भारतीय गैर न्यायिक

एक सौ रुपये Rs. 100

रु. 100 ONE HUNDRED RUPEES

भारत INDIA

INDIA NON JUDICIAL

महाराष्ट्र MAHARASHTRA ◐ 2023 ◐ 81AA 261081

मुद्रांक शाखा कोषागार कार्यालय, यवतमाळ 05 APR 2024 मुद्रांक लिपीक

आर.पी.दुधे मु.की.यवतमाळ जिल्हाधिकारी कार्यालय प.क्र.१/९३ व २/९३

अ.न. 10e दिनांक 5/4/2024

नाव कार्यकारी अभियंता बिन पेनगंगा

राह प्रकल्प विभाग, यवत ह. विवेक पवार

NOTARY Advocate Suraj N. Jaisingpure Area Yavatmal Dist. Reg.No. 15578 Exp.Dt.21/11/2024 GOVT. OF INDIA

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNALWESTERN ZONE BENCH AT PUNE

ORIGINAL APPLICATION NO. 109 OF 2023IN THE MATTER OF:

PRALHAD TUKARAM GAWANDE AND OTHERS ..Applicant

Versus

STATE OF MAHARASHTRA AND OTHERS ..Respondents

ADDITIONAL AFFIDAVIT IN REPLY ON BEHALF OF RESPONDENT NO. 3

I, Suraj Kisanrao Rathod, Age: 49 years, Occupation: Service, currently serving as Executive Engineer , having office at Lower Penganga Project Division Yavatmal , do hereby beg to state on solemn affirmation as under:

1. I say and submit that, I am filling this Additional Affidavit in Reply to this Original Application filed by the Applicant. I say that, I have gone through the contents of Application and Affidavits filed by the Applicant and the records available in the office. I am well conversant with the facts of this case and able to depose the same on oath. I crave leave of this Hon'ble Authority to file additional affidavit, if necessary. I deny each and every statement and averments made by the Applicant in the present Application as the same are false and baseless. I deemed to have denied all contentions of this Application unless they are specifically admitted by me herein after.

2. I say that, there is no violation of EIA Notification, 2006 by issuance of E-Tender Notice & Commencement of Construction Activity.

   - The office of Respondent no.3 has submitted the proposal of Environmental Clearance to MoEF on 30/11/2006, in compliance of EIA notification 1994. It is also confirmed by MoEF vide letter dated 09/03/2007 that, the present proposal is considered by Environmental Appraisal Committee for Environmental Clearance Certificate under EIA notification,1994. But thereafter, Environmental Clearance was granted on 17/05/2007, wherein it is mentioned that Clearance is granted as per provisions of EIA 2006. The said Contradiction is absolutely nothing but a typographical error.
   - I say and submit that, admittedly the work has started in the year 2011, and therefore the Condition No. 8 mentioned in the order of Environmental Clearance Certificate stands fulfilled i.e. work commenced within stipulated time period. The Factual report is submitted to MoEF vide letter dated 18-06-2012. The Environmental Clearance was granted to the project on 17/05/2007. As per the Condition No. 8 of Environmental Clearance Certificate that, it is valid for a period of five years from the date of issuance of this letter for commencement of construction work. Further in this context corrigendum is issued on 21 August 2013, mentioning specifically the validity of Environmental Clearance Certificate i.e 5 years "For the Commencement of Construction or operation" and not that, the Environmental Clearance is

only for 5 Years from the Commencement of Construction or operation. In the Factual Report letter dated 18/06/2012 it is stated that, "it was submitted that, since the work of the project was started in the year 2011, and therefore Condition No. 8 was fulfilled ".

3. I further submit that, the project activity is obstructed by local people which has caused delay in the construction work for some period. Looking into condition and oppose of project affected persons, the Contractor demanded to withdraw and terminate the work as per Tender condition. Finally the work was terminated.

4. I say and submit that, in the rejoinder Applicant has referred order dated 11/01/2019 passed in the OA no.431 of 2015, Manoj Kumar Mishra and Anr. vs. Union of India and Ors. The said order is irrelevant and not applicable to this Application. The Applicant is misleading this Hon'ble Tribunal. The referred case is regarding " Lakhwar Vyasi Hydro Electric Project (HEP) which involves construction of 204 mt. high concrete dam with a 40 km long reservoir on river, Yamuna, Ministry of Environment & Forest gave its approval on 03/02/1987" it is further mentioned that " The construction work started in 1987 and continued till 1992. Thereafter construction work stopped. The project was subsequently bifurcated into two components namely Lakhwar Multipurpose Dam (300 MW) and Vyasi HEP (120 MW). A separate Environmental Clearance was obtained for Vyasi HEP on 07/09/2007 and the Construction work on Lakhwar Multipurpose Dam, which was stopped in 1992 is yet to restart". also This judgement clearly mentions that, "There is change in scope of Project and it is mentioned that, the approval which was given in 1987 was only an administrative approval and not proper EC as it was given without proper EIA reports and EMP"

5. I further submit that, in the Affidavit in Reply of Respondent no.2, the Ministry of Environment, Forest, the following facts are mentioned :

    1. It is admitted that, the EIA Notification, 2006, clearly states that, it is the mandatory requirement of prior EC before the start of any construction work in the matter of new projects or expansion and modernization of existing projects or activities. Accordingly it is to be noted that, the Lower Penganga Irrigation Project is not a new project and also there is no any

change in the scope of work of this Project. The Lower Penganga Project was granted Environmental Clearance in the month of April 1984, by the Department of Environment, Government of India. As per MoEF Letter dated 30/08/2000, the Ministry issued a Circular indicating that, the Environmental Clearance issued prior to 1994 will not be valid, if in case Project where work did not commence before 01-08-1998. In all such cases fresh Environmental Clearance would be required. It is further directed vide MoEF letter dated 30/08/2000 that, the Environmental clearance accorded to Lower Penganga River Irrigation Project in 1984 has been withdrawn and directed to resubmit the proposal in accordance with "EIA Notification1994". Meanwhile on 26th June 1997 the Administrative Approval is granted to Project by Government of Maharashtra. At this stage EIA Notification of 27th January 1994 was in force. proposal of Environmental clearance was submitted to MoEF on 30/11/2006 in compliance with EIA Notification 1994. It is also confirmed by MoEF vide Letter 09/03/2007 that, the proposal is consider by Expert Appraisal Committee for Environmental Clearance under EIA Notification 1994 and accordingly Environmental Clearance was granted on 17/05/2007. All the conditions mentioned in Environmental Clearance are as per EIA Notification 1994. In the above context this office submitted the Factual Report on 18/06/2012 stating that, " the work is started in year 2011, and therefore the Condition No. 8 in EC is fulfilled i.e. work was started in stipulated time period as per the condition. Meanwhile MoEF issued Corrigendum on 27th September, 2013 regarding "Validity of Environmental Clearance. It is mentioned at para 8 of EC Dated 17/05/2007 that, validity mentioned as 5 years "FOR" the commencement of construction work. In this context the following amendment at para 8 of the EC is made which is as follows,

"The Environmental Clearance is valid for a period of 10 years from the date of issuance of this letter for commissioning of the project instead of the Environmental Clearance is valid for a period of 5 years from the date of issuance of this letter for commencement of construction work," with

a view that, the question of applicability of Notification 2006 and subsequent Amendment of 2022 does not arise to this Project.

2. It is submitted that, as admittedly mentioned at point no.8, Public Hearing was held only for Maharashtra on 06/05/2006. The proposal of Irrigation in Andhra Pradesh was not considered by EAC. Accordingly, based on the recommendations of EAC, the Ministry vide letter no. No.J.12011/68/2006-1A.1 dated 17/05/2007 issued EC to Lower Penganga Irrigation Project located in the district of Yavatmal of Maharashtra, for Maharashtra portion only. It is strongly denied that, Environmental Clearance is granted under the provisions of the EIA Notification, 2006.
3. It is further denied that, at para no. 10 of the Application, it is mentioned that, "Superintending Engineer. Yavatmal lrrigation Circle, Yavatmal, Government of Maharashtra vide letter no. 4193 YIC -61LPP /ECC|2012 of dated 18/6/2012 sought clarification regarding the validity of EC". I say that, the subject letter was issued by the Superintending Engineer. Yavatmal lrrigation Circle, Yavatmal informing the MoEF that, Environmental Clearance is granted to this Project by MoEF vide letter No. J l20ll/68/2006-lN dated 17/05/2007 and vide Condition No.8, mentioned in the order, the clearance is valid for a period of 5 years from the date of issuance of Clearance order for Commencement of Construction work. As the work was started before one year, the condition no,8 mentioned in the order of Environment clearance is complied with.
4. In the copy of the Site Inspection Report dated 28/12/2023 at Annexure 06, point 4 it is clearly mentioned that, as per MoEF Government of India letter dated 09/03/2007, it is informed to Project Proponent (PP) that, the proposal was considered by Expert Appraisal Committee, Government of India for EC under EIA Notification, 1994 in the Expert Appraisal Committee Meeting dated 21/02/2007. Copy of said letter is enclosed already in the Affidavit.
5. It is submitted that in the Circular No. J-11013/41/2006-IA.II (I) Government of India Ministry of Environment and Forests (IA Division)

Dated 8th December, 2006 it is annexed here as Exhibit J , it is stated that, "this Circular is EIA Notification 14 September 2006 Interim Operational Guidelines till 13 September 2007 in respect of River Valley and Hydro-Electric Power Project applications made under EIA 1994." it is mentioned that Pursuant to the new Environment Impact Assessment Notification of 14 September, 2006 ("EIA 2006") replacing the EIA Notification of 27 January, 1994 and its various amendments ("EIA 1994"), and in terms of the provisions of Para 12 of EIA 2006, the Ministry had earlier issued Interim Operational Guidelines on 13th October, 2006 and 21st November, 2006. In furtherance of these Guidelines, the following Guidelines are issued in respect of River Valley and Hydro-Electric Power Project applications made under EIA Notification, 1994 with the approval of Competent Authority:

- In respect of cases where site clearance has been accorded before 14th September, 2006 and EIA and EMP has been prepared and public hearing has been conducted; appraisal etc. will be in accordance to the procedure given in EIA Notification, 1994.

It is clearly mentioned in MoEF Government of India letter dated, 09/03/2007, Expert Appraisal Committee Meeting dated 21/02/2007 and EC LETTER dated 17/05/2007, that "EIA and EMP has been prepared and public hearing has been conducted as per the EIA 1994 Notification".

It is submitted that EIA, EMP, Public Hearing is conducted as per the EIA 1994 Notification. Public Hearing was conducted on Dated 06/05/2006 accordingly EIA,EMP,Public hearing is submitted to MoEF on dated 28.06.2006. EIA and EMP Submitted Booklet is annexed here as Exhibit K As per above mentioned circular in minutes of meeting of EAC dated 21/02/2007, it is mentioned that, "the proposal was considered for EC under EIA Notification 1994". And therefore, the Notification 2006 and subsequent amendment of 2022 are not applicable to this project.

6. It is Submitted that EC is granted to Telangana Part of Lower Penganga Project vide letter dated 28/05/2015 it is annexed here as Exhibit L.

	Date	Milestone of Project w.r.to compliance to Environmental Clearance
1.	06-04-1984	The Dept. of Environment, GOI has granted the Environmental Clearance to Lower Penganga Irrigation Project on 06-04-1984.
2.	26-06-1997	The Administrative Approval to Lower Penganga Irrigation Project was granted by Govt. of Maharashtra on 26-06-1997.
3.	13-09-2001	However, MoEF, GoI vide letter dtd 13-09-2001 informed that the Environmental Clearance issued in 1984 has been withdrawn by the Ministry on 30-08-2000 as work did not commenced and also suggested to resubmit the proposal in accordance with EIA Notification 1994 for fresh Environmental Clearance.
4.	06-05-2006	As per the EIA 1994 Notification Public Hearing was conducted. it is annexed here as Exhibit K
5.	28-6-2006	As per the EIA 1994 Notification EIA, EMP And public Hearing is completed and this is submitted to MoEF.
6.	30-11-2006	Accordingly in compliance with EIA Notification, 1994 proposal for Environmental Clearance was submitted to MoEF, GoI on 30-11-2006. With EIA, EMP.
7.	8-12-2006	In the Circular No. J-11013/41/2006-IA.II (I) Government of India Ministry of Environment and Forests (IA Division) , it is stated that, "this Circular is EIA Notification 14 September 2006 Interim Operational Guidelines till 13 September 2007 in respect of River Valley and Hydro-Electric Power Project applications made under EIA 1994" it is annexed here as Exhibit J
8.	09-03- 2007	As per MoEF, GoI letter dated 09-03-2007, it is informed to us that the proposal was considered by Expert Appraisal Committee, GoI for Environmental Clearance under EIA Notification 1994 in the Expert Appraisal Committee Meeting dated 21-02- 2007.
9.	17-05-2007	Subsequently, Environmental Clearance was issued by MoEF, GoI on 17-05-2007.
10.	31-03-2009	To comply the condition mentioned in Environmental Clearance and Forest Clearance, amount of Rs 117.30

		Crores was Deposited to Forest Department, GoM 31-03-2009 against Net present value, cost of afforestation, cost of tree cutting, catchment area treatment plan and survey and demarcation work. Table mentioning amount deposited under various heads .
11.	14.08.2009	Revised Administrative Approval to Lower Penganga Irrigation Project was granted by V.I.D.C. Nagpur on 14.08.2009.
12.	28-10-2009	As per condition mentioned in Environmental Clearance dated 17-05-2007, the work order for "Construction of Earthen Dam with Central Concrete Spillway, Stilling Basin, Non Over Flow Section, Piers, Guide Wall, Key wall, Pre-cast Pre-stressed Deck Bridge, Irrigation Outlet, D/S Bridge, Fabrication and Erection of Radial Gates and allied works for Lower Penganga Interstate Project." was issued on 28-10-2009 and actual commencement of project work was started in the year 2011.
13.	18-06-2012	As per condition mentioned in Environmental Clearance dtd 17-05-2007, Executive Engineer, Lower Penganga Project Division, Yavatmal has submitted Letter No. 4556/LLP/T-1/ECC/2012 dtd 18-06-2012 to Superintending Engineer, Yavatmal Irrigation Circle, Yavatmal mentioning that Rs. 76.57 crores has been spent for survey, Design, Excavation for foundation, Construction of Dam, Bridge, and required land Acquisition for Dam line and Quarries thus condition No.8 of Environmental Clearance is fulfilled. Immediately, Superintending Engineer, Yavatmal Irrigation Circle, Yavatmal vide letter No. 4193/YTC/T-6/LPP/ECC/2012 dt. 18-06-2012 submitted compliance letter to MoEF, GoI.
14.	21-08-2013	Subsequently, MoEF, GoI has issued Notification No. S.O. 2555(E) dtd 21-08-2013 regarding clarification to EIA Notification, 1994 that "The intent of the central government has been and has always been that the validity of Environmental Clearance is 5 years "for" commencement of the construction or operation and not that the Environmental Clearance is only for 5 years "from" the commencement of construction or operation. Further it is clarified that the expression "for the period of five years", all mean" for a period of five years for commencement of the construction or and not five years from commencement of the construction or operation".

15.	27-09-2013	After that, in response to compliance letter of Superintending Engineer, Yavatmal Irrigation Circle, Yavatmal, the Director, MoEF, GoI has issued Corrigendum dtd 27-09-2013 to the Environmental Clearance dtd 17-05-2007. In the Corrigendum it is mentioned that 'The environmental clearance is valid for a period of 10 years from the date of issue of this letterfor commissioning of the project instead of The environmental clearance is valid for a period of 5 years from the date of issue of this letter for commencement of construction work.
16.	29-01-2014	The Forest Clearance is issued to the project by MoEF, GoI vide letter dtd 29-01-2014.
17.	21-04-2023	E-Tender Notice for "Construction of Earthen Dam With Central Concrete Spillway, Stilling Basin, Non Over Flow Section, Piers, Guide Wall, Key wall, Pre-cast Prestressed Deck Bridge, Irrigation Outlet, Bridge, Fabrication and Errection of Radial Gates of size 18.30m x 16.50 m and allied works for Lower Penganga Interstate Project." Rs. 986.98 Cr. is published .

7. In the light of above submissions it is most respectfully prayed that, the present Original Application be disposed off finally.

Deponent

(S.K.Rathod)
Executive Engineer
Lower Penganga Project Division
Yavatmal

Place: Yavatmal

Date : /04/2024

VERIFICATION

I, Suraj Kisanrao Rathod , Age: 49 years, Occupation: Service, currentlyserving as Executive Engineer , having office at Lower Penganga Project Division Yavatmal, do hereby state on solemn affirmation that whatever stated herein above is based upon the information derived from the official records, which I believe to be true and correct.

The present reply is drafted as per my instructions.

Solemnly affirmed at Yavatmal,)

This day of 12th April, 2024)

Deponent

(S.K. Rathod)
Executive Engineer
Lower Penganga Project Division
Yavatmal

Advocate

Shakuntala
Wadekar

NOTARY
Advocate
Suraj N. Jaisingpure
Area Yavatmal Dist.
Reg.No. 15578
Exp.Dt.21/11/2024
GOVT. OF INDIA

N.R.S.No. 3160/2024 Dt. 12/4/2024
Solemnly affirmed before me
Shri. Suraj N. Jaisingpure
Advocate & Notary
At.Po.Dist. Yavatmal (M.S.) India
Dated 12/4/2024
Pages 10

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CANCELLED CANCELLED CANCELLED

EXHIBIT J

No J-11013/41/2006-IA.II (I)
Government of India
Ministry of Environment and Forests
(IA Division)

Paryavaran Bhawan
CGO Complex, Lodhi Road
New Delhi 110003

8th December, 2006

CIRCULAR

Subject: EIA Notification 14 September 2006 – Interim Operational Guidelines till 13 September 2007 in respect of River Valley and Hydro-Electric Power Project applications made under EIA 1994.

Pursuant to the new Environment Impact Assessment Notification of 14 September 2006 ("EIA 2006") replacing the EIA Notification of 27 January 1994 and its various amendments ("EIA 1994"), and in terms of the provisions of *Para* 12 of EIA 2006, the Ministry had earlier issued Interim Operational Guidelines on 13th October, 2006 and 21st November, 2006. Further to these Guidelines, the following Guidelines are issued in respect of River Valley and Hydro-Electric Power Project applications made under EIA Notification, 1994 with the approval of Competent Authority:

i. In respect of cases where site clearance has been accorded before 14th September, 2006 and EIA and EMP has been prepared and public hearing has been conducted; appraisal etc. will be in accordance to the procedure given in EIA Notification, 1994.

ii. In respect of cases where site clearance has been accorded before 14th September, 2006 but EIA and EMP and public hearing have not been completed; appraisal under EIA Notification, 1994 will be done only for those cases where receipt of the complete documents including public hearing

conducted as per EIA Notification, 2006 is made by 30th June, 2007. Other such cases will be appraised under EIA Notification, 2006.

iii. In respect of cases where site clearance has not been accorded but which were pending with the Ministry prior to 14th September, 2006 Notification; site clearance is not required and all such cases have to be processed as per EIA Notification dated 14th September, 2006.

