

## **CHAPTER - 12 COST ESTIMATE**

### **12.1 General**

This report envisages construction of an earthen dam across the Ken river and a concrete side channel spillway on the left flank of the river as its head works and a 231.45 km long canal for transferring water from Ken river to Betwa river. Two power houses are also located near the head works. The project provides irrigation in the command area enroute of the main link canal and Ken command. The command area proposed by the four Projects in the upper Betwa region will also be irrigated by way of substitution.

The cost estimate for this project has been prepared based on the quantities found out from the field survey, preliminary designs etc. The rates at the price level of April, 1994 have been worked out on the basis of Unified Schedule of Rates (USR), April, 1991 of Water Resources Department, Government of Madhya Pradesh after considering escalation at the rate of 10% per annum. The total cost of the project has been worked out as below:

### **12.2 Main Project**

#### **12.2.1 Unit -I : Head works**

Unit -I consists of head works including the dam, side channel spillway and stilling basin, which amounts to cost Rs. 367.92 crore.

##### **12.2.1.1 'A' Preliminary**

The estimated cost in this sub-head is Rs. 183.44 lakhs. It covers the expenditures already incurred by the department on surveys and investigations done by the G.S.I., C.S.M.R.S. New Delhi and N.C.A.E.R, New Delhi.

Provision is also made for future survey and investigation, G&D observations, camp equipments, training of engineers etc.

##### **12.2.1.2 'B' Land**

An estimate of Rs. 6917.44 lakhs has been prepared for this sub- head. Under this head, compensation for government/private land and forest lands coming under submergence, land for the borrow areas and quarries and land for colony areas have been made. Other provisions for compensation of standing crops have also been made.

##### **12.2.1.3 'C' Works**

The estimated cost under this sub-head is Rs. 23069.81 lakhs. This covers the cost of both earthen dam and concrete dam consisting overflow and non-

overflow section. Provisions have also been made for the cleaning of the site of construction, drilling work for consolidation, curtain grouting, cement required for grouting, plain and reinforced concrete for spillway and NOF section. Also provisions for steel radial crest gates with hoisting, earth work excavation and transportation, upstream pitching, turfing etc, are made under this sub head.

#### **12.2.1.4 'K' Building**

An estimate of Rs.1263.34 lakhs has been made under this head. Provision of buildings for the office and residential accommodation for the staff of Circle, Division and Sub-division at the project site have been made.

#### **12.2.1.5 'M' Plantation**

An estimate of Rs. 3.62 lakhs has been provided under this sub- head. This includes plantation of trees in colonies, downstream of earthen dam and along the approach road to the project site.

#### **12.2.1.6 'O' Miscellaneous**

Under this sub-head an estimate of Rs. 634.36 lakhs has been prepared. Provisions for external and internal electrification of the colonies, water supply and sewage disposal, recreation facilities, medical and security arrangement, fire fighting equipment, telephone facilities, visits of VIPs for inauguration ceremony etc. are being kept under this sub-head.

#### **12.2.1.7 'P' Maintenance**

A provision of Rs. 98.10 lakhs has been kept under this sub- head. The rate for building is taken as 1/2% of the cost of permanent building per year for 10 years and 1/4% on the cost of temporary building per year for 10 years.

The rate for colony and work site road is taken as Rs. 3872/- per km/ per year.

The rates for maintenance of concrete and earthen dam have been taken as 1/4% and 1/2% for average 5 years on 1/2 of the amount.

#### **12.2.1.8 'Q' Special T&P**

An estimate of Rs. 185.91 lakhs has been kept under this sub - head. Provisions for various machineries and equipments including transportation vehicles have been made in this head. The cost of machinery etc. will be initially charged to works. During construction the cost will reduce and the debit will be charged to works.

#### **12.2.1.9 'R' Communication**

A provision of Rs. 1155.46 lakhs has been made under this head. This includes construction of approach road to dam site, approach tunnel to power house no. 1, approach to colony and quarries etc.

#### **12.2.1.10 'X' Environment and ecology**

An estimate of Rs. 16.18 lakhs has been prepared for this sub- head. This includes soil conservation measures, compensatory afforestation, prevention measures of forest fires, restoration of land and public health measures etc.

