



KUNDALIA DAM PROJECT

KUNDALIA MAJOR MULTIPURPOSE PROJECT

TEHSIL-ZIRAPUR

DISTRICT- RAJGARH

PRILIMINARY FEASIBILITY REPORT

ESTIMATED COST	:	Rs. 3448.00	Crore
PROPOSED IRRIGATION	:	CCA 125000.00	Ha.
		GCA 200000.00	Ha.

JUNE-2016

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CHAMBAL BETWA BASIN
WATER RESOURCES DEPTT.
BHOPAL (M.P.)

TEHSIL-ZIRAPUR

DISTRICT- RAJGARH

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CHAPTER – 1

HISTORY OF WATER UTILISATION IN CHAMBAL BASIN

The river Kalisindh, which forms part of lower Chambal sub basin which ultimately is a part of Yamuna sub basin, is the biggest tributary of river Chambal. It holds around 35% of the catchment area of river Chambal lying in the state of M.P. The river Kalisindh is joined by another major tributary river Newaj, before it finally meets river Chambal. Till the end of 18th century almost all of the water available in the basin was simply flowing down in to Yamuna river to finally join the river Ganga. It is in the start of the 19th century, when some sincere efforts to harness this water wealth was started and completed in Chambal basin falling under sub zone I which now form the State of the M. P. Even almost all these efforts for harnessing the water wealth of Chambal were concentrated in the upper Chambal zone only and during the late fifties a series of multipurpose dam were constructed on river Chambal itself. These constitute Gandhi Sagar dam, Rana Pratap Sagar dam, Jawahar Sagar dam and the Kota barrage. Apart from this a number of minor and medium tank schemes and lift irrigation schemes were also taken up in the last two decades of the 20th century. Some of the important names under these schemes are Khankheddi lift irrigation schemes, choma, Chambaleshwar, Indergarh, Chaldu etc. However not much of the work was taken up in the case of lower Chambal sub basin i.e. in Zone-II except construction of 4 medium schemes on the tributaries of river Kalisindh namely Tillar, Chillar, Lakhundar and Piplia kumar, apart from construction of some minor irrigation schemes and small lift irrigation schemes.

Even no sizable project was taken up in this sub basin for water supply schemes except the construction of small anicuts and pickup weir by municipal bodies despite acute drinking water shortage in this region of Malwa.



A view of river in month of September

. A major project namely Ranjit Sagar dam near Shajapur town on main river Kalisindh is in the stage of investigation and consideration since from last 25-30 years, but still the project proposals could not materialized for one other reason. Similarly three other medium projects in the upper Chambal basin, namely Maxi nallah, Ankiya and Lodhari etc also could not be taken up so far for actual construction purposes due to various reasons. The ultimate sufferer is the upper Chambal basin area in terms of meeting out its irrigation, domestic, industrial and other needs due to non construction of any major dam /reservoir on the river. The situation is so critical that almost in every alternate year even the drinking water supply after march is to be planned once in three days or once in a week from most of the town situated in the Kalisindh sub basin.

The concept of Kundalia dam and reservoir has come up as a addition to earlier submitted Kalisindh - Chambal link canal project and as a part of Kalisindh river basin complex which will be having three major components of RS dam, Kundalia dam, and PKC link canal project. Even otherwise if the concept of PKC link canal project is

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delayed or is not materialized, than too construction of Kundalia major dams and RS dam can be taken up independently or as a complex for the overall interest of the state of M.P. Construction of these two major dams and reservoirs will be in a cascade pattern on main river and both of these two project are very much essential to raise the irrigation in sub basin area besides meeting out day by day increasing domestic and industrial demand.

The topographical and geographical constraint of the upper Chambal basin together with the most troublesome issue of submergence of land and property calls for a detailed reservoir capacity feasibility survey for the proposed project so that the interest of the State of M. P. can be taken care off in respect of minimizing the submergence of land and property.

The Govt. of M.P. with this primary objective has accorded the administrative approval vide its memo. No 22(A)20/01/SCS/31/2060/Bhopal of dated 11.09.07 for 140.43 lakh. Technical sanction to Rs120.00lakh was accordingly accorded by Chief Engineer Chambal Betwa Basin Bhopal vide memo no538/427/D-2/W/CB/07 Bhopal of dated11.10.07 to carry out this work.

The Govt. of M.P. with this objective has accorded the administrative approval vide its memo. No 22(A)303/2014/MPS/31/1476 Bhopal dated 13.10.2014 for Rs. 3448 Crore. The Ministry Environment, forest and climate change, Govt of India has accorded the environmental clearance for C.C.A. 58040 Ha. And G.C.A. 82625 Ha. Vide its memo No. J-12011/42/2011-IA.I dated 14th January 2015, but due to change in irrigation system from gravity canal system to pressurized irrigation system average irrigation efficiency has increased from 60% to 85%. Due to increase in efficiency C.C.A. has increased from 58040 Ha. To 125000 Ha. , therefore revised environmental is being sought.

Pressurized pipeline supplying sprinkler and micro irrigation system in the Kundalia major project offers the opportunity for high efficiency irrigation, meaning that more cultivable land can be brought under production. This is the basis upon which the planned CCA of kundalia mojar project was increased from 58040ha to 125000ha.

CHAPTER-2 PROJECT AT A GLANCE

1.0 General Report

Kundalia project is a major multipurpose project, which is proposed, in lower Chambal basin in lower zone-I. The project is proposed on river Kalisindh which is one of the major three river constituting this zone of lower Chambal sub basin. Under the scope of proposed project a barrier is proposed to be constructed on river Kalisindh near village Balaheda of Zirapur tehsil of district Rajgarh. The proposed dam site can be located at latitude $23^{\circ}55'41''$ and longitude $76^{\circ}18'15''$ on Topo sheet no 54D/4. The site is approachable from Km 42 of Zirapur - Pachor road by a 10.0km long road.



APPROACH TO BALAHEDA VILLAGE AND SITE (PMGSY ROAD)

The site is 26km from Zirapur town. The approach up to dam site from right flank is a PMGSY road which ends up to the right bank of the river.

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The project is second major dam which is proposed on the main river. The first dam is Ranjit Sagar dam which is proposed in the initial reach of the river in district Shajapur basically as a irrigation project whereas the project under reference is to be designed as a irrigation cum diversion structure under the topographical limitation of the river and sub basin and in particular the gross surplus availability of water taking into consideration.

The project in its proposed form will provide irrigation on d/s of proposed Kundalia dam on left and right flank of Kalisindh River. The irrigation will be provided by pressurized irrigation system nearly serving 125000ha in the districts of Rajgarh and Shajapur.

The planned use of pressurized pipeline supplying sprinkler and micro irrigation system in the Kundalia major project offers the opportunity for high efficiency irrigation, meaning that more cultivable land can be brought under production. This is the basis upon which the planned CCA of kundalia mojar project was increased from 58040ha to 125000ha.