(G.V. Subrahmanyam)
Director

To:

All officers of IA Division/SPCBs/State Governments/UT Administrations / MoEF website

Copy to:

1. **PPS to Secretary E&F**
2. **PPS to AS (CC)**
3. **PS to JS (CC-II)**

EIA-I

Environmental Impact Assessment Report

of

Lower Penganga Project
Near Tadsaoli Village, Ghatanji, Yavatmal

Comprehensive Report

Submitted to
Ministry of Environment & Forests
New Delhi

Submitted by
Lower Penganga Project Division,
Yavatmal, Irrigation Circle,
Yavatmal, Maharastra.

M/s Madhucon Projects Limited.
Madhucon House, Plot No.36,
Hitech City Road,
Jubliee Hills, Hyderabad - 500 033
Telephone: 040-2355600 1/2/3/4,
Fax: 040-23556005

M/s Bhagavathi Ana Labs Ltd.,
8-2-598/A/9/1,ASCI Colony,
Road No. 10, Banjara Hills,
Hyderabad - 500034.
Phone & Fax: 040 - 23356908
23356909

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SCHEDULE - II

(SEE SUB-PARA I (A) OF PARA 2)

APPLICATION FORM

I		
A	Name and Address of the project proposed	LOWER PENGANGA IRRIGATION PROJECT at Tadsaoli, Taluka-Ghatanji, Dist.-Yavatmal, (M.S.)
B	Location of the project Name of the Place	LOWER PENGANGA IRRIGATION PROJECT at Tadsaoli, Taluka-Ghatanji, Dist.-Yavatmal, (M.S.)
	District, Tahesil	Tahasil-Ghatanji, District- Yavatmal , Maharashtra
	Latitude /Longitude	Latitude - 19° 54′ 30" N Longitude-78° 12′ 30" E
	Nearest Airport	Nagpur, 150 km.
	Railway station	Kinwat 28 km South on Mudkhed-Adilabad SC Rly. Branch line.
C	Site Selection	
	Alternative sites examined Reasons for selecting the proposed site	Three sites have been studied and Tadsawali site has been selected Annexure-1
D	Does the site conform to stipulated land use as per local land use	Yes.
II	Objectives of the project	The proposed project is planned to irrigate the following area: In Yavatmal District : 99723 ha. In Chandrapur District : 41095 ha. In Adilabad District : 19232 ha. Total : 160050 ha.

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III A.	Land Requirement	
	1. Agricultural land 2. Forest land and density of vegetation, Private Land & Government Land 3. Others (Specify)	Forest land = 998 ha. Private Land = 16202 ha. Government land = 644 ha. Others (Roads, water bodies, fallow) = 842 ha. **Total = 19094 ha.**
B	1. Land use in the catchments / within 10 km radius of the proposed site	The land use in the catchment area consists of agricultural lands, waste lands with and without scrub, water bodies, built up land, forest land etc.
	2. Topography of the area indicating gradient, aspects and altitude	Topography of the project site and its surrounding is plain. The slopes of catchment area range between 1 to 5%.
	3. Erodibility classification of the proposed land	Erosion intensity of catchment area is severe and moderate to negligible in command area.
C	Pollution sources existing in 10 km radius and their impact on quality of air, water and land	No such sources are existing in 10 km radius
D	Distance of the nearest National park/Sanctuary/ Biosphere reserve/ Monuments/ Heritage sites/ Reserved forests	There is no wildlife sanctuary in the study area and Datodi RF 10 km W, Manjari RF 7.5 km N, Unkhed RF 5 km SE, Umri RF 5 km S,.
E	Rehabilitation plan for quarries/ borrow areas	No quarries outside submergence area involved. hence rehabilitation of quarries is not applicable.
F	Green belt plan	It is an irrigation project with proposed Irrigable command area = 160050 ha, In addition along with canal, adjacent to dam, roads green belt will be developed,
G	Compensatory afforestation plan if forest land is acquired	1120 ha of land reserved for afforestation is identified The forest clearance will be made after environmental clearance.

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IV	**Climate And Air Quality**						
A	Wind rose at site	Annexure 2					
B	Max / Min / Mean Annual Temperature	Max 44.8°C, Min 11°C, Mean 28°C					
C	Frequency of inversions	No such instances have been noticed					
D	Frequency of cyclones/ tornadoes/ cloud burst	Land locked area hence no cyclones or tornadoes.					
E	Ambient air quality data	SPM - µg/m³		SO_2 - µg/m³		NO_x - µg/m³	
		Min	Max	Min	Max	Min	Max
		43	95	4.2	9.9	8.0	19.2
F	Nature and concentration of emission of SPM, Gas (CO, CO_2 , NOx, CHn, etc.) from the project	It is an irrigation project no emissions are generated					
,V	**Water Balance**						
A	Water balance at site	Gross Storage = 1045.37 Mm^3 Dead Storage = 180.57 Mm^3					
B	Lean season water availability	Nil					
C	Source to be tapped with competing users (River, Lake, Ground, Public supply)	Penganga River					
D	Water quality	Water is potable pH 7.04 to 8.50 ; EC 385000 to 495000 us/cm; TDS 265 to 885 mg/l; T.Hardness 142 to 433 mg/l; fluorides 0.4 to 1.2 mg/l; SAR 1.1 to 2.1					
E	Changes observed in quality and quantity of ground water in the last 15 years and present charging and extraction details	In general the ground water quantity is decreasing due to scanty rainfall and over utilization due to increase in population, However proposed project being an irrigation project the ground water levels will be improved.					
F	1. Quantum of wastewater to be released with treatment details	Wastewater from colony will be treated through septic tank and soak pit hence the generation of waste water will be nil.					
	2. Quantum of quality of water in the receiving body before and after disposal of solid waste	Not applicable					

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	3. Quantum of wastewater to be released on land and type of land	Not applicable
G	1. Details of reservoir water quality with necessary catchment treatment plan	The reservoir water quality is suitable for irrigation, Excluding the submergence area and the intercepted catchment by the upstream projects all the other areas prone to severe soil erosion would be treated under the Catchment Area Treatment Plan
	2. Command area development plan	Command Area Development plan is furnished
VI	**Solid Wastes**	
A	Nature and quality of solid waste generated	The waste construction material generated during construction of dam will be used for filling in low lying lands near by the site, The stones will be used for canal construction.
B.	Solid waste disposal method	Not applicable.
VII	**Noise and vibrations**	
A	Sources of noise and vibrations	Noise pollution anticipated during the construction phase due to the operation of various construction related machinery will be temporary in nature. The necessary abetment measures will be made.
B	Ambient noise levels	Noise levels in study area ranging from 30 to 55 dB(A). The day equivalent was 41.2 to 50.7 dB(A) and night equivalents was 30.6 to 39.7 dB(A).
C	Noise and vibration control measures proposed	All noise generating equipment will be placed in closed rooms, Regular oiling & greasing will be carried out, worn out items will be replaced immediately. Mufflers for noise generating equipments will be provided. Provision of noise protection devices like earplugs to persons working near high noise generating equipments. A greenbelt will be developed surrounding of the source
D	Subsidence problem if any with control measures	Construction activity will be restricted to day time only.

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XI	Risk Assessment Report and Disaster Management plan	Technical advisory committee and Disaster Management committee will be formed. Dam break analysis report has been made and given in **Annexure 4.** Height of Dam above river bed: 35.63m
XII	**Reports prepared as per guidelines of MoEF issued from time to time**	
A	Environmental Impact Assessment	Enclosed
B	Environmental management Plan	Enclosed as part of EIA report
C	Detailed feasibility report	Enclosed
D	Duly filled in questionnaire	Enclosed
XIII	Details of Environmental Management cell	The post project monitoring committee will look after the monitoring of environmental management aspect under the C.E.V.I.D.C, Amravati. The environmental monitoring parameters will be Physico-chemical analysis of surface and ground water, Chemical analysis of soil, socio-economic status of the locality.

VIII	Power requirement indicating source of supply. Complete environmental details to be furnished separately if captive power unit proposed	Power required for lifting water into canal system will be taken from state power corporation and soon the proposed dam foot power house. Total power required: 120.727 MW
IX	Peak labour force to be deployed giving details of	Peak labour force will be around 2000 persons/day,
	Endemic health problems in the area due to waste Water / air / soil / borne diseases	Only malaria disease is prevalent in some villages of the study area.
	Health care system existing and proposed	Regular health check up is proposed for all employees and workers. A primary health centre will be set up at project site from project cost. Existing health centers nearby would be utilized if need arise to tackle water borne diseases. The proposed colony will be equipped with new Primary Health Centre.
X A	Number of villages and population to be displaced	Project displaced villages: 46 Project displaced families: 8136 Project displaced population: 36809 Project affected villages: 95 Project affected families: 15830 Project affected population: 74963
B	Rehabilitation Master plan	

The following has been proposed by LPP for the rehabilitation of the affected population.

- The structures affected due to the project will be valued as per the prevalent rates based on DSR & by accompanying necessary depreciation and the same will be compensated.
- House plots will be given on the following norms
  One family with land holding – one plot (4000 sq. ft.)
  One family without land holding – one plot (2000 sq. ft.)

The comparative study of Maharashtra R&R policy and National policy of 2003 has been made and given in **Annexure 3**.

The agricultural lands will be valued and compensated at the prevalent market rates as per the prevailing land acquisition act. Detail Disaster Management Plan is prepared under this necessary.

DECLARATION

I hereby give an undertaking that the data and information given above are true to the best of my knowledge and belief and I am aware that if any part of the data /information submitted is found false or misleading at any stage, the project is likely to be rejected and the clearance given, if any, to the project is likely to be revoked at our risk and cost.

Date:

Signature of the applicant with name and full address

Name : Ramesh Narayan Pise
Designation : Executive Engineer
Address :Lower Penganga Project Division
Yavatmal, Maharashtra

Place: Yavatmal, Maharastra

Given under the seal of
organization on behalf of whom
the applicant is signing

In respect to item for which data are not required or is not available as per the declaration of the project proponent, the project would be considered on that basis.

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Enclosures	
Annexure1	Alternate sites considered
Annexure 2	Seasonal Wind rose at site
Environmental Impact Assessment Report	
MoEF Questionnaire for Environmental Appraisal (For River Valley and Hydroelectric Project)	

Annexure-1

Alternate sites considered for Dam

Three alternate sites were studied in detail and investigations were carried out for selecting the dam site and they are as follows.

- Chanaka (on Hattighat) 32 miles on the down side of proposed site at Tadsaoli (Chikhalwardha).
- Dhanora 13 miles on the upper side of proposed Tadsaoli (Chikkalwardha) site.
- Tadsaoli (Chikhalwardha) the proposed site

a) Chanaka site

The site is situated at Latitude 19° 49′ N and Longitude 78° 31′ E about 32 miles in the down side of Chikhalwardha site and has 7281 sq miles of catchment area situated in the down side of the Dhanora site. This site was suggested by the state of Andhra Pradesh in their proposals. This site has two major disadvantages. The reservoir constructed at this site submerges large deposits of good quality of lime stone suitable of cement manufacturing secondly the foundation for a dam at this site was found to be very costly. There is no suitable site below Chanaka for the terminal storage at present planning.

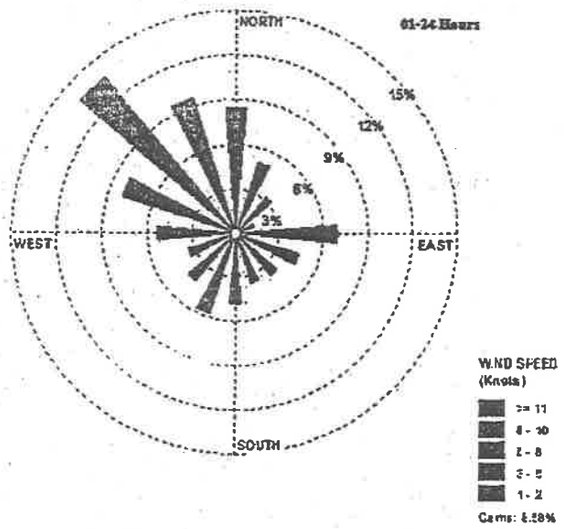
b) Dhanora site

The site is situated near Dhanora village at Latitude 19° 55′ N and Longitude 78° 01′ E about 13 miles on the upper side of Chikhawardha site. The catchment area at this site is 4500 sq miles. A storage at this site would have increased the idle length of canal before it could reach command land for irrigation. A canal from this upper site also involve construction of a costly acqueduct on fairly big Aran river. This is upstream most site with less drainage area and would have reduced the scope of irrigation.

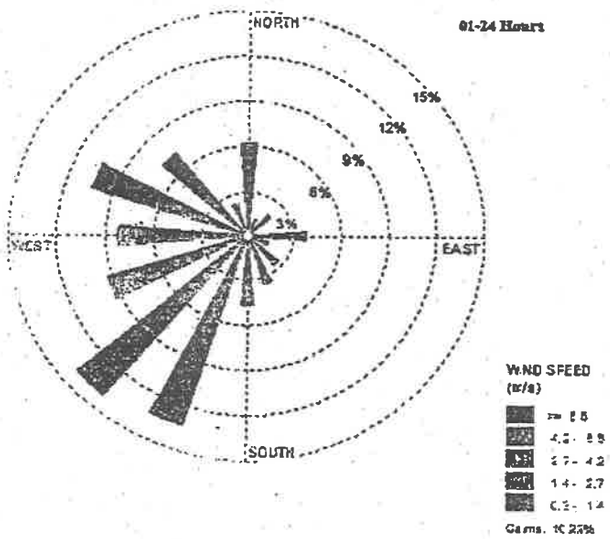
c) Tadsaoli site

The site with its entire catchment and sub mergence lie completely in Maharashtra. The site is situated near village Tadsaoli at latitude 19° 54′ 14″ N and 78° 12′ 30″ E it has a total catchment area of 17983 sq km (6945 sq miles) and un-intercepted catchment area of 7843 sq km (3028 sq miles). A left bank canal can be conveniently taken from this site and a branch to serve right bank area can be taken off at 52 km crossing river Penganga by an acqueduct near Chanaka. There is spund rock exposed at surface area shallow depth for almost the entire length of the dam and hence, construction would be economical. It is therefore, felt the site at Tadsaoli is the best choice.

Annexure-2



Average Wind Rose for summer

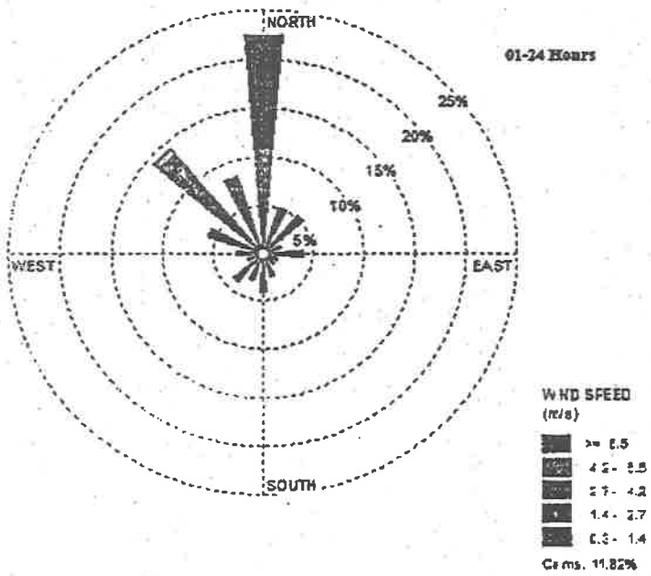


Average Wind Rose for Monsoon

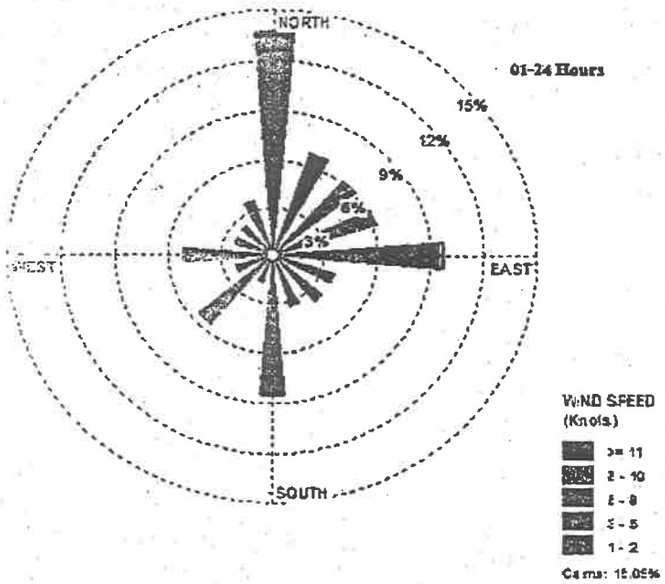
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Average Wind Rose for Post Monsoon



Average Wind Rose for Winter

526

ENVIRONMENTAL APPRAISAL QUESTIONNAIRE

QUESTIONNAIRE FOR ENVIRONMENTAL APPRAISAL

(FOR RIVER VALLEY AND HYDROELECTRIC PROJECTS)

Note 1 :	All information given in the form of annexures should be part of this file itself. Annexures as separate files will not be accepted.
Note2 :	Please enter x in appropriate box where answer is Yes/No

I. General Information

A. Site Information

1. Existing project/proposed project/ expansion project/modernization project : **Proposed Project**
2. If Existing/expansion/ modernization project, whether environmental clearance has been obtained : **Not Applicable**

B. Geographical Location

Village/s	District/s	Tehsil/s	State/s
Near Tadsaoli Village	**Yavatmal**	**Ghatanji**	**Maharashtra**

C. Latitude **19° 54' 30"**

D. Longitude **78° 12' 30"**

E. Elevation above Mean Sea Level **230.37m**

F. Total Area proposed for the Project (in ha.) **Submergence area 15951.00 ha**

G. Nature of Terrain **Plane land with gentle slopes**

H. Technical Classification of Soil (loam, sandy etc./aerial extent (ha) **Silty clay loam**

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A.

II. Existing land usage of the proposed project site area (in hectares)

	Main Structure	Submergence	Canal network	Township	Resettlement	Others (List)	Total
i)Agriculture a) Irrigated b) Unirrigated	29	13700	2238	-	-	235	16202
ii)Homestead	-	162	-	-	244	-	406
iii)Forest	-	747	251	-	-	-	998
iv)Grazing	-	151	-	-	-	-	151
v)Fallow	-	438	-	-	-	-	438
vi)Water bodies	-	86	-	-	-	-	86
vii) Marshes	-	-	-	-	-	-	-
viii)Others(Pl. specify) Roads Govt. land	- 2	167 500	- 144	-	-	-	167 646
Total	31	15951	2633	-	244	235	19094

B.

III. Alternate sites considered from the environment angle.

The proposed site at Tadsaoli village is ideal for the project among the three sites studied for the project, the details of the same are given in Annexure 1a.