#### **12.2.1.11 'Y' Losses on stock**

Under this head an amount of Rs. 65.60 lakhs has been provided @ 1/4% on all heads excluding sub-heads 'A', 'B' and 'Q'

#### **12.2.1.12 II-Establishment**

A provision of Rs. 2667.58 lakhs has been made under this head @ 10% of I-Works excluding 'B' land.

#### **12.2.1.13 III-Ordinary T&P**

A provision of Rs. 335.93 lakhs is made for this @ 1% of I-Works.

#### **12.2.1.14 IV-Receipt and recoveries**

A total of Rs. 228.98 lakhs has been made for this as per the provision.

#### **12.2.1.15 Indirect charges**

A total of Rs. 423.83 lakhs has been made for this sub head. An amount of Rs. 335.93 lakhs has been provided @ 1% of works as audit and accounts charges and an amount of Rs. 87.90 lakhs @ 5% of cost of culturable land as abatement of land revenue. The total estimated cost under head Unit-I 'Head works' has been worked out as Rs. 36791.63 lakhs. General abstract of cost of Unit-I is given in Table No.12.1.

**Table -12.1**  
**Unit-I: 'Head Works'- General abstract of cost**

<b>Sl. No.</b>	<b>Item</b>	<b>Amount (Rs. in lakhs)</b>
	<b>DIRECT CHARGES</b>	
<b>I</b>	<b>Works</b>	
	'A' Preliminary	183.44
	'B' Land	6917.44
	'C' Works (Concrete and Earthen dam)	23069.81
	'K' Buildings	1263.34
	'M' Plantation	3.62
	'O' Miscellaneous	634.36
	'P' Maintenance	98.10
	'Q' Special T&P	185.91
	'R' Communications	1155.46
	'X' Environment and ecology	16.18
	'Y' Losses on stock and unforeseen	65.60
	<b>Total of I - Works</b>	<b>33593.26</b>
<b>II</b>	Establishment	2667.58
<b>III</b>	Ordinary tools and plants	335.93
	<b>Total direct charges</b>	<b>36596.78</b>
<b>IV</b>	Deduct receipt and recoveries	(-) 228.98
	<b>Net direct charges</b>	<b>36367.80</b>
<b>V</b>	Indirect Charges	423.83
	<b>Grand Total</b>	<b>36791.63</b>

### **12.2.2 Unit -II : Canals (Link and enroute command)**

Unit-II consists of the main link canal with the provision of lining and the canal system consisting of branch canals, distributaries, minors and watercourses in the enroute command. The estimated cost is Rs. 572.44 crore.

#### **12.2.2.1 'A' Preliminary**

Under this head the expenditure already done by the department upto March 1994 has been taken into account. The surveys include alignment survey for the main link canal right from the offtake point on the Daudhan reservoir. L-section and cross sections were taken and plotted. Detailed estimates are then prepared on the basis of the contour plan prepared for a strip of 400 m i.e. 200 m on either side of the center line of the alignment. This was done to fix up the final alignment according to the bed slope of the canal. The expenditure also includes the representative survey of about 100 ha in the proposed command area. CSMRS, New Delhi was engaged to determine the soil characteristics test at about 10 different places along the link canal. Provision for future detailed survey on the final alignment of the link canal has been kept in this head. Provision for

preparation of the detailed project report, running and maintenance of the vehicles and other miscellaneous items have also been kept. The cost has been estimated to Rs. 248.33 lakhs for the enroute command.

#### **12.2.2.2 'B' Land**

Acquisition of private land for the main and branch canals as well as for residential and non-residential buildings have been made under this head. Solatium charges for compulsory acquisition, legal charges, diversion of communication system etc. have also been provided. Provision of Rs. 1450.27 lakhs have been kept under this sub-head.

#### **12.2.2.3 'D' Regulator**

Under this sub-head the estimate for head regulator at the offtake point of the link canal, cross regulator at the terminal point, regulator sluice for branch canal are made separately. Provision under this sub-head is Rs. 57.50 lakhs.

