activities can not sustain on this planet. It is estimated that entire hydrosphere contains about 1,460,000 000 cubic kilometer of water, of this 97.3% is in the ocean and island waters and the remaining 2.7% is found in the form of glaciers, icecaps, fresh water lakes, rivers and under ground waters. Mostly the fresh water is used for drinking, bathing, irrigation, navigation and fish production.

Natural waters of all the continents are divided into two groups; ocean, seas and in land waters. The inland waters are of two categories, one is lentic
and another is lotic, whereas ocean and seas form the greatest coherent volume of water to be found on the surface of the earth. They cover 70.84% of the 510 million Km² of surface area of our planet. Their depth exceeds, in more than the inland water. On the surface of the continents water appears in a more scattered from, covering 2.5 million km² of its territory. From this the area of fresh water amounts to 2 million Km². The volume of fresh water is smaller than that of seas and oceans. It amounts to barely 0.4% of the surface area of earth and to approx 1% of the area of the continents. Besides, their vast extent and volume of sea water can be characterized having a mean 3.5% dissolved solid content of which 2.73% is salt (NaCl). Whereas in the total fresh water the suspended solids are less and the presence of NaCl is almost absent.

World wide there are approximately 214 rivers flowing through more than one country. There are some rivers in south Asia that flow through India, Bangladesh and Pakistan. As the eastern and north eastern parts of India and Bangladesh are situated on the Ganga, Brahmaputra and Meghna basin system.

At present most of the rivers of the world are polluted due to sewage, domestic waste, industrial effluents and agriculture runoff containing substance varying in characteristics from simple nutrients to highly toxic substances due to which aquatic ecosystems are disturbed. The availability of clean water is going to become the greatest constraint for future development. Water pollution prudence approaches a critical point beyond which nature will be at an almost failure to repair the damage.

Most of the Indian rivers and fresh water streams are variably polluted. The river Damodar is the most polluted river. River coorum, river Ganga and river Yamuna are also highly polluted. In Ganga 27 cities contribute 902 million litres of waste water each day.
Many factors influence the composites of river water, causing variation from place to place. Rain is one of the source of chemical inputs to rivers and a stream flowing through a region of relatively insoluble rocks which can be chemically very similar to rain water and its composition. The dissolve load of a river represent chemical process in the chatchment areas while the sediment local reflect the physical processes of weathering and erosion. Inspite of extensive data available, so for the relationship between chemical and physical process in a river is not well under stood (walling 1992).

*It is the very substance of the people which is carried away here drop by drop there in floods, by the wretched vomiting of our sewers in to the rivers, and the gigantic collection of our rivers in to the ocean....*

*From this two results: The land impoverished and the water infected.*

Victo Hugo (1802-85)

Hugo’s ideas about sewage as a resource express the concerns of his time. The concept of turning sewage is a waste into resources is further highlighted in two of the commone’s law of ecology. (Commoner, 1971), “Every thing must go” and “Nature’s way is the best.” Nature’s way of disposing sewage is by recycling it to the land to keep unbroken, the cycles of elements upon which all life depends, the carbon cycle, the nitrogen cycle, the potassium and phosphorus cycles.

The average excretion per adult per day of ammonical nitrogen in the form of urea is about 0.5 OZ’ and this will be present in the sewage discharge as nitrate or ammonia depending on the effects of any biological treatment given. It was therefore seen that the passage of the river near a large population center, where parts of the river may be used at least once, will considerably the miniral content of the river water. [TEBBUTT, 1965], The use of fertilizers can in these circumstances produce an increase in the nitrogen content of the river water which can play an important part
inproviding nutrient for planktonic growth. This effect will need to be considered for the maintenance of flow is proposed.

Pollution of rivers may take place as a result of natural causes. This kind of pollution is generally inter mittent and being often connected with adverse weather conditions. Thus it may consist of runoff from land carring silt, vegetable matter, manure etc. washed into the during a storm. The extent and character of such pollution depend on the chemical and physical characteristics of the river bed catchment area and on the type of vegetation presentation. Rivers become polluted by various causes one of then is the result of the activities of man, so that it becomes less suitable for all the purposes, which it would be suitable in its natural state (KEY 1956).

Common law is concerned with any change in the natural state of the water by pollution and atleast, may prohibit the discharge of any matter that changes the waters' natural state.

