Study & Planning of Inter-Linking Rivers in Bundelkhand (U.P.)

SANJIV MISRA[1], DR. SYED AQEEL AHMAD[2], ANWAR AHMAD[3], MD. SAJID[4]
[1]*M. Tech Student, Integral University, Lucknow*
[4]*HOD (Department of civil engineering), Integral University, Lucknow*
[2]*Associate Professor, Integral University, Lucknow*
[3]*Asst. Professor, Integral University, Lucknow*

Abstract*— The paper explores the authentic background of gathering of the Ken- Betwa rivers interlinking project in Uttar Pradesh, its current status, and future repercussions and presents an assess of the ongoing conversations that assistance or question its reasonableness. A brief discussion on the Uttar Pradesh examples of water resources the chiefs in setting to the progression of gigantic water projects, especially for the climb and fall in tremendous water projects is moreover presented. Finally, a lot of procedure choices have been proposed that meet the targets of the interlinking waterway project while restricting the social and natural impacts recognized in this paper. Primary goal of this paper is study and examination of different exploration paper in view of between connecting stream task and execute the idea of between connecting waterway in Uttar Pradesh. Study and examination that impact of interlinking river project in Bundelkhand in U.P. what's more, how to full fill the necessity of sufficient water prerequisite. Feasibility Study of Proposed Interlinking among Ken and Betwa Rivers. Instructions to work on agrarian area during to dry season and flood.

Indexed Terms-- Water resources, inter – linking rivers, Ken-Betwa River, water transfer

I. INTRODUCTION

The extraordinary spatial and transient assortments in precipitation plans have phenomenally impacted water resources organizing, the chiefs, and improvement in India. Specifically, these models have incited the improvement of a couple of water move projects in the country. The Inter-Linking of Rivers (ILR) project is an awesome representation of such a water move project. In this paper, we will discuss huge backings and challenges to the execution of the ILR project and analyze potential elective game plan ideas for water resources the chiefs and orchestrating in India.

Commonplace water move is an undertaking to redistribute water from "overabundance" to "deficiency" zones with in India. The ILR project in India envisions interfacing 37 streams of 20 critical dishes in the country through 31 associations and channels. The endeavor has been raised as a solution for the 'secret of floods and dry season' in India and will similarly give water to water framework and power age.

Regardless, a couple of issues have been raised and chitchatted in view of particular common sense, normal, social, moral, institutional, money related, and political models, which question the extremely thinking, appropriateness and dynamic course of the assignment. These concerns make it hard to conclude when water move can be upheld as alluring.

This paper researches the verifiable background of gathering of the ILR project in Uttar Pradesh, its current status, and future implications and presents an assess of the ebb and flow conversations that assistance or question its common sense. A compact discussion on the Uttar Pradesh examples of water resources the leaders in setting to the progression of gigantic water projects, especially for the climb and fall in huge water projects is moreover presented. Finally, a lot of methodology choices have been proposed that meet the goals of the ILR project while restricting the social and natural impacts recognized in this paper.

The Indian Rivers Inter-point of interaction is a proposed gigantic degree primary planning undertaking that expects to effectively manage water resources in India by associating Indian streams by an association of provisions and channels to further develop water framework and groundwater recharge, diminish driving forward floods in specific parts and water lacks in various bits of India. India addresses 18% of the absolute people and around 4% of the world's water resources. One of the solutions for tackle the country's water difficulties is to associate streams and lakes.

The Inter-interface project has been separated into three segments: a northern Himalayan streams between associate section, a southern Peninsular part and starting 2005, an intrastate streams interfacing part. The errand is being directed by India's National Water Development Agency Ministry of Jal Shakti. NWDA has thought of and organized gives an account of 14 between associate tasks for Himalayan section, 16 between interface projects for Peninsular part and 37 intrastate stream associating projects.

The typical precipitation in India is around 4,000 billion cubic meters, but most of India's precipitation comes more than a 4-month time span - June through September. Moreover, the storm across the incredibly colossal nation isn't uniform, the east and north gets most of the deluge, while the west and south get less. India in like manner sees extended lengths of excess rainstorm and floods, followed by not great or late tempests with dry seasons. This land and time variance in availability of standard water versus the entire year interest for water framework, drinking and present day water prods an interest supply opening, that has been disintegrating with India's rising people.

Safeguards of the streams between interfacing projects ensure the answers for India's water issue is to apportion the ample rainstorm water overflow, store it in provisions, and pass this water using streams between associating undertaking on to locales and over events when water ends up being meager. Past water security, the endeavor is moreover seen to offer probably benefits to move establishment through course, hydro power similarly as to broadening pay sources in natural areas through fish developing. Foes are stressed over eminent normal, organic, social evacuation influences similarly as dark risks related with fiddling with nature. Others are concerned that a couple of adventures make overall impact and the honors of nations, for instance, Bangladesh ought to be respected and organized.

1. The need :

(a) Dry spell, floods and lack of drinking water

India gets around 4,000 cubic kilometers of deluge consistently, or around 1 million gallons of new water per individual reliably. Regardless, the precipitation plan in India changes definitely across distance and over plan months. A huge piece of the precipitation in India, around 85%, is gotten during pre-summer seemingly forever through storms in the Himalayan catchments of the Ganges-Brahmaputra-Meghna (GBM) bowl. The northeastern area of the country gets significant precipitation, in assessment with the northwestern, western and southern parts. The weakness of start date of tempests, a portion of the time put aside by postponed dry spells and changes in incidental and yearly precipitation is a significant issue for the country. The nation sees examples of drought years and flood years, with colossal bits of west and south experiencing more deficiencies and gigantic assortments, achieving huge trouble particularly the most un-lucky farmers and common masses. Nonappearance of water framework water commonly prompts crop disillusionments and farmer suicides. Disregarding abundant deluges during July-September, a couple of locale in various seasons see lacks of drinking water. A couple of years, the issue momentarily ends up being an unreasonable measure of precipitation, and significant length of obliteration from floods. This overflow lack nearby uniqueness and flood-drought cycles have made the necessity for water resources the chiefs. Streams between associating is one recommendation to address that need.

(b) Populace and food security

People extension in India is the other driver of need for stream between associating. India's general population improvement rate has been falling, yet continues to grow by around 10 to 15 million people reliably. The ensuing interest for food ought to be content with additional huge returns and better collect security, the two of which require adequate water arrangement of around 140 million hectares of land. As of now,

basically a little piece of that land is immersed, and most water framework relies upon storm. Stream between associating is pronounced to be an expected strategy for ensured and better water framework for extra farmers, and appropriately better food security for a creating people. In a tropical country like India with high evapotranspiration, food security can be achieved with water security which in this manner is achieved with energy security to siphon water to uplands from water flood lower rise stream face up to the sea level.

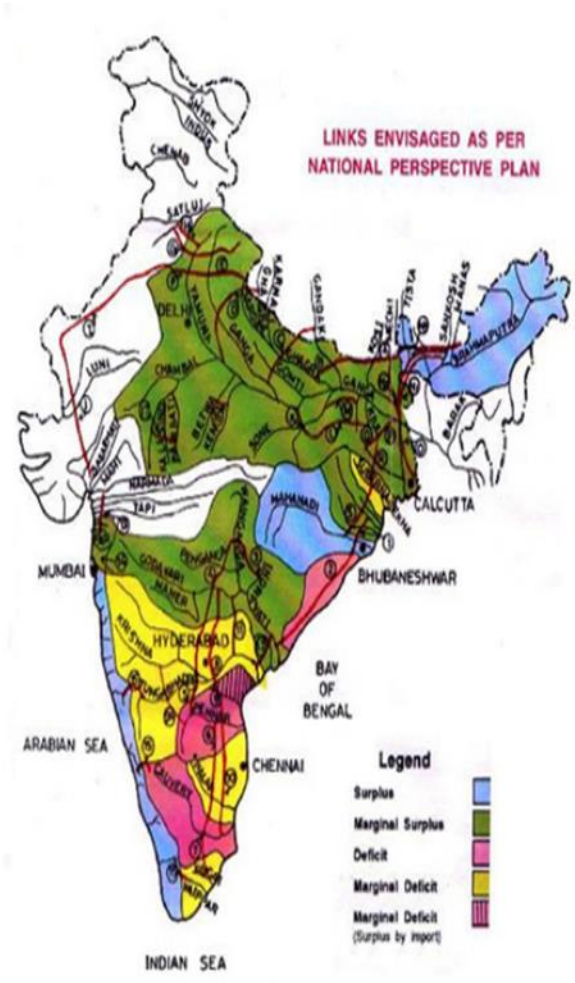

Fig.1 Interlinking River in India
(Sources: researchgate.net)

(c) Salt product needs

Exactly when satisfactory salt item isn't happening from a stream bowl to the sea attempting to saddle the stream water totally, it prompts stream bowl end, and the open water in downstream space of the stream bowl closer to the sea becomes saline and moreover dissolvable water. Land immersed with saline or stomach settling agent water dynamically goes in to saline or solvent base soils. The water penetration in solvent base soils is incredibly powerless inciting waterlogging issues. Augmentation of acid neutralizer soils would oblige the farmers to foster rice or grasses similarly as the soil productivity is poor with various yields and tree homes. Cotton is the inclined toward yield in saline soils diverged from various harvests. Interlinking water flood streams with water lack streams is expected for the long reasonable helpfulness of the stream bowls and for lightening the anthropogenic effects on the streams by allowing agreeable salt product to the sea as normal streams.

Route India needs starting point for collaborations and advancement of freight. Using related streams as course is a cleaner, low carbon impression sort of transport system, particularly for minerals and food grains.

(d) Momentum stores and misfortune in groundwater level

India at present stores only 30 days of precipitation, while made nations intentionally store 900 days worth of water interest in dry areas stream bowls and supplies. India's dam storehouses store only 200 cubic meters for every person. India in like manner relies extremely upon groundwater, which addresses over half of immersed locale with 20 million chamber wells presented. Around 15% of India's food is being conveyed using rapidly depleting groundwater. The finish of the period of tremendous augmentation in groundwater use will demand more critical reliance on surface water supply systems. Backers of the endeavor suggest India's water situation is currently essential, and it needs legitimate development and the leading group of surface water and groundwater use. A couple of backers feel that India isn't running out of water yet water is running out of India.

1.2 (a) Advantages of Interlinking River Project:

- This adventure can deal with the issue of dry season and flood considering the way that at the time of shortage the stream which causes flood can give water to the space of the stream which has an absence of water because the water can be taken

care of or water can be moved from water flood district to the setback. Ganga and the Brahmaputra region can discard floods that come every year with the help of this errand.

- The water framework, land will in like manner increase by around 15%.
- 15,000 km of stream and 10,000 km of course will be made. Along these lines diminishing the transportation cost.
- Enormous scope afforestation and around 3,000 spots of interest will be created.
- This adventure will handle the issues of drinking water and financially furthermore will resolve the issue.
- Landing positions for landless farmers in country regions is furthermore possible.

(b) Disadvantages of Interlinking River Project:

- There may be benefits similarly as bothers of the endeavor. Streams are being seen as an essential piece of our life from the beginning.
- Any kind of human mediation can turn out to be ruinous.
- For the completing of the Interlinking River project, numerous gigantic dams, streams, and archives ought to be assembled on account of which the enveloping region will become moist and will not be sensible for agriculture.
- This can similarly reduce the formation of food grains.
- Where or in what district to bring such a ton of water, which channel is to be moved, it is mandatory to sufficiently study and exploration it.
- The cost of this endeavor in 2001 was Rs 5,60,000 crore at this point truth be told, there is conceivable that it will be more.

Our study area is feasible analysis of Ken Betwa interlinking project, how to improve the shortage of water and how to grow agricultural sector in Bundelkhand region. So we are introduce the Ken Betwa Interlinking Project .

1.3 Ken Betwa Interlinking project :

To address the water lack issues influencing many pieces of the country, the focal government has concocted an aggressive venture for the interlinking of waterways. The Ken-Betwa interface project, visualized under the National Perspective Plan (NPP), will be one of the primary waterway interlinking activities to be executed in India. This venture means to give yearly water system to around 10 lakh hectares, help drinking water supply and produce hydropower of 103 MW in the Bundelkhand area spread across the provinces of Madhya Pradesh and Uttar Pradesh.

In the Union Budget 2022-23 introduced on February 1, 2022, finance serve Nirmala Sitharaman reported an immense spending plan assignment of Rs 44,605 crore for this aggressive waterway interlinking venture. This move will give a major push to this forthcoming framework project that is supposed to offer water system advantages to around 9 lakh hectares of farmland, alongside drinking water to 62 lakh individuals, 103 MW of hydropower and 27 MW of sun oriented power generation. In March 2021, the state legislatures of Uttar Pradesh and Madhya Pradesh marked a notice of figuring out (MoU) with the Jal Shakti Ministry, for executing the undertaking. On December 8, 2021, the Cabinet endorsed the subsidizing and execution of Ken Betwa stream connecting project that will be created at an expected expense of Rs 44,605 crore. The Cabinet likewise gave gesture to focal help of Rs 39,317 crore for the undertaking, including award of Rs 36,290 crore and credit of Rs 3,027 crore.