The project proposal will comprise of following main components: -

- 1) Construction of dam for 2655 m. This will consist of left earthen dam in 2335 m length and right earthen dam in 320 m length , and subsidiary bund in a saddle of 2 km .
- 2) Construction of a central gated spillway in 345m length which will consist of 11 no's of 17x12m size radial gates and 10piers of 3.5m thickness each.
- 3) Construction of right and left NOF in 120m length wherein 5 blocks of 20m each will be provided in left flank and 1 blocks of 20m each will provide in right flank.
- 4) One no of head sluice on left flank and one no. of head sluice on right flank from dam to provide irrigation on d/s of dam to approx. 125000ha of CCA.
- 5) One no of under sluice in pier number 9 to provide drinking water facility and release of water for d/s .for maintaining ecological requirements.
- 6) 350m long 7.50 m wide T-beam Type double lane Bridge over the spillway.
- 7) 10m long key wall on left earthen dam site at junction between earth dam and spillway.
- 8) 11 no's of radial service gates of size 17x12m (10+1stand by) with electromechanical rope drum hoisting arrangement. Alternatively this can be provided with hydraulic hoist.
- 9) 1 no's of emergency gate consisting of 8 multiple units of 17x 1.35m each and 1 top unit of 17x1.2m with gantry crane type of hoisting arrangement.
- 10) D/S energy dissipation arrangement in the form of slotted roller bucket of 15m radius.

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- 11) Construction of d/s training wall, guide wall and returned wall.
- 12) Construction of diversion barrage and channel from Lakhundar river .
- 13) Construction of complete left bank & right bank pressurized irrigation system including rising main, pump house, transmission line including construction of all the pressurized structure required therein.

The project on its completion will serve to meet irrigation requirement of 125000 ha of CCA.

The dam in its present proposal will also be able to take care of meeting out domestic & industrial water supply demand to the adjoining towns situated on the periphery of reservoir in M.P., besides other fringe benefits of ground water recharge, flood control, pisciculture and tourism. Construction of Kundalia dam is also essential for reducing the effect of likely flood damage in Kalisindh sub basin to a great extent.

Sub-Divisional Officer
Water Resources Sub.Dn.
Zirapur (M.P.)

Executive Engineer
Water Resources Division
Zirapur (M.P.)

CHAPTER-3 SALIENT FEATURES

1. **LOCATION**
 - I. State - Madhya Pradesh
 - II. Tehsil/District - Zirapur/Rajgarh
 - III. Village - Balaheda
 - IV. a) Longitude - 76°18'15''
 - b) Latitude - 23°55'41''
2. **HYDROLOGY**
 - I. **Catchment area**
 - a) Total - 4925 sq.km
 - b) Catchment area from Kalisindh - 3850 sq.km
 - c) Diverted catchment from Lakhundar - 1075 sq.km
 - II. **Annual rainfall**
 - a) Maximum - 2171.19mm (At Dewas RG)
 - b) Minimum - 323mm (At Khilchipur RG)
 - c) Average - 966.75mm
 - d) 75% weighted mean - 768.07mm
 - III. **Annual yield**
 - a) As per lower Chambal master plan
[812.13Mcum@0.175Mcum/sq.km](#)
 - b) As per rainfall runoff relationship considered in project for main dam
[679.128Mcum@0.180Mcum/sq.km](#)
 - c) As per rainfall runoff relationship considered in project for diversion barrage
[201.63Mcum@0.187Mcum/sq.km](#)
 - d) As per NWDA report
[997.76Mcum@0.215Mcum/sqkm](#)
 - e) Average yield
[858.535Mcum@0.185Mcum/sqkm](#)
 - IV. **Flood**
 - Probable Maximum Flood - 20747.50cumecs
3. **RESERVOIR DATA**
 - a) **Capacity**
 - I. Gross storage capacity - 582.75 Mcum
 - II. Dead storage capacity - 30.00Mcum
 - III. Live storage capacity - 552.75Mcum
 - b) **Principal levels**
 - I. Nalla bed level (N.B.L.) - 360.50 m
 - II. Lowest sill level (L.S.L.) - 390.00 m
 - III. Max. draw down level (MDDL) - 380.00 m
 - IV. Full tank level (F.T.L.) - 400.00 m
 - V. Maximum water level (M.W.L.) - 401.50 m
 - VI. Top bund level (T.B.L.) - 405.00 m
 - c) **Water spread area**
 - I. Water spread area at L.S.L. - 2155 ha.

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4.	<u>DAM</u>	II. Water spread area at F.T.L	-	7476 ha.
		I. Type	-	Zonal dam
		II. Max. height of earthen dam	-	32.001m
		III. Max. height of concrete dam from N.B.L.	-	44.50 m
		IV. Total length of dam	-	3100 m
		V. Top width	-	7.50 m
		VI. Length of spillway	-	345 m
		VII. Length of earthen dam	-	2755m (2487m+268m)
		VIII. Length of NOF	-	120m (60m+60m)
5.	<u>SPILLWAY</u>	I. Type	-	Gate controlled ogee spillway
		II. Crest level	-	388.00m
		III. Type of gate	-	Radial gate (17x12 m).
		IV. No. of gate	-	11
		V. Design discharge moderated	-	20747.50cumec
		VI. Length	-	225m between abutment
6.	<u>IRRIGATION</u>	I. Gross command area (GCA)	-	200000 ha
		II. Culturable command area (CCA)	-	125000 ha
		III. Annual irrigation	-	163000 ha
		IV. Crop pattern proposed	-	Double cropped (Rabi &Kharif)
		V. No. of village to be befitted	-	Approximately 419 villages
7.	<u>COST OF PROJECT</u>	I. Unit I head work	-	1400.03crore
		II. Unit II canal	-	2047.97 crore
		III. Total cost	-	3448.00 crore
8.	<u>BENEFIT COST RATIO</u>		-	1.85

CHAPTER – 4

INTRODUCTION

The river Kalisindh is among three major rivers of lower Chambal basin which forms upper reach of lower Chambal sub basin. This is the biggest river of zone I of lower Chambal basin. The total C.A. of the river is 24,663.00 sqkm and this shares 18.60 % of the total C.A. of the main Chambal River. The C.A. of river up to proposed dam site is 4925.00 sqkm. The river is basically an interstate river, and out of its total length of 351.00 kms the river in its first 180.00 km length right from its origin to the state boundary runs in the state of M.P and the remaining 171.00 km length lies in the state of Rajasthan. The river has number of major tributaries out of which Lakhundar lies completely in the state of M.P.