IV. Reason for selecting the proposed site from the environment angle

The site with its entire catchment and sub mergence lie completely in Maharashtra. The site is situated near village Tadsaoli at latitude 19° 54' 30" N and 78° 12' 30" E it has a total catchment area of 17983 sq km (6945 sq miles) and un-intercepted catchments area of 7843 sq km (3028 sq miles). A left bank canal can be conveniently taken from this site and a branch to serve right bank area can be taken off crossing river Penganga by an aqueduct. There is sound rock exposed at surface area at shallow depth for almost the entire length of the dam and hence, construction would be economical. It is therefore, felt the site at Tadsaoli is the best choice.

C

Ri

V. **Details of site**

A. Seismicity

1. Whether the proposed dam site fall in seismically active area

Yes [ ] No [X]

If yes

2. What is the estimate of of seismic hazard? **Not Applicable**

3. What models used for estimate? **Not Applicable**

(a) Determistic seismotectonic approach **Not Applicable**

(b) Combined seismotectonic probabilistic approach **Not Applicable**

4. Result of prediction **Not Applicable**

B. Landslide prone zone

1. Is the proposed project in the landslide prone zone

Yes [ ] No [X]

2. If yes

(a) Geomorphological condition **Not Applicable**

(b) Degree of susceptibility to mass movement **Not Applicable**

3. Whether any major landslide occurred in the past? **No**

4. If yes,

(a) Frequency of occurrence/decade **Not Applicable**

(b) Area affected (ha) **Not Applicable**

(c) Population affected (nos) **Not Applicable**

C. Flood/Cyclone/Droughts

1. Is the area prone to flash flood?

Yes [X] No [ ]

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2. If yes

(a) Frequency of occurrence/decade — 2 in [illegible]

(b) Area affected (ha) — All Villages along Penganga River

(c) Population affected (nos.). — Approximately about 20,000. Population affected 7 villages from Yavatmal Dist, are proposed for

3. Is the area prone to cyclone?

Yes [ ] No [X]

4. If yes

(a) Frequency of occurrence /decade — Not Applicable

(b) Area affected (ha) — Not Applicable

(c) Population affected (nos) — Not Applicable

5. Whether there is any relation between cyclone occurrence and flash floods ?

Yes [ ] No [X]

6. If yes, provide details — Not Applicable

7. Is the area prone to droughts

Yes [ ] No [X]

8. If yes,

(a) Frequency of occurrence per decade — Not Applicable

(b) Area affected (ha) — Not Applicable

(c) Population affected — Not Applicable

D. Sites likely to be submerged

1. Mineral bearing

S.No.	Name of the mineral	Reserves (million tonnes)	
		Indicated	Proven
	No mineral bearing areas identified in the submergence area		

2. Archaeological sites/monuments

S.No.	Sites/monuments	Antiquity
	No archeological monuments with in 7 km of the project site.	

3. Place of worship

S.No.	Place	Period of construction
1	One religious center of Kapeshwar Temple	About 300 years as per the version of the villagers

4. Agricultural land — 16202 ha

5. Population likely to be affected — 36809

VI. **Objective of the project**

A. Irrigation (ha) — ICA 160050 ha

B. Power generation (MW) — 4 MW

C. Drinking water supply (cumecs) — 76.29 Mm^3

D. Industrial water supply (cu.m. / day) — Not Applicable

E. Flood control (area to be protected, in ha) — Not Applicable

J.

F. Others (pl. specify) — Not Applicable

VII. Project profile

A. Height of the dam/reservoir (in meters)

1. Above mean sea level — 230.37 m
2. From existing ground level — 35.63 m above river bed
3. From deepest foundation level — 42 m

B. Gross storage capacity (M cum) — 1045.37 Mm^3

C. Catchment area (Sq. Km) — 17983 Sq km

D. Submergence area (hectares) — 15951.16 ha

E. Command area (hectares) — ICA 160050 ha

F. No. of turbines — One

G. Capacity of each turbine (MW) — 4 MW

H. Length of the main canal (Km)

1. Lined — LBC- 139.50 km, RBC-117 km (Maharashtra) 117KKmLined canal RBC-54 km (Maharashtra)
2. Unlined — Nil

I. Length of distributories (Km)

1. Lined — Yet to be finalised
2. Unlined — Yet to be finalised

Ri

J. Cropping pattern

1. Existing pattern

S. No	Crop	% of crops	Cropping area in ha
1	Cotton	50	80025
2	Jowar (Hybrid)	28	44814
3	Tur	13	20805
4	Paddy drilled	1	1600
5	Mug	5	8003
6	Udid	3	4802
	Total	100	160050

2. Proposed pattern (Irrigable Command Area: 160050 ha)

Season	No	Name of crop	Crop Percentage
A) Two seasons	1	Cotton (medium staple)	20
	2	Chilles	04
	3	Turmeric	03
B) Kharif seasonal Irrigated	1	Hybrid Jowar	20
	2	Ground nut	15
	3	Sunflower	05
	4	Vegatables	10
C) Kharif seasonal un irrigated		pulses & fodder	23
		Total	100
D) Rabi Season	1	Wheat	05
	2	Rabbi Jowar	10
	3	Gram	10
	4	Sunflower	15
	5	Saffolwer	15
	6	Vegetable	10
		Total	65

Note: As per approval of Director of Agriculture, Pune (Maharashtra)

K. Rationale for adopting the projected crop pattern

The crop pattern for this project is approved by the Director of agriculture, Government of Maharashtra vide letter no. IRR /L.P.P /A.G.59 /232 dt 19.03.96

L. Irrigation intensity (%) (ICA/CCA) 91%

V

M. Water join logging (ha)

1. Area already under water log — 1209 ha

2. Area expected to be under water logging after the completion of project — 8000 ha

3. Cropping area likely to be affected by waterlogging due to the project

(a) within the project area — 6800 ha

(b) outside the project area — Nil

4. Infiltration rate (cms/hour)

(At least for two locations in each of the major soil groups identified)

Major Soil Group	Clay Loam		Loam	
Infiltration Rate cm/hour	1.15	1.24	1.56	1.65

5. Saturated hydraulic conductivity for major soil groups (m/day) using in-situ auger hole / inverse auger hole method depending on depth of water table from the ground level within 2 meter or above 2 meters

–

N. Sedimentation (hectare meter/sq.km/year)

I

1. Present rate — 0.0489 ha-m/sq km/year

2. Rate expected after catchment treatment — Will be absent

3. Empirical estimates — Will be absent

4. Historical observation — 0.0489 ha-m/sq km/year

O. Length of river course which is likely to dry up due to impoundment (km) — Nil

P. In case of project where flow of water will be reduced due to withdrawal of water in between head race tunnel and tail race tunnel

1. Length (meter) — Not Applicable

R

2. Flow rate in river (cumecs) — Not Applicable

VIII. **Please indicate the area earmarked for each of the following (in ha)**

A.	Dam structure	31 ha
B.	Penstocks	Included in canal
	Forebay / surgeshaft	
C.	Power house	Included in canal
D.	Township	--
E.	Submergence	15951.10 ha
F.	Main canals	2633.00 ha
G.	Distributary canal	Yet to be finalised
H.	Approach road	--
I.	Green belt	Included in submergence
J.	Recreation facilities for tourist activities	Included in dam
K.	Botanical garden for conservation of rare and endangered species of flora	Included in dam
L.	Others (Please specify)	R & R- 243.90 ha, Lift-235 ha
	Total	19094 ha

IX. **Whether any of the following exist within 7 km. of the project site. If so, please indicate aerial distance from the periphery of submergence of the site and the name of the site**

S.No.		Name	Arial Distance (in Km)
1	National Park	None	--
2	Sanctuary/Tiger Reserve/Elephant Reserve	None	--
3	Core Zone & Buffer Zone of Biosphere Reserve	None	--
4	Habitat for migratory birds	None	--
5	Lakes/Reservoir/Dams	None	--

6	Stream/Rivers	Penganga River Aran River	--
7	Estuary/Sea	None	--
8	Mountains/Hills	None	--
9	Archaeological sites	None	--
10	Archaeological sites listed in notification	None	--
11	Defence Installation	None	--
12	Industries/Thermal Power Plants	None	--
13	Municipal Corporation/Municipal Council/Nagarpanchayat (by whatever name it is known in the state)	Gram Panchayat for all villages	--
14	Mangroves	None	--
15	Airports	None	--
16	Railway lines	None	--
17	National Highways	None	--

X. Description of the vegetation (a) within project site (b) within 7 Km from the periphery of project site under following headings

A. Agricultural crops : Cotton, Jowar, Tur, Paddy,Mug,Udid

B. Commercial crops : Sun Flower

C. Plantation : Mango & Gauva

D. Natural Vegetation/Forest Type: Eucalyptus , Teak, Neem and Mango

E. Grass lands : None

F. Endangered species : None

G. Endemic species : None

H. Others (Please specify) : None

XI. Description of fauna within 7 km under following headings.

A. Rare and endangered species : None

B. Species which require management : None

C. Species of economic significance : None

D. Species of special interest to local population or tourists : None

E. Aquatic fauna of commercial/recreational value and migratory fish species along with their spawning ground : None

XII. Raw materials used during construction

S.No.	List of construction materials to be used at all stages of construction	Quantity (tonnes /month)		Source of material	Means of transportation (Source to storage site) with justification
		Peak	Average		
1	Cement	1500	750	Ghuggus	Road
2	Stone	4000 m3	2000 m3	Local Quarry Yavatmal	Road Road
3	Steel	20	15	Local Quarry Yavatmal	Road
4	Sand	2000 m3	1000 m3	Penganga River	---
5	Hearting & Casing	10000 m3	5000 m3	Submergence	

XIII. In case of stone quarries details of site & surroundings be provided.

Most of the construction work involves concreting requiring metal of different sizes. The total rock in the areas requiring excavation for the project is yet to be assessed. However since rock has been found in abundance in the sub soils in the barrage and canals area, the same rocks will be used for construction. Any extra requirement will be met through the authorized suppliers from Yavatmal.

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XIV. **Meteorological data (Annual Average to be obtained from IMD)**

(Seasonal – Monitored Data)

A. Temperature (in °C)

1. Maximum 44.8 2.Minimum 11 3. Mean 28.0

B. Mean Rain fall (in mm) : 1016

C. Wind Speed (km/hr)

Mean wind speeds (high) - 0.91m/s
Maximum wind speeds - 6.2 m/s
Minimum wind speeds - 0.831 m/s

D. Humidity

Annual mean humidity 52 %
Max. Humidity 87 %
Minimum humidity 24%

E. Cloud Cover 1- 6 octanes

XV. **Water Balance.**

A. Lean season flow (cumec)

1. at the dam/reservoir site — No flow
2. at the periphery of submergence (major streams only) — No flow
3. one km. downstream of dam/reservoir — No flow

B. Water required (cumec) — Canal discharge- 111.23Cumecs

1. Power generation
2. Irrigation — Canal discharge- 111.23 Cumecs
3. Drinking water — 76.29 Mm³
4. Industrial water — Not Applicable
5. Others (please specify) — Evaporation -153.32 Mm3 (5.42 TMC)

C. Ground water potential in command area.

Season	Availability Yield in (kl/day)	Slope % Area (ha)	Location A	Location B
Pre-monsoon	11464	0-0.5 % 0.5-1 % 1-2 % 2-5 % >5 %		
Post-monsoon	13757	0-0.5 % 0-05-1 % 1-2 % 2-5 % >5 %		

D. Ground Water Quality

(Water samples may be taken 10 minutes after the starting of pumping for the tubewells in each of the soil groups.

S.No	Parameters :	Values
1	Electrical conductivity	1.245 to 2.250 us/cm
2	pH	7.2 to 8.2
3	Residual Sodium Carbonate (Millie equivalent / liter : me/l)	3.3 to 7.2
4	Heavy metals (Only if industrial effluent is discharged in project area)	No industries present

E. Groundwater withdrawal rate/recharge rate not used for irrigation purposes

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F. Provide the average value of the following based on analysis of pumping test (at least two tests for each of identified lithological zone) data

1. Transmissivity (sq.meter/day)
2. Storage coefficient
3. Lithology of the testing site

XVI. Competing Water use downstream. (Cubic meter /day)

S.No.	Usage	Present Consumption m^3/day		Addition Proposed Mm^3	
		Surface	Ground	Surface	Ground
1	Irrigation	57500	-	934.692	-
2	Industry	-	-		-
3	Drinking	629	-	76.29	-
4	Others Evaporation	489	-	153.32	-
	Total	58618	-	1164.302	-

XVII. Physico chemical analysis of Raw Water to be used at Project Township at intake point.

Annexure - 2

XVIII. Physico chemical analysis of treated water to be used in the Project/Township.

Only chlorination is carried out to make the water portable (bacteria free)

XIX. Waste Water Management

A. Waste water treatment plan

B. Composition/characteristics of discharge before and after treatment

Items	Units	Composition	
		Before	After
1	Septic Tank followed by Soak pit	Normal domestic sewage	30% reduction in BOD and 80% reduction in Suspended solids after the septic tank

C. Daily discharge (cum./day) form different sources

1. Domestic — 20 m^3/day

2.	Other	2 m^3/day
	Total	22 m^3/day

D. Quantity of water recycled

(in %)	None
(in cu.m./day)	None

E. Details of recycling mechanism **Not Applicable**

G. Mode of final discharge/disposal

S.No.	Mode	Length (in m.)	Quantity (in cu m./day)
1	Open Channel	None	None
2	Pipeline	None	None
3	Others (Please specify)	**Septic Tank followed by Soak pit**	**22 m^3/day**
Total			**22 m^3/day**

G. Point of final discharge:

S.No.	Final Point	Quantity discharged (in cu m./day)
1	Agricultural land	None
2	Fallow Land	None
3	Forest Land	None
4	River	None
5	Lake	None
6	Estuary	None
7	Sea	None
Total		None

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H. Lean season flow rate in case of river/stream

(cu m./sec) — Nil

I. Downstream users of water

1.	Human	629.00 m³/day
2.	Irrigation	57500 m³/day
3.	Industry	Nil
4.	Others (Please Specify)	
	Live stock	489 m³/day
	Total	58618 m³/day

J. Analysis of river water 100 meters upstream of discharge point and 100 meters downstream of discharge point : Not Applicable

XX. Solid Waste

		Quantity
A.	Debris (tones)	1000 tons
	Arising out of construction	
B.	Sewage (tonnes)	None
C.	What are the possibilities of recovery and	None
	Recycling of waste (tones)	None
D.	Possible uses of Solid Wastes	
E.	Method of disposal of solid waste	

	Method	Qty (TPM)
1.	Landfill	100
2.	Recovery	Nil
3.	Downstream users	Nil

XXI. Noise level during construction

A.	Source	Compressors
		85 dB(A)

B. Level at source

C. Level at project boundary (dB) — 65 dB(A)

D. If the source is within forest area/sanctuaries etc, — Not Applicable

E. Impact of noise on wildlife habitat — Not Applicable

F. Abatement measures

Noise generating heavy machinery will be operated only during day time, and regular maintenance will be carried out as per the instructions of the suppliers of the machinery, DG sets used during construction will be provided by silencers and will be kept in closed enclosure.

XXII. Pollution sources

S.No	Source	Around the periphery of submergence	At a distance of 7 km from the periphery of submergence zone	In the catchment area	Within 7 Km in the stretch in which the river is likely to dry up
1	Industry	None	None	None	None
2	Municipal Waste /Sewage	None	None	None	None
3	Mining	None	None	None	None
4.	Beneficiation Plants	None	None	None	None
5	Tail pond dams	None	None	None	None
6	Run off from Ash ponds	None	None	None	None
7	Others (Pl. specify)	None	None	None	None

XXIII. Atmospheric Emissions in case of DG sets

A. Flue gas characteristics

S.No.	Gas	Characteristics (in g/Nm3)
1	SPM	**D.G. sets used during construction will be provided by silencers and will be kept in closed enclosures.**
2	SO2	
3	NOx	
4	CO	

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XXIV. Storage (of inflammable/explosive/hazardous/toxic substances)

S. No.	Name	Number Of Storages	Height	Dia-meter	Physical and chemical Composition	Consum-tion (in TPD)	Maximum Quantity at any point of time (TPD)	Source of Supply	Means of transportation
				Not Applicable					

XXV. Occupational Health

A. What are the major occupational health and safety hazards anticipated - NIL

B. What provisions have been made/proposed to be made to conform to health/safety requirements.

Primary health centers are available in the near by village, and hospital at Pandharkawda, Ghatanji, Yavatmal, however LPP will establish permanent health centre for catering the workers and for near by villagers at the project site

C. Details of personal protective equipment provided/to be provided to the workers

All protective equipment like helmets, safety shoes, ear muffs, etc will be provided for the workers working during construction as per their requirement.

D. Is the area prone to disease like malaria/fileria etc.

Yes – To tackle this problems district hospital offering tertiary level care, with rural hospitals at the secondary level and primary health centers, sub centers and dispensaries providing basic health care to the rural population.

XXVI. Catchment area

A. Total catchment area (ha) — 17983 sq km

B. Monuments in the catchment area

1. Fort at Mahur,

2. Lonar carter lake

C. Sites of cultural importance in the catchment area

1. None

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2. None

D. Sites of religious importance in the catchment area

1. Kepeshwar Temple

2. Mahur's Renukadevi temple.

3. Balaji Temple, Wasim.

E. Other river valley projects in the catchment area

1. Upper Penganga Project

2. Arunavati Dam Project

3. Lower Pus Dam Project

F. Major development projects located in the catchment area

1. Industry : Sugar industry at Pusad, Bodegaon and Mangrul
2. Mining : None
3. Roads : Village roads, district roads and State Highways
4. Railways : Railway line connecting Hyderabad and Mumbai
5. Thermal power plant : None
6. Others (Pl. Specify) - None

G. Catchment area treatment plan

S.No.	Year	Area to be treated (sq km)	Outlay (Rs. lakh)
		Very High Erodability	
1	1st year	1300	350
2	2nd Year	1300	350
3	3rd Year	1300	350
4	4th Year	1300	350
5	5th Year	1300	350
6	6th Year	1300	350

The expenditure of catchment area treatment plant is calculated based on 0.5% of the total project cost.

XXVII. Green Belt (other than catchment area)

A.	Total area of project / township (in ha)	19094 ha
B.	Area already afforested (for existing projects), in ha.	--
C.	Area proposed to be afforested (in ha.)	1126
D.	Width of green belt (minimum, in m.)	
1.	Periphery of the reservoir	30 m
2.	Canal bank	5 m on both sides
3.	Township	Along internal roads at RR villages
E.	Trees planted & proposed	Nos.
1.	Planted	-
2.	Survival Rate	-
3.	Proposed	2500 per hectare
4.	List of Species	Species will be identified with help of Department of Forests from Annexure 3

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XXVIII. Construction Phase

A. Estimated duration of construction (in months): 84

B. Number of persons to be employed for construction

	Total	From affected population	Others
1. Peak	2000	1000	1000
2. Average	500	300	200

C. Details of site and area where migrated labourers will be temporarily settled

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The major works will be executed by using machineries, only minimum labour will be engaged and most of them will be from the local villages however for migrated labour a temporary camp site near to the project will be arranged

D. What provision has been made for the sewage treatment for the construction workers?

All domestic waste will be diverted to septic tank followed by soak pit

E. How the fuel (Kerosene/wood, etc.) requirement of labour force will be met to avoid cutting of trees from the adjoining areas

Most of the labour will be from local villages who are already procuring fuel (kerosene /wood) from the local market. However if required the project authorities will be provided fuel.