The Ken-Betwa connect project (KBLP) is the main waterway interlinking undertaking, among the 16 comparable tasks arranged under the Peninsular Rivers Development of the NPP. It will interface the feeders of the Yamuna River, specifically the Ken waterway in the Panna area of Madhya Pradesh and the Betwa stream in Uttar Pradesh.

The primary target of the NPP is the exchange of water from waterway bowls with excess water to those with scant water, for handling the issue of water shortage. The NPP includes two parts - the Himalayan Rivers Development and Peninsular Rivers Development.

The Ken Betwa waterway connecting project, the development plan for which has been anticipated eight years, will be executed in two stages:

- Stage I: In the principal stage, the Daudhan dam complex and its appurtenances, for example, low-

level passage, undeniable level passage, 221-kilometer Ken-Betwa connect channel and forces to be reckoned with will be finished.

- Stage II: In the second phase,the improvement works under the Ken betwa interface task will be begun for the lower Orr dam, Bina complex undertaking and Kotha flood.

1.4 Ken Betwa waterway connecting project course of events:

- August 1980: The NPP is planned.
- August 2005: MoU endorsed by state legislatures of MP, UP and the focal government, for readiness of the DPR for the task.
- April 2010: The National Water Development Agency (NWDA) finishes the DPR for stage I of the KBLP.
- January 2014: The NWDA finishes the DPR for stage II of the undertaking.
- September 2014: Special Committee on interlinking of streams (ILR) comprised, for carrying out the ILR program.
- April 2015: A team for interlinking of waterways was comprised by MoWR, River Development and Ganga Rejuvenation.
- Walk 2021: Governments of UP and MP sign a MoU with the Jal Shakti Ministry for executing the Ken betwa waterway connecting project.
- February 2022: Government declares spending plan assignment of Rs 44,605 crore for the venture during the Union Budget 2022-23.

The undertaking will be finished at an expected expense of around Rs 44,605 crores. The Ken-Betwa Link Project Authority, a specific reason vehicle (SPV) for carrying out the task will be framed and the focal government will bear 90% of the absolute undertaking cost, while the rest will be borne by the states.

1.5 Ken Betwa stream connecting project:

Benefits and effect

The public authority imagines the program of interlinking of streams as a first concern, towards economical improvement of water assets in India. The Ken Betwa interface project has been arranged as a multi-reason project, for giving a few advantages concerning better use of water assets and tending to the water shortage in a few pieces of the Bundelkhand district.

The district is inclined to repeating dry spell conditions that have influenced financial improvement nearby. Also, attributable to the hard rock and minor alluvium landscape, the area isn't rich in groundwater. Consequently, the task will help in using the floodwater during storm and balance out the accessibility of water during lean months, particularly in dry spell years.

The undertaking connecting Ken and Betwa waterway will likewise give yearly water system and hydropower age. The locale that will profit from the Ken betwa connect pariyojna incorporate Chhatarpur, Tikamgarh, Sagar, Damoh, Datia, Vidisha, Shivpuri, Raisen and Panna in Madhya Pradesh and Jhansi, Mahoba, Banda and Lalitpur in Uttar Pradesh. Upwards of 62 lakh individuals in the Bundelkhand district will likewise encounter further developed drinking water supply because of the undertaking.

II. LITERATURE REVIEW

Claudia W. Sadoff, et al. (2002) perceiving and understanding the extent of routinely between related benefits got from the pleasant organization and improvement of worldwide streams is central both to better organization of the world's waterway between connecting, and to relations among the nations sharing those waterway between connecting.

R. E. Tharme (2003) addresses just the previous subject in any detail data on the quantities of utilizations per technique is by and by deficient for most of nations. An exemption is North America, for which Reiser et al. (1989a) detailed the most usually applied EFMs, in light of the consequences of two non-measurable studies by the American Fisheries Society during the 1980s, and Armor and Taylor (1991) introduced an assessment of the situation with the instream stream steady approach (IFIM), as the most normally applied EFM. Information for the investigation of worldwide patterns in waterway EFMs were gotten from the fundamental discoveries

of a global audit of accessible data, from the beginning of the field of EFAs to February 2002.

The ebb and flow assessment relies upon existing data of the open water resource, geohydrology, people projection and region clever water necessities in critical dishes of the country. As per creator is how to headway of water resources by intra and bury bowl move in the stages agreeing the general population.

Kelly D. Rear entryway (2004) examination of the concealment of information and the political and legal plans that give elite dynamic control to government authorities and their nearest logical and proficient partners shortens the creation of a reasonable epistemic local area, one where an assortment of country specialists banter logical information and expert ideas, values, and plans prior to arranging and executing public tasks.

Kelli Krueger et al. (2007) gives an interdisciplinary obligation to the discussion on the reachability of this water the chiefs plan. It is believed that pioneers, NGOs, and various accomplices will use the information gave in this report to encourage a savvy and trustworthy methodology for water the leading body of the space through extra critical assessment.

Jeroen Warner, Philippus Wester and Alex Bolding (2008) presumes that the outline of stream bowl limits, the organizing of partner portrayal, and the production of institutional game plans for waterway bowl the executives are political cycles that spin around issues of decision, and thus require majority rule banter. The attention on rules, standards and methodology anyway doesn't enlighten us much regarding human office — who makes and carries out these guidelines, standards and systems? We are inclined toward the accompanying meaning of a water the board system, suggestive of Lasswell's (1936) meaning of governmental issues, as it features decision.

R. Sani, B. K. Gupta, U. K. Sarkar, A. Pandey, V. K. Dubey and W. Singh Lakra (2010) was to evaluate the LWRs of these two unstudied streams for fisheries the board. Creator discernment has significance for assurance and the board as one of the streams (the Betwa) has been upheld under India's most memorable interlinking course of action, and considering the way that up until recently no length-weight data for the Gomti waterway has been represented. All data were log-changed and the subsequent least squares direct backslides (Zar, 1984) performed by Graph cushion Prism 5, with the heap as the dependent variable after the eminent length-weight relationship Log W = Log a + b Log L (Beckman, 1948).

S.K. Mazumder (2011) wishes to look at the different advantages and awful signs of the NWDA plot as pointed out by the two going against bundles followed by the various difficulties in its execution.[9] Suggestion of the NCIWRD and the maker's own examinations concerning the execution of the proposed public water system are given close to the end.

B. Surya Prakasa Rao, N. Srinivas, N. Bhaskara Rao, S. V. J. S. S. Rajesh and P. Pernaidu (2012) examination of land and biological issues of the proposed associate channel (In champalli to Nagarjunasagar) of Godavari to Krishna Rivers taking on remote recognizing and geographical information system (GIS). The audit revealed that 23 towns are to be reestablished while executing the channel and around 816 towns would benefit from it through drinking water/groundwater despite crop necessities.

The method for the audit involves four standard advances. In the underlying advance, modernized GIS data base were created on different effective aides like surface lineaments, squander, point data, geography, geomorphology and soils. The second, third and fourth steps incorporate GIS compromise of a couple of educational assortments, ultimately, they draw out the normal impact in the audit district .

W. S. Lakra , et al. (2011) drive to status, issues, conceivable outcomes and ideas on maritime conditions and freshwater fish assortment of stream bury interfacing in India. The creator is highlighted explaining and mixing the long game plan and its ideas, making measure data base, need of fitting advancement, work and related issues especially with respect to riverine maritime natural framework and conservation of fish biodiversity.

S. K. Sharma (2012) make sense of that the proposed Indian Interlinking of Rivers acknowledges unprecedented importance so the overabundance water from flood slanted snow dealt with surges of northern India , be diverted to water deficit districts of principally southern, western and central India.[12]Administration of India has an incredibly determined game plan for a Sustainable Floodplain Management through interfacing critical flood slanted streams of north with the dry season slanted surges of south India for achieving a Socioeconomic Sustainability in the country.

Kiran K. Singh (2012) a feasibility examination of redesigning of geology through interlinking of waterway.[13] This creator Express the sense about the feasibility and practicability of such endeavor by researching its geological and social results. It proposes measures to direct and increment water resources that are less hurting to the environment.

Dharmendra Mehta, Naveen K. Mehta (2013) to understand the true underpinning of Interlinking River Projects and to discuss issues and troubles connecting with Interlinking River Projects.This was an audit driven in view of assistant data available from various sources close by composing overview. Recorded as a hard copy study, research information from 1986 to 2008 was assembled and thought of. The discretionary data was assembled from magazines, books, web, industry journals, etc Writing review has shown before assessment work done around here. Gigantic wellsprings of information were found in the point concerning interlinking streams projects. The impact on the environment has been analyzed.

Mary C. George, Prakash D. Korgaonkar and K. Geetha (2014) the possibility of between bowl move of water, related issues and stresses of interlinking of waterways, monetary and organic benefits inciting sensible improvement of region similarly as disagreeable impacts due to between bowl water transfer. Author inspected about The solution for executing the Interlinking waterway project is centralization of the general large number of streams and to shape a National authority including capacity from various fields like methodology makers, scientists, hydrologists, engineers, monetary experts, NGOs, environmentalists, GIS trained professionals, farmers from various areas of country.

H. Mahabaleshwara , H.M. Nagabhushan (May-2014) the survey turns out to be a veritable reference and resource for the coordinators, field engineers, supervisors, examiners and the general populace overseeing water resource cheating, use and move. The hydrological furthest reaches of floods and droughts will effectively influence social and reasonable improvement of a country or region. The excellent and long stretch response for twofold issue is cover bowl water move. To set up this adventure report with the help of Water balance looks at, Toposheet studies, Ecology and environmental impact examination, etc.

Dr. Ashok K. Keshari (2014) is to make sense of various conflicting objections related with the interlinking of streams and to present different model dynamic (MCDM) techniques that can be used settling the conflicting goals and issues related with a particular stream between associate. The survey reveals that expected tradeoffs among various objectives can be achieved as Pareto-ideal or non - unsatisfactory plans using necessity or tendency based multi target smoothing out search and higher emotional information can be considered in appearing at the best compromise course of action, joining all organic, normal, hydrological, social and trans limit issues related with a particular stream between interface.

Pooja Mehra1 and H. N. Verma (2015) focal point of point is watershed progression and the chiefs drenching whole Basins Areas with a fundamental of interfacing Indian between connecting waterway. There is a lot of progress in rain fed developing and rain fed harvests' yields have extended basically through gathering of improved rain fed developing advancement. Nevertheless, there are at this point various issues in rain fed locales related to soil deterioration, sogginess stress and gather dissatisfaction.

Ravi Babu B et al. (2016) make sense of socio-judicious benefit of interlinking of Krishna and Godavari water ways. The undertaking proposes to offer, are not by and large plausible and provincial

handiness may be better worked on through water gathering . Interlinking of streams is unquestionably a respectable solution for the deficiency of water, if interlinking should be done after bare essential socio-reasonable examinations without making any issue the environment or maritime life.

Mr. Ismail Mondal et al. (2016) study and assessment of progressing design for water resource the leaders of attainable improvement through stream - interlinking using remote identifying and GIS development. Objectives of this paper is Carrying out the fundamental organized field studies and assessments covering the topological, Geological, geotechnical, geophysical and hydro topographical perspectives, agribusiness soil outline, etc.

Sunil Kumar Vyas, et al. (2016) discuss around Inter-connecting credibility of five stream bowls of Rajasthan in India.Rajasthan has arranged geographical circumstances as least yearly typical precipitation, nonappearance of interminable streams, starvation and dry season conditions, sparse under-ground resources due to that the perseverance of the man and bio-assortment in Rajasthan is very difficult. This proposed interlinking assignment is particularly useful and major for the viable progression of these five stream bowls in Rajasthan.

Pammi N Sinha (2017) expects to survey the unique course of the Sankh-South Koel and the South Koel - Subarnarekha ILR participates in India using publically open data and contraptions. With this point, this investigation attempts to determine an applied issue by checking out at the connected theories around it. By settling this issue, the ongoing hypothesis attempts to strengthen the IBWT dynamic cycle in India. It will add to the headway of a systemic gadget for the pivotal IBWT dynamic in light of the acknowledged methods open in the field of IBWT and WRM. The objectives of this paper rely upon the recommended methodology available; they ascend out of the overview and discussion of courses of action and practices in IBWT and WRM.

K. D. Joshi, et al. (2017) is centroid on Studies on climate, fish assortment and fisheries of Ken-Betwa streams and proposed for between interfacing. The flow part incorporates the outcomes of very far reaching assessments drove curiously on physicochemical, natural, and fishery limits of these streams, endeavored some place in the scope of 2007 and 2012, achieving a preliminary assessment of the sensible impacts of the proposed associating of the streams.

Nevil K. Trambadia, et al. (2019) assessment and Feasibility Study of proposed interlinking among Ozat and Mahuvanti waterways. Concentrate on space of this creator is picked reliant upon field overview.The streams Ozat and Madhuvanti running equivalent and ordinary distance is nearby 10km. In these the two Rivers the Ozat River is Surplus bowl which necessities to move into water lack Basin of Madhuvanti River. Our proposed site is picked for interlinking of the two streams near Nana kajaliyana town since this point is nearest of for the two streams. During the apex flood condition the downstream space of Ozat River is brought down at every time of tempest. Created by this interlinking is simply to save the presence of human do needful as possible by applying underlying planning push ups.