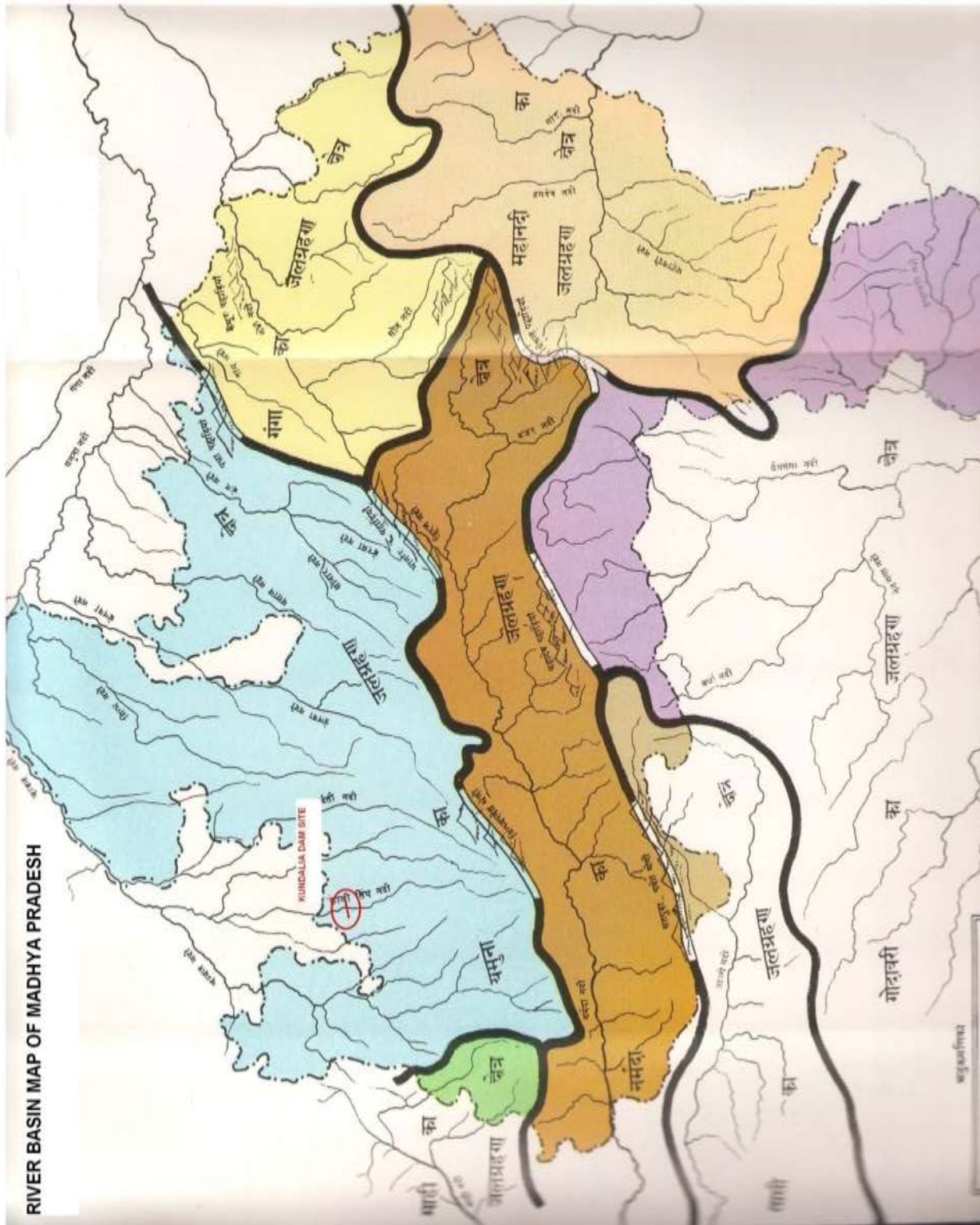
The project proposal in its present form includes diversion and transfer Lakhundar sub basin available water in to main sub basin by constructing diversion barrage, for optimum utilization of water wealth as good storage site is available on river Lakhundar, whereas other tributaries like Ahu, Parwan, Chauli, Rewa, Piplaud, Amajhar lies fully in the state of Rajasthan except river Kanthal, which is a interstate river. Except Lakhundar and Kanthal all other major tributaries are originating within the state of Rajasthan and are meeting in the river Kalisindh after traversing through the state of Rajasthan. The river finally meets into the river Chambal near kota town in the state of Rajasthan d/s of Kota barrage at an elevation of 195.00m and the river Chambal finally joins river Yamuna forming the great Yamuna sub basin as a part of GangaBasin.

The Kalisindh sub basin supports a large medium dense habitat area almost equally distributed on both of the banks. The CCA 125000 ha area is proposed under cultivation. Thus, basically the basin is agricultural predominant basin having very less forest cover. Owing to this cultivation intensity the basin also supports fairly dense human and live stock population.

Despite fairly good availability of dependable water in the natural stream due to good dependable rainfall not much of the area is brought under assured irrigation in the basin and most of the culturable area is rain fed. The situation turns critical in respect of agriculture as 90-95% of

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availability of rain is concentrated in three months (July-sep.)



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and the river Kalisindh and its all tributaries all practically having negligible water beyond October for Rabi crops.



A view of River Kalisindh in Summer

This situation has occurred due to non construction of any major/medium dam project on the river Kalisindh and even as on today, only four small medium irrigation project namely Tiller, Lakundar, Chiller, Pipalia Kumar has been constructed on the tributaries of river Kalisindh and only one major irrigation project RanjitSagar is now proposed on main Kalisindh river other than the Kundalia dam.

Unfortunately not many good site are also available for construction of major/medium storage irrigation project on river Kalisindh itself as the river after its origin traversing initial reach mostly runs through plains Similar situation exists in case of Lakhundar river. Therefore the solution lies in the construction of dam at proposed site with diversion of its tributary water in it to create a sizable reservoir.



Another view of River Kalisindh in Summer

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It is with this concept the present project report has been prepared for the Kundalia dam which will act as a storage reservoir to meet out irrigation demand for approx. 125000ha CCA by pressure irrigation on d/s of dam in Kalisindh sub basin in M.P.

CHAPTER – 5

PHYSICAL FEATURES

1 General Report

The Kundalia project is a new major multipurpose project proposed on river Kalisindh by MPWRD which is a right bank tributary of river Chambal. The river Chambal is a right bank principal tributary of the river Yamuna. The river Kalisindh lies and form part of lower Chambal basin and it joins ultimately in river Chambal, which finally meets river Yamuna. The whole of the catchment, of Kalisindh sub-basin lies between North latitudes of 22⁰35' and 24⁰10' and East longitudes 75⁰50' & 76⁰40'. The Kalisindh river rises at an elevation of 610 m from Barziri hill in the Bagli tehsil of the Dewas district in Madhya Pradesh and traverses to a total length of 351 km before finally meeting with river Chambal, out of the total length 180 km lies in Madhya Pradesh and the remaining 171km falls in Rajasthan. Thus the river is basically is a inter state river. The average bed slope of Kalisindh river is 0.15%. The catchment area of Kalisindh up to its confluence with Chambal is 24,663sq km and out of this 12358sqkm area falls in the state of M.P. The area up to proposed Kundalia dam site is 3850 sq km. The whole of the catchment area up to the proposed dam site falls under the state of Madhya Pradesh .The districts covered by the sub basin under the proposed dam are Ujjain, Dewas, Shajapur and Rajgarh in Madhya Pradesh. Lakundar river is the main tributary of river Kalisindh and the dam is proposed just down stream of the confluence of these two river.