F. Measures of Health care with emphasis on protection from endemic diseases.

Tie up with Government hospital and NGOs of the local area, for regular visits of the doctor to the site. Workers can meet the doctor at the hospital whenever the need arises.

XXIX. Human Settlement

	Aerial distance from the periphery of the reservoir		
	Upto 2000m From periphery Of the reservoir	2000m to 5000 m from periphery of the reservoir	5000m to 10000m from the periphery of the reservoir
Population	2426	4707	8437
Number of Houses	472	903	1942
Present Occupational Pattern	Cultivators, Agricultural labourers, construction labourers	Cultivators, Agricultural labourers, construction labourers, servicing and repairs in house hold industries	Cultivators, Agricultural labourers, construction labourers, servicing and repairs in house hold industries, Trade and commerce, Transport & communication

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XXX. Rehabilitation & Resettlement Plan

A. Village(s) affected by the project

S. No.	Villages			Population		Occupation		Average Income per annum	
	Tribal	Mixed	Others	Tribals	Others	Tribals	Others	Tribals	Others
	-	46 Nos	-	11075	25734	Cultivators, Agricultural labourers, construction labourers, servicing and repairs in house hold industries			Rupees 25000 to 30000

B. Population to be displaced

S.No.	Name of Village	Population					
		Land oustees only		Homestead oustees only		Land and Homestead only	
		Tribal	Others	Tribal	Others	Tribal	Others
1		Annexure - 4					
2							
3							
4							
5							
6							

C. Rehabilitation Plan for oustees **Annexure 5**

D Details of site where the people are proposed to be resettled **Annexure 6**

E Compensation package with full details (tribals and others, separately) **Annexure 5**

F. Agency/Authority responsible for their resettlement : Lower Penganga Project Division Yavatmal Irrigation circle, Yavatmal.

G. Whether the cost of Rehabilitation measure is included in the project cost ?

Yes [x] No [ ]

G. If not, How the expenditure on rehabilitation measure is to be met ?

Not applicable

XXXI. Expenditure on Environmental Measures

A. Capital cost of the project (as proposed to the funding agency/financial institutions (Rs Lakhs) **2000.01 Crores**

B. Cost of environmental protection measures (Rs. lakhs)

S.No		Recurring Cost per annum	Capital Cost
1	Catchment area treatment	None	2100
2	Restoration of project site	None	None
3	Restoration of canal site	None	None
4	Cost of rehabilitation	None	20000
5	Health delivery system	2.0	50
6	Conservation of flora & fauna	None	25
7	Drainage	2.0	2636
8	Pollution Monitoring	None	None
9	Solid Waste Management	None	None
10	Green Belt of main project site	0.2 1.5	2 for project site 15 for canal sites
11	Reclamation of borrow/Mined area	None	None
12	Others (Pl. Specify)	None	None
	Total	5.7	24811

XXXII. Public Hearing

A. Date of Advertisement Lokmat(Marathi)- 28/04/2006
Hitvad(Eng) – 29/04/2006

B. Newspapers in which the advertisement appeared English
(Local Language)
Marati ,Telugu
Annexure - 7

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C. Date of Hearing 06/05/2006

D. Panel Present

E. List of persons present along with addresses and occupation

Minutes of the meeting enclosed as **Annexure 8**

F. Summary/details of public hearing

S.No.	Issues raised	Recommendation of panel	Response of Project Proponents
		Annexure 8	

The data and the information given in this Performa are true to the best of my knowledge and belief

Date:

Signature of the applicant with name and full address

Name : Ramesh Narayan Pise
Designation : Executive Engineer
Address :Lower Penganga Project Division
Yavatmal, Maharashtra

Place: Yavatmal, Maharastra

Given under the seal of organization
on behalf of whom the applicant is signing

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LIST OF DOCUMENTS TO BE ATTACHED WITH THE QUESTIONNAIRE IN RESPECT OF RIVER VALLEY AND HYDROELECTRIC PROJECTS.

1	Topographic map of the main project site indicating contours (1: 2500 scale), location of structures, roads etc.
2	Topographic map covering 7 Kms. Radius indicating main features, ecologically sensitive areas, area to be submerged, main canal net work (in case of irrigation projects only).
3	Location map indicating areas for dumping of excavated material.
4	Comments/observations/Recommendations of Chief Wildlife Warden in case Wildlife habitat/migratory path exists within 7 Kilometers of project site
5	Copy of the application submitted to the State Government for forest clearance in case of diversion of forestland is involved.
6	Copy of advertisement issued in report of public hearing
7	Details of public hearing.
8	Ecological study.
9	Conservation plan for affected flora/fauna.
10	Index map of catchment areas indicating year wise target (Physical & financial).
11	Action plan for control of water logging
12	Action plan for command area development in respect of irrigation potential.
13	Action plan for health delivery systems.
14	Action plan for rehabilitation & resettlement.
15	Plan for restoration of quarry areas/burrow areas and areas for dumping excavated material.
16	Plan for green belt (other than catchment area).

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Annexure 1

Land Breakup (Area in ha)

Land required	Government	Private	Forest	Total
Submergence	500	14704	747	15951.10
Canal	144	2238	251	2633
Allied works	2	507.90	-	509.90
Total	**646**	**17450**	**998**	**19094**

Annexure-1a

Alternate sites considered for Dam

Three alternate sites were studied in detail and investigations were carried out for selecting the dam site and they are as follows.

- Chanaka (on Hattighat) 32 mies on the down side of proposed site at Tadsaoli (Chikhalwardha).
- Dhanora 13 miles on the upper side of proposed Tadsaoli (Chikkalwardha) site.
- Tadsaoli (Chikhalwardha) the proposed site

a) Chanaka site

The site is situated at Latitude 19° 49′ N and Longitude 78° 31′ E about 32 miles in the down side of Chikhalwardha site and has 7281 sq miles of catchment area situated in the down side of the Dhanora site. This site was suggested by the state of Andhra Pradesh in their proposals. This site has two major disadvantages. The reservoir constructed at this site submerges large deposits of good quality of lime stone suitable of cement manufacturing secondly the foundation for a dam at this site was found to be very costly. There is no suitable site below Chanaka for the terminal storage at present planning.

b) Dhanora site

The site is situated near Dhanora village at Latitude 19° 55′ N and Longitude 78° 01′ E about 13 miles on the upper side of Chikhawardha site. The catchment area at this site is 4500 sq miles. A storage at this site would have increased the idle length of canal before it could reach command land for irrigation. A canal from this upper site also involve construction of a costly acqueduct on fairly big Aran river. This is upstream most site with less drainage area and would have reduced the scope of irrigation.

c) Tadsaoli site

The site with its entire catchment and sub mergence lie completely in Maharashtra. The site is situated near village Tadsaoli at latitude 19° 54′ 30″ N and 78° 12′ 30″ E it has a total catchment area of 17983 sq km (6945 sq miles) and un-intercepted catchments area of 7843 sq km (3028 sq miles). A left bank canal can be conveniently taken from this site and a branch to serve right bank area can be taken off at 52 km crossing river Penganga by an aqueduct near Chanaka. There is sound rock exposed at surface area shallow depth for almost the entire length of the dam and hence, construction would be economical. It is therefore, felt the site at Tadsaoli is the best choice.

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Annexure - 2

Water Quality

S.No	Parameter	Unit	Penganga Upstream				Confluence of Aryan River				Aryan River			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5	5	5	5	5	5	5	5	5
2	pH		7.30	7.25	7.45	7.52	7.70	7.80	8.00	8.24	7.59	7.82	7.63	7.54
3	Turbidity	NTU	5	5	5	5	5	5	5	5	5	5	5	5
4	Elec. Cond	milli siemens	524	435	468	521	495	385	425	480	600	421	437	475
5	Total Dissoilved Solids	mg/l	328	286	299	315	305	235	273	310	390	287	300	315
6	Alkalinity as CaCO3	mg/l	184	165	170	190	145	136	156	185	235	160	162	155
7	Chlorides as Cl	mg/l	37	28	30	31	35	30	32	30	20	23	25	35
8	Sulphates as SO4	mg/l	20	12	15	18	20	15	20	24	20	12	13	22
9	Nitrate as NO3	mg/l	2	2	2	2	2	1	1	1	11	6	7	2
10	Phosphates as PO4	mg/l	0.03	0.06	0.05	0.05	0.03	0.02	0.03	0.04	0.02	0.03	0.02	0.01
11	T. Hardness as CaCO3	mg/l	180	138	148	171	142	113	124	183	231	153	160	153
12	Calcium as Ca	mg/l	52	35	41	45	40	32	33	48	64	38	44	41
13	Magnesium as Mg	mg/l	12	12	11	14	10	8	10	15	17	14	12	12
14	Sodium as Na	mg/l	35	26	26	31	40	22	27	25	24	12	26	31
15	Potassium as K	mg/l	5	5	4	4	3	3	4	3	1	2	3	5
16	Flouride as F	mg/l	0.5	0.55	0.45	0.65	0.5	0.4	0.5	0.45	0.6	0.51	0.58	0.63
17	Iron as Fe	mg/l	0.25	0.2	0.17	0.18	0.03	0.05	0.1	0.15	0.12	0.07	0.06	0.02
18	Boron as B	mg/l	0.1	0.05	0.04	0.08	0.05	0.04	0 05	0.04	0.05	0.09	0.07	0.1
19	SAR		1.6	1.4	1.3	1.5	2.1	1.3	1.5	1.1	1.0	0.6	1.3	1.5
20	Percent Sodium		44	43	42	43	54	44	47	36	31	25	40	45
21	RSC		0.68	0.55	0.43	0.38	0.07	0.45	0.64	0.05	0.08	0.13	0.04	0.05
22	DO	mg/l	5.10	5.80	5.80	5.60	5.10	5.30	5.80	5.80	5.20	5.45	5.60	5.90
23	BOD	mg/l	2.00	1.00	1.00	1.00	3.00	2.00	2.00	1.00	2.00	2.00	2.00	1.00
24	COD	mg/l	8	4	5	4	10	3	5	8	7	6	6	6

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Annexure - 3

LIST OF PLANTS, SHRUBS, GRASSES PROPOSED

Trees : Dallbergia sissa, Alkbizia lebbeck, Accacia procera, Pongamia innata, Kassia simaea, Acacia nilolica , Accacia calichu, Anogeisus latifolia, Tectona grandis, Terminalia spp., Pterocarpus masupium, Lagerstroemia parviflora, Emblica officinalis, Hardwickia binata, Cordia dichotoma, Buchnania lanzan, Cochlospermum religiosum, Schleichera oleosa, Dendrocalans strictes, Bambusa bamhas and Bambusa vulgaris.

Shrubs : Carissa spinarium, Hollgarhina antidysenterica, Zyzyphus martuana, Dodonea viscosa, Carissa carandus, Cassia auriculata, Jatrophacurcus, Gymnosporea spinosa, Inga dulce, Combretum decadrum, Balia trandeosa, Cassia auriculata, Cassia fishila, Randia dumetorium and Grevia damine, .

Grasses : Heteropogon contortus, Sehima nervosum, Cynodon dactlyus, Bothriluv, Andropogan, Foeveolatus, Cenchrus ciliaris,Dicarithium anulatum and Thysanolaena maxima.

Occupational Profile of Project Affected Families

No	Village	Affected Families	Population	No of affected persons			Occupation of the affected persons			
				SC	ST	Others	Farming	Industrial Labor	Artist	Other
1	Khadka	170	824	21	372	431	668	8	4	144
2	Chimata	36	176	-	170	6	111	2	1	62
3	Ayata	254	1061	71	567	523	904	22	11	124
4	Jalandri	12	65	-	44	21	62	0	0	3
5	Kawatha	83	41	31	204	179	384	6	3	21
6	Umri	222	1227	62	680	485	1040	34	17	136
7	Gudha	31	179	30	13	136	126	2	0	51
8	Amboda	116	665	113	7	545	520	4	2	139
9	Palshi	226	1034	62	281	691	768	14	7	245
10	Kapeswar	169	746	13	244	489	552	10	5	179
11	Sakhara	173	950	-	10	940	825	4	2	119
12	Warud (Tuka)	81	426	32	119	275	306	9	3	108
13	Datori	207	1090	110	460	520	756	20	10	304
14	Dhanora (rani)	290	1410	176	298	936	1276	34	17	83
15	Kawatha (Bazar)	318	1416	104	598	714	1104	38	19	255
16	Mukindpur	69	389	7	51	331	306	14	7	62
17	Sadoba (sawali)	645	3096	655	353	2088	2300	254	127	415
18	Donwada	44	187	-	31	156	180	0	0	7
19	Zapalwadi	63	323	11	284	28	300	4	2	17
20	Sakur	136	690	53	195	442	603	14	7	66
21	Bilkayata	84	430	74	297	59	363	8	4	55
22	Manusda.i	159	793	86	477	230	665	18	9	103
23	Irul	42	233	-	5	228	129	28	28	48
24	Ratnapur	102	510	1	183	326	468	8	4	30

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25	Kopari	91	458	5	216	237	369	8	4	77
26	Kapsi	13	74	-	74	-	46	6	3	19
27	Kawatha (khurdi)	134	562	44	170	348	471	4	2	85
28	Yedshi	47	266	-	160	106	220	14	7	25
29	Koli (K)	131	709	5	35	669	612	10	0	87
30	Ghoti	411	2007	77	919	1001	1529	176	88	214
31	Datisawali	283	1453	438	9	1006	1224	54	27	148
32	Dhanwad (dhanoda)	212	1182	45	411	726	1044	26	13	99
33	Bhosa	137	609	166	134	309	460	20	10	119
34	Anantwadi	90	608	108	180	220	500	14	7	87
35	Khambala	243	1219	18	17	1184	932	26	13	248
36	Pathari	134	735	47	244	444	484	16	8	227
37	Rampur	77	403	10	155	238	338	10	5	50
38	Dhanora (sikh)	57	304	-	163	141	248	10	5	41
39	Chinchkhed	245	1152	166	93	893	816	34	17	285
40	Sinakhed	267	1300	280	156	864	1020	44	22	214
41	Vasaram naik (tanda)	170	900	-	32	864	765	22	11	102
42	Bondgavan (chaupali) karalgaon	84	385	270	-	115	252	6	3	124
43	Karalgaon	36	155	48	103	4	97	6	3	49
44	Palasa	205	1033	51	284	698	753	16	8	256
45	Near	44	181	50	1	130	114	4	2	61
46	Wadasa	259	1359	15	145	1199	1056	18	9	276
	Total	8136	36809	3555	9644	22175	28066	1099	556	5667

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Annexure – 5

REHABILITATION AND RESETTLEMENT DETAILS

Rehabilitation policy for the project

The rehabilitation policy adopted for the proposed project is liberal and comprehensive. The principles and provisions set out for this policy for rehabilitation of the displaced families, at their new resettlement/village site without affecting their social and economic life have been described below:

- Each project affected family which will be rendered houseless on account of acquisition of land /house for the project shall be entitled for houseless grant and the families becoming landless will be entitled for landless grant.
- There is a provision of providing land in the command in lieu of land acquired under submergence of the project if asked by the PAP. Till the allotment of land in the command a grant of Rs.600 per month will be provided to the PAP(Subsistence allowance).
- While developing the rehabilitation sites, civic amenities such as power, water, drainage facilities etc. shall be provided.
- For imparting education to the children educational facilities of the project schools will be extended to PAFs.
- Transport grant for shifting of dismantled material and household articles from the existing houses to new settlement sites shall be given.
- A community hall at the rehabilitation site shall be constructed for socio-cultural activities, functions, ceremonies and services.
- Approach road to the rehabilitation site will be developed
- Vocational training will be provided to the project oustees and preference in employment to the affected people will be given.
- The facilities like post office, police post and banks etc. will be extended

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to the locals by the project authorities.

R&R Package

The Resettlement & Rehabilitation Package has been prepared in line to the R&R scheme prepared by the State Govt. of Maharashtra. The proposed sites for project ousters will be provided with water supply schemes either in the form of providing wells or bore wells or in the form of tap water. While selecting the sites for villages due care will be taken to see availability of water for drinking. As far as water for irrigation is concerned as per the present norms it is to state that the project affected persons will be given land for agriculture purposes in the command area and within a radius of 8 km from new villages. So that there lands will be benefited with canal irrigation system.

I. a) Resettlement Grant

Each oustee family, which will be rendered houseless on account of acquisition, shall be entitled to:

1. The compensation in form of houseless grant.
2. Infrastructure facility in oustee colony, which will include developed plot of size Measuring 50' x 40', electrification for streetlight, lines for drinking water, suitable pacca approach road and Sulabh Sauchalaya.

The Deputy Commissioner concerned will be the sanctioning authority for rehabilitation. Grant, which shall be provided by the project authorities and placed at the disposal of the concerned Deputy Commissioner for disbursement to eligible families. All these grants shall be in addition to the compensation paid under land acquisition act.

II. b) Employment

The Project Authorities shall provide preference in employment to project affected families in the category of unskilled and skilled workmen as per the need of the project. Every affected family shall be helped in starting some gainful occupation/getting training to facilitate secondary employment in the region. The project authorities will construct shopping complexes in which a limited number of small shops/stalls will be earmarked for allotment to the eligible persons after appropriate consultation regarding capability and aptitude on a nominal rental as fixed by the Corporation. Some members of the oustee families may qualify to go for vocational training

courses, like ITI etc. N.H.P.C will pay the training cost for the interested persons. The Project authorities will also consider to award petty contracts to the eligible PAFs on preferential basis so that some of them may be engaged in such jobs also. Secondly, the project authorities will make the condition for contractors to engage eligible persons from affected families on a preferential basis wherever possible during construction stage. As a mode of livelihood.

Preference in giving fishing rights in the Project Reservoir to the members of the PAFs will also be considered. These steps will ultimately lead to facilitation for adjustment of all the eligible persons in different employment/income.

c) Training

As per Government Resolution No. RPA/1086/CR-4067/R-1 dated 2.9.87by the Government of Maharashtra the project authorities are made responsible for providing employment to the project affected persons on priority and also for providing necessary vocational training to them. In Lower Penganga project total of about 12270 skilled and unskilled workers will be required during construction period of 10 years. Out of these 35% will be of the skilled category such as mason, welder, carpenters, fitters mechanics, drivers, black smiths, electronics, plumbers, draftsman, etc. Thus about 4300 skilled workers will be needed for the project. The above skilled workers can be created by improving training to the eligible candidates in the industrial training institutes. After successful completion of the training they will be employed on regular basis by the contractor or by the department at prevailing wages as per the minimum wages act for that category of work.

d) Promotion of various economic activities

Economic rehabilitation would be done through promotion of various economic activities such as agriculture, horticulture, animal husbandry, cottage and small-scale industries, fisheries etc. These occupations besides meeting the food requirement of the affected household are likely to be helpful in uplifting their economic condition.