Swamy H.M, Sanjay, Basavaraju G. (2019) audit was predominantly focusing in on how interest in stream interfacing is a better decision than connected farmers inconvenience over credit swearing off. All through the examinations on close to advantages of advance doing without, stream associating and making stores on developing neighborhood analyzed. The survey has been coordinated for the most part founded on composing study a more noteworthy measure of discretionary information. Various journals, research papers, Annual reports, E-sources and Newspaper articles have been checked on in making this survey.

Dr. Rashmi Sharma (2019) the interlinking of waterways, organic and money related benefits, inciting reasonable new development. Guide of Rajasthan was mulled over with one of a kind references to streams of Rajasthan and how they can be interlinked. This ILR are unquestionably significant for India and especially Rajasthan Reliable endeavors should be made for Interlinking Rivers. Each town and town should be made responsible for its own water security.

Vinayak S Sindhur, et al. (2019) oversees various pieces of interlinking of streams like procedure of

interlinking streams, direct of stream ,advantages and injuries, etc. Objectives of this creator is the crucial idea behind stream interlinking is to give water in the area which faces most discernibly awful water scar-city is generally fundamental for the year. The thought through which this stream interlinking endeavor is endeavored is to divert a few water from significant delivered streams into dry streams and GIS (land information system) and Open source Map (OSM) is used in this survey.

Dr. K. P. SUDHEER, et al. (2019) tended to morphological examination of Krishna and Tungabhadra bowls using remote identifying strategy. The specific focuses of the flow audit are structure completed stream leakage map in Geographic Information System (GIS) by consolidating available assistant aides in India Water Resources Information System (India WRIS) of CWC. Assemble extra required information on critical flood protection structures, existing water resources projects, huge metropolitan regions/towns, CWC Hydrological Observation (H.O.) stations, air terminals, islands, etc, and to be composed with the last stream squander guides.

A. Inferences of literature review

After study of above literature, we found that some authors focused on environmental and biodiversity effects of inter – linking of rivers. Some author discussed around mobilization of people during to ILR development project, benefits and challenges, prevention from drought & flood planning & development of interlinking of river.

B. Research Gap

Over all analyze the research paper that discussed the many types of aspect about Ken Betwa Linking Project like as environmental study, construction of KBLP, geographical study, benefit and requirement of KBLP etc. But we are study and analysis that KBLP is how to full fill requirement of drinking water, improvement in agricultural field in future. Discuss the socio – economical aspect and study of KBLP. Our study area focused on only Bundelkhand region .

C. Objective

Main objective of this paper is study & analysis to implement the concept of inter-linking river in Uttar Pradesh.

- To analysis of water avilability and demand
- To full fill the requirement of drinking water in future
- To improve the agricultural field

III. PROBLEM STATEMENT

While the exercises are the design blocks for development, the water framework vault projects now and again achieve submersion of houses and house objections conveying people down and out other than causing loss of significant country land impacting the over all accommodating surface of the affected people. Such horrible social impacts in view of water framework projects are overall undeniable maintaining in see the benefits inclined to accumulate from them. At any rate cutoff such unpleasant impacts and for giving elective objections to resettlements through course of action of house regions, dwelling, system related to preparing, roads, drinking water, power, clinical center, etc and besides extending sensible reclamation backing and subsequently enabling the negatively affected people to recuperate fundamentally their past levels of assumptions for regular solaces. The comparable requires wary orchestrating and execution of the resettlement and reclamation the leaders plan with worked in noticing system both by the endeavor managers similarly as the affected people.

The Ministry of Environment and Forests (MoEF) and Central Water Commission (CWC) of the Government of India are the nodal associations for examination and consent for the water framework projects. Besides, need for opportunity of the endeavor and obtaining assent from the Ministry of Social Justice and Empowerment and Ministry of Tribal Affairs (MoTA) Government of India are moreover major. The MoEF is incredibly excited about restricting and if possible avoiding both quick and indirect ominous impacts while embracing such endeavors. The National Water Development Agency and the Government of Madhya Pradesh are moreover also excited about restricting the opposing/unfriendly outcomes on the ground and on people before execution of the endeavor. Therefore, there is a sincere necessity for definition and execution of a low down Resettlement and Rehabilitation Plan for restricting troublesome monetary biological impacts and making courses of action for choices for diminishing/avoiding such hostile effects, expecting to

be any. The ongoing survey was finished for Ken-Betwa Link Project: Phase - I in accordance with the above necessities for normal space by the concerned subject matter experts.

- Discussion

Ken and Betwa streams have their beginnings in Madhya Pradesh State. The streams travel through Madhya Pradesh and Uttar Pradesh. Full scale length of Ken stream is 427 km out of which 84 km falls in Uttar Pradesh (UP)., 51 km along the ordinary furthest reaches of UP and Madhya Pradesh (MP) and the rest in MP. The Ken joins stream Yamuna in Uttar Pradesh. The start of Betwa stream is in Bhopal district of Madhya Pradesh. It streams for a full scale length of 590 km (232 km in Madhya Pradesh and 358 km in Uttar Pradesh) till it crossroads with Yamuna stream in Uttar Pradesh. Henceforth both are bury state streams.

Fig.2 Map of Ken – Betwa interlinking Project
(Sources: financialexpress.com)

No huge water framework projects were taken up such a long ways in Ken stream bowl in Madhya Pradesh up to Gangau weir to furnish the water to immerse the backward and drought slanted request districts in the region of Chattarpur, Panna and Tikamgarh of Madhya Pradesh and Jhansi and Mahoba of Uttar Pradesh. Existing exercises on upstream of proposed Daudhan Dam in Ken bowl flood around 6757 ha under medium water framework and 31,122 ha under minor water framework projects which addresses around 38% of agrarian grounds in the catchment district.

To direct the challenges of the developing neighborhood, as to move the monetary status of farmers and other property subordinate families close by, the Government of Madhya Pradesh shaped suggestion for Ken Multipurpose Project (KMPP) on Ken stream which is generally called Greater-Gangau dam and moreover coordinated an unmistakable endeavor report in 1982. The recommendation was supposed to give yearly water framework to 3.23 lakh hectares other than hydro-power age with two powerhouses having presented constraints of 60 MW (3 x 20 MW) and 12 MW (2 x 6 MW).

The NWDA, resulting to undertaking pre-reasonableness and reachability reports for cover interfacing Ken and Betwa streams, definite Ken-Betwa Link Project. The rule objectives of this between interfacing project are according to the accompanying: • Divert 659 MCM water from Ken bowl to Betwa bowl;

- Give water framework to CCA of 2.41 lakh ha in MP and 2.14 lakh ha in UP
- Give enroute water framework office to 0.60 lakh ha CCA in MP and UP with the help of association channel; and
- Use the between bowl moved water for flooding 0.62 lakh ha through upper Betwa projects.

Thusly, the Ken-Betwa Link Project, involved three essential parts of request districts:

i. Ken request locale which is the area proposed under the past KMPP as at first shaped by the Government of Madhya Pradesh in Ken bowl with CCA of 2.41 lakh ha and yearly water arrangement of 3.23 lakh ha.
ii. Command district in enroute associate stream locale to the level of 0.60 lakh ha CCA in Chhatarpur, Tikamgarh, Mahoba and Jhansi regions.
iii. CCA under the four (as of now three) projects proposed before by the Government of Madhya Pradesh for 102017 ha with yearly watered space of 1.27 lakh ha known as Upper-Betwa request in Betwa bowl. Flow recognized CCA in Upper-Betwa locale is only 42300 ha with yearly water arrangement of 62230 ha.

The Ken-Betwa Link Project, Phase - I imagines the going with major parts.

i. An earthen cum (or a composite) significant dam at Daudhan on Ken stream at around 2.5 km upstream of the ongoing Gangau weir with FRL of 288 m and gross accumulating cutoff of 2853 MCM and a full scale length of 2031 m containing 1.929 km long entry followed by 218.695 km length of association channel, power house 1 and sturdy 2.
ii. Upper Betwa Projects - around 591 MCMof water let into Betwa bowl on upstream of Parichha weir will be utilized through substitution to give yearly water arrangement of 1.27 lakh ha.

After status of Detailed Project Report (DPR) for Ken-Betwa Link Project in December 2008, the DPR was streamed to the Governments of Madhya Pradesh and Uttar Pradesh in February 2009 for their thoughts and insights. Therefore, the GoMP suggested an elective recommendation for involving the water in Upper Betwa reach according to which the height of the proposed Makodia dam is proposed to be reduced to avoid immense degree submergence close by Bhopal city and proposed a couple of medium and minor intends to involve indistinguishable measure of water in Upper Betwa comes to.

To talk about different issues raised by both the Governments of Madhya Pradesh and Uttar Pradesh, a Secretary level gathering was assembled by MoWR on 03.02.2010 at New Delhi between the authorities of both the Governments and MoWR. During the gathering, it was believed that the Survey and Investigation of the elective task/plans proposed by Madhya Pradesh in Upper Betwa district will require around 2 years time. Subsequently, to keep away from unjustifiable deferral in execution of Ken-Betwa Link Project, Phase-I it was chosen to reevaluate the DPR into two separate parts viz., DPR of Ken-Betwa Link Project (Phase-I) including parts of Daudhan complex and DPR of Ken-Betwa Link Project (Phase-II) containing Upper Betwa projects. As needs be, the initial segment i.e., DPR of Phase-I is arranged including the expense of redesigning/remodel of Bariyarpur weir and Parichha weir.

IV. METHODOLOGY

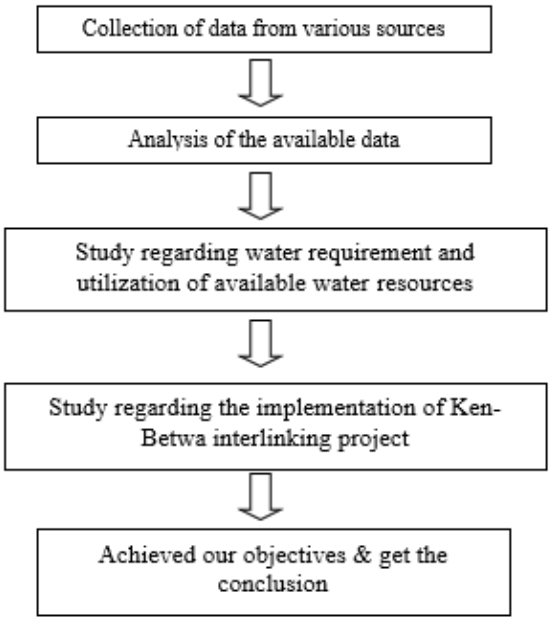

Fig.3 Flow chart diagram of methodology

A. Data Collection

To get our goal, data collection is primary segment of the project. Put up the data according to our objective:

- To study & analysis of inter linking river (Ken-Betwa rivers), data collection from Ken – Betwa Link Project (Phase-I) National water Development Agency (NWDA) .
- To improve the adequate water requirement and prevention from flood and drought, firstly we should have data of future population and resources of water.
- Data of population obtain from 2011 census.
- For socio and economical data collection from political news based Ken Betwa interlinking project & various journal/research paper, government data like as “Jal –Vikas”.

B. Analysis of Implementation (Ken-Betwa interlinking)

The KBLP is one of the first interlinking of stream projects under National Perspective Plan (NPP) prepared for execution Under NPP, 30 nos. of connections have been distinguished for between bowl water move from water overflow bowls to water deficiency bowls/regions. KBLP was likewise

distinguished as fundamentally important undertaking way back in year 2002 by the Task Force on Interlinking of Rivers (TFILR). The KBLP was announced as public task in the year 2008 and was likewise remembered for the Prime Minister's Package of Bundelkhand district.

The different phases of the execution of the undertaking are as per the following:

- Circulate the most recent PIB notice among different services, and get endorsement from PIB and the bureau.
- Acquire the leftover clearances, for example, the second stage natural leeway for the Lower Or undertaking, backwoods freedom for the Daudhan Dam, and so forth. The Panna Tiger Reserve (PTR) scene the board plan is concluded.
- Lay out a guiding advisory group and Ken-Betwa Link project (KBLP) the executives, and addressed by MP, UP, and the middle.
- At last, decide the wellspring of financing/establishment.
- Partake in Project Management Consultancy (PMC) to oversee and regulate the execution of the undertaking.
- Pre-development overview, course of action/staged designing, offering, land obtaining process, and so on.
- Conclude the R&R plan and make a move to migrate and resettle the families impacted by the venture according to the R&R plan.
- Granted prizes for works carrying out different parts.

The Ken-Betwa Link Project (KBLP) is a multi-reason project with water system, hydropower and water supply benefits. The task will give yearly water system to an area of 10.62 lakh ha (8.11 lakh ha in MP and 2.51 lakh ha in UP) in the Chhattarpur, Tikamgarh, Panna, Sagar, DamohandDatia areas of Madhya Pradesh and Banda, Mahoba, Jhansi and Lalitpur locale of Uttar Pradesh in Bundelkhand locale as well with respect to the Vidisha, Shivpuri and Raisen regions of Madhya Pradesh. The venture will give 194 Million Cubic Meter (MCM) of water for enroute drinking water supply to a populace of 62 lakh (41 lakhin MP and 21 lakh in UP). The venture will likewise create 103 MW of hydropower and 27 MW of sun based power.