The proposed Kundalia dam site is located in Balaheda village of Zirapur tehsil of Rajgarh district in Madhya Pradesh. Its latitudes and longitudes are 23⁰55'41''N and 76⁰18' 15''E respectively. The Kalisindh sub basin up to Kundalia lies between the 22⁰35' and 24⁰10' and East longitudes 75⁰50' & 76⁰40'. The length of river up to Kundalia dam site is nearly 150km.

2 Drainage basin

The catchment area of Kalisindh sub-basin up to Kundalia dam site is 3850 sqkm, and 1075sq km diverted catchment of lakhundar , total 4925sq km which is 19.86% of the total sub-basin area

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of Kalisindh. The length of Kalisindh river up to proposed Kundalia dam site is, approximately 150 km. The final dam site is situated in the close proximity of the state boundary and after travelling nearly 30km, the river enters in the state of Rajasthan. The sub-basin has Deccan trap as the main rock belonging to the middle series of the fold classification with simple AA flows without tectonic imprint and dykes and pertains to the cretaceous coocene age. The rocks have their origin in the erruphin of theletic magma probably in the beginning of third era. The formation comprises of taped flow of varying thickness. The major part of the basin is occupied by the hard rocks belonging to age ranging from Achaeen to upper retacesins and represented by granites, granitic gneisses, schist's, phyllites, quartzite's, slates, sand stones, lime stones, basalt and conglomeratic rocks.



A view of Fractured rock available in river bed

3 Soil types

The soil type in the catchment area and too a greater extent in command area is mixed red and black as per the general classification. A brief description of the soil in the Kalisindh and sub-basin are given in the following paragraphs.



A view of Soil cover available in Command Area

Soils on hill and hill ridges (Entisols)

These soils are fine loamy to coarse loamy in texture and grayish brown to dark reddish brown in colour. They are highly, excessively drained, stony and gravelly in nature. These soils are of shallow depth with low nutrient status and are slightly acidic to neutral in reaction. They are low in organic matter content and have poor water retention capacity. These soils are unsuitable for normal crop husbandry. However, they may be utilized for forestry, pasture development and growing grasses.

These soils occur on level to gently undulating terrain. They are yellowish brown to dark brown in colour. These soils are shallow to deep, coarse to fine medium textured with low nutrient status. These soils are moderately eroded. Their water retention capacity varies with the soil texture and organic matter content. In this category too the shallow soils are unfit for normal crop husbandry whereas deep soils are suitable for growing Kharif crops like Sorghum, millets, pulses, bajra and cowpea.

Pediment soils (Entisols and Vertisols)

These soils on gently to undulating gneissic terrain comprising the vast pediment and pediment plains characterized by intermittent rocky wastelands and shallow water bodies. They are shallow to deep coarse to fine medium on texture and poor in nutrient status. They are moderately eroded. The deep soils in this category are fit for cultivation of crops like sorghum, till, bajra, millets and groundnut. Shallow soils are best suited for raising pastures.

Soils of level alluvial plain and undulating flood plain (Inceptisols and Vertisols)

These soils occur on level to undulating terrain. These are deep to very deep, fine to fine loamy, well to moderately drained and contain calcium carbonate deposits. They are low in organic matter content and suited to crops like jowar, arhar, soyabean and moong under dry land and sugarcane under irrigated conditions. Wheat, gram and linseed may be grown during the Rabi season soils of dissected flood plain (Inceptisols)

These soils are very deep, well drained, calcareous, and gravelly with abundant lime nodules in the soils. These are fine loamy in texture, yellowish brown Colour with low organic matter content. They possess moderate water retention capacity. These soils are severely eroded during floods and need extensive conservation measures. Land situated away from the streams can be put under cultivation for Kharif crops viz jowar, bajra and arhar.

4 Population

The sub-basin is having medium to dense population on the upstream as well as on the down stream. The average density of population approximately 150 person/sqkm. On an average a population of nearly 7.5 lakh is likely to be benefited (directly or indirectly) by the project by the end of year 2050.

Despite high intensity of irrigation in the sub-basin, owing to the typical land holding pattern sufficient work force for the proposed construction of dam and its appurtenance will be available

from the categories of marginal farmer's, land less agricultural laborers and other laborers engaged in part time small works.



A view of habitants in Kalisind Basin (Zeerapur)

5 Natural resources

Except agricultural based land resources, there are number significant mineral or other natural resources available in the basin area. Some agricultural product based industries has come up in recent past mainly like soyabean oil producing units, textile units etc. Some small-scale industrial areas are also opened in Rajgarh, Shajapur and Ujjain district. However one of the biggest industrial area i.e. Dewas is situated on the periphery of the basin and large no of major industrial unit are situated in this area. Another medium size industrial area at Maksi has come up in recent past which is situated with in the basin boundary. The forest cover in the basin is very poor and is of scattered type can be classified as forest with open shrubs.

CHAPTER – 6

SURVEY AND INVESTIGATIONS

General

The Kalisindh sub basin which is the upper most sub basin of lower Chambal zone I is situated just adjoining to the lower Chambal sub basin. This part of the sub basins of Malwa region are witnessing the effects of extension of a desert of Rajasthan. The availability of rainfall is on descending pattern and the vegetation cover has reached to a alarming dangerous level together with deepening of ground water table to 150m and even more. The situation in this particular region of Malwa is so alarming that almost in every year or alternate year there is a acute short fall of water for even drinking purposes leaving the other requirements of irrigation and industrial use. The only available alternative to combat the situation is to utilize the maximum available monsoon runoff in the rivers of this region by way of construction of storage dams for post monsoon uses.



SHIFTING OF BENCH MARK AT KUNDALIA DAM SITE

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The MPWRD with an aim to harness the untapped water wealth of the river Kalisindh in the interest of the beneficiary of the sub basin has ordered to carry out a prima feasibility survey and investigation for likely construction of a dam across river Kalisindh.

Under the investigation capacity survey has been carried out at this stage to find out the available storage capacity, and its possible use, in the parent basin on u/s and d/s of proposed dam, surplus availability of water and other parameter required for finalization of suitable storage site on river Kalisindh.

Contour Survey of the command area

Experts of Water Resource Dept, Govt. of Madhya Pradesh and WAPCOS visited the tentative proposed dam, sites in the basin area. After geological reconnaissance and detailed appraisal of the geological features of the project area, the proposed site has been found to be geologically safe and suitable for construction of headworks structures.

Following Topographical Survey Works have been carried out.

First of all, double leveling survey work i.e. shifting of TBM to proposed Dam and Command area GTS BM of SOI has been done from dated 01.11.012 to 26.11.13. During this survey work, three circuits were formed. Further, the location and value of BM has been provided by S.O.I.Dehradun. Uttarakhand and the location and value of BM are as under:

- I. GTS PWD Rest House Soyat = 339.92 m,
- II. GTS BM PWD Rest House = 417.73 m,

Concerned Asst. Engineer has checked the observed level on time to time.