The PAPs will be provided with water supply schemes either in the form of providing wells or bore wells or in the form of tap water. Care will be taken to see availability of water for drinking. This will be done in consultation with geologists of ground water survey department. All the resettlement colonies will be provided with the following amenities in accordance with rehabilitation act 1986,2001 and vide revenue and forest department circular No RPA/1087/CR-27/(1987) R-1, Mantralaya Bombay.

- Bore wells or piped water supply will be provided for drinking water.
- One school with plat ground
- One samajmandir (Community Hall)
- Internal And Approach roads
- Electric supply
- Cremation of Burial ground
- Drainage gutters.
- Public latrines
- Land for cattle shed
- Land for thrashing floor
- Land for pickup shed for ST bushes
- Pasture land
- Land for market and expansion of gaothans

Presently the resettlement process is at preliminary stage. The lands will be acquired and packages mentioned will be put in to effect once after completing the PAPs concents as per the capability of sites.

e) Compensation Planned To PAPs

An amount of 4236 lakhs has been provided as compensation to the project affected persons.

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Annexure 6

No	Village	Location of proposed New Gaothan	Distance of proposed new Gaothan from old Gaothan – kms	Tentative site no
1	Khadka	Sr.No.91 of Village Khadka	2	1
2	Chimata	Sr.No.91 of Village Khadka	3.5	1
3	Manusdari	Sr.No.145 of Village Manusdari	2.5	2
4	Bilayata	Sr.No.145 of Village Manusdari	3.0	2
5	Ratnapur	Sr.No.70 & 71 of Village Ratnapur	2.0	3
6	Irul	Sr.No.15 of Village Irul	1.5	4
7	Ghoti	Sr.No.1 & 297 of Village Ghoti	0.5	5
8	Koli (BK)	Sr.No.88 of Village Koli (BK)	1.0	6
9	Kapsi	Sr.No.85 of Village Pardi	2.0	7
10	Kopri	Sr.No.85 of Village Pardi	2.0	7
11	Kawatha (Kh)	Sr.No.113 of Village Kawatha (Kh)	2.0	8
12	Yedshi	Sr.No.26,27,& 28 of Village Yedshi	1.5	9
13	Palshi	Sr.No.18 of Village Palshi	2.5	10
14	Sakhara Tanda	Sr.No.10 of Village Sakhara (Tanda)	0.5	11
15	Jalandri	Sr. No. 35 of Village Kapeshwar	3.0	14
16	Ayata	Sr. No. 35 of Village Kapeshwar	2.5	14
17	Kapeshwar	Sr. No. 35 of Village Kapeshwar	1.0	14
18	Kawatha (BK)	Sr. No. 35 of Village Kapeshwar	1.0	14
19	Sawali (Sadoba)	Sr. No. 5 of Village Sawali (Sadoba)	0.5	12
20	Umari	Sr. No. 67 of Village Umari	2.5	13
21	Gudha	Sr. No. 26,27,&29 of Village Barbhai	3.5	15
22	Zapalwadi	Sr. No. 26,27,&29 of Village Barbhai	3.5	15
23	Warud	Sr. No. 26,27,&29 of Village Barbhai	3.5	15
24	Datodi	Sr. No. 26,27,&29 of Village Barbhai	4.5	15

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पत्र क्र. तांक्रि/४४१/२००२/ ४८९

भूविज्ञान आणि खनिकर्म संचालनालय,
महाराष्ट्र शासन, जुने सचिवालय इमा
शिव्हील लाईन्स, नागपूर-४२० ००१.
दिनांक :- 2 FEB 2002

प्रति,

कार्यकारी अभियंता,
अकोला/वाशीम कालवा विभाग,
यवतमाळ.

विषय :- जिल्हा यवतमाळ, तालुका दारव्हा, पोस्ट वाडसावळी येथील वाळूचे अनधिकृत खनन प्रकरणाबाबत.

संदर्भ :- आपले कार्यालयीन पत्र क्र. कॅम्प-१/ता.गा./५/निरिक्षण/दारिव्ह/ २००१/(३४), दिनांक ३१.१२.२००१.

-०-

महोदय,

विषयांकित बाबीसंबंधी संदर्भीय पत्रान्वये आपण केलेल्या विनंतीनुसार विषयांकित क्षेत्राच्या संरक्षणाबाबत निरिक्षण या संचालनालयाकडील दिनांक २८ व २९.१.२००२ रोजी करण्यात आले. या निरिक्षणाचे वेळी निम्न पैनगंगा प्रकल्पाचे अधिकारी सर्वश्री वाईकर, उपअभियंता डेहणीकर व शाखा अभियंता सालंकार उपस्थित होते.

संयुक्तपणे केलेल्या या निरिक्षणानंतर प्रस्तावित कालव्याचे संरेखन लगतचे क्षेत्रातील अनधिकृत खनन लक्षात आल्यामुळे " अ " आणि " ब " या दोन्ही ठिकाणी कालव्याचे संरेखनात बदल सुचविण्यात आले आहेत. प्रस्तावित संरेखनात बदल सोबत जोडलेल्या नकाशात दाखविण्यात आले असून त्याप्रमाणे कालव्याचे संरेखन करण्यात यावे.

तसेच कालव्याचे बांधकाम पुर्ण झाल्यानंतर वेळोवेळी या बांधकामास कोणत्याही प्रकारचे आर्थिकदृष्ट्या महत्वाचे खनिज आढळून आल्यास त्याबाबतची माहिती तात्काळ या संचालनालयाकडे पाठवावी, जेणेकरुन याबाबत तपासणी या संचालनालयातर्फे करण्यात येईल व आवश्यकता भासल्यास कालव्याच्या क्षेत्रातून त्यानुसार काही प्रमाणात बदल करावा लागेल. या अटीवर आपणास निरापत्ती बाबी संबंधी संमती प्रदान करण्यात येत आहे. यामध्ये अभियांत्रिकी दृष्ट्या बदल होणार नाही याबाबत कृपया कटाक्षाने काळजी घ्यावी.

आपला,

सहपत्र :- संबंधीत क्षेत्राचा नकाशा.

संचालक(कोतवार)
भूविज्ञान आणि खनिकर्म संचालनालय,
महाराष्ट्र शासन, नागपूर.

DRAFT APPROVED BY D. & M.
/२८/२/२००२/

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NO IRR/Lower Penganga/Proposed Cropping Pattern AG 56

Commissionerate of Agriculture, M.S.
Pune. 411001 dt. 19.3.1996

To,
Superintending Engineer,
Yawatmal Irrigation Circle,
Yawatmal.

Subj:- Lower Penganga Distt. Yawatmal.
Proposal of revised cropping pattern approval

Ref:- Your Marathi letter No. 1572/T-8 cropping Pattern/Lower penganga dt. 13-3-96

The cropping pattern for the Lower Penganga Project has already been approved vide Deptt. letter No. IRR/LPenganga/AG.59 dt.1-9-92. However, Superintending Engineer, Yawatmal Irri. Circle, Yawatmal has communicated vide letter under reference, that coal and lime stone mines have been found in the command areas which has been reduced the command areas considerably. In view of this fact Superintending Engineer, Yawatmal has proposed to irrigate new command area, by three lift irrigation schemes.

The revised cropping pattern for lower Pengaga project lift irrigation scheme is approved subject to the following conditions.:-

1) Rotation will be followed so as to meet the timely requirements of crops.
2) Quantum of water reserved for the particular crops included in the cropping pattern should be given to other crops replaced in the contingency cropping in adversity condition.
3) Percentage of the crop in the cropping pattern are based on the existing situation and development policy and subject to change as per the advancement in agriculture technology and development policies.

Season 1	No. 2	Name of crop 3		Percentage 4
A) Two Seasonal crops	1	Cotton	..	20
	2	Chillies	..	04
	3	Turmeric	..	03
				27
B) Kharif Seasonal (Irrigated)	4.	Hy.Jowar	..	20
	5.	Gr. Nut	..	15
	6.	Sunflower	..	05
	7.	Vegetable (Onion)	..	10
				50
C) Kharif seasonal (Un Irrigated)	8	Tur (Pulses)	..	23

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1	2	3	4
c) Rabi crops			
	9. Wheat		05
	10. Gram		10
	11. Hy.Jowar (Rabi)		10
	12. Subflower		15
	13. Safflower		15
	14. Vegatables		10
	Total Rabi		65
Total cropping intensity (A + B + C + D)			165 %

Irrigation Intensity 141 %

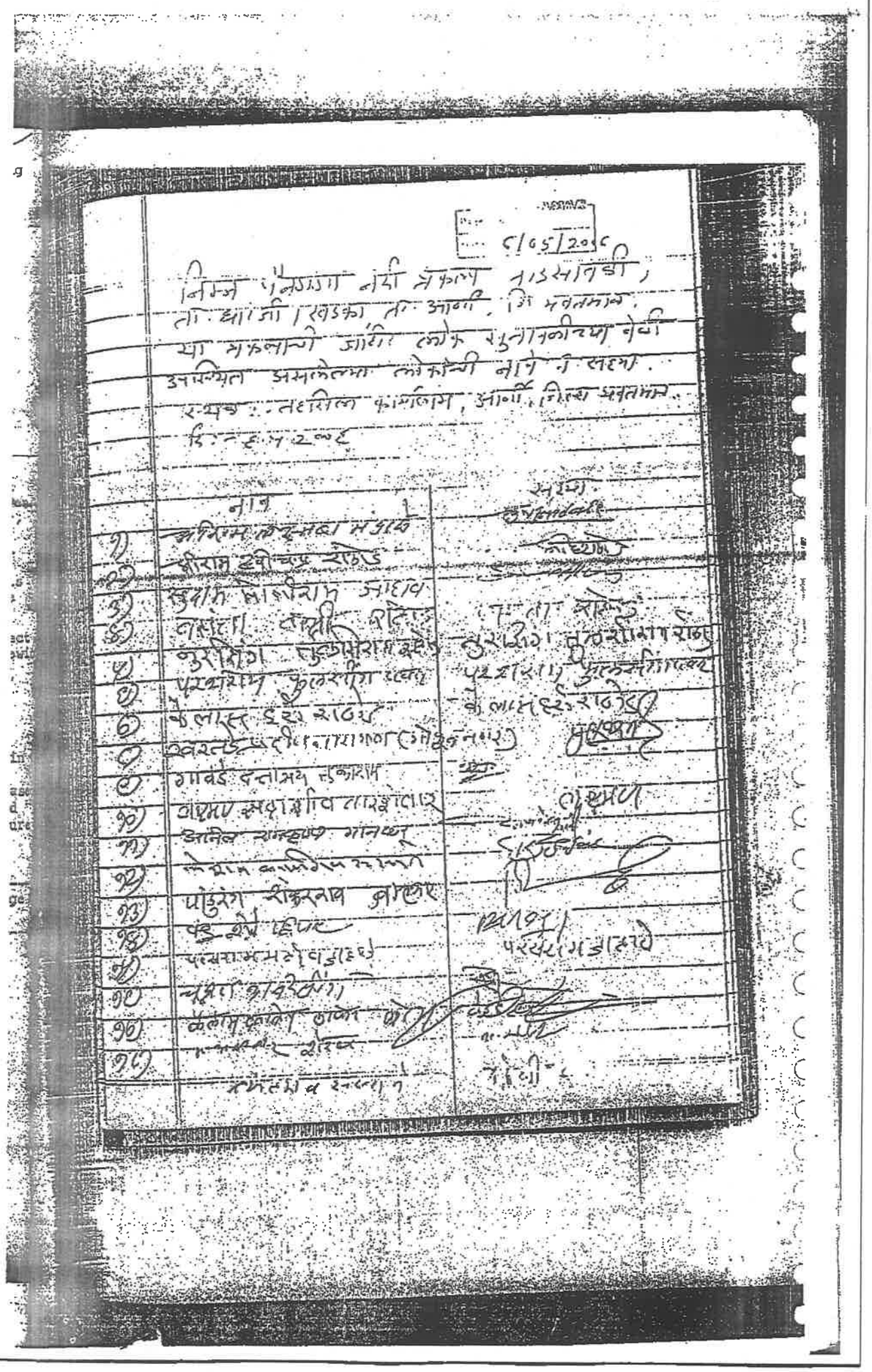
Additional Director of Agricul.
(Extn.) C/o.Commi. of Agricul.
M.S.PUNE 411001.

Copy to Jt. Director of Agriculture, (EXTN), Amaravati for information.

Copy forwardedwith compliments to Executive Engineer, Irrigation Project, Investigation Division, Yawatmal, for information and necessary action.

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दि. ६/०५/२०१८

विषय : नांदगाव नदी प्रकल्प गाडसांगवी, ता. धारूर, खोऱ्यातील आणि मे. मनसमाज या संस्थेच्या जागेत लोकसहभागातून नदी पुनर्जीवन करण्यासंदर्भात समन्वयाच्या कामी नावे निश्चित करणेबाबत.

स्थळ : तहसील कार्यालय, धारूर, जि. बीड यथावत.

दि. ६/५/२०१८

	नाव	सही
१)	अविनाश कृष्णराव मुंडके	
२)	श्रीराम हरी चव्हाण	
३)	सुधाकर लिंबाजीराव जाधव	
४)	[illegible]	
५)	कुरेशी [illegible]	
६)	[illegible]	
७)	[illegible]	
८)	[illegible]	
९)	गावंडे दत्तात्रय [illegible]	
१०)	[illegible]	
११)	अनिल रामकृष्ण गानबोटे	
१२)	[illegible]	
१३)	पांडुरंग शंकरराव [illegible]	
१४)	[illegible]	
१५)	[illegible]	
१६)	[illegible]	
१७)	[illegible]	

Comparative Statement of National Policy for Resettlement & Rehabilitation of Project Affected Families (NPRR – 2003) & National Rehabilitation Policy (NRP – 2006) and Maharashtra Projected Affected Person Rehabilitation Act, 1986/99

Sl. No	Provision of NPRR – 2003	Proposed Provision of NRP – 2006	As per Maharashtra Projected Affected Person Rehabilitation Act, 1986/99 (MPARA)
1	Each PAF owning agricultural land in the affected zone and whose entire land has been acquired may be allotted agricultural land or cultivable waste land to the extent of actual land loss subject to a maximum of one hectare of irrigated land or two hectares of un-irrigated land / cultivable waste land subject to availability.	AF owning agricultural land in the affected zone and whose entire land has been acquired may be allotted in the name of the khatedar(s) in the AF, on replacement cost basis, agricultural land or cultivable waste land to the extent of actual land loss by the khatedar(s) in the AF subject to a maximum of one hectare of irrigated land or two hectares of un-irrigated land/cultivable wasteland, if government land is available. This benefit will also be available to AFs who have as a consequence of acquisition, been reduced to the status of marginal farmers.	Benefit of Agricultural land to PAP in command area. Min 0.40 ha & Max. 1.60 ha
2	Any Project Affected Family (PAF) owing a house and whose house has been acquired may be allotted free of cost house site to the extent of actual loss of area of the acquired house but not more than 150 sq.m of land in the rural areas and 75 sq.m of land in the urban areas.	Affected Family (AF) owing a house and whose house has been acquired may be allotted free of cost house site to the extent of actual loss of area of the acquired house but not more than 150 sq.m of land in the rural areas and 75 sq.m of land in the urban areas. However, every nuclear family of adult husband/wife and minor children within this definition of a family would be entitled to an additional entitlement of 10 sq.m floor area.	Benefit of min. 370 sq.m and Max. 740 in case of Agriculturist and 185 to 370 sq.m for Non-Agriculturist.
3	Each PAF of BPL category shall get a one time financial assistance of Rs. 25,000/- for house construction. Non-BPL families shall not be entitled to receive this assistance.	Each AF of BPL category shall get one time financial assistance which is not less than what is given under any programme of house construction by the Government of India.	Benefit of Rs. 10000/- to all. Financial assistance of Rs. 28500/- for construction of house to BPL category PAF is given under Indira Awas Yojana.
4 & 5	In case of allotment of wasteland/degraded land in lieu of acquired land, each tenure holder shall get financial assistance of Rs. 10000/- per hectare for land development. In case of allotment of agricultural land. A one-time financial assistance of Rs.5000/- per PAF for agricultural production shall be given.	In case of allotment of wasteland/degraded land in lieu of acquired land, each khatedar shall get a one-time financial assistance of Rs. 10000/- per hectare for land development. In case of allotment of agricultural land. A one-time financial assistance of Rs.5000/- per AF for agricultural production shall be given.	No such provision, as agricultural land is allotted. No such provision.

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6	Each PAF having cattle shall get financial assistance of Rs.3000/- for construction of cattle shed.	Each AF having cattle shall get financial assistance of Rs.3000/- for construction of cattle shed.	No such provision, in act. Revised guidelines for new project only. Valuation of the property is awarded to the PAF & he is allowed to use the material of property free of cost.
7	Each PAF shall get financial assistance of Rs.5000/- as transportation cost for shifting of building materials, belongings and cattle etc. from the affected zone to resettlement zone.	Each AF shall get financial assistance as transportation cost for shifting of building materials, belongings and cattle etc. from the affected zone to resettlement zone on actual cost basis.	Free of cost transportation by deptt. The expenditure incurred against this work comes to Rs. 5000/- PAF.
8	Each PAF comprising of rural artisian/small trader and self employed person shall get one time financial assistance of Rs. 10000/- for construction of working shed/shop.	Each affected person who is a rural artisian, small trader or self employed person shall get one-time financial assistance of Rs. 10000/- for construction of working shed/shop. In case of projects involving land acquisition on behalf of a Requiring Body, (a) the RB shall provide employment to affected persons who lose their employment due to the project, subject to availability of vacancies and suitability of the affected person for the employment; (b) the obligation at Para 7.11 (a) will apply only to the extent of one person per nuclear family of adult husband/wife and their minor children. (c) the RB will give preference to groups and cooperatives of affected persons in outsourced contracts; (d) the RB will give preference to willing landless labourers and unemployed affected persons while engaging labour in the project during the construction phase.	Vide. Govt guidelines dated 17.04.06 applicable for new projects only. However, under the various Govt. of Maharashtra Schemes the necessary training is awarded for self employment.
9	Each displaced PAF shall get a monthly subsistence allowance equivalent to 20 days of minimum agricultural wages per month for a period of one year.	In case of projects involving land acquisition on behalf of a Requiring Body, each displaced AF shall get a monthly subsistence allowance equivalent to 20 days minimum agricultural wages per month for a period of one year.	100 to 75% resettlement grant to land less small & marginal farmers in slab. Under EGS scheme every major PAF Member resident of Maharashtra state is entitled for the assured employment if he is registered under the scheme & ask for the work.