Aside from different advantages, the venture will revive every one of the tanks in the enroute area of connection channel by taking care of through the connection waterway, at every possible opportunity and would help in ground re-energize. The venture intend to utilize miniature water system in around 5 lakh ha order for better water use effectiveness. It is arranged utilize Supervisory Control And Data Acquisition (SCADA) for better water the executives in the two bowls and administrative board will be laid out for water bookkeeping and guideline of water in Ken and Betwa bowls.

Along these lines the venture is focused on not just giving water security in the Bundelkhand locale yet in addition guaranteeing the general preservation of the district and uncommonly for scene subordinate species like tiger, vultures and gharial. Natural life Institute of India (WII) is setting up a conceivable Landscape Management Plan (LMP) for the preservation of untamed life and biodiversity in the PTR region as well as in encompassing area of around 47620 sq km spread in 11 locale of MP and UP including woods area of 12125 sq. Km. to counterbalance the effect of Daudhan repository. Further, every one of the expectations contained in the Wildlife leeway of National Board of Wildlife (NBWL) will be followed while executing the undertaking. Under LMP, it is proposed to incorporate Panna Tiger Reserve (PTR) with Nauradehi Wildlife Sanctuary (WLS) and Durgavati WLS in MP and Ranipur WLS in UP to expand the conveying limit of PTR .

The execution of KBLP is intended to be embraced together (Center and States) through the Special Purpose Vehicle (SPV) of Ken-Betwa Link Project Authority (KBLPA) The interlinking of stream projects face a few obstructions especially the participation of party states in water sharing and prerequisite of high capital expense. The joint execution of the undertaking with significant focal financing will be a phenomenal illustration of the helpful federalism. The execution of KBLP will urge states to come ready for the execution of comparative different undertakings in light of a legitimate concern for the country. The Ministry of Jal Shakti is likewise

thinking about the foundation of a public stage/authority, probably named as National Interlinking of Rivers Authority (NIRA) for the execution of such undertakings through joint SPV.

So as to carry out the KBLP proficiently utilizing condition of-craftsmanship arranging and checking apparatuses/innovation and information abilities accessible in the field, it is wanted to connect with a Project Management Consultancy to help the KBLP. PMC will likewise be mindful to production of Management Information System (MIS) for catching information/data from numerous internet-based frameworks, examinations the data, and reports information to help with the executives navigation.

KBLP would be huge advantage for the financial thriving of the Bundelkhand district which faces intermittent dry season circumstance The locale isn't exceptionally wealthy in that frame of mind because of hard rock and minimal alluvium landscape. Further developing the water accessibility in similarly dry locale further develops the conveying limit by turning out more revenue to country regions. This venture will carry financial success to this retrogressive region because of expanded farming exercises and capture the relocation of individuals from the locale.

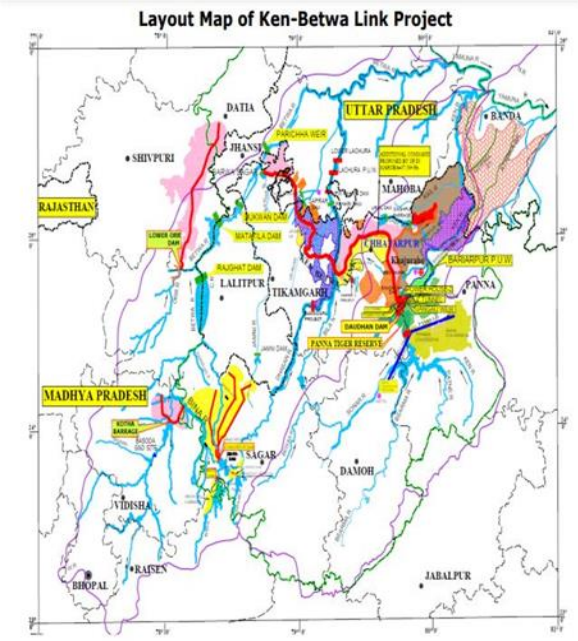

Fig.4 Layout Map of Ken Betwa Link Project

Source: The Ken-Betwaprojectlayout map is from the http://www.nwda.gov.in

The complete assessed cost of the KBLP has been worked out as Rs.35111.24 crore at 2017-18 cost level. The advantage cost proportion and IRR has been worked out as 1.58 and 10.96% separately.

C (i) Social Impact evaluation of Project area

A significant objective of KBP is to give water system to the water scant Bundelkhand area. As indicated by the Water Resources Ministry, an aggregate of 10 towns comprising of 1,585 families are probably going to be impacted by this task. The task conceives development of a dam across stream Ken in Chhatarpur locale in Madhya Pradesh to inundate 6.35 lakh hectare area of land, drinking water purposes and age of 78 MW hydropower.

The venture includes two force to be reckoned with of 2x30 MW and 3x6 MW every, two passages of 1.9 km long upper level, 1.1 km long passage lower level and a 221 km long Ken-Betwa interface waterway, proposed on the left bank of the stream.

The venture will give water system offices to 6,35,661 hectares of land in Panna, Chhattarpur, Tikamgarh regions in Madhya Pradesh, and Banda, Mahoba and Jhansi locale in Uttar Pradesh.

Loss of Land: In all 6422.62 ha of private terrains would be lost by the venture impacted families for the development of Daudhan dam and other task parts alongside channel network under the undertaking. Plus, according to the task plan around 5339.00 ha of timberland grounds would likewise be brought under different undertaking parts. This demonstrates that the land proprietors would lose their landed properties.

Loss of Livelihood: About 72% families would become landless, almost 21% would become minimal ranchers and very nearly 7% will fall under the little rancher classification. Because of land securing the undertaking impacted large ranchers would lose their enormous rancher status.

Loss of Employment: Due to land securing, a few families, who become landless, would lose their all out

independent working gigs, who in any case have been participated in their cultivating action.

Loss of Income: project impacted family's financial climate will influence their day to day life because of loss of land, work and business bringing about decreased standard family pay.

C(ii) Economic Impact assessment of Project region
This task will demonstrate a few financial advantages like improvement of agro-based ventures, transportation and storerooms. Expanded in ranch supplies, creation and utilization of compost, pesticide, ranch gear and work age. Monetary advantages of water system water supply remember different advantages for, crop creation; re-energizes groundwater; animal cultivation; ranch gear and agro-handling.

The negative piece of KBP project is misfortune in harvest and animals creation because of submergence of the yield region in the upstream of the repository. Because of the execution of Ken-Betwa Link Project, it will offer a decent chance to local people for getting work during the development time of the undertaking. Local people would get inclination for work on day to day wage premise as causal/laborers. This will help the economy, both public and nearby levels. Further, the expanded agrarian creation in the order region will animate the advancement of forward and in reverse linkages and thusly the financial improvement of the area.

Table-1 Benefits from Ken-Betwa Link Project

S. No.	Component	CCA (ha)	Water Utilisation (MCM)	Cost (Rs. crore)
1.	Daudhan Dam and its Components	MP - 4,47,368 UP - 2,51,064	MP- 2,349.87* UP - 1,700.08* * includes irrigation, domestic requirement and transmission losses	27,018.49
2.	Lower Orr Dam	MP - 90,000	MP - 291.77 (includes irrigation and domestic requirement)	3,065.14
3.	Kotha Barrage	MP - 20,000	MP - 88.19 (includes irrigation, domestic and industrial requirement)	708.73
4.	Bina Complex	MP - 96,000	MP - 413.35 (includes irrigation, Domestic & industrial requirement)	4,318.88
	Sub-total	MP - 6,53,368 UP - 2,51,064	MP - 3,143.18 UP - 1,700.08	_
	Total (MP & UP)	9,04,432 ha Say 9.04 Lakh ha	4,843.26	35,111.24
5.	Domestic/Industrial Water Requirement(MCM)			
(a)	Daudhan Dam and its Components	_	MP - 60 UP - 67	
(b)	Lower Orr Dam	_	MP - 6.0	
(c)	Kotha Barrage	_	MP - 7.5	
(d)	Bina Complex	_	MP - 88.4	
	Total Domestic/Industrial Water Requirement 228.9			
6.	Environmental Flow		547.51(MCM)	

7.	Power Generation	103 MW
8.	Solar Power Generation	27 MW

Source: http://www.nwda.gov.in

Ken-Betwa interface venture will produce work at the hour of development and post development stage. Around 4000 - 5000 people will get work under the undertaking during the activity stage. The complete work age as far as man days will be more than 225 lakh man days in the order region of the undertaking.

There are a few places of interest around the Daudhan region because of which the venture site forms into a decent vacationer resort which is a positive impacts. The task has the arrangements for laying new streets in the venture region for the simple correspondence and transportation of merchandise and materials required forthe dam development. The laid streets likewise will make a street correspondence network nearby and would work with local people and others for their developments and furthermore to begin limited scope enterprises.

This undertaking conceives the formation of clinical and wellbeing offices for the staff, dam development laborers, and workers during the execution of endlessly project related exercises. These clinical and wellbeing offices have the arrangements of in-patient and out-patient treatment.

After the task execution additionally, the made clinical and wellbeing offices won't be removed and could be used by local people. This would overcome any issues of existing clinical and wellbeing infrastructural offices and to a biggest degree would tackle the issues of local people.

D. Water avilability and demand in future:
Accessibility of water: Major wellspring of new water is accessible as surface overflow and ground water. In the accompanying examination, volume accessibility of surface water and ground water will be made and afterward summarized to compute complete water accessible.

Surface water: Surface water accessible in various locale of Bundelkhand is as precipitation produced overflow which is put away in put away in dams, tanks and other water bodies. Water in Bundelkhand is additionally accessible from Betwa, Yamuna, Dhasan, Ken and Baghain Rivers. Following area will evaluate accessible surface water. Table.2 underneath shows 10 years precipitation information of 7 regions of Bundelkhand. It tends to be seen from the table that typical precipitation in Bundelkhand is underneath public ordinary precipitation which is 1187 mm.

To change over precipitation, falling over the geological area of Bundelkhand, into spillover a component of 0.4 has been embraced. Overflow along these lines acquired has been additionally diminished by 25% to represent E-streams into the waterway. Outline computation of surface water is displayed beneath in Table 4. Accessible surface water computation depends on water move through Ken River, stockpiling utilized from Rajghat and Matatila dam on Betwa River, water move from Lachura dam (Arjun Sahayak Project) on Dhasan stream and lift channel surface water computation depends on water move through Ken River, stockpiling utilized from Rajghat and Matatila dam on Betwa River, water move from Lachura dam (Arjun Sahayak Project) on Dhasan stream and lift channel frameworks on Yamuna River. In this manner complete accessible surface water(Storage+Runoff) in Uttar Pradesh area of Bundelkhand emerges to be 9013.78 MCM.

Absolute accessible surface in addition to ground water: Total surface and ground water accessible in Bundelkhand is 9013.78 MCM and 4679.13 MCM individually. Thus, complete water accessible in Bundelkhand is 13692.91MCM and area wise absolute accessibility is organized beneath. It is seen from the table that Chitrakoot, Mahoba and Hamirpur region have undeniably less water than that accessible at Jhansi, Lalitpur, Jalaun and Banda.

Absolute water accessible and expected in 2050 is summed up in table 3 underneath. Absolute accessible water is displayed in section 5 and all out water necessity is displayed in segment 10. It tends to be seen from the table that all out water accessible in the locale of Lalitpur, Jalaun, Chitrakoot, Mahoba and

Banda is more than that of water expected in these regions.

Table 2: Rainfall (in mm)

Year/ District	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average
Lalitpur	607.84	1264.9	925.97	1473.43	594.94	321.50	861.20	651.00	794.00	862.90	835.77
Jhansi	548.28	869.08	678.86	1022.62	418.52	388.70	588.20	453.40	725.80	498.60	619.21
Jalaun	691.50	895.10	564.27	913.06	374.35	339.10	639.80	317.70	564.20	497.50	579.66
Chitra koot	489.05	958.75	1027.5	1210.85	463.50	327.00	947.25	945.00	911.75	895.50	817.62
Mahoba	518.87	739.43	641.64	816.31	323.27	263.60	1073.4	490.97	543.97	509.07	592.06
Hamir pur	523.79	873.10	559.86	852.90	312.93	337.33	670.33	344.99	769.33	974.00	621.86
Banda	489.05	833.92	696.08	947.13	409.43	470.25	1130.5	502.08	730.88	928.73	713.81

Source: http://planning.up.nic.in

Table 3: Water requirement for Bundelkhand

S. No.	District	Surface Water (MCM)	Ground Water (MCM)	Total Water available (3+4)	Irrigation (MCM) total sown area*0.54	Drinking (MCM)	Live Stock (MCM)	Industrial (MCM)	Total Water requirement
1	Lalitpur	1604.43	678.13	2282.56	1519.89	53.48	25.52	53.48	1652.37
2	Jhansi	1188.27	709.14	1897.41	1710.49	87.51	27.45	87.51	1912.96
3	Jalaun	1093.84	1210.62	2304.46	1759.50	73.98	23.13	73.98	1930.59
4	Chitrakot	830.08	239.83	1069.91	865.92	43.40	21.92	43.40	974.64
5	Mahoba	895.25	470.46	1365.71	1186.09	38.33	16.22	38.33	1278.97
6	Hamirpr	969.34	490.01	1459.35	1474.08	48.35	22.84	48.35	1593.62
7	Banda	2432.58	880.95	3313.53	1773.87	78.80	27.07	78.80	1958.54
Total		9013.7	4679.14	13692.92	10289.84	423.85	164.15	423.85	11301.69

Source: http://planning.up.nic.in

In the investigation for water prerequisite for future populace development, extended request up to year 2050 is taken. Airthmetitc technique utilized for populace forecasting. Populace development of 1.1% each year and 80 litters for every capita each day has been taken on. The accessible area wise evaluation information for the year 2011 are utilized for human populace guaging. This populace was anticipated for the year 2021 based on medium variation development rate as given in U.N. Distribution 'Total populace Prospects - 2004 correction.' Water prerequisite is arranged in table 4 beneath.