Bench Marks have also been established by double leveling connecting to GTS bench marks each KM Stone and other permanent structure on the road Soyat to Susner and Susner To dam site To Zirapur ,Machalpur Gogatpur and each Village Survey has been by connecting double leveling.

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Topographical Survey

Topographical survey of Command area in scale 1:3960, with contour at 0.5 m interval on village maps are being carried out. For this purpose the survey party has collected the village maps; khasra map of land, details of each land like area, details of land owners etc. i.e. RoRs are either down loaded from the official website of Govt. of Madhya Pradesh 'www.bhulekh.com' or recorded from the corresponding Tahasil records in case of non-available in the web site and developed digitized version of the maps.

Incorporating all the collected details, topographical plan of each cultivation land are being prepared developing contour at 0.5 m intervals taking levels at suitable intervals and at each corner of the plot as well as at centre point of each plot.

CHAPTER -7

FOREST LAND

As stated in the relevant para's of the report, the entire catchment area and command area of Kundalia project is having very little forest cover and out of the total area likely to come in the submergence of proposed Kundalia dam with FRL of 400m is hardly 5.35% of the total area of 7476 ha coming under submergence even this small percentage of forest area approx. constituting 680 ha at FRL of 400 m coming under submergence is mainly low to medium density forest and very little or practically no impact is expected on the flora and fauna and environmental and ecological system of the Kalisindh river basin with the construction of the proposed Kundalia dam. The necessary permission and clearance for acquisition of this forest area as per the prevailing norms and guidelines of GOI will be obtained by fulfilling the terms and condition of payment of compensation in lieu of acquisition and use of forest land. Simultaneously the condition of in lieu of plantation will be satisfied by making suitable provisions in the cost estimate for this project to take care of the said activity.

The Ministry of Environment, forest and climate change, Govt of India has accorded the forest clearance for aera 680ha vide its memo F.No. 8-02/2014-FC dated 15.09.2015.

CHAPTER - 8

DEPARTMENTAL INFRASTRUCTURE FOR CONSTRUCTION

The core construction activities for proposed Kundalia dam are concentrated only in Zeerapur tehsil of district Rajgarh in M.P. The MPWRD is the sole construction agency for the execution of water resources works in the state. The present existing setup of MPWRD consist one division office functioning at Rajgarh (which is also a district headquarter) under the overall control of chief engineer of Chambal Betwa basin. The division strength consists of 4-sub division with headquarters at Sarangpur, Zeerapur, and Rajgarh, Khilchipur whereas one quality control sub division also functioning at the Narsinghgarh under the jurisdiction of this division. The division falls under the jurisdiction of water resources circle Guna, where too sufficient facility with scope of future development exists for office and residential. Two more water resource div. are also functioning in the near vicinity of the proposed project. Out of this the Narsinghgarh div. is in the administrative control of chief engineer C.B. Basin Bhopal whereas the Shajapur div. is functioning under the control of Chief Engineer Narmada Tapti basin Indore. As per the available work load any of the div. among these three div. can be conveniently deployed for this work in the initial stage. Later on during the peak construction period a separate div can also be deployed with its headquarter at Zeerapur / Rajgarh/Sarangpur/Biaora/Narsinghgarh.

All these proposed divisional headquarter is well connected by a network of NH, SH, MDR etc. and is also having a connecting railway link having its ends terminating on Delhi-Bombay and Maksi-Maksi railway line at Bhawani mandi and Sarangpur respectively. The site is approachable by Bina-Kota railway line from Biaora railway station. The existing WRD setup at these places includes office complex and residential complex (colony) along with ample open space and this facility is just sufficient for taking up for proposed construction of Kundalia dam project with suitable addition and modification in the available infrastructure in terms of construction of stores, office, residential building etc. with minimum expenditure.



A view of area available for construction activities

Sufficient working space for office, residential, workshops, contractor's establishment, can be made available as per prevailing government policy and norms in case a part of infrastructure establishment is decided to be kept at the dam site itself or in nearby town of Zeerapur. Suitable establishment at appropriate places in the command area can also be established which will be helpful for execution of irrigation canal system and its operation and maintenance at a later stage.

The present technical staff available with the water resource department and the contracting agencies possesses sufficient knowledge and skill which is required for execution of such medium sized earthen dam, spillway and irrigation network. The proposed construction of dam project will not involve and requires any foreign aid, transfer of knowledge and skill and import of any goods or material. Therefore once the project is cleared for construction with fulfillment of all necessary formalities and the required fund release is assured the construction of project can be completed within the stipulated period of six years from the date of start.

CHAPTER - 9

SOCIO ECONOMIC IMPACT

The entire area coming under the impact of proposed Kundalia project is an agriculture activities predominant area, but the area is also rapidly growing as a industrial area also. The areas adjoining to Kalisindh sub basin on left flank has witnessed rapid urbanization and industrialization near Shajapur, Maksi, Dewas, etc. But otherwise the rest of the area is a rural area mainly surviving on agriculture only. The land holding are small to mini size and about 80% holding is less than 5 ha in size. By and large about 20-30% of population in rural areas falls below poverty line. Nearly 10% of rural population falls under the category of land less formers mainly surviving on the work being generated in Kharif and Rabi crops in their areas. Less than 5% of the population at present is engaged in the industrial jobs and with the moderate rate of industrialization this percentage will touch percentage of about 10%-15% in next 30 year. The area also supports a huge numbers of migratory industrial labours as well as agriculture sector based laborers.



Another of u/s development of Kalisindh Basin

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For the assessment of likely impact on socio- economic front by the proposed construction of Kundalia dam the entire area can be divided as area falling on left flank of dam and area falling on the right flank of the dam. Since the proposed site for Kundalia dam is situated just 30km u/s of Rajasthan state borders, as such the interest of d/s areas are not much significant in the case despite being the case of interstate river at least for M.P. The entire catchment area up to the dam site since lies in the state of M.P. therefore also the state of Rajasthan cannot claim for any water quantum stored in the Kundalia dam as per the national policy and mutual agreed terms and conditions. The part of Rajgarh,Shajapur and Mandsaur districts on the left bank of the proposed dam can only be provided irrigation facilities with this dam. The most crucial associated part is that a part of this command is again situated at a high altitude which cannot be provided with a conventional flow irrigation and the irrigation facilities to this draught prone area can only be provided by a lift irrigation system from the proposed main canal.

As narrated in relevant Para of the report this area is also facing acute drinking water shortage and most of the town in sub basin and on its periphery like Shajapur,Sarangpur,Pachhor,Rajgarh,Dewas,Maksi are being provided drinking water once in three days or even once in a week. In worst years the drinking water is being transported by railway tankers. Thus the execution of the project is a absolute necessity of meeting out drinking water, industrial and irrigation requirement of the adjoining areas. The project on its completion will provide following main benefits :-

About 75% of the area between FRL and LSL will be annually available for tank bed cultivation. This land will be highly fertile and will not be requiring any irrigation for taking Rabi summer crop.

