

EXECUTIVE SUMMARY

The Ken-Betwa link project envisages diversion of surplus waters of Ken basin to water deficit Betwa basin. The quantity of water proposed to be diverted from Ken basin, after considering in basin demands and downstream commitments earmarked for providing irrigation in Madhya Pradesh and Uttar Pradesh, is 1020 Mm³. This link canal will provide irrigation to water short areas of upper Betwa basin of Madhya Pradesh by way of substitution and also to enroute areas of Madhya Pradesh & Uttar Pradesh. The command envisaged in the earlier proposed Ken Multi-purpose Project (KMPP) by Madhya Pradesh State Government is also to be irrigated from this project. Apart from drinking water facility & enroute irrigation of 47000 ha in Chhatarpur & Tikamgarh districts of Madhya Pradesh and Hamirpur & Jhansi districts of Uttar Pradesh, provision for downstream commitments of 1375 Mm³ for M.P. and 850 Mm³ of water for U.P. has also been kept.

A dam is proposed on river Ken at Daudhan 2.5 km upstream of existing Gangau weir. The 75% dependable yield of Ken upto Daudhan site has been assessed as 6188 Mm³. The net water availability at dam site after accounting all the upstream requirements is obtained as 3291 Mm³. The downstream commitments from Ken at Daudhan are 2225 Mm³. Out of which, 850 Mm³ is provided to Uttar Pradesh and 1375 Mm³ to Madhya Pradesh as per Interstate agreement of 1981 on river Ken. This 1375 Mm³ will be utilised to irrigate the entire command of KMPP. The surplus water for diversion at Daudhan is 1020 Mm³. Out of which, 659 Mm³ is transferred to Betwa river upstream of Parichha weir and 312 Mm³ is utilised in the enroute command.

The dam proposed at Daudhan is an earthen dam with a side channel spillway with FRL of 287 m and gross storage capacity of 2775 Mm³. The maximum height of the dam is 73.80 m. The total length of the side channel spillway is 326 m. 15 gates of 18 m x 18 m size are provided to pass the design flood of 45104 cumecs. Two power houses, one (Power House No.1) at the foot of the dam and other (Power House No.2) at the end of 2 km long tunnel are proposed. The installed capacities of Power House No.1 and 2 are 3 x 20 MW and 2 x 6 MW respectively. The Power House No.1 will be a pumped storage scheme and the pondage between the existing Gangau weir and Daudhan dam will be utilised to store water releases from the Power House. This storage will be pumped back by the

Francis type reversible turbine of this Power House during off peak periods.

The total length of the link canal from Ken at Daudhan to its outfall point is 231.45 km including a 2 km long tunnel in its head reaches. The design discharge of the link canal at its head is 72 cumecs. The canal is designed as a trapezoidal section with rounded corners and lined for the entire length. The full supply depth and bed width of the canal at its head are 3.56 m and 12 m respectively with 1 in 10,000 bed slope. The side slopes of the canal are 1.5 (H): 1 (V). The canal crosses several rivers/streams. The link canal after traversing about 230.00 km outfalls in an existing reservoir namely Barwa Sagar from where the diverted water will join Betwa river through a natural stream in the upstream of Parichha weir.

The Betwa command comprises of four projects namely Barari, Neemkheda, Richhan and Kesari in the upper reaches of the Betwa basin. An area of 1.27 lakh ha in the Raisen and Vidisha districts of Madhya Pradesh will be benefitted by utilising 659 Mm³ of water annually from this link by way of substitution. This link is also to provide annual irrigation to 47000 ha area enroute in the drought prone Chhatarpur and Tikamgarh districts of Madhya Pradesh and Hamirpur and Jhansi districts of Uttar Pradesh. The water use for this command is 312 Mm³. Besides, an area of 3.23 lakh ha annually under earlier proposed KMPP command (termed as Ken command in this report) in the Chhatarpur and Panna districts of Madhya Pradesh will be benefitted. The water use in this command is 1375 Mm³, which will be met from releases of Daudhan dam into Ken river through Power House No.1.

The link will also provide 11.75 Mm³ water for drinking water supply to the enroute villages of Chhatarpur & Tikamgarh districts of Madhya Pradesh and Hamirpur & Jhansi districts of Uttar Pradesh.

Detailed surveys and investigations of the headworks and the main canal have been carried out for establishing the feasibility of the project. The preliminary designs and preparation of cost estimates have been done on the basis of these surveys and investigations.

Auxiliary and incidental benefits that will occur by the commissioning of this scheme are of immense value to the people of the area. Ground water will get supplemented due to increased use of surface water for irrigation. The scarcity of drinking water in these dry areas will be mitigated considerable. The afforestation programme could be implemented on canal banks

resulting in environmental improvement. The communication system will improve because of canal roads and CD works raising marketing opportunities. The formation of the reservoirs will help tourism development, fish and aquaculture, bird sanctuaries etc. Besides, there will be an increase in employment opportunities during the construction of project.

Interlinking river development programme, particularly those that include the development of one or more dams and reservoirs, can produce far-reaching changes in the environment of the region. Environmental effects, or changes resulting from project development, may occur upstream, on site, downstream or along the link project as well as changes in population distribution and land use in the immediate reservoir area as well as other zones due to increased development for irrigated agriculture, industry or other purposes (fisheries, resettlement). Adequately planned such big projects provide major economic benefits. However, as with many other developments, there may be direct & indirect adverse environmental & social effects (costs) as well as beneficial environmental impacts secondary to the initial project purposes. With careful planning, adverse effects can be minimized or mitigated, and secondary beneficial effects enhanced. Net benefits from the link project often will increase when it become regional development project that integrate irrigation, power generation and municipal water supply with catchment area management, conservation, tourism, fisheries and rural development. Thus, environmental & socio-economic analysis is one of the ways in which resource development project can be analysed, to identify and minimise potential resource conflicts/adverse environmental effects, thus enhancing overall project viability. It was felt necessary to carry out a study to assess the likely effects on various aspects such as agro-economic, socio-economic and environmental impacts. National Council of Applied Economic Research (NCAER), New Delhi was engaged by NWDA to carry out the bench mark survey of the socio & agro-economic conditions prevailing in the region of the link project.

The total cost of the link project has been estimated as Rs. 1988.74 crore (1994-95 price level) comprising Rs. 991.07 crore for Main Project (Unit-I: Head works Rs. 367.92 crore, Unit-II: Canals Rs. 572.44 crore and Unit-III: Power Rs. 50.72 crore). The cost of canal system is Rs. 554.11 crore for Ken command (i.e. KMPP) and the estimated cost of four projects is Rs. 443.55 crore for Betwa command. The schedule of construction of the link project is planned for a period of 9 years including pre-construction year. The annual benefits accrued from the project are estimated to be in the

order of Rs. 449.79 crore (1994-95 price level). The rates at April 1994-95 price level have been worked out based on the Unified Schedule of Rates (USR), April 1991 of Water Resources Department, Govt. of Madhya Pradesh after considering escalation @ 10% per annum.

The Benefit-Cost ratio for the Ken-Betwa link project as a whole has been computed based on the corresponding annual costs and annual benefits from this project, which comes to 1.87. The internal rate of return (I.R.R.) of the project works out to 13.00%.