#### **12.2.2.4 'E' Falls**

In this estimate the cost of one major fall along the main route of the link canal and 236 falls on the branch canals and distributaries in its enroute command have been worked out as per the cost curve of Hasdeo Bango Project in Madhya Pradesh and duly updated to the price level of 1994. Rs.136.77 lakhs is provided under this sub-head.

#### **12.2.2.5 'F' Cross drainage works**

Provisions for 59 Nos. of C.D. works have been worked out and the costs of individual works have been derived. Total provision in this sub-head is Rs. 3341.28 lakhs.

#### **12.2.2.6 'G' Bridges**

Provisions for 60 Nos. of bridges on the main canal only have been kept in this estimate on the basis of the cost curve derived for Hasdeo Bango Project in Madhya Pradesh after necessary escalation in the price level. An amount of Rs. 438.23 lakhs has been made under this sub-head.

#### **12.2.2.7 'H' Escape**

Atleast four Nos. of escapes have been provided at different R.D. along the main canal and the estimate of each has been derived from the cost curve of Hasdeo Bango Project after due escalation. Cost under this sub-head is Rs. 19.95 lakhs.

#### **12.2.2.8 'K' Buildings**

The cost under this sub-head amounting to Rs.500.77 lakhs have been arrived at on individual estimates as per the plinth area rate derived from the model estimates of each type of building.

#### **12.2.2.9 'L' Earth work**

A major share of the total estimated cost has been made under this sub-head. The following provisions are made in the estimate.

Ordinary jungle clearance, cutting and felling of trees including its uprooting, stripping of the seat of embankment, excavation in hard soil, hard rock, soft rock etc., compaction of earth by S.F.R., construction of dowlah, transportation charges for earth and moorum, providing P.C.C. for lining, tamping in canal bed and side slopes etc. Total cost has been worked out as Rs. 38243.16 lakhs.

#### **12.2.2.10 'M' Plantation**

Under this sub-head provision of Rs. 95.41 lakhs for plantation in the colonies and different offices alongwith the plantation of trees on the embankment of the link canal on both sides have been made. The cost includes the price of the saplings and protective measures also.

#### **12.2.2.11 'O' Miscellaneous**

Under this sub-head the provision for external electrification of the colonies, water supply and special lighting arrangements for construction works have been included. The cost has been worked out as Rs. 325.96 lakhs.

#### **12.2.2.12 'P' Maintenance**

Provisions for maintenance of water supply and sewerage of colonies, telephones, security arrangements, school bus and inspection vehicles are kept under this sub-head. Maintenance cost is taken as 1% of I-Works less 'A' Preliminary, 'B' Land and 'Q' Special T&P. Provision under this sub-head has become Rs. 493.97 lakhs.

#### **12.2.2.13 'Q' Special T&P**

The following provisions are kept under this sub-head of the estimate:

Exploratory and quarrying equipment, heavy earth moving and other equipments like sheep foot roller, water tanker, vibrator, concrete mixer, trucks etc. Provisions for electrical equipments like generator, pump etc. have also been kept. Cost of work-shop tools and inspection vehicles are also figured in this estimate. The cost under this sub-head is Rs. 90.33 lakhs.

#### **12.2.2.14 'R' Communication**

Cost of construction of quarry roads, temporary roads in the work area and temporary river crossings are provided under this sub-head of the estimate. The amount under this sub-head is Rs. 70.73 lakhs.

#### **12.2.2.15 'U' Distributaries and minors**

The rate per hectare for the distributaries has been worked out as per the Hasdeo Bango Project after duly escalated to the price level of 1994. This rate includes the cost of lining also. Total provision under this sub-head is Rs. 5019.37 lakhs.

#### **12.2.2.16 'V' Water courses and field channels**

The rate per hectare has been worked out from the rate of Hasdeo Bango Project after escalating the same to 1994 price level. The estimated cost under this sub-head is Rs. 426.53 lakhs.

#### **12.2.2.17 'W' Drainage**

This cost of Rs. 182.72 lakhs has been arrived at by considering the rate of Hasdeo Bango Project after escalating to price level of 1994. Provision of chak and collecting drains for command area has been made under this sub-head.

#### **12.2.2.18 'Y' Losses on stock**

Provision of 1/4% of the cost of works less 'A' Preliminary, 'B' Land and 'Q' Special T&P has been made as losses on stock under this sub-head. The amount arrived at this sub-head is Rs. 123.38 lakhs.