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10	Each PAF owning agricultural land in the affected zone and whose entire land has been acquired shall get one-time financial assistance equivalent to 750 days minimum agricultural wages for "loss of livelihood" where neither agricultural land nor regular employment to one member of the PAF has been provided.	In case of projects involving large acquisition on behalf of a Requiring Body, (a) affected families who have not been provided agricultural land or employment shall be entitled to a rehabilitation grant equivalent to750 days minimum agricultural wages; (b) if the Requiring Body is a corporate organization/company, such PAFs, in addition, shall be given 20% of this amount in the form of shares in the Requiring Body at book value as per guidelines to be notified by the Central Government; (c) in all cases where loss of agricultural land or displacement takes place on account of land development projects, in lieu of land for land for employment, such AFs would be given site or apartment within the development project. In the case of irrigation projects, fishing rights in the reservoirs shall be given to the oustees, if such rights were enjoyed by them in the affected zone; (b) In other cases also, unless there are special reasons, fishing rights shall be given to displaced persons only.	No such provision. But there is a provision for resettlement grant.
11	Each PAF owning agricultural land in the affected zone and whose entire land has not been acquired and consequently he becomes a marginal farmer shall get one time financial assistance equivalent to 500 days minimum agricultural wages.	-Deleted-	No such provision. But there is a provision for awarding resettlement grant.
12	Each PAF owning agricultural land in the affected zone and consequently he becomes a small farmer shall get one time financial assistance equivalent to 375 days minimum agricultural wages.	-Deleted-	No such provision. But there is a provision for awarding resettlement grant.
13	Each PAF belonging to the category of "agricultural labourer" or "non-agricultural labourer" shall be provided a one time financial assistance equivalent to 625 days of the minimum agricultural wages.	-Deleted-	No such provision. But there is a provision for awarding resettlement grant.

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14	In case of linear acquisitions, of Long stretches of land: In case of projects relating to Railway Lines, Highways, Transmission Lines and laying pipelines wherein only a narrow stretch of land extending over several kilometers is being acquired, the Project Affected Families, will be offered an ex-gratia amount of Rs. 10000/- per family, no other Resettlement & Rehabilitation benefits shall be available to them.	In case of linear acquisitions, in projects relating to Railway Lines, Highways, Transmission Lines and laying pipelines wherein only a narrow stretch of land is being acquired, each Khatedar will be offered an ex-gratia amount of Rs. 10000/-jly, no other Resettlement & Rehabilitation benefits shall be available to them.	Vide Govt. guidelines dated 17.04.06 applicable for new projects only.
15	Each Tribal PAF shall get additional financial assistance equivalent to 500 days minimum agricultural wages for loss of customary rights/usages of forest produce.	In case of projects involving land acquisition on behalf of a Requiring Body, each tribal AF shall get an additional one-time financial assistance equivalent to 500 days minimum agricultural wages for loss of customary rights/usages of forest produce.	No such provision. But there is a provision for awarding resettlement grant.
16	Tribal PAFs resettled out of the district/taluka will get 25% higher R&R benefits in monetary terms.	In case of projects involving land acquisition on behalf of a Requiring Body, tribal AFs resettled out of the district will get 25% higher R&R benefits in monetary terms.	Vide Govt. guidelines dated 17.04.06 applicable for new projects only. But through State Tribal department assistance is awarded by various self beneficiary schemes.
17	Tribal PAFs shall get land free of cost for community & religious gathering.	Settlements predominantly inhabited by tribals shall get land free of cost for community and religious gatherings.	For community & religious gathering of PAF space is allocated in the layout.

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Environmental Impact Assessment Report

of

Lower Penganga Project
Near Tadsaoli Village, Ghatanji, Yavatmal

Comprehensive Report

Submitted to
Ministry of Environment & Forests
New Delhi

Submitted by
Lower Penganga Project Division,
Yavatmal, Irrigation Circle,
Yavatmal, Maharastra.

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EIA-II

ANNEXURE 20- B

SCHEDULE – II
APPLICATION FORM

CHAPTER I
INTRODUCTION

1.1 PREAMBLE

The Lower Penganga Project (LPP) is one of the major projects in Vidarbha region of Maharashtra State. This project is proposed on Penganga River on the upper side of village Tadsaoli in Ghatanji Tehsil of Yavatmal district. It is suggested by the Godavari Water Dispute Tribunal (GWDT) award to take up this project as inter-state project between States of Maharashtra and Andhra Pradesh. The project is administratively approved by Government of Maharashtra vide Government Resolution No. 1096/168/96 WRI Mantralaya Mumbai dated 26th June 1997.

To expedite the irrigation projects under the Godavari Basin in Maharashtra, Irrigation Department has entrusted the project construction including the Environmental Clearance from State Pollution Control Board and Ministry of Environment & Forests to Madhucon Projects Limited.

The present Environmental Impact Assessment report is for the Lower Penganga Irrigation Project, comprising of a barrage across River Penganga, near Tadsaoli village in Ghatanji Tehsil of Yavatmal district, Maharashtra. The proposed project envisages the construction of a central gated masonry spillway with earth embankment on both left and right flanks. The total length of dam is about 2 km and maximum height above riverbed level is 35.63 m. The length of proposed spillway is 375 m in riverbed having 12 x 8 m size radial gates 25 in numbers.

The proposed project will have

- One Left Bank Canal (LBC) 139.5 km to irrigate 14219 ha of land in Yavatmal district, Maharashtra.
- Two Right Bank Canals (RBC) - One RBC of length 54 km for Andhra Pradesh to irrigate 19232 ha of land in Adilabad District and another RBC of length 117 km to irrigate 41095 ha of land in Chandrapur District, Maharashtra State.

The project will irrigate 85504 ha of land by three lift irrigation schemes in Yavatmal district. The important details of the proposed project are presented in Table 1.1.

Table 1.1

Project Details

Project	Lower Penganga Project, Yavatmal		
Proposal	Barrage across River Penganga		
Location	Tadsaoli Village, Ghatanji Tehsil, Yavatmal District, Maharashtra		
Latitude & Longitude	19° 54' 30" N and 78° 12' 30" E		
Water utilization	1164.30 Mm^3 (41.12 TMC)		
Height of the barrage	35.63 m above riverbed level		
Gross Catchment Area	17983 sq. km		
Free Catchment Area	7843 sq. km		
Command Area in ha	**By gravity (LBC & RBC)**	**By Lift (Parwa, Kali, Mukutban)**	**Total**
Gross Command Area	100680	117449	218129
Culturable Command area	81801	93959	175760
Irrigation Command area	74546	85504	160050
Villages benefited	351 (Yavatmal District – 193, Chandrapur District – 158)		
Total beneficiaries	291539		
No. of villages affected	46		

The proposed project envisages the construction of a central gated masonry spillway with earth embankment on both left and right flanks. The total length of the dam is about 2 km. The central gated masonry spillway is 666 m long. The reservoir thus formed will have a gross storage of 1045.37 Mm^3 (36.938 TMC) at RL 261.50 and water spread area of about 162 km^2. The project will irrigate about 99723 ha of land in Yavatmal district by three lift irrigation schemes and left bank canal upto 139.5 km. About 19232 ha land irrigated in Adilabad district in Andhra Pradesh state by Right Branch Canal (RBC) offtaking at 52 km of LBC. Further, 41905 ha of land is irrigated in Chandrapur district by RBC offtaking from 139.5 km of LBC. The offtaking canals from 52 and 139.5 km cross the Penganga river by aqueducts at Chanakha and Mukutban respectively in Yavatmal district. The project location map is shown in the following **Figure 1.1**.

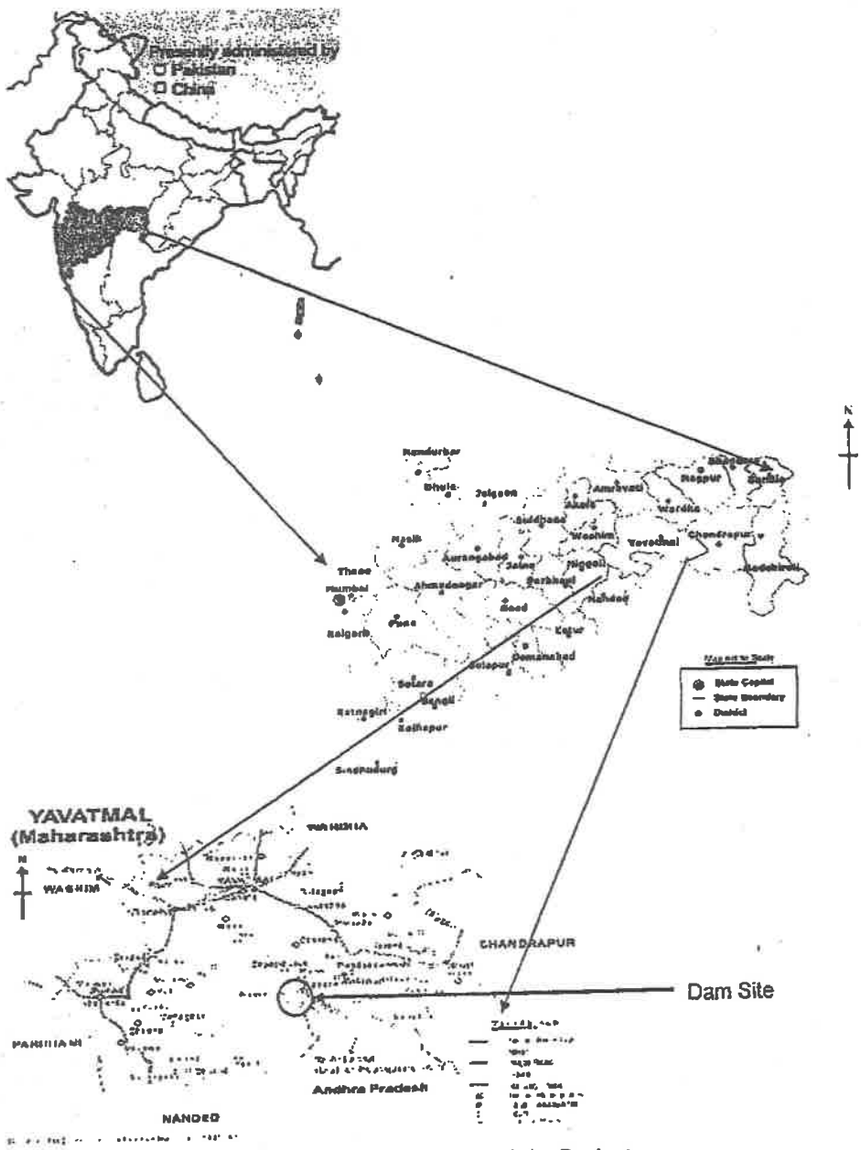


Figure 1.1 Location Map of the Project

1.2 Penganga River & Drainage Area

The proposed project area falls under the Godavari River Basin. The Penganga River originating from village Madha in Buldhana district at an altitude of 685.7 m and traverses for 668.8 Km up to Wardha River with gross catchment area of 17983 km². The river flows mostly in southeastern direction upto the upper Penganga dam site. Here it flows in south direction for a short distance and again flows in SE direction upto the Shahasrakund falls from where it flows in a north direction for some distance. From the point of its confluence of its tributary Pus River, it flows in eastern direction upto the lower Penganga dam site. Beyond this point, till it confluence with Wardha River, it flows in SE direction.

The important tributaries of Penganga are Kayadu and the Sat joins on its right and the Kas, the Pus, the Adan, the Waghavi, the Khuni on the left bank. All the left bank tributaries drain in Vidarbha region. The Kas joins upstream of the upper Penganga dam site. Hence, this is one of the major river basins in the country for realizing the irrigation potential and which can sustain projects in a major way.

1.2.1 Present Proposal – Lower Penganga Project

The area covered by Yavatmal district in Maharashtra State has very low rainfall. The average rainfall is 880 mm. The total yield available from the catchment area of Maharashtra state at the Project site is 55.3 TMC at 75% dependability.

Lower Penganga Project (LPP) is a project directed at harnessing the Penganga River water for irrigating the fields along the River in Yavatmal, Chandrapur Districts in Maharashtra and Adilabad in Andhra Pradesh State. A barrage is proposed on the Penganga River near Tadsoli village in Ghatanji tehsil of Yavatmal district in Maharashtra state. The salient technical details of the Lower Penganga project are given in **Table 1.3.**

	Total	75980	24700	100680
B	Culturable Command Area (CCA) (ha)			
	LBC	15625	–	15625
	RBC	45159	21017	66176
	Total	60784	21017	81801
C	Irrigable Command area (ha) (ICA)			
	LBC	14219	--	14219
	RBC	41095	19232	60327
	Total(gravity)	55314	19232	74546
D	By lift Irrigation (ha)	GCA	CCA	ICA
	Lift 1 – Parwa	55013	44010	40050
	Lift 2 – Kali	54881	43905	39954
	Lift 3 – Mukutban	7555	6044	5500
	Total (Lift)	117449	93959	85504
	Total (gravity)	100680	81801	74546
	Total Command	218129	175760	160050
12	Taluka wise area benefited in ha Maharashtra Yavatmal District – 99723 (Kelapur 18411, Ghatanji 35230, Digrus 9833, Zari-jamani 3905, Pusad – 1823, Mahagaon – 17935, Arani – 8010, Wani 2774, Yavatmal – 1802) Chandrapur district – 41095 (Korapna – 19178, Rajura – 21917) Andhra Pradesh Adilabad - 19232			

Table1.3

Lower Penganga Irrigation Scheme - Salient Features

No	Parameter	Description	
1	Location		
	Village, Tahasil, District, State	Tadsoli, Ghatanji, Yavatmal Maharashtra	
	Topo sheet No	56 - I/1	
	Longitude	78° 12' 30" E	
	Latitude	19° 54' 30" N	
2	Hydrology		
	Name of the River	Penganga River	
	Name of the Basin	Godavari Basin	
	Gross catchment area	17983 km² (including Maharashtra & A.P)	
	Free Catchment area	7843 km²	
	Rainfall Area	The catchment of Penganga bridge C.W.C. St.No. 59 site 18441 km²	
	Average runoff	29.16 cm	
	75% dependable runoff	18.829 cm	
3a	Yield & Utilization		
	75% dependable yield free catchment area	1476.758 Mm³ (52.182 TMC)	
	Post monsoon flow 5%	73.83 Mm³ (2.609 TMC)	
	Regeneration flow 10% upstream project yield	15.26 Mm³ (0.539 TMC)	
	Total yield at site	1565.85 Mm³ (55.33 TMC)	
	Up stream reservation (future, existing & on going minor, medium and major projects)	401.54 Mm³ (14.1889 TMC)	
	Net yield available at dam site	1164.3054 Mm³ (41.1415 TMC)	
3b	Yield utilized for the projects	Maharashtra	Andhra Pradesh
	Irrigation (Flow & lift)	822.377 Mm³	112.315 Mm³
	Domestic water supply	67.14 Mm³	9.15 Mm³
	Annual evaporation	134.92 Mm³	18.40 Mm³
	Total	1024.43 Mm³	139.86 Mm³

1.4.1 Canal Alignment

a) **Left Bank Canal:** The length of the main canal is 139.5 km. The sill of the head regulator is at RL 249.0 m while the CBL is at head is 247.8 m to enable the canal to draw maximum discharge at FSL. The slope of the Bed gradient is 1:7000. The canal crosses the Waghavi River at aqueduct arrangement. The canal then crosses NH 7 in 82 km immediately, after crossing NH7, the canal crosses the Khuni River at 83.7 km. Then, the canal passes through the Ghatanji Taluk and Zari Taluk. Then the Canal crosses over to Adilabad district of Andhra Pradesh.

b) **Right Bank Canal:** The canal branches out at distance of 52 km of Left Bank Canal. The slope of the Bed gradient is 1:1000. The canal passes through the Ghatanji Taluk of Maharastra and Adilabad district of Andhra Pradesh. The canal crosses the NH7 at 15.5 Km. The command Area details under *both LBC and RBC* are as follows.

1.4.2 Lift *Irrigation Scheme:*

Lift cum flow segment distribution is planned to irrigate the proposed command area. Each segment will have a main lift cum flow canal with distribution system. For each scheme a rising main has been aligned to reduce the length of the canal.

Head Works

The headwork of each canal consists of Rising mains, delivery chambers and intake pumping installations. The total lifting stations selected are fifteen. The diameters of rising main pipes is proposed to adopt as 0.6m, 1.5m, 1.4m, 1.3m, 1.2m, 1.1m, 1.0m with thickness between 5mm to 8mm. The velocity in the rising mains is restricted to 2.5m/s. The energy required to discharge water in each stage pumping is 199000HP with power requirement of 120727 KW.

The updated estimated cost of the project is Rs 2001.01 crores. It is proposed to irrigate 175760 ha of land in Maharashtra and Andhra Pradesh. The cost per ha of the cropped area is Rs.1.13 lakh per hectare. The catchment area map and the command area map are given as **Figure 1.3 & 1.4** respectively.

1.3 INTERSTATE ASPECT

According to the interstate agreement of 07.08.1978 which has been incorporated in the final decision of Godavari Water Disputes Tribunal, the state of Maharashtra is entitled to use all water resources upto Tadsaoli (Chikhalwardha) dam site Latitude 19° 54′ 30″ Longitude 78° 12′ 30″ on the Penganga River subject to the lower Penganga project being taken up as a joint project of the states of Andhra Pradesh and Maharashtra.

The suffering due to submergence is entirely in the state of Maharashtra and this aspect will have to be taken into account while deciding share of costs and benefits of this project between two states. The gross command area in the Andhra Pradesh according to survey conducted by Maharashtra is 24700 ha. Out of this 19232 (ICA) ha are proposed to irrigate and the utilization at the canal head is 121.13 Mm^3 main canal including domestic purpose.

1.4 PROJECT IN DETAIL

The proposed project is being planned to utilize 41.12 TMC of water to irrigate 218129 ha by lift and flow irrigation. The scheme envisages the construction of a barrage across Penganga River about 2 km upstream of Tadsoli village. It is proposed to lift water from the fore-shore of the barrage through a system of rising main to the required height and is distributed through gravity canal system to irrigate 100680 ha and through lift irrigation using three lifting points to irrigate 117449 ha covering Maharashtra and Andhra Pradesh states.

The length of the dam is 1998.0 m including central spillway. Twenty five vertical lift gates of 12m X 8.0 m sizes are proposed over the weir for a maximum flood discharge of 38725 m^3 / s.