Pollution of river is also concerned with the effects of effluents containing matter in suspension. This may vary widely in particle size & may be organic or inorganic. Oxidizable organic matter which through the activity of microorganisms reduce the dissolved oxygen content of the river water due to B.O.D. required by bacteria. The river has the quality of self purification due to its flowing which receives atmospheric oxygen. In a healthy river adequate reserves of oxygen to carry out the work of biochemical oxygedation is available. If this is not so anaerobic-break down of organic matter will occur accompanying with evil smelling products and a profound affect on the aquatic biota organism present.

The effect of sludge deposit in relatively shallow rivers is shown to be of considerable importance (Owens and Edward 1963).
The pollution is also in the form of concerned substances which interfere directly with the biological balance of the organism in the river. As toxic substances often present in industrial effluents may exert directly inhibitory influences on fish and fish food, and up set the ecological balance of the river.

The number of types of toxic substances which may be present in industrial wastes is very great and the degree to which these substances are reduced by sewage treatment processes is affected by the extent to which they are removed by sedimentation or by biological oxidation. The abstractor of river water for domestic or industrial supplies will normally employ sedimentation for removal of suspended solids as an initial stage of treatment. Abnormally, high concentration of suspended solids in the river water will lead to increased consumption of coagulating chemicals, and the production of increased quantities of sludge for disposal. The standards applied contained terms limiting. The suspended solids and B.O.D. of the wastes to less than the normal Royal Commission Standard.

The treatment and purification of sewage so as to render it fit for admission to a river, without causing pollution or sewage generally contains a fair amount of ‘infiltration water’ eg. Ground water that has leaked though the sewer joints and trade wastes may also be present.

It can how ever, be stated here that in the absence of large proportions in hibitory trade wastes the technical problems involved in the treatment of sewage have now been virtually overcome and by using one or more biological methods it is possible to produce an effluent of a high degree of purity.

Various pathogenic bacteria are known to occur in the water at the points of sewage disposal (Tiwari et al. 1991). Bacteria are present in crude sewage in very great numbers amounting to millions per ml. Although
treatment of the sewage results in a reduction of the number of organism by one or two orders of magnitude the number in the fully treated effluent is still very great most sewage bacteria are harmless saprophytic type but pathogens are also be present in smaller numbers. These organisms (E.Coli, etc.) cause typhoid and para typhoid fevers, dysentery and cholera.

Before World War II the most important pesticides and herbicides were arsenic compounds, copper compounds and such naturally occurring organic materials as 'Pyrethrum' rotenone and nicotine.

Since then, a large number of synthetic organic compounds have been developed which have tended to replace the older chemicals and are finding increasing and extensive application for agricultural and other purposes. Unfortunately, some of these compounds are extremely toxic to birds, mammals and fish as well as their wide spread and uncontrolled used as pesticides and weed killers cause pollution of rivers and fish mortality, especially after rain. These substances are toxic to man in varying degrees, and their possible presence in sources of drinking water needs to be care fully watched.

In a survey of fish moralities conducted by the U.S. Public Health Service in a 31-states are during June to October, 1960 agricultural pesticides accounted for the largest number of fish killed. Reference to the risks related to the agricultural uses of weed killers is made in an annual report of the Nene River Board mentioned fish mortality caused in this way. It is, therefore, of great importance that toxic chemicals should be used with the utmost care and stored well away from streams.

Some of these insecticides (especially DD T and BHC) are occasionally used at a sewage disposal works to control flies masquitoses associated with
biological filters. The amounts used are probably too small to affect fish in the stream receiving the sewage effluent but it needs careful watching.

The extent to which contamination of river water may occur will depend on several factors. One of the most important of these is the extent to which the chemicals are retained in the soil by absorption. The danger of pollution of rivers by these substances is naturally greater than in ground water where opportunities for protection by absorption and biodegradation in the soil are enhanced.

There are many other miscellaneous discharges, occasional or continuous, which may have a bad effect on the quality of river water or may make it difficult or even impossible for fish and other river life to establish themselves or even to exist at all.

Examples of such pollution's are solid pollution, oil pollution, drainage from various tips drainage, seepage from Pits, drainage forms and manured land, surface and road drainage, sludge from mili dams boiler blow off water, pollution resulting from sheep dipping and watering cattle in streams etc.

In order to make the information from many source readily accessible the Water Pollution Research Laboratory in tends to make available on request a life of substance on which information may be obtained from the laboratory concerning toxicity and biodegradability (Ministry Technology 1966)

Water pollution brings about undesirable changes in the water so, it is very essential to examine scientifically the water quality, which is recently is being done by physico-chemical and biological analysis of the water along with bacteriological study, Besides these factors. Further the meteorological conditions. Atmospheric temperature, relative humidity, Rain falls photoperiod also play and important role on physico-chemical factors of the water.
As regards this, the physical factors are: water temperature, turbidity, colour, water current.