#### **12.2.2.19 II - Establishment**

This cost is the 10% of the work less 'B' Land of the estimate. The amount under this provision is Rs. 4981.44 lakhs.

#### **12.2.2.20 III - Ordinary tools and plants**

Provision of Rs. 512.65 lakhs @ 1% of the Works has been kept for this in the estimate.

#### **12.2.2.21 IV - Receipts and recoveries**

Provision of Rs. 72.80 lakhs for receipts and recoveries on the special tools and plants and temporary building have been kept as per the guidelines of the CWC's working group report.

### 12.2.2.22 Indirect charges

A total provision of Rs. 557.84 lakhs @ 1% cost of the Works has been kept for the audit and accounts charges and @ 5% cost of culturable land for abatement of land revenue have been made under this sub-head. The total estimated cost under head Unit - II 'Head Works' has been worked out as Rs. 57243.77 lakhs. General abstract of cost of Unit - II is given in Table No. 12.2.

**Table -12.2**  
**Unit - II : 'Canals' - General abstract of cost**

Sl. No.	Item	Amount (Rs. in lakhs)
	DIRECT CHARGES	
<b>A</b>	Works	
	'A' Preliminary	248.33
	'B' Land	1450.27
	'D' Regulators	57.50
	'E' Falls	136.77
	'F' Cross Drainage Works	3341.28
	'G' Bridges	438.23
	'H' Escapes	19.95
	'K' Buildings	500.77
	'L' Earthwork	38243.16
	'M' Plantation	95.41
	'O' Miscellaneous	325.96
	'P' Maintenance	493.97
	'Q' Special T&P	90.33
	'R' Communications	70.73
	'U' Distributaries and minors	5019.37
	'V' Water courses and field channels	426.53
	'W' Drainage	182.72
	'Y' Losses on stock	123.38
	<b>Total of A Works</b>	51264.65
<b>II</b>	Establishment	4981.44
<b>III</b>	Ordinary tools and plants	512.65
	<b>Total direct charges</b>	56758.73
<b>IV</b>	Deduct receipt and recoveries	(-) 72.80
	<b>Net direct charges</b>	56685.93
<b>V</b>	Indirect Charges	557.84
	<b>Grand Total</b>	57243.77



### **12.2.3 Unit - III : Power**

Unit-III consists of two power houses, power intake structures, tunnels and penstocks, surge tank, tail race and approach tunnel for the power house No. 1, switch yard and transformer yard, transmission line, cost of electrical equipments etc. The estimated cost is Rs. 50.72 crore.

#### **12.2.3.1 'A' Preliminary**

Under this sub-head, the cost of survey work already done by the department has been included. Provisions for future survey including the foundation exploration of the power houses, construction of access road, consultants fees for the design of various electrical components, training to engineers and purchase of miscellaneous T&P and camp equipments are kept under this sub- head. The estimated cost has come is Rs. 41.82 lakhs.

#### **12.2.3.2 'J' Power plant civil works**

The estimate under this sub-head includes the following sub- estimates prepared separately for the power house No. 1 and power house No. 2.

##### **(a) For Power House No.1**

- (i) Sub-estimate for the power intake structure includes the cost of excavation of hard strata, laying of R.C.C. with necessary provisions for scaffolding and cost of reinforcement bars, cost of trash rack panels, cost of intake gates including the cost of hoisting etc. The estimated cost is worked out as Rs. 103.85 lakhs.
- (ii) Sub-estimate for the pressure shaft: This includes the cost of underground excavation for pressure tunnel, laying of R.C.C. including cost of reinforcement etc. The estimated cost in this head is Rs.199.65 lakhs.
- (iii) Sub-estimate for the underground power house including upstream and downstream valves: Under this head, provision have been made for the underground excavation with disposal of all material as directed, providing and laying RCC including cost of reinforcement bars, providing glass panels, mosaic floor, anchor bars for grouting, steel doors and windows, steel ladders, sanitary and water supply, cost of telecommunications, paintings and white washing on walls and doors and windows etc. The cost has been worked out as Rs. 558.86 lakhs .
- (iv) Sub-estimate for ventilation tunnel: This estimate has been worked out as Rs. 4.26 lakhs which includes the cost of underground excavation for the ventilation tunnel and providing rock bolting and grouting.