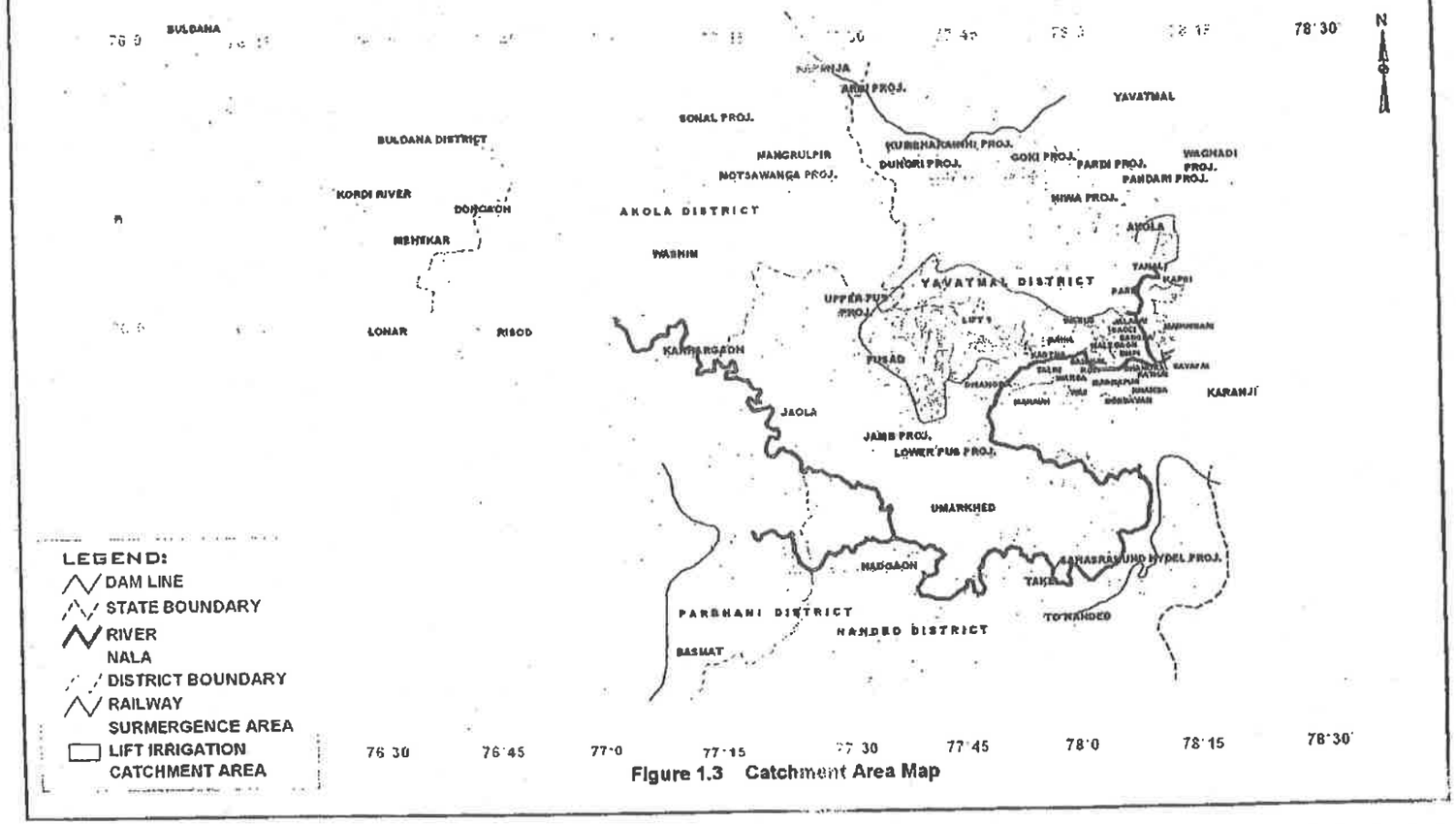


Figure 1.3 Catchment Area Map

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1.5 SALIENT FEATURES OF THE PROJECT AREA

The following are the salient features of the project area and its surroundings.

Table 1.4

Salient Features of the Study Area

S. No	Selection Criteria	
1	Latitude	19° 54' 30" N
2	Longitude	78° 12' 30" E
3	Climate Conditions	Summer (March – May) Monsoon (June – August.) Post Monsoon (September. – November) Winter (December – February)
4	Temperature range	15.6 to 44.4° C
5	Land type	Hilly Region, Dark Fine clay
6	Predominant wind direction	Summer – N followed by NNW
7	Nearest Village	Tadsaoli Village 2km NE
8	Nearest Town/ city	Pandari Kowda 40 km NE
9	Major Urban Settlement	Yavatmal 80 km
10	Water bodies	Lower Penganga River, Adan River
11	Hills & Mountains	-
12	Ecological sensitive Zones	Tipeshwar Widlife area (approx. 17km)
13	Historical Places	Unkeshwar temple in submergence area
14	Tourist spots	No tourist spots.
15	Nearest Airport	Nagpur, 150 km
16	Nearest Highway	NH7 Nagpur-Hyderabad 40 km NE
17	Nearest Railway station	Kinwat 28 km S on Mudkhed Adilabad SCR Branch line
18	Reserved forests	Datodi RF 10 km W, Manjari RF 7.5 km N, Unkdeo RF 5 km SE, Umri RF 5 km S.

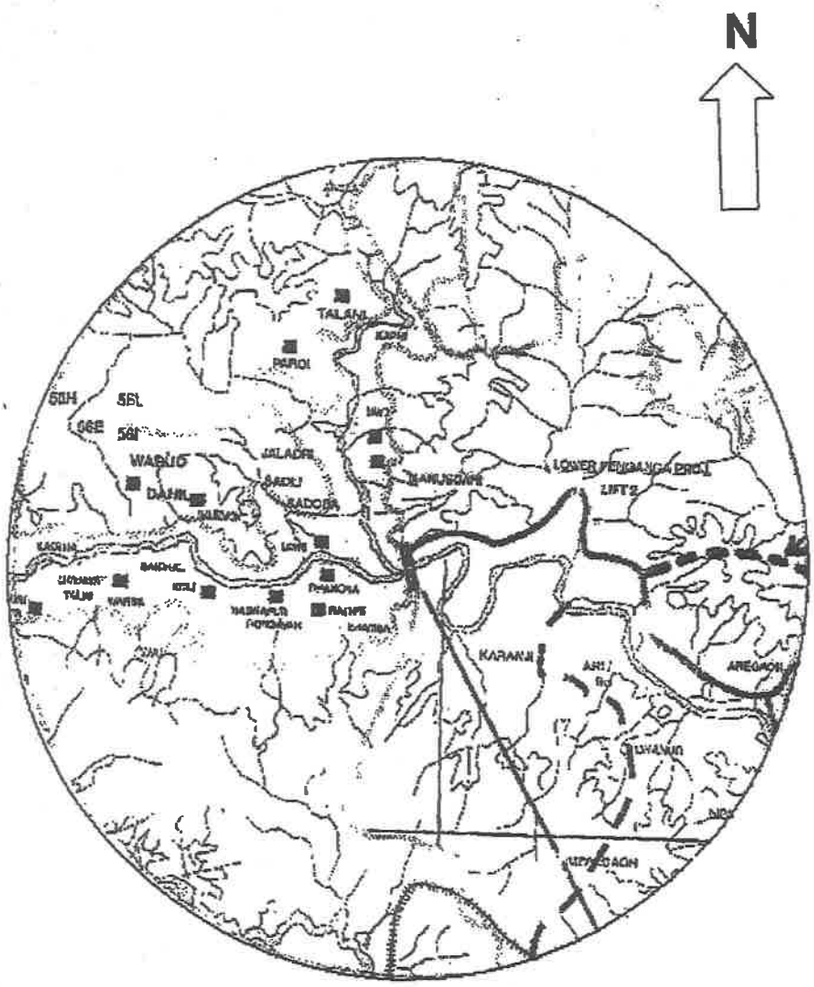


Figure 1.5
Topographical Map Showing 10 Km Study Area around Barrage

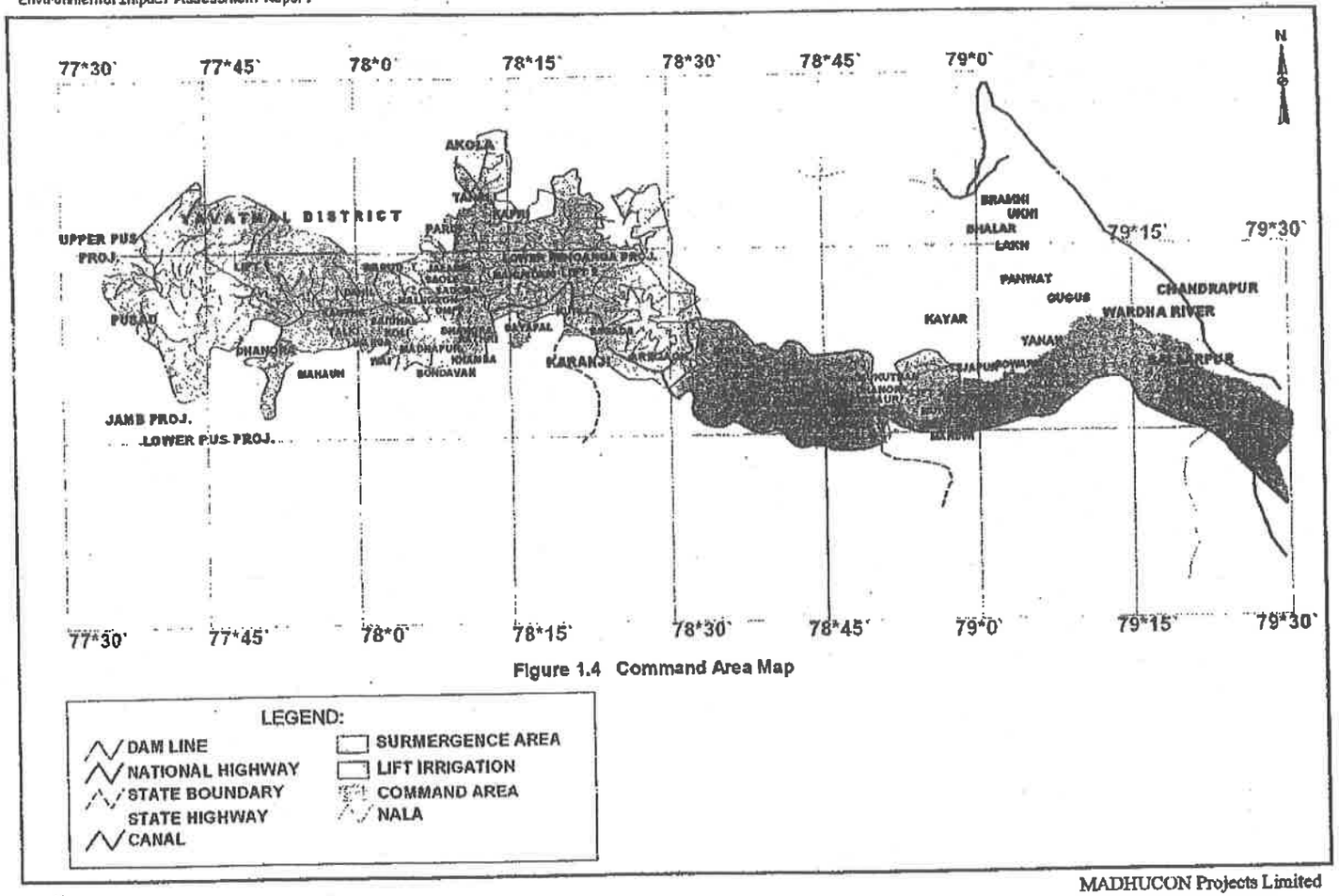
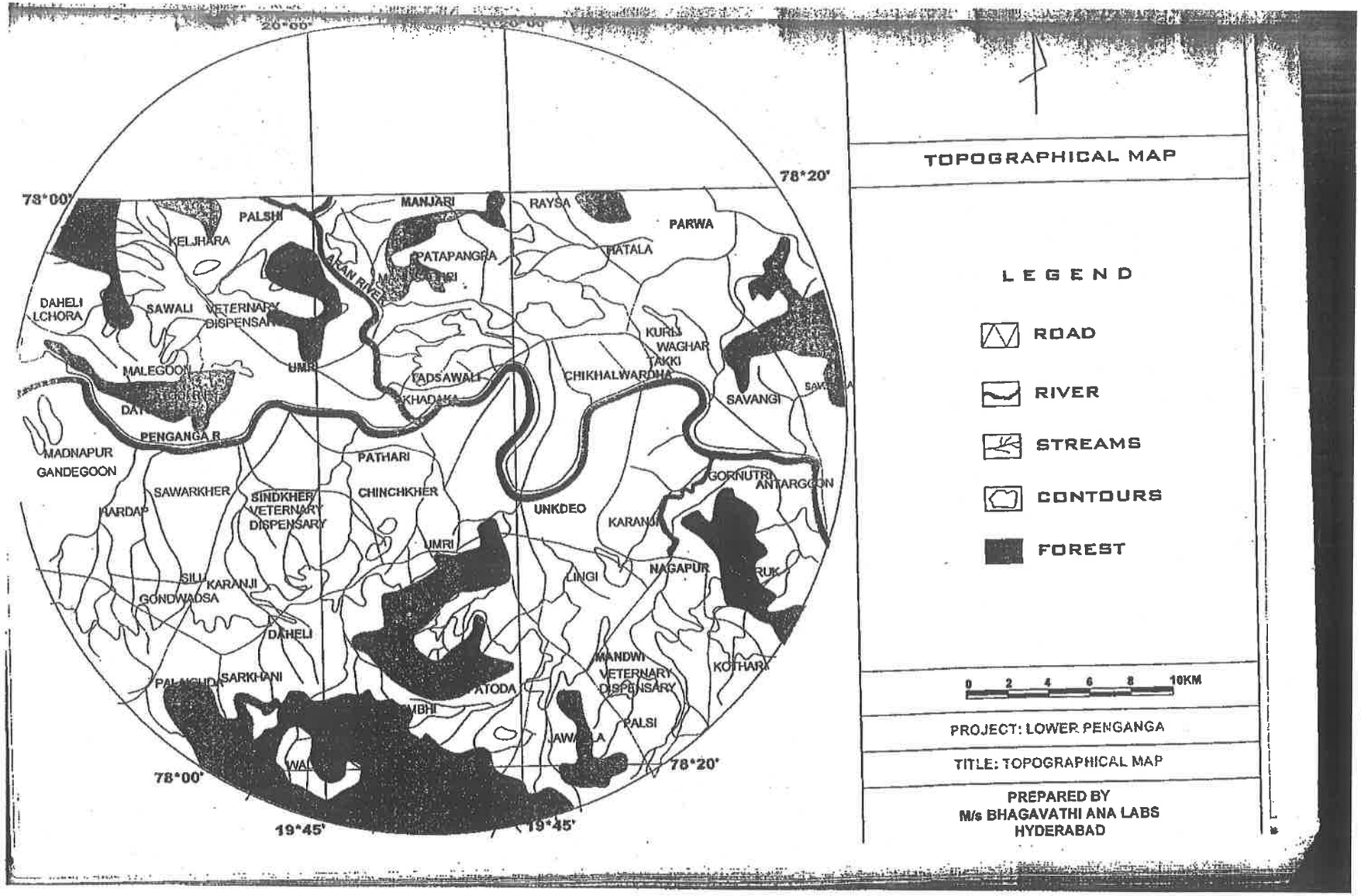


Figure 1.4 Command Area Map

709
709
592
188


TOPOGRAPHICAL MAP
LEGEND
ROAD
RIVER
STREAMS
CONTOURS
FOREST
0 2 4 6 8 10KM
PROJECT: LOWER PENGANGA
TITLE: TOPOGRAPHICAL MAP
PREPARED BY
M/s BHAGAVATHI ANA LABS
HYDERABAD
20°00'
78°00'
78°20'
19°45'
MANJARI
RAYSA
PARWA
PALSHI
KELJHARA
PATAPANGRA
HATALA
ARAN RIVER
DAHELI
LCHORA
SAWALI
VETERNARY
DISPENSARY
KURLI
WAGHAR
TAKKI
MALEGOON
UMRI
TADSAWALI
CHIKHALWARDHA
SAVANGI
PENGANGA R
MADNAPUR
GANDEGOON
PATHARI
GORNUTRI
ANTARGOON
SAWARKHER
SINDKHER
VETERNARY
DISPENSARY
CHINCHKHER
UNKDEO
KARANJI
UMRI
NAGAPUR
LINGI
SILI
KARANJI
GONDWADSA
DAHELI
MANDWI
VETERNARY
DISPENSARY
KOTHARI
SARKHANI
PALSI
JAWALA

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1.6 NEED FOR EIA STUDIES

Planning and implementation of water resources projects involve a number of socio-economic aspects and issues such as environmental sustainability, appropriate re-settlement and rehabilitation of project-affected people and livestock, public health concerns of water impoundment, barrage safety etc. Common approaches and guidelines are necessary on these matters. Moreover, certain problems and weaknesses have affected a large number of water resources projects all over the country.

There has been substantial time and cost over-runs on projects. Problems of water logging and soil salinity have emerged in some irrigation projects leading to degradation of agricultural land. Complex issues of equity and social justice with regard to water distribution are required to be addressed. The development and over exploitation of groundwater resources in certain parts of the country have raised the concern and need for judicious and scientific resource management and conservation.

All the above factors stress the importance of a well-planned approach before taking up any water resources project. Environmental Impact Assessment is one of the management tools, which helps to study the impact of any activity on the environment and helps in formulating control measures right from the planning stage itself.

1.6.1 Present Study

To study the project from the environmental angle and for getting the clearance for the project from the statutory bodies, LPP proposed to undertake the Comprehensive Environmental Impact Assessment Study (CEIA) based on four-season data generation during year 2005-06 starting from Summer 2005 including Monsoon, Post monsoon, and Winter seasons.

Irrigation Department of Maharashtra has entrusted the responsibility of conducting the impact assessment studies to M/s. Maducon Projects Limited, Hyderabad.

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CHAPTER II

PRE – PROJECT STATUS

CHAPTER II
PRE-PROJECT STATUS

2.0 PREAMBLE

Baseline environmental status in and around the project area depicts the existing conditions of Air, Noise, Water, Soil and Socio-economic environment. Area covering 30 km radially, with the proposed barrage as the nodal center has been selected for baseline data collection. Baseline data was collected for various environmental components viz. Air, Noise, Water, Land and Socio-economics so as to compute the impacts that are likely to be arising out of the construction of the barrage. In keeping with the legislative requirements, Environmental consultant has performed a CEIA study based on the monitoring data collected from summer 2005 to winter 2005-06. From the data generated with respect to the baseline status, an environmental management plan has been prepared to manage and mitigate these impacts.

2.1 SITE DESCRIPTIONS AND ENVIRONS

The River Penganga originates near village Madha in Buldhana district at an attitude of 685.7 m. Penganga River is a major tributary of Wardha River in the Godavari basin drains upto the dam site reaches cultivable and forest lands in Buldhana Parbani, Akola, Yavatmal and Nanded districts in Maharashtra. The river flows mostly in southeastern direction upto the Upper Penganga dam site, from here it flows in south direction for a short distance and again flows in southeastern direction up to the Shahasrakund, from here it flow in a north direction for some distance. The river flows in the eastern direction upto the Lower Penganga dam site. Beyond this point till its confluence with Wardha River, it flows in southeastern direction.

The proposed dam site is about 2 km upper stream of Village Tadsaoli and it is approachable from Pandhar-kawda, which is a Taluka head quarter. The Pandhar-kawda is situated on Nagpur-Hyderabad NH-7 at a distance of 145 km from Nagpur. The distance from Pandhar kawda to Tadsaoli is 45 km. The dam site is located in Geological Survey of India Topo sheet no 56/I/1 at latitude 19° 54' 14" N and 78° 13' 00" E. Dam site can be approached from Pandari kowda by

traveling in south west direction by NH-7 for about 2 km and then follow metalled ODR 20 km upto Chikhalwardha village and then travel 13 km on metalled ODR upto site.

