AN APPRAISAL OF WATER RESOURCES OF THE KOSI COMMAND AREA: A GEOGRAPHICAL STUDY

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Abstract:

The kosi river is colled the mourning of Bihar but if properly planned ,the Kosi river can prove to be a boon not only for bihar but also for India and Nepal. The Kosi-Mechi Link project is proposed to divert the Kosi river supplies for irrigating the un-irrigated areas in both Nepal and Bihar in India, besides transferring part of it into for ultimate use in Ganga. The water of Kosi river is proposed to be stored in the proposed Kosi high dam at Barahkshetra in Nepal. The regulated releases from the reservoir, after generation of power at the toe of dam, are proposed to be diverted from proposed Chatra barrage at 8 km d/s of dam for irrigation and diversion in kosi- Mechi Link canal on left and Kosi- Ghaghra Link canal on right. Water is needed to ensure food security, feed livestock, and take up industrial production and to conserve the biodiversity and environment.

Keywords: Food security, feed livestock, Industrial production, Conservation, Biodiversity

Methodology

The present research work based on the observational description and observational rational methods in order to decipher the theme of the research. Various statistical and cartographic methods has applied where ever needed. The present research study based on both primary and secondary data. The primary data collected through personal observation, interview, questionnaires schedule etc. Map and diagrams, graphs etc. have been widely used in this research papers. The Study is on the basis of empirical data accessed from different source like Central Statistical Organization (CSO), Economic Surveys, Planning Commission of India, GOI Websites and other relevant Websites. Research Journals, National and International Reports.

Discussion

A power channel is also proposed to take off from the right bank of Kosi-Mechi link canal at6.4 Km to meet the water requirement of existing Kosi canal system ex - Kosi barrage at Hanuman Nagar after power generation at three falls in the power channel.

The Kosi-Mechi link canal will comprise the following components
Headworks consisting of a 269.0 m high dam on Kosi at Barahkshetra with a gross capacity of 13450 MCM, an installed capacity of 3000 MW of power and a barrage at Chatra on Kosi 8 Km d/s. 3 nos of barrages at level crossings on Burhi Khola, Lohandra Nadi and Biring river Three canal power houses at 3 drops of 12.2 m each in the power channel which takes off from right bank of link canal at 6.40 km. The installed capacity of each power house is 60 MW.

A 112.55 km. long link canal traversing entirely in Nepal only and off-taking from proposed Chatra barrage at FSL of 113 0m on left bank of Kosi river with discharge of 1407.80 cumecs and bed width of 155.0 m in head reach and 97.64 cumecs and 10.0 m in tail reach.

BENEFITS OF THE SCHEME

The scheme envisages to provide following benefits

A. ower generation of 60 MW each at 3 places along the power channel i.e. total of 180
Irrigation benefits in total area of 4,74,000 ha both in Nepal and Bihar in India out of which 1,75,000 ha lies in Nepal (including 68000 ha of existing Chatra canal system) and 2,99,000 ha in Bihar.

B. Domestic and Industrial water supply for the en-route towns.

C. Inland navigation through Pumea Br canal by remodelling the canal and extending it upto Ganga.

Flushing dose provided for Eastern Chatra canal as per the project report of Kosi high dam. As per above study it will be seen that after meeting all commitments 19253 MCM is available as surplus at Kosi dam which can be used for diversion elsewhere like Kosi- Ghghra diversion.

Appraisal water transfer throw the link canal

1-The Kosi- Mechi link canal provides irrigation to en-route command areas of both Nepal and India (4640 MCM) in addition to stabilizing the existing irrigation in Kosi command. The quantity of water to be diverted through the link canal is, therefore, inclusive of annual water requirement of existing Kosi Project (9268 MCM) and annual requirement of Navigation (8830 MCM). In addition, the link canal will cater the quantum of water to be exported to Mahananda basin @ 28 cumecs (883 MCM) including domestic and industrial needs (24MCM)) of en-route towns also. Besides transmission loss in the channel @ 0.60 cumec per Sqm accounts for 57 cumecs.

Taking all these committed needs viz en-route irrigation, requirement of existing irrigation Schemes and power channel, export to Mahananda; drinking and industrial needs, the total quantity of water proposed to be diverted through Kosi Mechi Link canal works out .

2. It may be mentioned that a provision of 2118 MCM has been kept in the reservoir forflushing dose to eastern Chatra canal while a provisions of 7482 MCM has been kept for diversion to proposed Kosi-Ghaghra link canal on Western side of the river out of surplus 2118 + 7482 = 33302 MCM available at dam site. Thus annual withdrawal from the Kosi reservoir works out to 23702 MCM.

3. The quantity required for existing Kosi canals and navigation i.e. 9268 + 8830 = 18098 MCM three canal power houses by utilising the available drop of 12.0 m at each power house.