Current Status of Irrigated And Sown Area: Data of year 1999 for net watered and net planted region is contrasted and information of year 2018. Net watered region is expanded from 27.74% to 46.59% for example roughly 5.5 lakh hectare extra land is shrouded under Irrigation in most recent 20 years. Net planted region remains practically steady Complete topographical area of Bundelkhand is 29.41 lakh hectares. Region watered in Bundelkhand locale by different sources is broke down for the year 2018 and region wise inundated region is classified in table 6 beneath.

Table 4: Projected human population and water requirement by the year 2050

S. No.	District	Human Population		Water Demand in 2050 (MCM)
		2011	2021	
1.	Lalitpur	1221000	1355310	53.4798
2.	Jhansi	1998000	2217780	87.5124
3.	Jalaun	1689000	1874790	73.9782
4.	Chitrakoot	991000	1100010	43.4058
5.	Mahoba	875000	971250	38.325
6.	Hamirpur	1104000	1225440	48.3552
7.	Banda	1799000	1818789	78.7962
	Bundelkhand		9593340	

Source: http://planning.up.nic.in

Table 5: Status of Irrigated and Net Sown Area

Year	% of Net Irrigated area to total area	% of Net Sown area to total area	Net Irrigated Area	Net Sown Area	Total Geographical Area
1999	27.74	68.50	816000	2015000	2941800
2018	46.59	69.96	1370662	2057967	2941800
Increase		554662	-	42967	

Source: http://planning.up.nic.in

Table 6: Irrigated Area (Ha)

Irrigation	Lalitpur	Jhansi	Jalaun	Chitrakoot	Mahoba	Hamirpur	Banda	Total
Canal	96099	121078	156772	4700	24960	26743	46023	476375
Govt. Tubewell	0	3506	20064	0	263	19090	16361	59284
Private Tubewell	74035	33188	58600	58541	5298	78798	82528	390988
Wells	81561	113491	16195	4655	68956	20101	15323	320282
Ponds	26909	35249	2895	6948	23212	2930	3818	101961
Other sources	12451	2988	527	69	2731	2728	278	21772
Total	291055	309500	255053	74913	125420	150390	164331	1370662

Source: http://planning.up.nic.in

E (i) How is the Ken-Betwa link project going to help in fulfilling the demand of water in the Bundelkhand region:

The Ken-Betwa Link Project (KBLP) is the first Interlinking of River Project under National Perspective Plan (NPP) which is prepared for execution. The Bundelkhand area faces repeating dry spell conditions which has hampered the financial improvement of the locale. The locale is additionally not extremely wealthy in that frame of mind because of hard rock and minimal alluvium landscape. Thusly, there is a requirement for a venture of a scale which will help in outfitting the rising water during rainstorm

period and balance out the water accessibility in the district in lean periods especially during dry season years.

The Ken Betwa Link Project imagines to give tremendous advantages to the water starved areas viz. Panna, Tikamgarh, Chhatarpur, Sagar, Damoh and Datia of Madhya Pradesh and Banda, Mahoba, Jhansi and Lalitpur of Uttar Pradesh in Bundelkhand locale as well concerning the Vidisha, Shivpuri and Raisen regions of Madhya Pradesh. The venture will give north of 10 lakh hectare yearly water system and will likewise give drinking water supply to a populace of around 62 lakhs. Aside from different advantages, the undertaking will help in restoring tanks in the area by taking care of them through the connection trench, at every possible opportunity, and would help in ground re-energize. The undertaking intends to utilize miniature water system widely for better water use proficiency. The undertaking will prompt coordinated improvement and the executives of water assets in the locale and along these lines give water security to the area.

Ken stream from which redirection of water to Betwa has been proposed is a highway waterway between M.P. furthermore, U.P. Upper piece of the catchment lies in M.P. while lower a piece of the catchment lie in U.P. Gangau weir across waterway Ken is a pre-autonomy time project, having gross capacity limit of 40 MCM. Water put away in Gangau weir is used through Bariarpur Head works situated around 45 km in its downstream. U.P. has got trench network spread over Banda area to use this water. Nonetheless, M.P. is still during the time spent developing channel organization. Sharing of Ken water between these two States is administered by Interstate Agreement of 1981. Anyway with development of proposed Daudhan dam across Ken with gross capacity of 2853 MCM, use of Ken water in ideal and effective way is conceivable. U.P. wanted more portion of Ken water for use in their current Ken order as well as enroute order after readiness of possibility report by NWDA.

Like agreeing among states and Center for the execution of KBLP is a vital stage for the reason for ILR and helpful federalism, its effective execution would be much more basic for the idea of bury bowl water move for tending to the hydrological awkwardness in the nation and increasing the water accessibility in water short/shortage regions. There are many difficulties in the execution of such enormous foundation project like comprehension among party states, supporting, R&R and land procurement, probable natural effects, cost acceleration, extreme deferrals, question goal. and so forth. This task additionally influences some piece of Panna Tiger Reserve making it seriously testing.

E (ii) Agricultural improvement

The Bundelkhand district is habitually in the hold of extreme dry spells, especially during the non-storm time frame. The locale is likewise not extremely rich in that frame of mind to hard rock and negligible alluvium territory. Thusly, there is a requirement for a task of a scale which will help in outfitting the rising water during the rainstorm time frame and balance out water accessibility in the locale in the lean time frame, especially during the dry season years. Thus, the public authority endorsed the execution of the KBLP on December 8. It conceives to give gigantic advantages to the locale covering a yearly water system of 10.62 lakh hectares, drinking water supply to a populace of around 62 lakh and furthermore create 103 MW of hydropower and 27 MW of sun based power, using around 4,909 million cubic meters (MCM) of water.Coming to the focuses raised by Thakkar, Stage-II timberland freedom is conceded on satisfying the states of Stage-I leeway, i.e., move of essential non-woodland land/corrupted backwoods land for compensatory afforestation (CA), move of cost of CA and Net Present Value (NPV) in the Compensatory Afforestation Fund Management and Planning Authority (CAMPA) asset of the State and so on separated from different states of woodland leeway. The headway on these circumstances can be made solely after endorsement of the undertaking by the public authority and monetary help. At first, the attention would be ashore procurement, recovery and resettlement (R&R), ecological administration plan and so on prior to arranging and taking up development work.

The proposals of the CEC were entirely talked about by a Special Committee on Interlinking of Rivers (SCILR), headed by the Union Minister of Jal Shakti, the summit body for taking choices on different issues on ILR, during its seventeenth gathering hung on

February 26, 2020. In view of the suggestions of the CEC to look at the option of the KBLP through a particular office to meet the water system requirements of the proposed order region, the Special Committee was of the assessment that every one of the accessible other options/choices have proactively been analyzed while setting up the Detailed Project Report (DPR) and the KBLP was the main feasible choice to meet the water needs of the dry season inclined Bundelkhand district. The answers to the suggestions of the CEC have been submitted to the expressed board by the National Water Development Agency (NWDA) and the case is getting looked at in the Supreme Court. The court, in its judgment dated February 27, 2012, had coordinated to take up the Ken-Betwa interface project for execution at the primary case itself.

The article expresses that the KBLP will prompt a deficiency of 10,500 hectares of natural life living space in the PTR. The figure cited did not depend on realities. According to the definite evaluation made, the Daudhan repository will cause the submergence of 4,141 hectares of the center area of PTR (around 7% of the absolute center area of 57,600 hectares of PTR) and one more 1,314.4 hectares in the PTR cushion. The connection trench will affect one more 65.50 hectares of the center region and 58.02 hectares of the cradle region of the PTR. In this manner, the complete region affected by the venture is 5,578 hectares in particular, a simple 3.5 percent of the absolute area of 1,57,800 hectares of the PTR. The creator overlooks that this deficiency of the center area of PTR is being repaid by giving income land/corrupted woodland land for compensatory afforestation nearby the PTR. The water lake made under the task will likewise shape a piece of the PTR, along these lines expanding the general region of the PTR and its conveying limit. According to the evaluation made, around 43% of the lowered region will be accessible as field land after November which would prompt a critical expansion in herbivorous populace in the PTR. In addition, a thorough Landscape Management Plan (LMP) is being ready by the Wildlife Institute of India (WII) for the preservation of natural life and biodiversity, in the PTR region as well as in the encompassing region to balance the effect of the Daudhan repository. Under LMP, it is proposed to incorporate the PTR with Nauradehi natural life asylum (WLS) and Durgavati WLS in MP and Ranipur WLS in UP to build the conveying limit of the PTR. In this manner, the undertaking is focused on not just giving water security in the Bundelkhand area, yet in addition guaranteeing the general protection of the locale, particularly for scene subordinate species like tigers, vultures and gharials.

The article makes reference to that the expense of environment administrations lost because of the redirection of woods land has not been remembered for the expense of the venture, which is really not right. If there should be an occurrence of submergence because of the Daudhan supply, the worth of eco-administrations of Rs 3,512.8 crore as NPV of lowered region has been added to the expense of the undertaking, aside from saving liberal arrangements for compensatory afforestation and catchment region treatment.The article further notices that the venture is intended for helping the Upper Betwa district which is outside the Bundelkhand locale. Maybe, the creator has not gone through subtleties of the DPR. The undertaking is wanted to help the Bundelkhand locale in two states to a great extent. An arrangement of 2,266 MCM of water has been kept to meet the necessity of the area going under Upper Ken basin.The hydrological reads up for the undertaking have been completed by the National Institute of Hydrology, Roorkee, according to the standard methodology adhered to for water asset projects in the country. The hydrology has been analyzed and investigated completely by the Central Water Commission.The venture will likewise restore every one of the tanks in the in transit region of the connection trench by taking care of through the connection channel, at every possible opportunity and would help in groundwater re-energize. The utilization of miniature water system is additionally arranged in around 5 lakh hectares order of the undertaking for better water use efficiency.The fears on the reasonability of the KBLP are unwarranted and absent any trace of ground real factors in the locale. Water is a critical driver of by and large financial advancement in any locale. The task would be a major shelter for dry season inclined and water-starved Bundelkhand area. The task will carry monetary success to this retrogressive region because of expanded horticultural exercises and the capture of relocation of individuals from the district.

The KBLP is situated in the Bundelkhand district of Madhaya Pradesh and Uttar Pradesh in India. The KBLP imagines the development of a dam at Daudhan, an area upstream of the Periccha Weir in the Ken River (Figure 5), and afterward, will redirect the Ken River water from this supply through a trench to the Betwa River. The KBLP has three water system parts. It proposes to give water system to:

- Enroute order region of the connection channel (An in Figure 5);
- Downstream region of the Ken River (B in Figure 5); and
- Move water to downstream region of the Betwa River by subbing the water system interest of the upper spans of the Betwa River (C in Figure 5).

Seven locale in Bundelkhand district cover the KBLP order region (Figure 4). The on the way order of the connection waterway falls inside Tikamgarh and Chhatarpur areas in Madhya Pradesh and Jhansi and Hamirpur in Uttar Prdesh. The Ken Multi-Purpose Project (KMPP), proposed already by the Government of Madya Pradesh, falls inside Chattarpur and Panna locale in Madhya Pradesh. The Betwa order, which comprises of four activities specifically, Barari, Richhan, Neemkheda and Kesari, is situated in the Raisen and Vidisha locale in Madhya Pradesh.

By and large, the Bundelkhand area, encounters exceptionally factor between and intra-yearly precipitation. Normal yearly precipitation of the seven areas surpasses 950 mm each 2 out of 4 years (50 % steadfastness precipitation), and surpasses 640 mm each 3 out of 4 years (75 % trustworthiness precipitation). Four storm months (June-September) get over 90% of the yearly precipitation. In this manner the kharif (or the wet) season (June-October) requires barely any water system for the vast majority of the yields. Be that as it may, water system request is high in the rabi (dry) season (November-March), with yearly possible vanishing of the area at 1,690 mm.