- 1) About 10% of the area situated on the periphery of the reservoir will be benefited by direct lifting of water by the farmers. This area can roughly assessed as 1500-2000ha.
- 2) Increased ground water table will permit additional irrigation coverage in the command area. By a rough approximation at least a 10% increased in ground water can be taken by way of recharging of ground water table and subsequent increase in ground water level.
- 3) Generation of direct and indirect employment to laborers in the construction of dam and canal system for a period of 5-6 years and for another 4-5 years in ayacut development programme. The proposed construction will also provide increased labor requirement in agriculture sector in long term.

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- 4) Availability of water for NISTARI purposes throughout the year.
- 5) Availability of drinking water facilities to the villages situated on the periphery of the reservoir.
- 6) Pisciculture in the reservoir will promote high protein food supplement to large number of population.

The d/s area falling under the command will receive comparatively more benefits than the u/s side. The main areas of expected benefits will be as below:

- a) About 125000 ha of CCA will be brought under assured irrigation.
- b) Higher probability of taking summer crops /perennial crops resulting in high economic returns.
- c) Increased ground water table and availability will ensure increased crop production and higher intensity of irrigation.
- d) Extended drinking water facility to the villages and towns in the command area by increased ground water resources.
- e) Water availability for NISTARI purposes in command and adjoining areas.
- f) Increased production of fodder resulting in increased milk and animal products production.
- g) Generation of direct and indirect employment to land less farmers in multiple activities of agriculture.
- h) Creation of employment to about 250-500 laborers on dam and canal construction activities for a period of about 6 year.
- i) Development of agriculture based industries in the command area like sugar, soyabean and milk processing unit and food processing units etc.

The proposed construction besides above benefits will also result in numerous other fringe benefits such as associated development of infrastructure facilities in terms of road construction, house building activities construction of Krishi Upaj Mandi, opening of workshops etc. The creation of large man made reservoir will automatically invite tourism and water sport activities as the lake is very near to the towns of Shajapur, Dewas, Sarangpur etc. The construction of project will also result in effective flood control in the Kalisindh sub basin as well as in Chambal basin. This will also be helpful in improving environmental & ecological balance on u/s and d/s areas of catchments & command.

CHAPTER - 10

ENVIRONMENTAL AND ECOLOGICAL ASPECT

The proposed project is situated on the western part of the state which is already experiencing the oncoming of desert from the adjoining state of Rajasthan. The increasing pressure of growing population and tendency of increasing agricultural production by way of using excessive ground water has added to this problem of recurring draught conditions and near desert conditions in the region of Malwa. The inception of a major storage project will greatly help in combating these two factors of alarming ground water conditions and confinement of incoming desert from the state of Rajasthan. It is beyond doubt a construction of a major storage reservoir project is always associated with environmental and ecological problems. These are complex in nature and their relative long term effect are to be anticipated while finalizing a multipurpose project. The situation is further complex in the Malwa region where the existing forest cover is very meager and density of population is comparatively much more as compared to the other parts of the state. The construction of a dam and creation of a big reservoir behind it, the surrounding system is bound to change where the total gains are to be evaluated against the expected losses. The development of water resources in India that too particularly for rain fed river basins (where 90-95% of rain is concentrate in just 2.5 month) is invariable and without creation of big storage reservoirs which are able to store about 9 months of drinking and irrigation requirement, the overall sustainable of development of this region cannot be thought for.

The construction of dam and creation of reservoir for storage of water for non- monsoon 9 month period affects cultivable and non cultivable land, flora and fauna, denudation of natural forest, water logging, salinity and alkalinity, water table change, change in water quality, air, water and noise pollution etc. But it simultaneously adds to some associative good effects also in terms of availability of drinking water for live stock, availability of fodder, availability of required minimum water for psyculture, etc.

The most unfortunate part of the rain fed river basins in the Yamuna basin are, that they support large population on their area and practically not too many sites are available which favors construction of dam and reservoir on it without much disturbing natural system. Balancing ecology

KUNDALIA DAM PROJECT

and environment without submerging cultivable land and displacement of population, flora and fauna construction and development of water sector project is impossible. They invariably require acquisition of land and property and ultimately the resettlement in surrounding catchment area. Thus the construction of Major River project with least disturbance to environmental and natural ecological system should only be the theme for taking up of new multipurpose river projects. The river projects and particularly the Kundalia project is thus so planned that it allows self resilience and adjustment in its surrounding to create a stable ecological system in the basin on all the three fronts related to physical, biological and human areas of activity. The project construction will also involve a small submergence of area of less than 100ha in the reservoir. This area being a attached part to the major forest area and pockets (which will remain outside of submergence) will allow in maintaining ecological balance and will be helpful in self migration of wild life to the adjoining areas.

As narrated in the report the construction of proposed dam and its canal system will involve very meager submergence of forestland and forest area, as such the most important part of disturbance to natural flora and fauna will be negligible. It is the human part that is going to be adversely affected by the construction of dam and reservoir in terms of submergence of cultivable and non-cultivable land along with the properties and other assets. This loan factor was given highest important in planning of this project .The principle levels i.e. FRL & MWL has been so fixed so as to have lowest submergence under normal reservoir operation and maximum flood conditions.

The construction of proposed dam and reservoir besides creating number of other small problems like epidemic, change of water quality, water logging in the command area will also simultaneously have a beneficial role in maintaining natural ecological balance in the river basin. The river Kalisindh is not a perennial river from its origin to the dam site. The river goes dry by around Jan/Mar in each year creating numerous problem and disturbance in the surrounding area. The construction of this dam will charge the river from dam to its confluence point where it meets with river Chambal for full year. A provision of 5Mcum of water in the Kundalia reservoir is additionally made in the water planning which will be regulated in the river solely for this purpose. This will greatly help in maintaining ecological balance in the river. If the

KUNDALIA DAM PROJECT

The soil survey of the topography of command area, slopes in the basin, the expected trend of cropping pattern associated with the very poor ground water availability simply eliminates the likely chance of water logging in the command area. The height of storage will also not encouraged algae growth and there is no danger of major change in quality of water in the situation .

CHAPTER - 11**AGRICULTURE AND IRRIGATION PLANNING****Description of command area :**

The Kundalia major project aims at utilizing the water of Kalisindh river for providing irrigation facilities to a cultivable area of about 125000 ha. The irrigation facilities provided by the project shall boost the agriculture production as well as in growing improved varieties of the crops in the area that will alleviate economic status of the people.