Besides, the changes in the water are mainly due to the chemical factors which are studied namely: pH, Turbidity, Total Alkalinity, Total Hardness, CO₂, Chloride Dissolved oxygen (D.O.), Chemical Oxygen Demand (C.O.D.), Biochemical Oxygen Demand (B.O.D), Ammonical Nitrogen (NH₄-N), Nitrite Nitrogen (NO₂-N), Nitrate Nitrogen (NO₃-N), Phosphate, Sulphate, Sodium, Potassium, Fluoride.

The presence and development of the biota in the water depend upon the physico-chemical nature of the water. The biota mainly were studied are phyto-zooplankton and fishes, besides bacteria i.e. Total caliform, E.Coli. India has emerged as the second largest producing country in the world in fresh water culture.

The rivers are the great resources of fish production. Fishes form the major of valuable consumable material. Which are taken from water. Fishes have the great economic value and are the rich proterous food.

The blue revolution brought about increase in the fish production. This blue revolution has in many ways retrested the step of the 'Green Revolution' in agriculture.

In the past civilizations made an effort by projecting green revolution as their mission to save human at large. The reality is that it is the blue revolution the management of water resources that can steer the population to achieve food security.

In the above concern the rivers Betwa is studied and the detailed description is given in discussion.
Betwa is a hilly river. This river arises from Satpura hills of vindhya ranges, district Raisen (M.P.) near Barkhera village south west of Bhopal. It flows in eastern part of the Malava Platue, Vidisha, Guna, Shivpuri (M.P.) and enters Jhansi, Jalaun, Hamirpur districts (U.P.). The elevation of the river is about 576 meters above mean sea level.

This is an interstate river between the two states Viz-M.P. and U.P. It flows in a north easterly direction through Madhya Pradesh and enters in to Uttar Pradesh near village Bangwan of Jhansi district. The total stretch of the river from its origin to its confluence with Yamuna is about 590 Km. About of which 232 Km. lies in Madhya Pradesh and the rest 358 Km. in Uttar Pradesh. At an elevation of about 106 meter. The Betwa basin lies between the latitudes of 22°54'1N and 26°00' N and the longitudes of 77°10'1E and 80°20'1E.

The basin includes parts of a number of districts of Bundelkhand region Viz-Sagar, Tikamgarh, Chhatarpur, (M.P.) and Lalitpur, Jhansi, Jalaun and Hamirpur (U.P.). The catchment area of the river basin is 43895 Km² of which 30217 Km² is in M.P. and rest 13678 Km² in U.P.

It covers the area of Bundelkhand uplands, the Malva platue and the Vindhyan scrap lands in the districts of Tikamgarh, Sagar, Vidisha, Raisen, Bhopal, Guna, Shivpuri, Chhatarpur of M.P. and Hamirpur, Jalaun, Jhansi districts of U.P.

During its course from the source up to the confluence with the Yamuna, the river is joined by a number of tributaries, the important among them are Dhasan, Jamini, Bina, Berma on its right bank whereas on its left bank are Kaithan, Kaliastoe, Narain. Out of the above tributaries two tributaries-Jamini and Dhasan are very large and important.

Jamini river is an important tributary of Betwa, which enters Lalitpur district through the forest near Madanpur village and flow's north word for 45
Km leaving the town of Mahroni on its right. It then takes north easterly bend and after 6 Km furthers comes to form the boundary of the district for about 60 Km. It comes very close to Betwa just before it finally leaves the district. Jamini has been dammed in lalitpur.

Another large tributary of Betwa is Dhasan river. This river touches Lalitpur district at the south eastern tip and flows about 38 Km before it re-enters the neighboring district of Tikamgarh. There is a small stream named Rohini, a sub-tributary of river Dhasan, which flows in the north east direction across the Mahroni Tehsil in the south west corner of the district. Rahini has a dam for irrigation.

Besides, there are some important reservoirs also on river Betwa Viz- Pariechha, Matatial, Dhukwan and Rajghat. Parichha is situated about 21 Km north east of Jhansi on river Betwa. Its weir provides irrigation and power generation in Jhansi, Jalaun and Hamirpur districts (U.P.) through 30.2 Km main canal and 2625 Km distribution system. The CCA is 0.43 M Ha and annual irrigation is 0.23 M Ha.