- (v) Sub-estimate for the tail race tunnel: Under this sub- estimate the provisions have been kept for the underground excavation in hard rock by blasting, providing and placing M 150 grade concrete for lining, drilling of grout holes, providing temporary and permanent steel supports, cost of cement pressure grouting etc. which comes to Rs. 349.85 lakhs.
- (vi) Sub-estimate for the approach bridge: The cost under this head is worked out as Rs. 86.34 lakhs which includes the provision of excavation in hard and soft rock, providing and laying of RCC including the cost of reinforcement bars, providing steel N-trussed bridge and extra cost for additional lift of excavated material.
- (vii) Sub-estimate for the tail race outfall structure: This includes the cost of excavation in hard rock, providing and laying of RCC including the cost of reinforcement bars, providing trash rack panel, G.I. pipe railing, fabrication and erection of service gates alongwith hoisting arrangement, providing and fixing of gantry crane, M.S. ladder including G.I. pipe railing etc. The cost has been worked out as Rs. 83.27 lakhs.
- (viii) Sub-estimate for control and power cable tunnel: The cost under this sub-estimate has been worked out as Rs. 9.92 lakhs which includes the cost of excavation in hard rock, providing M 150 grade concrete, rock bolting and other miscellaneous items such as portal structures, lighting and drainage arrangements etc.

**(b) For Power House No.2**

- (i) Sub-estimate for the power house and penstock: This sub-estimate includes the cost of drilling by diamond core drilling, excavation in hard rock, grouting, cost of cement for consolidation grouting, providing and laying R.C.C. including the cost of reinforcement bars, steel lining for penstock, embedded metal works for draft tube, cost of draft tube and penstock gates, ventilation and air conditioning arrangements, steel stairs, mosaic floors, steel roof truss, doors and windows etc. The cost has been worked out to be Rs. 375.79 lakhs.
- (ii) Sub-estimate for tunnel and surge tank: Under this head, provisions have been made for the underground excavation for the tunnel and the surge tank, RCC lining in tunnel and surge tank including the cost of reinforcement, drilling of grout holes, cost of cement for grouting and other miscellaneous items such as air vent, temporary lighting etc. The cost under this sub-estimate is Rs. 708.28 lakhs.

#### **12.2.3.3 'M' Plantation**

Provision of plantation in and around the power house and along the approach road to both the power houses has been made under this sub-head which works out to be Rs. 1.33 lakhs.

#### **12.2.3.4 'P' Maintenance**

Maintenance cost has been kept as 1% of the IWorks excluding 'A' Preliminary, 'B' Land and 'Q' Special T&P. The estimated cost is Rs. 44.31 lakhs only.

#### **12.2.3.5 'S' Power plant electrical works**

Under this sub-head, costs of all the electrical equipments required for generation and transmission of power from both the power houses have been made. This includes the cost of preliminary expenses on design and consultancy work, generating plant i.e. turbines, generation and its accessories including its transportation and erection charges, auxiliary equipment like electric overload crane, lifts, gantry crane for draft tube gates, cost of butterfly valves, cost of draft tube gates and its erection charges, cost of transformers, circuit breakers, isolators etc. and other miscellaneous equipment for transformer yard & switch yard and cost of construction of transmission line of about 30 km.

The cost has been estimated under this sub-head as Rs. 1949.73 lakhs.

#### **12.2.3.6 'Y' Losses on stock**

Loss of suspense @ 1/4% on IWorks excluding the cost on 'A' 'B' and 'Q' has been made under this estimate, which works out as Rs. 11.19 lakhs.

#### **12.2.3.7 Establishment**

This cost is the 10% of the IWorks excluding 'B' Land of the estimate. The amount under this provision is Rs. 452.84 lakhs.

#### **12.2.3.8 Ordinary T&P**

A provision of 1% cost of IWork has been kept under this sub-head, which is amounting to Rs. 45.28 lakhs.