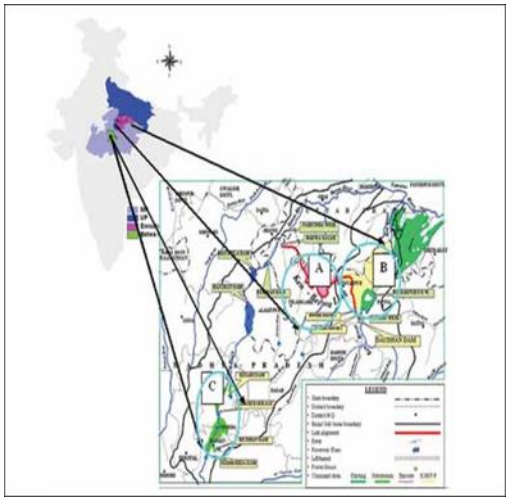

Fig.5 Ken-Betwa Project index map.
Source: The Ken-Betwa project index map is from the feasibility report (NWDA 2005)

A significant objective of KBLP is to give water system to the water - scant Bundelkhand locale. The on the way order, which falls under the NRLP, waters just 7 % of the absolute order region of the KBP (Table 7), and records for 10 % of the water system supply. The KMPP order has 65 % of flooded region, representing 70 % of the water system supply. The KMPP proposes inundating:

- 84 % and 83 % in the on the way order;
- 60 % and 74 % in the Ken order; and
- 47 % and 73 % in the Betwa order

In the kharif and rabi seasons, separately. It is fascinating to inspect these ideas, given the examples of precipitation, past patterns of development of watered region, and present water system land-use designs in the Bundelkhand district. We analyzed the similarity and practical nature of the proposed water system design in both the kharif and rabi seasons in the KBLP order, which additionally gave intriguing knowledge with regards to terms of editing designs as well. The KBLP proposes paddy as a significant flooded crop in the kharif season (Table 8), which comprises of 18 % of the yearly gross watered region, however 41 % of the kharif inundated region. How much the past or current trimming designs in the order region figure in deciding editing designs for the task is without a doubt a fascinating inquiry, and one which we look at exhaustively in a later area.

Table 7. Net and gross irrigated area (1,000 ha) and irrigation supply (million m^3) in the KBP command.

Component in KBP command	Net irrigated area (1,000 ha)	Gross irrigated area (1,000 ha)				Total irrigation supply
		Kharif season	Rabi season	Perennial Crops	Total	
En-route command	27.0	22.6	22.2	1.9	46.7	312
Ken command	241.3	144.7	178.5	0.0	323.2	225
Betwa command	102.0	48.2	74.8	3.8	126.7	659
Total	370.3	215.5	275.5	5.7	496.6	3,196

Source : KBP feasibility report (NWDA 2006)

Table 8. The proposed cropping patterns in the KBP command area.

Season	Crop	Crop area (percent of gross irrigated area)			
		En-route	Ken	Betwa	Total
Kharif	Paddy	32	15	20	17.8
	Jowar/bajra/maize	6	6	4	5.5
	Pulses	2	11	5	8.7
	Oilseeds	4	9	6	7.7
	Vegetables	2	4	2	3.1
	Fodder	2	1	_	0.4
Rabi	Wheat	32	34	40	35.1
	Pulses	4	12	10	10.7
	Oilseeds	4	7	5	6.5
	Vegetables	4	_	4	1.4
	Fodder	4	2	0	1.8
Perennial	Sugarcane	4	_	3	1.1
Total		100	100	100	100

Source : KBP feasibility report (NWDA 2006)

The evaluation in this paper, on assessing the advantages of the proposed water system water moves, utilizes information from many sources. We survey the similarity of the proposed editing designs in contrast with the past patterns utilizing the time series information of land use and trimming designs from 1970-1997 out of seven locale covering the order region. Information on different parts of Indian agribusiness at the locale level gathered by ICRISAT, and Hyderabad is the hotspot for time series information (ICRISAT 2000). An essential overview directed in transit and in the KMPP order regions, surveys the distinctions of proposed editing designs by the NWDA practicality report and those tracked down by and by on the ground. It additionally surveys the net worth of advantages in existing watered and unirrigated order regions, and the distinctions between these are then utilized for evaluating the advantages of proposed water system moves in the KBLP.

The essential study, separated by land-use designs, comprises of an irregular example of 1,000 ranchers — 20 ranchers each from 50 towns. Chosen towns for the overview fall inside the two order regions, an unpleasant sign of areas for which is accessible in the file map (Figure 5). Towns were chosen to address head, center and tail segments, and furthermore the current surface and groundwater flooded regions and the downpour took care of region in the KBLP order (Table 9).

Table 9. Composition of the sample in proposed KBP command.

Land-use patterns	Total	Distribution among districts				
		Jhansi	Tikamgarh	Chhatarpur	Harimpur	Panna
Canal irrigation	320	40	40	220	0	20
Groundwater irrigation	180	20	20	100	20	20
Rain-fed	500	20	60	360	20	40
Total	1000	80	120	680	40	80

Source :https://publications.iwmi.org

- Irrigation Trends in the KBLP Command

A significant expansion in the edited region in the Bundelkhand locale in the past was because of expanded water system in the rabi (dry) season. We surveyed the patterns of region extension utilizing time series information of editing designs in seven areas covering the KBLP (Table 10). In spite of the fact that development in the inundated region in the kharif season was irrelevant, development in the harvest watered region and the net flooded region were particularly comparable in the rabi season. Truth be told, water system has added to basically every one of the expansions in the trimmed region in the rabi season beginning around 1970, which is multiple times the expansion in the edited region in the kharif season. Nonetheless, water system was not a huge variable in that frame of mind of the harvest region in the kharif season.

Table 10. Trends of cropped and irrigated area in the KBP command area districts

Item	Trends of cropped area and net irrigated area				
	Units	1970	1980	1990	1997
Net sown area	1,000 ha	2,597	2,649	2,792	2,976
Cropped area - kharif	1,000 ha	786	930	1,076	1,024
Cropped area - rabi	1,000 ha	1,670	1,678	1,909	2,131
Net irrigated area	1,000 ha	342	405	727	1,151
Irrigated area - kharif	1,000 ha	5	6	6	31
Irrigated area - rabi	1,000 ha	337	400	721	1,151
Cropping intensity	%	108	110	115	122
Irrigation intensity	%	104	102	103	104
	Net irrigated area under different sources of irrigation				
Canals[1]	%	48	38	37	24
Tanks[1]	%	3	2	2	2
Groundwater[1]	%	46	54	47	59
Other sources[1]	%	3	6	14	15

Source: ICRISAT 2005

To begin with, the developed region in the kharif season is just a little piece of the cultivable region in the Budelkhand locale, and the net planted region comprises of a significant piece of the developed region of the rabi season. Truth be told, the distinction between net planted region and the edited region in the rabi season shows that main a little piece of the cultivable region was trimmed at least a couple of times around here. Was insufficient soil dampness a limitation for the development of yields in the kharif season? Strangely, normal precipitation, and besides

the 75 % reliable precipitation, of 90 days of the kharif season (July, August, and September), are altogether higher than the likely evapotranspiration over a similar period (Figure 6). In this way, lacking soil dampness isn't the least bit a limitation for the overwhelming majority of the harvests in the kharif season.

In any case, numerous different elements might have added to bring down the yield region in the kharif season. A few ranchers keep the region neglected in the kharif season in anticipation of wheat crop development in the rabi season. The Bundelkhand area creates probably the best wheat assortments in northern India. By and large, wheat development gives family food security bringing exorbitant costs or possibly a guaranteed pay from the base cost emotionally supportive network. In certain areas with dark soil nonetheless, the kharif crop development isn't reasonable in view of the outrageous soil dampness conditions. Another chance is that precipitation and the accessible water system assets are not sufficient for long length harvests, for example, paddy and sugarcane in the kharif season. Be that as it may, as we find in a later segment, the net worth of results of brief length crops, for example, heartbeats and oilseeds are essentially as high as the net worth of paddy in the KBP region. It appears thusly, that ranchers in the Budelkhand area like to utilize precipitation in the kharif season to develop brief term crops with more significant yields.

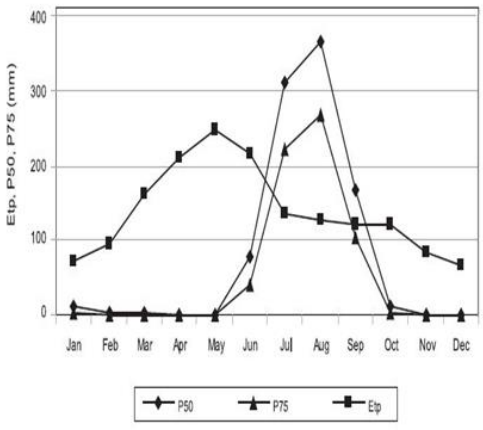

Figure 6. (Potential evapotranspiration, and 50 % and 75 % exceeding probability rainfall in command area)
Source : IWMI Water and Climate Atlas (IWMI 2000)

Second, the water system improvement in the past has simply added to build the flooded region of the rabi season. Truth be told, the development of the flooded region in the rabi season has added to 96 % of the development of the absolute net watered region during 1970-1997, and of the all over water system in 2006, more than 99 % was during the rabi season. Was insufficient access or control of water the justification for the low flooded region in the kharif season? A few investigations show lacking accessibility of water as a critical component for low water system force in the Bundelkhand locale (Bharatndu et al. 998; NWDA 2006). Notwithstanding, our study shows that ranchers, even in the groundwater order regions don't involve water system for any yields in the kharif season. Truth be told, around 60 % of ranchers in the inundated order region use groundwater. Given the control of water system application, it is sensible to accept that ranchers would have inundated essentially the groundwater flooded region in the kharif season, had there been a deficiency of soil dampness for their yields. In any case, the information shows practically everything ranchers didn't inundate their bundles during the kharif season in the proposed KBLP order region. This is valid even in the bundles in the channel order regions.

In the KBLP, precipitation sufficiently meets the water necessities of ebb and flow trimming designs. What's more, as referenced previously, ranchers in the KBLP appears to favor oilseeds and heartbeats in the kharif season as they get higher net returns, and furthermore require less water. Given these patterns, one chance, and, truth be told, a reasonable situation is that ranchers wouldn't inundate their packages in the order region in the kharif season even with the accessibility of more water from the proposed water system moves. Did the possibility investigation of the KBP (NWDA 2006) consider the previous patterns or the current status of water system designs in the order region for planning the trimming designs, and assessing the ensuing water system interest? It appears, not. As a matter of fact, very in spite of the momentum trimming designs, the plausibility report proposes 58 % of the KBLP order region to be inundated in the kharif season. Besides, rice is the dominating yield in the kharif season trimming designs, covering 41 % of the complete region, despite the fact that, late patterns propose that the area of rice, both in outright number

and furthermore comparative with different harvests, has been diminishing from 20 % in 1970 to 15 % in 1997.

Anyway, given these patterns, under what conditions will the ranchers in Bundelkhand locale flood more paddy, or water some other yield, in the kharif season? Did the choices on proposed editing designs mirror the latest things on the ground or the rancher's inclinations in the order region? Absolutely, the investigation of information shows that such choices did not one or the other. It is critical that these variables are considered while setting up the point by point project report. Truth be told, this is exceptionally basic in assessing the water system interest in the KBP.

As indicated by the achievability report, the assessed water system water interest for June to October in the kharif season is almost 50% of the complete water lets out of the Daudhan Reservoir to the task order region. Consider the possibility that the ranchers choose not to inundate their harvests in the kharif season from the water system water discharges. Under this situation, can other significant destructive water-utilize areas (homegrown and industry) drink such a huge amount of water in the order region? These issues should be tended to while setting up the point by point project report. In the following segment, we examine exhaustively the advantages of water system on crop creation and domesticated animals as proposed by the plausibility report, and present elective situations to survey how to build the planned advantages.

Net Benefits of Irrigation Water Transfers

Preferably, the financial advantages of water system water supply remember immediate and backhanded benefits for:

1) crop creation;
2) creature cultivation;
3) ranch types of gear and information supplies (in reverse linkages);
4) agro-handling (forward linkages); and
5) work age.

New water system moves can have backhanded positive effect in both inside and outside the undertaking order region. The return streams of water system in the order region re-energizes groundwater. This thusly can work with conjunctive water use inside the order region, and groundwater water system outside the order region. Thusly, the absolute 'successful order region' from the new water system supply incorporates both the complete surface just and conjunctive flooded region inside the order, and the all over region outside the order that groundwater (which is re-energized from return streams inside the order) inundates.

New water system water moves can likewise involve an advantage misfortune. This can be a gross advantage misfortune in the downstream of the repository because of the diminished waterway stream, and furthermore in the upstream of the supply because of submergence of the yield region. Moreover, such exchanges can likewise make an advantage misfortune in the order region because of the securing of homestead lands for the on the way trench order.