After power generation, a quantum of 9268 **MCM** of water would **finally** be discharged into Kosi river upstream of the existing Hanuman nagar barrage to meet the requirement of eastern and western Kosi canals. The remaining quantity of 8830 MCM would be released 280 cumecs round the year to permit inland navigation. The existing Purnea Branch canal Kosi Project is proposed to be used for navigation by re modeling the canal and extending upto Ganga for which a detailed survey and investigation is proposed to be carried out by NWDA.

Observation and Findings

Table -1

S N.	Name of Project	Culturable Command area in ha.		
		Nepal	India (Bihar)	Total
1	Hanuman Nagar Barrage (Existing)			
	i. Eastern Kosi Main Canal	-	3,48,000	3,48,000
	ii. Raipur Br. Canal		1,03,000	**1,03,000**
	Sub Total-1	-	4,51,000	4,51,000
2.	Link Canal	-		
	i. Eastern Chatra Canal	1,75,000	56,000	2,31,000
	ii. Additional New area(en-route)	-	2,43,000	2,43,000
	Sub-Total-2	1,75,000	2,99,000	4,74,000
	Total 1& 2	1,75,000	7,50,000	9,25,000

is to be diverted through the link canal upto RD 6.4 Km only after which it will be routed through the power Channel off-taking to the right from 6.4 Km of Link canal togenerate 180 MW of hydro power at

Taking into account this quantity of water, the area benefited due to Western Kosi canal is also to be added.

Availability of water

The annual surface water resources assessed at Kosi high dam site has been carried out by various organization/ agencies at different times as indicated below

On the basis of 75 % dependable inflow yield as 46727 MCM, the N.W.D.A. worked out the water resources available for use in downstream of Kosi dam as 43011 MCM as given here below

SN	Particulars	In MCM per annum
1	75% dependable yield at Kosi High Dam	46,727
2	U/S utilization for Nepal portion considered on approximate basis	
i.	Irrigation	3,584
ii	Domestic w/s	330
iii	Industrial w/s	330
	Sub total 2	4,244
3	Regeneration from u/s utilization	528
4	Overall availability at 75% dependability 1-2+3	**43,011**

The N.W.D.A report further indicates that according to the simulation study this value of 43011 MCM gets reduced to 40377 MCM, (vide Annex-3.2 1 & 3.2.2 of NWDA Report) the breakup being 26395 MCM for monsoon and l3982MCM for non- monsoon season. Explanation to this reduction has been given by the NWDA. This, being the latest figure, has been adopted by the Committee for working out the Water Balance at Kosi dam as detailed in following paragraph.

Status of shortage or surplus in the command

Comparing the water availability with the demand in the basin stated above, it transpires that the command area will face shortage to the tune of 12862 MCM during non- monsoon season, though there is surplus of 25313 MCM during monsoon period. this include a shortage of 2701 MCM in Mahananda basin (vide Annexure 8.2.2.5) of the Kamla-Balan- Kosi composite basin during non-monsoon. This shortage can be met by MSTG Link. Still the command of Kosi-Mechi Link canal will be left with a shortage of 10162 MCM - 2701 MCM) during non-monsoon season, even though there is a surplus of 25313 MCM during monsoon period. This shortage can be met by conservation of more monsoon flows. This can be possible by constructing additional storages on tributaries like Sun Kosi, Tamur and Arun, wherever possible. These storages will not only increase the availability of flows during non- monsoon but also facilitate silt control in the flows coming down. The silt control in the dows will check the vagrant and erosive tendency of the river lower down.

REVIEW OF PROVISION OF FLOOD MODERATION IN TRE SCHEME

The proposed Kosi High Dam, a major component of the scheme, is an indispensable and a major component of long term measures for the solution of this problem of flood and irrigation in this belt. As such it is essential to re-assess the provisions made in the reservoir scheme for mitigating the severe problems of flood and irrigation prevailing in the basin. The component wise assessment is mentioned in the succeeding paragraphs.

Provision of Flood Cushion in the Kosi high dam

The CWINC in the year 1950 had recommended for construction of Kosi High Dam at Barahkshetra to impound 8518 MCM (6.9 million acre ft) of which 3827 MCM (3.10 million acre f1.) was intended for silt storage and the remaining 4691 MCM (3.8 million acre ft.) was intended to moderate flood to a safe maximum discharge of 5663 cumec (2 lakh cusec) along with other allied provisions. A review of the provisions made in the Kosi high dam (a mentioned in para 8.2.1) reveals that there is no provision of flood cushion for moderating the flood to a safe maximum discharge in the river.While formulating the reservoir capacity of Kosi High Dam, NWDA has considere the probable maximum flood of 42475 cumec (15 lakh cusec). In the CWC report the PMF of 42475 cumecs was routed with flood impinging level at the crest level of spillway (321.50 m) and the routed maximum discharge worked out to be 14300 cumecs (5 lakh cusec), thus accounting for a flood storage of 3208 MCM (2.6 million acre ft) between crest level and MWL (338.30 m) The gross storage of KHD Project is considered as 13450 MCM upto FRL 335.25 m. But in the feasibility report, it is mentioned that the water level during the flood season is proposed to be maintained below the crest regulating the releases through sluices and spillway gates. These two statements seem to be contradictory and misleading. It seems that conservation storage in the non-monsoon has been considered as 13,450 MCM upto FRL 335.25 m, but in the monsoon period it is up to crest level 321.50 m only.