#### **12.2.3.9 Indirect charges**

1% charges on IWorks have been kept under this sub-head as indirect charges, which amounts to Rs. 45.28 lakhs.

The total estimated cost under the head Unit-III Power has been worked out as Rs. 5071.86 lakhs. General abstract of cost of Unit - III is given in Table No. 12.3

### 12.3 Ken command

The item wise cost of canals under Ken command has been worked out using quantities given in the project report of the proposed Ken Multi-purpose Project prepared by Madhya Pradesh Water Resources Department. The rates at April,1994 price level have been worked out based on the USR (April, 1991) of Madhya Pradesh Water Resources Department after considering escalation at the rate of 10% per annum. The estimated cost of canal under Ken command comes to Rs.554.11 Crore. General abstract of cost of Ken command is given in Table No. 12.4.

**Table. 12.3**  
**Unit - III : 'Power ' - General abstract of cost**

<b>Sl. No.</b>	<b>Item</b>	<b>Amount (Rs. in lakhs)</b>
	<b>DIRECT CHARGES</b>	
<b>A</b>	<b>Works</b>	
	'A' Preliminary	41.82
	'J' Power plant civil works (Total for PH-1 and PH-2)	2480.07
	'M' Plantation	1.33
	'P' Maintenance	44.31
	'S'Power plant electrical works	1949.73
	'Y' Losses on stock	11.19
	<b>Total of A Works</b>	<b>4528.45</b>
<b>II</b>	Establishment	452.84
<b>III</b>	Ordinary tools and plants	45.28
	<b>Total direct charges</b>	<b>5026.58</b>
<b>IV</b>	Indirect Charges	45.28
	<b>Grand Total</b>	<b>5071.86</b>

**Table -12.4**  
**Ken Command General abstract of cost**

Item	Amount (Rs. in lakhs)
Works	
'A' Preliminary	478.67
'B' Land	743.70
'D' Regulators	157.08
'E' Falls	41.32
'F' Cross Drainage Works	2371.97
'G' Bridges	237.07
'H' Escapes	199.46
'J' Power Plant Civil Works	522.59
'K' Buildings	1141.54
'L' Earthwork and canal lining	18712.71
'M' Plantation	22.97
'N' Tanks and reservoirs	1272.01
'O' Miscellaneous	1058.05
'P' Maintenance	481.25
'Q' Special T&P	1023.07
'R' Communications	497.78
'S' Power Plant and electrical system	1032.90
'U' Distributaries, minors and sub-minors	18652.87
'V' Water courses and field channels	910.82
'W' Drainage	113.67
'Y' Losses on stock	118.57
Establishment cost @ 10% of I-Works less 'B' Land	4904.64
Ordinary T&P@ 1% of I-Works	497.90
Total Receipt & Recoveries	(-) 299.42
Total Indirect Charges	518.12
<b>Grand Total</b>	<b>55411.32</b>

#### **12.4 Betwa command**

The command area identified for the four projects in upper Betwa sub basin namely Neemkheda dam, Richhan dam, Barari barrage and Kesari dam are termed as Betwa command of K-B link project. Cost of each of these projects have been estimated on notional basis considering unit cost of Rs.35,000 per hectare area irrigated. This is shown in Table -12.5. Different project reports prepared by the State Government have been referred for estimating the unit cost per hectare area irrigated.

**Table -12.5**  
**Estimated cost of projects under Betwa command**

<b>Sl. No.</b>	<b>Name of projects</b>	<b>Annual irrigation(ha)</b>	<b>Estimated cost (Rs. in lakhs)</b>
1	Barari barrage	44355.50	30453.15
2	Neemkheda dam	1053	368.55
3	Richhan dam	36828	12889.80
4	Kesari dam	1840	644.00
	<b>Total</b>		<b>44355.50</b>

Thus the total cost of these four projects comes to Rs. 443.55 crores.

### **12.5 Recurring and non-recurring expenditures on Tools and Plants**

Recurring and non-recurring expenses on ordinary and special tools and plants for unit-I, unit-II and unit-III have been worked out. All the expenditures in the running and maintenance of vehicles and special tools and plants are taken in recurring accounts and the capital costs of all vehicles and equipments for construction purposes are charged to non-recurring expenditure.