We utilized the information gathered from the essential review for assessing the net monetary advantages in three parts. They are:

1. Esteem added direct yield creation and domesticated animals benefits. The esteemed added creation is the complete worth of results less all out bought inputs. The buy inputs are the amount of the expense of yield creation inputs, land lease, capital expense deterioration and recruited and family work costs. The worth added benefit from animals creation is the gross pay from domesticated animals creation less the all over cost of data sources and work.
2. Esteem added aberrant yield and animals creation in the non-order region flooded through groundwater, which is re-energized by the return streams of water system in the order region.
3. Yield and animals creation misfortune because of submergence of the harvest region in the upstream of the repository.

We likewise assessed the accompanying aberrant monetary advantages:

1. Esteem added through forward linkages, which incorporate the advantages due to agro-based businesses, transportation and storerooms, and work age.
2. Esteem added through in reverse linkages, which incorporate the advantages because of expanded

ranch supplies and administrations like compost, pesticide, ranch hardware and work age.

Be that as it may, data accessible from the essential overview on forward and in reverse linkages for ex risk benefit assessment is extremely restricted. Thusly, we utilized the multiplier factor, which catches the backhanded advantages from water system in the order region because of expanded forward and in reverse linkages in the area. Bhatia and Malik (2005) assessed that the water system multiplier for the Bakhra water system order in the Haryana, which surveyed the roundabout advantages of in reverse and forward linkage, is around 1.90 - and that implies each Rs. 100 that the venture produces as an immediate advantage will yield another Rs. 90 as a circuitous advantage. Malik (2007) additionally contended that considering the little size of the order region and the degree of enhancement that can be anticipated with new water system, the KBP wouldn't produce roundabout financial advantages however much those in the Bakhra water system order. He contends that the KBP can measure up to a little really look at dam in a town in the slope areas of Shivalik in Haryana. The World Bank (2006) has assessed the local multiplier for the check dam in the Shivalik slopes to be in the request for 1.40. Subsequently, for this review, we utilized the provincial multiplier of 1.4 to appraise the aberrant advantages in the Bundelkhand districts because of moves of water system water to the KBP. What's more, we likewise surveyed the awareness of the assessed water system advantages to higher provincial multipliers.

RESULT

Following area manages the method for satisfying future water need of 4598.71MCM. Locale wise water the executives plan will be proposed. In the proposed plan to full fill the interest, it is tried to keep away from development of expensive dams and accentuation is given on destructive use and miniature water system methods. It is likewise recommended to utilize existing conventional lakes, in seven areas of Bundelkhand, to store water with next to no new development. Customary capacity will likewise help in re-energizing ground water. Water system from these little lakes will bear least foundation cost as water system should be possible in restricted region where these are found. Customary strategy for water system in Bundelkhand will likewise make individuals of Bundelkhand mindful about significance of water protection.

5.1 Direct benefits of new irrigation supply:

Direct advantages of new water system supply is the amount of the net worth added benefits from crop creation and animals, emerging from changes in land use and editing designs. As talked about previously, the attainability investigation of the KBLP proposes a somewhat unique land-use and editing example to that which exists as of now (Table 7).It proposes to irrigate the whole crop area in the kharif season, the present survey data show farmers hardly irrigate any crop in the kharif season. To solve this problem the water supplied from KBLP will irrigate the whole crop area in kharif season as proposed in the planning of the project. It additionally assigns a huge piece of the kharif season region to paddy crops, though the previous patterns show a decrease in the paddy region. The study results show that paddy covers just a tiny region in the current order areas of channel or groundwater water system. Given these transient and spatial patterns, almost certainly, ranchers in the KBLP would keep on following a comparative land-use example to that which exists now. They would likewise differentiate editing examples to incorporate more non-paddy crops in the order regions, which have a more noteworthy interest and require little water system. To catch the ramifications of these different trimming designs, we surveyed the direct financial advantages and water interest under a few situations. All situations accepted that the net

Table11: Water requirement gain from Ken Betwa Linking Project and other sources

S. No.	District	Water Demand	Water supplied from KBLP	Water supplied from Other sources
1.	Lalitpur	376.43 mcm	56 mcm	82.89 mcm(From ongoing new dams (Jamrar, Bhaoni, Bandai and Bhaurat dam) 18 mcm (Storing in existing ponds) 219.71 mcm (Using underground water or stored water)
2.	Jhansi	701.55 mcm	*	100 mcm (Sahzad dam) 56.25 mcm (From ongoing new dams Eirach Dam) 385 mcm (Enroute in 42 tanks covering 4500 submergence area,80% Sprinkler and 20% drip irrigation: Proposed for 256600 instead of existing flow irrigation) 173.51 mcm (Using underground water or stored water)
3.	Jalaun	391.56 mcm	*	27 mcm (From existing ponds) 365.00 mcm (Using underground water or stored water)
4.	Chitrakoot	636.72 mcm	*	75 mcm (From existing ponds) 77.70 mcm(Using underground water or stored water) 112 mcm(Enroute in 42 tanks covering 4500 submergence area,80% Sprinkler and 20% drip irrigation: Proposed for 256600 instead of existing flow irrigation) 380 mcm (By creating new storage)
5.	Mahoba	438.90 mcm	74 mcm	74 mcm(From existing ponds) 152.43 mcm (Enroute in 42 tanks covering 4500 submergence area,80% Sprinkler and 20% drip irrigation: proposed for 95000 instead of existing flow irrigation) 142 mcm (Using underground water or stored water)
6.	Hamirpur	1005.00 mcm	300 mcm	48 mcm(From existing ponds) 338 mcm (Enroute in 42 tanks covering 4500 submergence area,80% Sprinkler and 20% drip irrigation: proposed for 225585 instead of existing flow irrigation) 158.76 mcm(Using underground water or stored water) 165 mcm(By creating new storage)
7.	Banda	1113.54 mcm	505 mcm	267 mcm (Using underground water or stored water)

300 mcm (Enroute in 42 tanks covering 4500 submergence area,80% Sprinkler and 20% drip irrigation: proposed for 200000 instead of existing flow irrigation)
41.8 mcm (From existing ponds)

planted region will stay a consistent, while the gross harvest region will increment from 460,0001 ha up to 490,000 ha. The last option figure shows that the water system commitment to increment trimming force is exceptionally peripheral. As a matter of fact, the NWDA (2006) has expected in its possibility study, that editing force in the KBP task will increment up to 134 %. We concentrate on the ramifications of these presumptions in the accompanying situations.

Situation 1. Situation 1 (S1) accepts a comparative trimming example to that which exists now in the kharif season, yet expects the full water system of harvests in the rabi season. The present editing designs show essentially heartbeats and oilseeds in the kharif season, and wheat and gram in the rabi season (Table 12). This situation likewise accepts that the extra absolute harvest area of 30,000 ha will be proportionately split between crops.

Situation 2. In situation 2 (S2) we expect the equivalent editing design as the one proposed by the possibility study. In S2, all harvests are inundated in the kharif and rabi season, and paddy and wheat are the transcendent yields in the water system plans of both these seasons.

Table 12. Cropping pattern (CP), irrigation pattern (irrigated [I] or unirrigated [UI] area) and net value of ha of crops

Crops	Cropping pattern (CP)- as a % of total crop area, irrigation pattern (irrigated [I] or unirrigated [UI]) as a % of crop area							Net value per ha of crop area ($/ha)	
	Current patterns			Scenario 1		Scenario 2			
	CP	I	UI	CP	I	CP	I	I	UI
Kharif season									
Paddy	0.2	0	100	0.2	0	17.8	100	335	212
Jowar/bajra/maize	6	0	100	6	0	5.5	100	199	125
Pulses	21	0	100	21	0	8.7	100	35.7	225
Oilseeds	23	0	100	23	0	7.7	100	282	231
Vegetables						3.1	100	361	228
Fodder						0.5	100	260	164
Rabi season									
Wheat	33	49.6	50.4	33	100	35.1	100	247	144
Jowar/bajra/maize	0.3	5.5	94.5	0	100	0	100	199	125
Pulses	16	28.7	71.3	16	100	10.7	100	304	192
Oilseeds	1	67.4	32.6	1	100	6.5	100	271	222
Vegetables						1.4	100	361	228
Fodder						1.8	100	260	164
Annual crops									
Sugarcane						1.1	100	361	228
Total	100	22	78	78		100	100	260	192

Net value livestock production/ha of net sown area	269	252

Source :https://publications.iwmi.org

Situation 2. In situation 2 (S2) we expect the equivalent editing design as the one proposed by the possibility study. In S2, all harvests are inundated in the kharif and rabi season, and paddy and wheat are the transcendent yields in the water system plans of both these seasons.

Situation 3. Situation 3 (S3) has a comparative editing example to situation 2 (S2). Nonetheless, it expects an alternate water system plan, where ranchers flood just paddy and vegetable harvests in the kharif season. Almost certainly, on normal precipitation conditions, different harvests, basically coarse oats, heartbeats and oilseeds, require no water system in the kharif season. This situation additionally accepts all 'rabi' crops get full water system.

We evaluated the net worth of result of each editing design utilizing the assessed net upsides of flooded and unirrigated crops from the essential overview. In any case, we likewise made the accompanying suppositions in assessing the net worth of result, everything being equal:

- The essential overview offered just the net benefit of result of the kharif crops that got no water system. Accordingly, we accepted the distinctions of the net worth of result per ha of all harvests in the rabi season (US$260/ha with water system and US$164/ha without water system) among inundated and downpour took care of conditions and utilized these figures to assess the net worth of result of paddy, jowar, heartbeats and oilseeds under water system conditions in the kharif season. We duplicated the net worth of these yields under unirrigated conditions by an element of 1.58 (=260/164-the proportion between net worth per ha in flooded to unirrigated region to appraise the net worth under watered conditions.
- The essential study didn't catch the distinctions of net worth of result of vegetables and sugarcane. Here as well, we evaluated the distinctions of net worth of results of vegetables and sugarcane in flooded and downpour took care of conditions, by utilizing the net upsides of result per ha of heartbeats and oilseeds in the kharif season. . The distinctions of net worth in the result of all rabi crops is for the grain crop.
- The circuitous advantages of forward and in reverse linkages are assessed with the water system multiplier of 1.4.

The proposed situation in S2, with full water system, has the biggest expansion in the net worth of yield creation (Table 13). It increments 50 % over the ongoing net worth of harvest creation. Nonetheless, the distinction of net worth between the proposed situation in S2 and other two situations is extremely inconsequential. For instance, the net worth of harvest creation of S2 is just 19 % and 7 % higher than S1 and S3, separately. How do these advantages contrast and the expansion in water system? A significant piece of the kharif crop region under S1 and S3 isn't flooded. Consequently, we assessed the absolute immoderate water utilization of harvests, and utilized water efficiency — net worth of result per m^3 of destructive water use — as a premise of correlation for execution between the situations (Table 13). The absolute net worth added yield in this table is the amount of the net worth of creation of harvests and the animals, and the backhanded advantages of the extra water system water moves of the KBLP.

We saw that the expansion in wasteful water use in the KBLP order region was nearly higher than the worth expansion that water system made. This is obvious from the distinction in the momentum net worth of creation per m^3 of destructive water use and the net values found in situations S1 and S2. For example, the efficiency per destructive water use has, as a matter of fact, diminished from the current degree of 0.16 $/$m^3$ to 0.13 $/$m^3$ in S2. What's more, the efficiency gauge, even at 1.9 local multiplier level will build just to 0.15$/$m^3$. Subsequently, given the overall distinctions of harvest efficiency of inundated and downpour took care of conditions, even the proposed trimming examples won't essentially increment net advantages comparative with the expansion in wasteful water use.

Table 13. Net value of production, consumptive water use and the irrigation water requirements under different scenarios.

S. No.	Factors	2006	Situation 1	Situation 2	Situation 3
1.	Net sown area (1,000ha)	370	370	370	370
2.	Gross cropped area (1,000ha)	460	490	490	490
3.	Gross irrigated area (1,000ha)	104	260	490	387
4.	Net value of crop production ($, million)	95	119	142	133
5.	Net value of livestock production($,million)	96	96	100	98
6.	Total net value of output ($, million)	190	216	242	231
7.	Increase in direct benefits ($, million)		24	50	39
8.	Increase in indirect benefits ($, million)		22	45	35
9.	Total net value added benefits due to additional irrigation ($, million)		46	96	75
10.	Total consumptive water use (million, m^3)	1,250	1,787	2,004	2,022
11.	Net value of output per drop of consumptive water use ($/m3)	0.16	0.14	0.15	0.13
12	Irrigation requirement (million m^3)	301	752	1,165	1,095
13.	Change in irrigation requirement (million m^3)		450	863	794
14.	Change in irrigation requirement - % of proposed irrigation supply (3,196 million m^3)		14	27	24

Source :https://publications.iwmi.org

We assessed the advantage cost proportion of the water system part by expecting 10 years of the undertaking development period, US$431 million of the all over cost as assessed by the NWDA, 100 years of the task's life expectancy, and a typical yearly expense of 5 % of the absolute expense for activity and upkeep. At a 10 % limited rate, the advantage cost proportion of the water system part under the three situations is 0.4, 0.8 and 0.6, individually. Assuming the 1.9 multiplier is utilized for surveying the aberrant advantages, the advantage cost proportion increments to 0.5, 1.1 and 0.9, individually for the three situations. To be sure, expansion in the net advantages when contrasted with the expense of water system part of the KBLP is by all accounts extremely immaterial, considerably under the most hopeful situations of the backhanded advantages that the venture would create. The financial and ecological effect of the Ken-Betwa undertaking would have produced huge advantages to the KBLP area, as lacking power and drinking water supply are significant imperatives for monetary improvement in Bundelkhand, survivor of serious dry season years. This venture additionally advances public coordination and a fair sharing of the country's normal water abundance likewise shows and guarantees an incredible worry for water preservation and ideal utilization of accessible water assets. A few ranchers were sold their animals as they can't give a satisfactory drinking water supply for their animals. On account of the Ken-Betwa connect project, no authority figure is accessible for the quantity of individuals to be dislodged. It is assessed that the for the most part tribals and ranchers individuals will dislodged.