Statistics :-

Tehsil wise agriculture statistics for the area commanded by Kundalia major project is given in the table below :-

TABLE - NO. I
STATEMENT SHOWING COMMAND AREA VILLAGES IN DIFFERENT
TEHSILS

S.N.	Name of District	Name of Teshil	No of Villages
1	2	3	
1	Rajargh	Zeerapur	169
		Sarangpur	76
		Khilchipur	10
2	Agar	Susner	129
		Nalkheda	35
		Total :-	419

Cropping Pattern:-

Prevailing crop practices in the command of the project are given in below table no.2. The total Gross command areas are 200000 hectares out of which Culturable Cultivation area 125000 hectares and annual irrigation 163000ha. The cropping pattern proposed in the table no.2, which is based on a planned cropping intensity of 130%. The main crop planned are Wheat and gram in rabi, and soybean, maize and pulses in kharif. During the rabi season 100% of the service area

(125000ha) would be irrigated, including 2000ha of perennial crop (oranges), while in kharif season the planned irrigated area would drop to 38000ha.

TABLE - NO. 2
Cropping pattern

Season	Type of Crop	Command Area (Ha) Total
Khariff	SOYABEAN-2KH	15000
	MAIZE 2 KH (American)	4800
	MAIZE 1 KH (Ordinary)	3900
	GROUNDNUT – 2 KH	3250
	PULSE 2KH	8250
	VEGITABLE 1KH	2800
	TOTAL	38000
Rabi	WHEAT-OLV (Ordinary)	24000
	WHEAT-1MV (High yield)	42000
	GRAM - N2RA	42000
	OIL SEEDS (TIL, ALSI)	2400
	TOTAL	110400
Perennial	ORANGE (ORCHARD)	2000
Total annual Irrigation		150400

Area proposed for irrigation :-

The area to be commanded from the Kundalia major project Table below gives the annual irrigation proposed from the pressurized system of this scheme.

TABLE - NO.3

Season	Cropping intensity	C.C.A. Hact.	Proposed annual irrigation Hact.
1	2	3	4
Kharif& Rabi	120%	125000	150400

Influence of sprinkler Application Efficiency on Total Gross Irrigation demand

The planned use of pressurized pipeline supplying sprinkler and micro irrigation system in the Kundalia major project offers the opportunity for high efficiency

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irrigation, meaning that more cultivable land can be brought under production. This is the basis upon which the planned CCA of kundalia mojar project was increased from 58040ha to 125000ha.

The on- farm irrigation efficiency of a properly designed and managed micro irrigation system (i.e ,drip or micro spray)can be up to 80-90%, while for well managed sprinkler system the efficiency may be uo to 70-80% which are both significantly higher than traditional surface irrigation methods .

Effect on cost of B-land in unit 2

Due to change in irrigation system gravity to pressurized irrigation system CCA increased form 58040ha to 125000ha and cost of B-land in unit 2 has also decreased because in gravity irrigation system permanent land acquisition is required but in pressurized irrigation system small area for pump houses required permanent land acquisition and rest temporary land acquisition is required for running the pipeline system.

Power Requirement calculation

TABLE - NO. 4

Power Requirement calculation

Sr. No.	Particulars	A1	A2	A3	A4	A5	
1	CCA	25000	15000	35000	30000	20000	ha
2	Duty	0.35	0.35	0.35	0.35	0.35	lit./sec/hr
3	Discharge	8.75	5.25	12.25	10.50	7.00	Cumecs
4	Average CCA Level	445	430	400	385	410	m
5	MDDL	380	380	380	380	380	m
6	Velocity	1.8	1.8	1.8	1.8	1.8	m
7	Diameter	2.49	1.93	2.94	2.73	2.23	m
7	Length	12000	7500	12000	9000	6000	m
8	Static Head	65.0	50.0	20.0	5.0	30.0	m
9	Frictional Loss	7.96	6.43	6.73	5.45	4.45	m
10	Command area loss	12.00	7.50	12.00	9.00	6.00	m

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11	Provision for exit gradient and filter losses	25.00	25.00	25.00	25.00	25.00	m
12	Design Head	109.96	88.93	63.73	44.45	65.45	m
13	Power Requirement	11236.88	5452.24	9117.41	5450.94	5350.67	KW
14	Total Power Requirement	11236.88	5452.24	9117.41	5450.94	5350.67	KW
	Pumps Provided	11*1000	1000*6	1000*9	1000*6	1000*6	38000

Cost calculation

TABLE - NO. 5

Sr.No.		Reservoir		Weight	
1	Cost of A1(Approx length =1 2Km)(RM)	71.78	Cr	11484.00	MT
2	Cost of A2(Approx length = 7.5Km)(RM)	29.72	Cr	4755.00	MT
3	Cost of A3(Approx length =12Km)(RM)	94.54	Cr	15126.24	MT
4	Cost of A4(Approx length = 9Km)(RM)	62.00	Cr	9919.80	MT
5	Cost of A5(Approx length = 6Km)(RM)	35.89	Cr	5742.00	MT
6	U Disnet upto 0.6 to 1.2 Ha	1250.00	Cr		
7	Cost of Pump and motor , Installed capacity 38 MW	95.00	Cr		
8	Civil works of Pump House	22.80	Cr		
9	Electrical Works & Substation	38.00	Cr		
10	Transformer Bay at Zirapur and 132 KW Transmission line of 30 Km	15.00	Cr		
11	Cost of DC	20.00	Cr		
		1734.72	Cr		
	Grand Total	1734.72	Cr	47027.04	MT
	Cost per Ha of CCA	1.39	Lakhs/Ha		

KUNDALIA DAM PROJECT

CHAPTER - 12

GENERAL ABSTRACT

S.No.	Sub Head	Amount (in Rs Lakh)			
		Unit-1	Unit-II	Unit-III	Total
1	2	3	5		6
1	Direct Charges				
	I-Works				
	'A' Preliminary	398.64	600.00	0.00	998.64
	'B' Land	87879.58	1000.00	0.00	88879.58
	'C' Works	47000.00	0.00	0.00	47000.00
	D' Regulators	0.00	0.00	0.00	0.00
	E' Falls	0.00	0.00	0.00	0.00
	F' Cross Drainage Works	0.00	0.00	0.00	0.00
	G' Bridges	0.00	0.00	0.00	0.00
	H' Escapes	0.00	0.00	0.00	0.00
	'K' Building	172.15	200.00	0.00	372.15
	'L' Earth work	0.00	0.00	0.00	0.00
	L1 Transimission Line	0.00	1500.00	0.00	1500.00
	L2 Pump House	0.00	15600.00	0.00	15600.00
	L3' Rising Main	0.00	29400.00	0.00	29400.00
	'M' Plantation	25.15	60.00	0.00	85.15
	N Tank & Reserviors	0.00	1000.00	0.00	1000.00
	'O' Miscellaneous	385.71	100.00	0.00	485.71
	'P' Maintenance	473.27	1282.58	0.00	1755.85
	'Q' Special T & P	0.00	0.00	0.00	0.00
	'R' Communication	327.02	750.00	0.00	1077.02
	S' Power Plant (54 MW)	0.00	0.00	21272.35	21272.35
	U-Distributaries & Minors	0.00	125000.00	0.00	125000.00
	x' Environment	75.00	10.00	0.00	85.00
	Total of I- Work	136736.52	176502.58	21272.35	334511.45
II-	(A) Establishment charges 3% (I-works- B Land)	1465.71	5265.08		6730.79
III-	Ordinary T & P 0.5% of(I- Work)	0.00	0.00		0.00
IV-	Deduct recoveries & receipts on capital works.	25.82	30.00		55.82
	Total of Direct Charges	138176.41	181737.66		319914.06
2	Indirect Charges				