It is worth to be added that as per the Kosi Technical Committee (1965), recommendation, this proposed Kosi High Dam should have provision for 4691 MCM (3.8 MAF) flood cushion so that flood can be moderated to safe maximum discharge of 5660 cumecs (2 lakh cusec). This provision will ensure dependable flood protection and at the same time this will facilitate construction of forward embankments on either side of the defined channel carved out for moderate flood. And by doing so, a vast tract of culturable land can be brought under cultivation for reasonably stable defined channel. The variation between maximum and minimum discharge must be kept within reasonable limit which may be 15:1 This is required for improved morphology and navigation through the river. To maintain the river morphology it is essential to provide at least 200 cumec (i.e. 3629 MCM) water d/s of the Kosi barrage even in non-monsoon period.

Soil conservation to control inflow of sediment load

In view of the heavy sediment load being carried in the Kosi river, it is necessary to adopt soil conservation meanires in the upper catchments so that optimum benefit can be assured from the constructed and proposed schemes. As the Tamur tributary having 10 percent catchments of the Kosi river, contributes 26% of the coarse silt, the Kosi Technical Committee (1965) has suggested that as the first step soil conservation should be done in its catchments.

The plan of soil conservation for the Tamur catchments should include debris (check) dams at suitable points. These dams will help to check the high velocity by controlling gradient. Conservation plans on land, supplemented by Conservation forestry and other coordinated measures on the unfarmed portion of catchments, provide a soil conservation scheme.

Surface sowing of cloves, and even grasses under some circumstances, resulted in the establishment of surprisingly good pastures on deteriorated sown and native grass lands, particularly when grazing was strictly controlled.

Top dressing with phosphate and trace elements proved to be the biggest factor in promoting the introduction of clovers and the strengthening of grass is on deteriorated hill country soils.

Rational grazing of cattle was more effective than sheep grazing in regenerating poor pastures, and cattle obviated the need to burn native pastures periodically. When burning and rabbits were eliminated the rapid recovery of native pasture under controlled cattle grazing was not promising.

The value of planted trees in healing unstable eroded land, particularly in gullies, was confirmed in all districts, as was the effectiveness of native cover regenerated by complete spelling in areas of higher rainfall.

Pasture furrows were valuable in conserving water and reducing the scour of soil.

Graded banks and broad-base terraces were strictly effective in stopping the loss of soil from cultivated slopes by sheet and rill erosion and in greatly reducing uncontrolled run-off.

Wide and low, grossed waterways, proved effective in harmlessly disposing of run off that could not be retained on the land.

Dam capable of temporarily storing flood waters and regulating their discharge through a pipe demonstrated their merits.

Gully Control Works, such as debris dams and drops, proved effective.

It was found that all the other conservation practices were of limited use until dressing and over sowing not only increased the protective value of the pasture but also increased the cropping capacity of the land and so provided revenue for other improvement and supporting conservation practices. However, top dressing and seeding are difficult and expensive on hill country. The economical solution was found in New Zealand in the serial mechanization of this work"

The effective and profit giving soil conservation thus is very important for the catchments of the dams in the Himalayan region for very effectiveness and effective life of the structure.

Navigation System

The proposal of NWDA to remodel Purnea Branch Canal as navigation channel for 8830 MCM water does not appear logical as it will involve numerous additional works. Instead navigation can be well planned and provided without much ado from Nepal to sea port at Kolkata through river route.

Suggestion

The proposed Kosi High Dam should have provision of flood cushion for 4691 MCM (3.80 MAF) as recommended by Kosi Technical Committee (1965) so that flood can be moderated to safe maximum discharge of 5660 cumecs (2 Lakh Cusecs)

Soil conservation measures in the upper catchments should be included in the Link Schemes to control inflow of sediment load in the Kosi dam reservoir so that optimum benefit can be assured from the proposed dam.

The shortage to the extent of 2,701 MCM in Mahananda basin of the Kamala- Balan-Kosi- Mahananda composite basin during non-monsoon period be met by MSTG Link.

The remaining shortage of 10,162 MCM during non-monsoon should be met by conservation of more of monsoon flows by constructing storage reservoirs on the tributaries of Kosi viz. Sun Kosi, Tamur and Arun.

The proposal of NWDA to remodel Purnea Branch Canal as navigation channel does not appear logical. Instead navigation should be provided through river route itself.

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