Matatila dam is located in Lalitpur district but does not provide any irrigation to Lalitpur district. The dam was constructed in 1957 for irrigation but Matatila power house with three machines of 10.2 MW each on the existing. Dam has been commissioned in 1965. Matatila dam provides 16.36 McM water for drinking purpose also benefited districts are Jhansi, Jalaun, Hamirpur (U.P.) and Gwalior (M.P.)

Dhukwan weir on river Betwa serves to enhance the irrigation capacity of Betwa canals. Rajghat dam project is an interstate project of the M.P. and U.P. being constructed on river Betwa about 22 Km. from Lalitpur city.

The physiography of the Betwa river stretch under study is that it flows in Hamirpur district starts from pothia village up to confluence with Yamuna
near Murapur-Bhilawan villages which covers 22 Km distance. The
topographical study of this stretch is done having in veiw, locations of the
villages, city, Nala discharges, Bathing, washing ghats and confluence with
Yamuna at the sides of the basin along with the nature of the basin.

The survey of the river was made and finally five stations were selected
at town and village section.

These stations were selected in such a way which may reflect the entire
study of this stretch of the river by physico-chemical and biological analysis of
this river water.

**River Management**

The optional use of water is concerned, there is very great scope for
putting to use in irrigation potential that has created in the major and medium
sectors but this has not yet been utilized.

From the long rang point of veiw, it is clear that we have no option but
to economise, to the maximum extent possible, in the use of water not only in
irrigation but also in the industrial, domestic sectors and fish productivity.

For this, the management of the river is very important to make the river
for its optimum use by making it pollution free as well as its conservation.

A River Board has the power under *section 3* of the rivers (Prevention of
Pollution) *Act 1951*, to apply to the country court for an order prohibiting the
use of land for any kind of tipping which causes or is likely of cause pollution
of a stream.

The water resources *Act, 1963* requires rivers authorities to fix
Minimum Acceptable Flows (MAF) for the rivers within their areas having
regard to the need for safe guarding fisheries, amongst other things. There
have been various suggestions put for word on the amount of water required to
safe guard the interests of the fisheries. These may be satisfactory for rivers
containing non migratory species.

The discharge limits of inland surface water, Public sever and on land
for irrigation water are to be maintained in this river as for the standards given
in EPA 1986, which will be mentioned in detailed in discussion. This
mechanism will be very useful to make the river pollution free.

Further the conservation of this river is also very important which may
be done by doing storage of water in surface reservoirs. Moderating flows as
well as droughts and enhancing lean season flows in rivers. It must therefore
be perceived as a major instrument for improved water conservation and
management and it would be entirely appropriate for The Ministry of Water
Resources to make a financial assistance it for the priority treatment of the cat
chments of flood prone rivers as well as of resurvoises.

Purpose of the study is to make a comparative statement of the quantum
and nature of pollution in river Betwa by estimating the physico-chemical and
biological factors of the assessment of fish productivity as well as for the
suitable use of this water for human beings.

Aim of the study

Thus our investigations were made to assess the quality of this river
water and the effect of city sewage and municipal wastes.

In the present study on attempt has been made to know the physico-
chemical and biological aspects of the river water an effect of the domestic and
city sewage as well as municipal wastes on the ecology of the river Betwa in
Hamirpur districts.
The brief study points are as follows:

1. To study the physico-chemical parameters of river water.

2. To study the biological and Most Probable Number (MPN) of bacteria in river water.

3. To study how for the water of Betwa river in Hamirpur district is suitable for drinking purposes.

4. To study for the management of the river.

5. To study for the maximum fish production in Betwa.

KEN BETWA LINK PROJECT

Recently the Rivers Link Yojana has been passed by the central government under this Ken-Betwa link canal project is also is approved. As Ken is to be joined with Betwa and further the major canals are to be made which will drain water for irrigation besides dam is also proposed. But this proposal is being objected by different sectors like social workers as well as some environmentalists because it has some drawbacks such as the ecology of the Ken at Banda will be disturbed whereas the volume of water in river Betwa will increase which may affect Hamirpur district due to floods and some farmers will also be badly affected due to their agricultural lands which will be acquired at large scale. As in bundelkhand region there is no other source of livili hood. Further they have to be rehabilitated. Though the above project has some advantages by providing irrigation facilities.

Now this project for the time being has been postponed.
Therefore all the aspects for the said project should be considered very particularly. For this a committee should be constituted including environmentalists. Who will take care the ecology of river Ken along with the problems of the rehabilitation. As the river Betwa already contains sufficient water, but the river Ken is already facing water scare city in Banda district.

Having in view the above problem it will be better that the minor canals may be formed from Betwa to fulfil the need of irrigation. So that the ecology of the river Ken might not disturbed.