CONCLUSION

The Ken-Betwa project is set to help the dry season inclined locale of Bundelkhand, which is spread across 13 areas in Uttar Pradesh and Madhya Pradesh. MOA on sharing of water for the KBLP was signed by both state govt. on 22nd March 2021. Central govt. has released the fund for the project implementation of the present in the union budget 2021-22.

The project will definitely to improve the socio-economic situation in the backward Bundelkhand region. It targets increased agricultural activities and employment generation. While the Centre has promised that the project provides for environment management and safeguards, to many environmental and wild life.

The venture intends to utilize miniature water system frameworks widely to further develop water proficiency. There are additionally plans to fix and extend the current enroute water tanks interfacing the trench to accomplish comprehensive water the board nearby. After execution, water freedoms bookkeeping, water control, and oversight divisions ought to be laid out to accomplish the best use and the executives of water assets in the rgion. The task will prompt the thorough turn of events and the executives of water assets nearby and will set a model for other comparative undertakings.

After practical investigation of Ken Betwa connecting project, we observed that Ken Betwa connecting is just a single piece of answer for water emergency of Bundelkhand in light of the fact that all out water interest of Bundelkhand area is 11301.69 mcm while 4909 mcm water will be provided from Ken Betwa Linking Project.

However, the whole situation of the crisis will be attained from best management of available water. Some other strategy recommendation given following:

- To further develop water supply through conventional water bodies/lakes, the majority of which are as of now in extremely frail circumstances. Customarily, every town had more than one lake, and they are still a lot in the Bundelkhand locale.
- In any case, after autonomy, because of distraction to foster water to satisfy the developing interest for water system and different areas, these water bodies/lakes were ignored, and no consideration was paid to their support and upkeep.
- Customarily, these were additionally the local area's strict social places, and the local area use to protect these as water asylums. The disregard of these lakes eventually brought about decreasing their ability to collect and store water significantly because of weighty siltation over the long haul.
- To improve the per unit productivity of water the water use efficiency can be improved by educating the formers and promoting the use of micro irrigation in place of flood irrigation, which is the norm in the region.
- Ranchers at large still inundate their fields by flood water system, having the most minimal water use proficiency. Fifth Minor Irrigation Census information show that just 0.25% of minor water system plans in Uttar Pradesh, India, utilize a sprinkler water system/trickle water system framework.
- Data innovation may likewise add to tending to the circumstance. Tragically, the infiltration of data innovation in the water system and water area is immaterial.

ACKNOWLEDGMENT

In the feeling of extraordinary joy and fulfillment I present this undertaking named "STUDY and PLANNING OF INTER-LINKING RIVERS IN BUNDELKHAND (U.P).". The finishing of this task is no question a result of important help and commitment of number of individuals. I might want to communicate my true on account of my aide Md. Sajid (Asst. Teacher, Department of Civil Engineering) for his ceaseless assistance and significant ideas and furthermore giving empowering climate, without which my venture and its documentation could never have been conceivable. I'm additionally appreciative to my Head of Department (Civil Department) for his important assistance, consolation and motivation. The fruition of any errand isn't just the prize to the individual action associated with achieving it, yet in addition the people engaged with moving and directing. I'm appreciative to my companions for their

consistent inspiration and remarks that has assisted me with finishing this report.

REFERENCES

[1] Claudia W. Sadoff, David Grey "Beyond the river: the benefits of cooperation on international rivers." The World Bank, MSN J11-1102 1818 H Street, NW, Washington, DC 20433, USA Received 25 May 2002; received in revised form 18 June 2002; accepted 17 July 2002 ,Published by Elsevier Science Ltd.

[2] R. E. Tharme "A global perspective on environmental flow assessment: emerging trends in the development and application of environmental flow methodologies for rivers." 22 September 2003 https://doi.org/10.1002/rra.736

[3] S. K. Gupta and R. D. Deshpande **"**Water for India in 2050: first-order assessment of available options" Physical Research Laboratory, Navrangpura, Ahmedabad 380 009, India, Current Science, VOL. 86, NO. 9, 10 MAY 2004

[4] Kelly D. Alley "The Making of a River Linking Plan in India: Suppressed Science and Spheres of Expert Debate" India Review, vol. 3, no. 3, July 2004, pp. 210–238 Copyright © 2004 Taylor & Francis Inc. ISSN 1473-6489 print DOI:10.1080/14736480490520386.

[5] National Water Development Agency " Terms of reference for preparation of detailed project report of Ken Betwa link project" Approved TOR by MOWR vide letter No.2/25/2003-BM/1092 dt. 8.8.2006)

[6] Kelli Krueger, Frances Segovia, Monique Toubia "Assessment of the india river linking plan : A closer look at the Ken Betwa pilot link" Natural Resources and Environment At the University of Michigan April 2007

[7] Jeroen Warner, Philippus Wester and Alex Bolding (2008) "Going with the flow: river basins as the natural units for water management" Article in Water Policy · July 2008 DOI: 10.2166/wp.2008.210 Source: OAI

[8] R. Sani, B. K. Gupta, U. K. Sarkar, A. Pandey, V. K. Dubey and W. Singh Lakra "Length–weight relationships of 14 Indian freshwater fish species from the Betwa (Yamuna River tributary) and Gomti (Ganga River tributary) rivers" J. Appl. Ichthyol. 26 (2010), 456–459 _ 2010 National Bureau of Fish Genetic Resources Journal compilation _ 2010 Blackwell Verlag, Berlin ISSN 0175–8659.

[9] S.K. Mazumder (2011) "Interlinking Indian rivers merits"Journal of Multi Disciplinary Engineering Technologies Volume 5 No.1 January 2011

[10] B. Surya Prakasa Rao, N. Srinivas, N. Bhaskara Rao, S. V. J. S. S. Rajesh and P. Pernaidu Geological and environmental issues of the proposed link canal (Inchampalli to Nagarjunasagar) of Godavari to Krishna Rivers adopting remote sensing and geographical information system (GIS), Journal of Geology and Mining Research Vol. 4(4), pp. 75-85, May 2012 Available online at http://www.academicjournals.org/JGMR DOI: 10.5897/JGMR11.045 ISSN 2006-9766 ©2012 Academic Journals

[11] W. S. Lakra ,U. K. Sarkar ,V. K. Dubey , R. Sani , A. Pandey River inter linking in India: status, issues, prospects and implications on aquatic ecosystems and freshwater fish diversity, Rev Fish Biol Fisheries (2011) 21:463–479 DOI 10.1007/s11160-011-9199-5, Received: 2 August 2010 / Accepted: 19 January 2011 / Published online: 29 January 2011 Springer Science+Business Media B.V. 2011.

[12] S. K. Sharma "Sustainable Flood Plain Management through linking of major rivers in India" ARPN Journal of Science and Technology, ISSN 2225-7217, VOL. 2, Special Issue, ICESR 2012, http://www.ejournalofscience.org

[13] Kiran K. Singh "Re-designing geography through ingter linking of river" International Journal of Science" Environment and Technology,Vol. 1, No 4, 2012,358 362.

[14] Dharmendra Mehta, Naveen K. Mehta (2013) "Interlinking of rivers in India – Issues & challenges" JEL Code: M10, N 50, N 55, P 28. Published by Geo-Eco-Marina 19/2013.

[15] Mary C. George, Prakash D. Korgaonkar & K. Geetha **"**Interlinking of river basin**"** International Journal of Civil, Structural, Environmental and Infrastructure Engineering Research and Development (IJCSEIERD) ISSN(P): 2249-6866; ISSN(E): 2249-7978 Vol. 4, Issue 2, Apr 2014, 33-46 © TJPRC Pvt. Ltd.

[16] H. Mahabaleshwara , H.M. Nagabhushan (May-2014), "Inter basin water transfers in India – A solution to hydrological extremities" IJRET: International Journal of Research in Engineering and Technology eISSN: 2319-1163 | pISSN: 2321-7308, Volume: 03 Special Issue: 03 | May-2014 | NCRIET-2014, Available @ http://www.ijret.org

[17] Agricultural Finance Corporation Ltd. Mumbai, India, "Resettlement and Rehabilitation : Project Affected Families Economic Rehabilitation Plan (PAFERP)" Volume – III Resettlement and Rehabilitation : Project Affected Families Economic Rehabilitation Plan (PAFERP) as per "The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act 2013".

[18] Dr. Ashok K. Keshari "Multiplication decision making techniques in resolving conflicting issues of rivers" publication at: https://www.researchgate.net/publication/270393990 (22 November 2014)

[19] Agricultural Finance Corporation Ltd. "Ken – Betwa Link Project (Phase-I) Environmental Impact Assessment and environmental Management Plan" National Water Development Agency (Ministry of Water Resources, River Development and Ganga Rejuvenation, Government of India) July 2015.

[20] Pooja Mehra1 and H.N.Verma (2015), Watershed Development and Management Saturating Whole Basins Areas, Advances in Economics and Business Management (AEBM) Print ISSN: 2394-1545; Online ISSN: 2394-1553; Volume 2, Number 6; April-June, 2015 pp. 657-659 © Krishi Sanskriti Publications http://www.krishisanskriti.org/aebm.html

[21] Ravi Babu B and P Padmavathi (2016) "Interlinking of Krishna and Godavari rivers: An ecological study" Department of Zoology & Aquaculture, Acharya Nagarjuna University, Guntur, A.P, India, ISSN: 2347-5129 (ICV-Poland) Impact Value: 5.62 (GIF) Impact Factor: 0.549 IJFAS 2016; 4(5): 593-595 © 2016 IJFAS www.fisheriesjournal.com

[22] Mr. Ismail Mondal, Dr. Jatisankar Bandyopadhyay, Dr. Ashis Kr. Paul (2016), "Sustainable Development and Management of Ground Water Resources, its Remedial Measures for Emerging Crisis and Climate Change in West Bengal" at: https://www.researchgate.net/publication/299509652

[23] Sunil Kumar Vyas, Gunwant Sharma, Y.P. Mathur, Vinay Chandwani, **"**Interlinking feasibility of five river basins of Rajasthan in India" Available online at www.sciencedirect.com **Science Direct** journal homepage: www.elsevier.com/pisc, Received 25 February 2016; accepted 6 April 2016Available online 3 May 2016**.**

[24] Pammi N Sinha (2017)"An alternative approach to evaluating inter-basin water transfer links" Department of Geography Durham University, UK 2017

[25] K. D. Joshi, Md. A. Alam, D. N. Jha, K. Srivastava, S. K. Srivastava, V. Kumar & A. P. Sharma (2017) "Studies on ecology, fish diversity and fisheries of Ken–Betwa rivers (India): Proposed for inter-linking" Aquatic Ecosystem Health & Management, 20:1-2, 71-85, publication at: https://www.researchgate.net/publication/316601539

[26] Nevil K. Trambadia,Vinodkumar M.Patel, Manoj J.Gundalia "The International journal of analytical and experimental modal analysis" Volume XI, Issue IX, September/2019 ISSN NO: 0886-9367.

[27] Swamy H.M, Sanjay, Basavaraju G. (2019), **"**River-Linking, Flipside to Loan Waiver"**,** Bulletin of Environment, Pharmacology and Life Sciences Bull. Env. Pharmacol. Life Sci., Vol 8 [3] February 2019 : 01-07 ©2019 Academy for Environment and Life Sciences, India Online ISSN 2277-1808 Journal's URL:http://www.bepls.com

[28] Dr. Rashmi Sharma **"**Interlinking of Rivers can solve the water problem in Rajasthan" International journal of Advance research, Idea & innovations in Technology ISSN: 2454-132XImpact factor: 4.295© 2019,www.IJARIIT.com.

[29] Vinayak S Sindhur, Vishwanath P Patil, Jyoti, Shwetha N, G.E. Ruddrappa "Interlinkig of Indian major rivers" International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056 Volume: 06 Issue: 06 | June 2019 www.irjet.net p-ISSN: 2395-0072

[30] Dr. K. P. Sudheer, Dr. K. Srinivasan, Dr. Balaji Narasimhan " Morophological study of Krishna and tungbhadra basin using remote sensing techniqe"Envronmental and water resources engineering division department of civil engineering Indian institute of technology, Madras, Chennai - 600 036 March 2019. Volume XI, Issue IX, September/2019 ISSN NO: 0886-9367.