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(a) Capitalisation of abatement of land revenue @ Rs. 500.00 per hectare	459.20	22.00		481.20
(b) Audit and accounts charges @ 1% of I- works	1367.37	1765.03		3132.39
Total of Indirect Charges	1826.57	1787.03	21272.35	24885.94
Total	140002.97	183524.68	21272.35	344800.00
Net Total (Crore)	1400.03	1835.25	212.72	3448.00

KUNDALIA DAM PROJECT

CHAPTER - 13

WATER BALANCE STUDY BREAKUP OF YIELD, USE, BALANCE AND SURPLUS WATER

Catchment area at site (Kundalia + Lakhundar)			3850+1075 =4925	sqk m
Water availability:				
Gross annual 75% dependable surface yield (Kundalia +Lakhundar)			926.10	Mc um
(@ 0.188+ @0.187 Mcum per sq km of catchment area)				
Ground water availability upto Kundalia Dam @10% of Surface water			92.61	Mc um
(@ 10% of surface water availability)				
	Total		1018.71	Mc um
U/S Use For different Projects				
Use in u/s of dam		1.Ranjeet sagar tank	222	Mc um
		2.Minor tanks	7.97	Mc um
		3Medium proposeed and constructed tanks	29.241	Mc um
		4.For lakhudar(mi nor,medium tank)	76.10	Mc um
Total U/S irrigation use proposed by surface water			335.311	Mc um
U/S Use of Surface water upto Kundalia dam				
Domestic use from surface water			10.00	Mc um
Industrial use from surface water			20.00	Mc um
Enviornmental and ecology			20.00	Mc um
Total U/s Use by Surface water			385.31	Mc um
U/S Use of Ground water upto Kundalia dam				
u/s irrigation use by ground water			30	Mc um
Domestic use from ground water			10	Mc um
Industrial use from ground water			20	Mc um
Total U/s Use by Ground water			60.00	Mc

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				um
Balance quantity of water:(926.1-385.311-60)			573.40	Mc um
Water availability by regeneration:				
From irrigation use @ 10% of (385.311+30=415.31)			41.53	Mc um
From domestic and industrial use @ 60% (10+20+10+20=36)			36.00	Mc um
Total Net Water Availability by regeneration			77.53	Mc um
available Quantity of water at Kundalia dam site (99+77.5311=650.9301)			650.93	Mc um
Committed Use in Sub -Basin From the Reservoir				
Quantity of water Release for D/s for environmental and ecological Balance.			30	Mc um
Committed D/s water use for drinking water including reservoir losses & supply losses.			10	Mc um
Committed D/s water use for Industrial purposes including reservoir losses & supply losses.			15	Mc um
Balance Quantity of water available for Committed irrigation purposes (650.9301-30-10-15=595.9301)			595.93	Mc um
Maximum Irrigation requirement in basin on d/s of dam including reservoir losses & irrigation losses @75% dependability			473.96	Mc um
Water available for miscellaneous purposes and for providing irrigation in draught year to Kharif crop			121.97	Mc um

CHAPTER - 14

Comparative statement

Teh :- Zeerapur

Dist. :- Rajgarh

		Data for Previous Environment Clearance	Data for additional command area Environment Clearance
1	LOCATION		
I.	State	Madhya Pradesh	Madhya Pradesh
II.	Tehsil/District	Zirapur/Rajgarh	Zirapur/Rajgarh
III.	Village	Balaheda	Balaheda
IV.	a. Longitude	76 ⁰ 18'15''	76 ⁰ 18'15''
	b. Latitude	23 ⁰ 55'41''	23 ⁰ 55'41''
2	HYDROLOGY		
	Catchment area	4925 sq.km	4925 sq.km
	Yield	679.128Mcum@0.180Mcum/sq.km	679.128Mcum@0.180Mcum/sq.km
	Flood	20747.50cumec	20747.50cumec
3	RESERVOIR DATA		
a)	Capacity		
I.	Gross storage capacity	582.75 Mcum	582.75 Mcum
II.	Dead storage capacity	30.00Mcum	30.00Mcum
III.	Live storage capacity	552.75Mcum	552.75Mcum
b)	Principal levels		
I.	Nalla bed level (N.B.L.)	360.50 m	360.50 m
II.	Lowest sill level (L.S.L.)	390.00 m	380.00 m
III.	Max. draw down level (MDDL)	380.00 m	380.00 m
IV.	Full tank level (F.T.L.)	400.00 m	400.00 m
V.	Maximum water level (M.W.L.)	401.50 m	401.50 m
VI.	Top bund level (T.B.L.)	405.00 m	405.00 m
c)	Water spread area		
I.	Water spread area at L.S.L	2155 ha.	2155 ha.
II.	Water spread area at F.T.L	7476 ha	7476 ha
III.	Forest land	680ha(clearance obtained)	680 ha(clearance obtained)

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4	<u>DAM</u>		
I.	Type	Zonal dam	Zonal dam
II.	Max. height of earthen dam	32.001m	32.001m
III.	Max. height of concrete dam from N.B.L.	44.50 m	44.50 m
IV.	Total length of dam	3100 m	3100 m
V.	Top width	7.50 m	7.50 m
VI.	Length of spillway	345 m	345 m
	Length of earthen dam	2755m (2487m+268m)	2755m (2487m+268m)
	Length of NOF	120m	120m
5	<u>SPILLWAY</u>		
I.	Type	Gate controlled ogee spillway	Gate controlled ogee spillway
II.	Crest level	388.00m	388.00m
III.	Type of gate	Radial gate (15x12 m).	Radial gate (17x12 m).
IV.	No. of gate	19	11
V.	Design discharge moderated	20747.50cumec	20747.50cumec
VI.	Length	225m between abutment	225m between abutment
6	<u>IRRIGATION</u>		
I.	Gross command area (GCA)	82625 ha	200000 ha
II.	Culturable command area (CCA)	58040 ha	125000 ha
III.	Annual irrigation	75000ha	150400 ha
IV.	Crop pattern proposed	Double cropped (Rabi &Kharif)	Double cropped (Rabi &Kharif)
V.	No. of village to be befitted	Approximately 180 villages	Approximately 419 villages
7	<u>COST OF PROJECT</u>		
I.	Unit I head work	1069.8704crore	1400.03crore
II.	Unit II canal	420crore	2047.97crore
V.	Total cost	1489.8704crore	3448.00 crore
VI.	Cost per ha.	2.57	2.75