The nearest major town is Pandari Kowda at a distance of about 40 km by road. The nearest railhead is Nagpur at a distance of 150 km, while the nearest airport is Nagpur. Mumbai is the capital of Maharashtra, which is about 600 km from the project site.

Apart from the Godavari River, there is Waghi River, flowing in the study area. The study area seems to be plain with minor undulations and sloping towards the river in the catchment areas. There is Tipeshwar wild life Area existing at a distance of 20 km on the downstream of the proposed barrage.

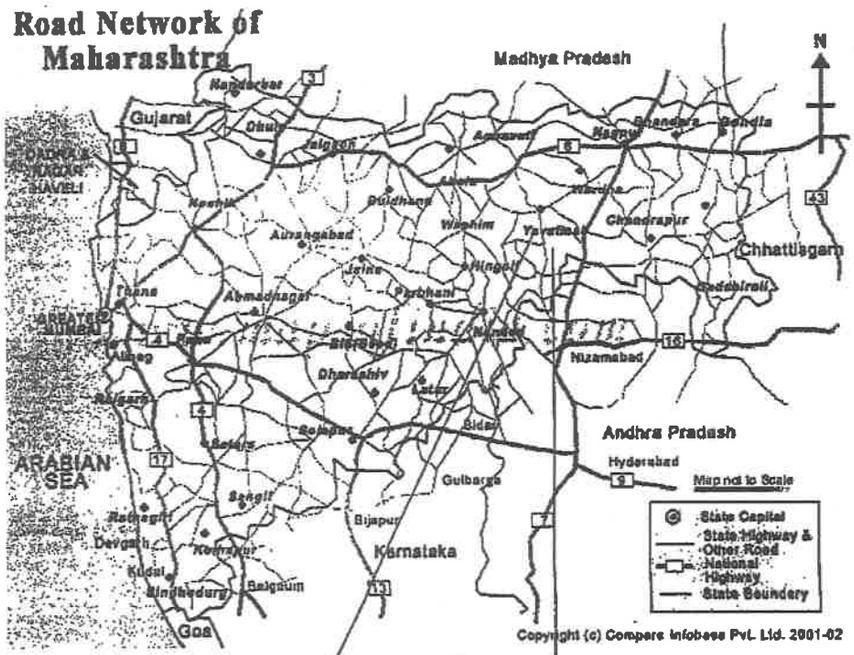
The study area seems to be well connected by road network to the major towns namely Pandari Kowda, Ghatanji, Arni and Yavatmal. Pandiri Kowda is connected by National highway-7 with Adilabad and Yavatmal.

The district head quarter Yavatmal is located at about 84 km and the dam site can also be approached from Yavatmal. The route is approachable in all seasons. The route is as follows.

Yavatmal to Ghatanji	35 km by state highway 237 & 235
Ghatanji to Patapangra	35 km mettaled MDR
Patapangra to dam site	13 km metalled ODR

The Road network map of Maharashtra & Yavatmal are shown as Figure 2.1 while the rail network is shown as Figure 2.2.

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Road Network of Maharashtra
Madhya Pradesh
Gujarat
Chhattisgarh
Andhra Pradesh
Karnataka
Goa
ARABIAN SEA
Mumbai
Pune
Nagpur
Aurangabad
Nashik
Solapur
Kolhapur
Nanded
Nizamabad
Hyderabad
Gulbarga
Bijapur
Sangli
Ratnagiri
Sindhudurg
Belgaum
Jalgaon
Dhule
Parbhani
Jalna
Latur
Beed
Yavatmal
Chandrapur
Wardha
Amravati
Akola
Buldhana
Ahmednagar
Thane
Raigarh
Map not to Scale
State Capital
State Highway & Other Road
National Highway
State Boundary
Copyright (c) Compare Infobase Pvt. Ltd. 2001-02

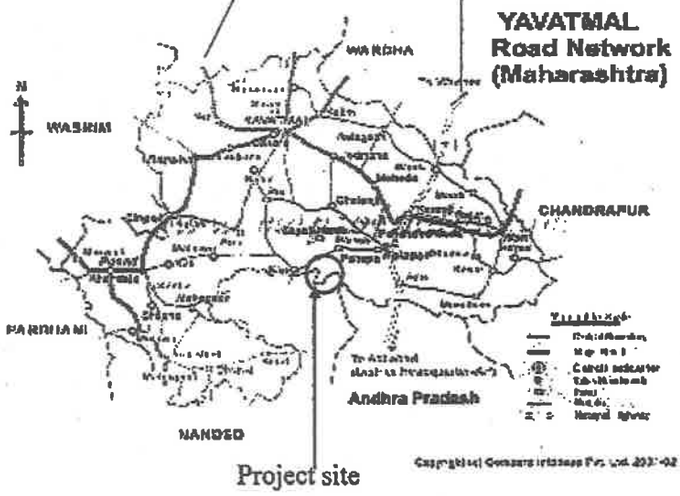

YAVATMAL
Road Network
(Maharashtra)
WARDHA
WASHIM
CHANDRAPUR
PARBHANI
NANDED
Andhra Pradesh
Project site

Figure 2.1
Road Network Maps

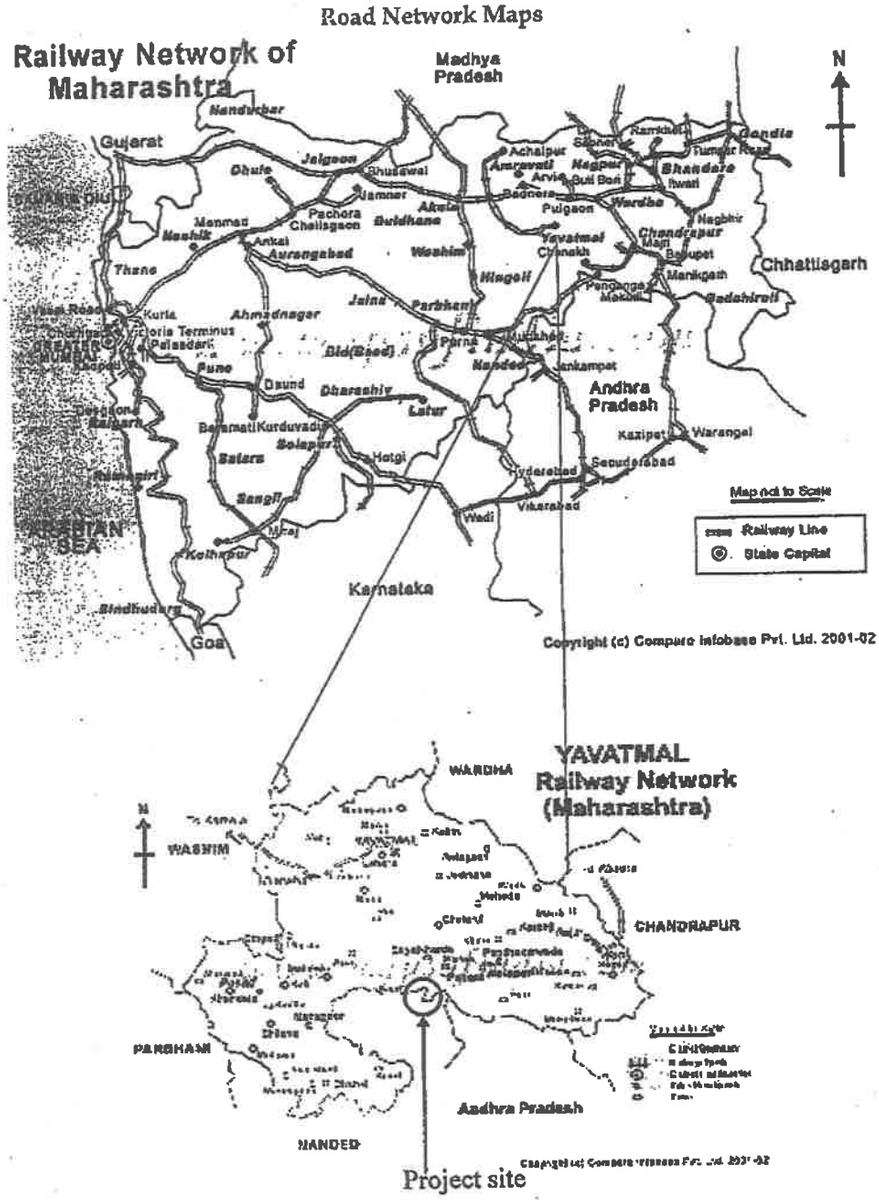


Figure 2.2
Rail Network Maps

2.1.1 Dam Site Selection

Three alternate sites were studied in detail and investigations were carried out for selecting the dam site and they are as follows.

- Chanaka (on Hattighat) 32 miles on the down side of proposed site at Tadsaoli (Chikhalwardha).
- Dhanora 13 miles on the upper side of proposed Tadsaoli (Chikkalwardha) site.
- Tadsaoli (Chikhalwardha) the proposed site

2.2 STUDY PERIOD

The baseline data generation for the comprehensive EIA has been carried out during the 2005 and 2006 for four seasons (Pre-Monsoon, Monsoon, Winter and Post-monsoon) . The data generation with respect to meteorological conditions, air pollution levels, noise levels, water quality, soil quality and socio economic conditions were carried out for a period of three months in a season. Secondary data with respect to the meteorological conditions like the rainfall for the past few years has been collected from the project authorities.

2.3 BASELINE DATA GENERATION

The baseline status with respect to meteorological conditions, air environment, noise environment, water environment, soil environment and socio economic environment are studied in detail to establish the pre project conditions in the study area. The detailed methodologies and the study results are presented in the subsequent chapters.

2.3.1 Air Environment

For the environmental impact studies, an area covering 10 km radial distance surrounding the proposed site was identified as study area (Impact Zone). The

studies were carried out on each individual components were briefly reported below and the details are reported in subsequent chapters.

The topographical information of project site, study area and details about different activities related to project were collected. Different air pollution parameters like SPM, SO_2 and NO_x were identified as related to the project activities for representing baseline status of ambient air quality within the study area.

Pre-calibrated High Volume & RD Samplers have been used for monitoring all the air pollutants.

2.3.2 Noise Environment

Excessive noise levels cause adverse effects on human beings and associated environment including domestic animals, wild life, natural eco-system and structures. Hence noise survey is carried out at the site where proposed project is coming and nearby villages. Noise levels (A-Weighted) were measured by using precision Noise level meter. The principle of propagation of sound waves was used to estimate the noise levels at various locations.

2.3.3 Water Environment

Information on water resources in the study area was collected. The water resource in the study area mainly comprises of, groundwater, surface water sources etc. The parameters of prime importance for water quality studies were selected under physical and chemical groups etc. were analyzed. Samples were collected at different locations in the study area.

2.3.4 Land Environment

Soil samples were collected from the plant site, not only at its immediate vicinity but also in the surrounding villages in a 10 km radial zone. Physico-chemical properties of the soils were determined. Information on land use pattern in the study area was also collected. Information regarding existing cropping pattern, their types and yield of the crop was collected from various sources. Based on the

attenuation factors for dust aerosols and air pollutants, green belt species have been identified.

2.3.5 Eco-system

Information on eco-system within 10 km radius was collected from the state Agricultural and Forest departments. The important flora species native to the area is enumerated. A test check survey was also under taken to judge the correctness of the data collected.

2.3.6 Socio-Economic Environment

A field survey was conducted within 10 km radius of the site and the surrounding impact zone. The parameters selected under socio-economic component were demographic structure of the study area, provision of basic amenities, industries likely to come up in the study area, welfare facilities proposed by the project proponent, safety training and management, community and occupational health hazards. Relevant information was collected from selected villages and analyzed. The frequency of monitoring followed is given in Table 2.1.

Table 2.1

Environmental Attributes and Frequency Of Monitoring

Ambient Air Quality	SPM, RPM, SO_2 and NOx	24 hourly samples twice a week for the entire study period
Meteorology	Surface: Wind Speed, direction, temperature, relative humidity and rainfall	Continuous monitoring station for entire study period on hourly basis.
Water Quality	Physical, Chemical and Bacteriological Parameters	Once during the season.
Ecology	Existing Flora and Fauna	Through field visit during the study period and substantiated through secondary sources.
Noise Levels	Noise levels in db (A)	Hourly observations for 24 hours
Soil Characteristics	pH, Total Acidity, Nitrates, Potassium	Once during the season

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Land Use	Trend of land use change for different categories	Data from various Government agencies
Socio-economic aspects	Socio-economic characteristics, Labour force characteristics, population statistics and existing amenities in the study area.	Data collected from actual survey done by NGO

605 201

Project,
Yavatmal

rnment

CHAPTER III

BASELINE STUDIES

CHAPTER III

BASELINE STUDIES

3.0 METEOROLOGICAL CONDITIONS

Meteorological conditions in the study area will have a critical impact on the overall shaping of the project and its impact on the other aspects of the environment like air, water, soil, flora, fauna and socio economics of the region. Hence study of meteorological conditions is an important part of any impact assessment study.

3.1 METHODOLOGY

To study the meteorological conditions in the study area a meteorological station was installed near the proposed dam site. The following parameters were monitored during the study period.

- φ Wind Speed
- φ Wind direction
- φ Temperature
- φ Relative humidity
- φ Rainfall

The observations were made at one hourly intervals and primary data was generated for processing. Data from the secondary sources like the gauging station of irrigation department were collected to study the trend during the previous years.

3.2 CLIMATE

The climate of the state is tropical. The Western Ghats run north to south separating the coastal districts of Thane, Mumbai, Raigarh, Ratnagiri and Sindhudurg from rest of the State. The average height of the range is about 1000 m above msl as the ridge runs across at right angle to the monsoon stream, it forms an important climatic divide. The coastal areas receive very high monsoon rains while to the east of the ghats rainfall drops drastically within short distance from the ghats. Towards further east, the rainfall once again gradually increases.

CHAPTER III

BASELINE STUDIES

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- φ Temperature
- φ Relative humidity
- φ Rainfall

The observations were made at one hourly intervals and primary data was generated for processing. Data from the secondary sources like the gauging station of irrigation department were collected to study the trend during the previous years.

3.2 CLIMATE

The climate of the state is tropical. The Western Ghats run north to south separating the coastal districts of Thane, Mumbai, Raigarh, Ratnagiri and Sindhudurg from rest of the State. The average height of the range is about 1000 m above msl as the ridge runs across at right angle to the monsoon stream, it forms an important climatic divide. The coastal areas receive very high monsoon rains while to the east of the ghats rainfall drops drastically within short distance from the ghats. Towards further east, the rainfall once again gradually increases.

The climate in Yavatmal district is extreme with large variations in the temperature. The maximum and minimum temperatures in the valley are recorded of the order of 44.4°C and 15.5°C respectively. The precipitation of the catchment area is mainly due to south-west monsoon and is from June to October. There are occasional post-monsoon showers in December. There are frequent dry spells of a fortnight or more even during August and September. In early October sometimes-heavy showers are received. The average annual rainfall in the valley is of the order 1016 mm out of which 762 mm precipitation is experienced from June to October. The rainfall increases in the valley from West to East.

3.2.1 Weather Conditions in the study Area

The state experiences four seasons during a year. March to May is the summer season followed by rainy season from June to September. The post monsoon season is October and November. December to February is the winter season. The state comprises of four meteorological sub-divisions namely Konkan, Madhya Maharashtra, Marathwada and Vidarbha.

The climate in the study region is generally hot and humid and is characterized with seasonal variations of the following

Winter	Dec to Feb
Summer	Mar to May
Monsoon	Jun to Aug/Sep
Post monsoon	Sep/Oct to Nov

Summary of the climatological data of Yavatmal Indian Meteorological Department is presented here under. The data has been ascertained by establishment of a micro-meteorological station in the study area. .

3.2.2 Temperature

The temperature profile of this region is presented below based on Yavatmal IMD data.

Table 3.1
Temperature Variations

Sr. No.	Description	Minimum temperature (°C)	Maximum Temperature (°C)
1	Extreme Conditions	11 (Jan)	44.8 (May)
2	Winter Season mean	11.5	36.1
3	Summer Season mean	23.3	44.7
4	Monsoon season mean	20.8	42.6
5	Post Monsoon Season mean	12.7	33.1

3.2.3 Humidity

The relative humidity is high during the south-west monsoon season when they are between about 60 and 80 per cent. With the withdrawal of the south-west monsoon, humidity gradually decreases and in the cold and summer seasons the air is generally dry. The summer season is the driest part of the year when the relative humidity in the afternoon is generally less than 30 per cent.

Annual mean humidity	52 %
Maximum Humidity	87 %
Minimum humidity	24 %

3.2.4 Rainfall

The State experiences extremes of rainfall ranging from 6000 mm over the ghats to less than 500 mm in Madhya Maharashtra. The Konkan sub-division comprising of coastal districts and Western Ghats receives the heaviest rains, the ghats receiving more than 6000 mm and the plains more than 2500 mm.

Rainfall decreases rapidly towards eastern slopes and plateau areas where it is minimum (less than 500 mm). It again increases towards east i.e. in the direction of Marathwada and Vidarbha and attains a second maximum of 1500 mm in the eastern parts of Vidarbha. Thus, the Madhya Maharashtra sub-division is the region of the lowest rainfall in the state. The state receives its rainfall chiefly during the south west monsoon season (June to September) while Konkan receives almost 94% of the annual rainfall during the monsoon season, The other sub-divisions namely Madhya Maharashtra, Marathwada and Vidarbha receive 83%, 83% and 87% respectively during this season.

The number of rainy days has great significance in artificial recharge to ground water. These vary from 75 to 85 in Konkan to 30 to 40 days in Madhya Maharashtra and Marathwada. The number of rainy days in Vidarbha is around 40 to 50 days during South West monsoon season.

The intensity of rainfall plays a vital role in artificial recharge to ground water. In general, the intensity of rainfall is high in coastal and ghat areas as compared to the other parts of the state. The intensity of rainfall varies from storm to storm and with occurrence of depression and low pressure areas during monsoon season.

The variability of annual rainfall over the state in general, is high. Only in the coastal areas, the variability is less than 20% otherwise the variability ranges between 20% and 35% over the state. On sub-divisional basis, the variability of annual rainfall in Konkan is the least (23%) while it is the maximum in Marathwada (31%). In Madhya Maharashtra and Vidarbha the variability is 30% and 26% respectively.

The study of droughts shows that Konkan experiences one drought in every eight years while Marathwada and Madhya Maharashtra, the frequency is one drought in every five years. In Vidarbha, it is one drought in every six years. The average rainfall in Yavatmal is around 1134 mm with average number of rainy days 59.

3.2.5 Wind Speed and Direction

In Yavatmal district winds are generally light during, October to March. They gain in strength in the later half of the summer and south-west monsoon seasons. During the south-west monsoon season winds are predominantly from the west or south-west. In the post-monsoon and winter months they are mainly from directions between east and north. From about the beginning of summer, winds from directions between south-west and north-west appear and these predominate by May and continue till the onset of the south-west monsoon.

Mean wind speeds (high) - 0.91m/s
Maximum wind speeds - 6.2 m/s
Minimum wind speeds - 0.831 m/s

Calm periods – October to February (mostly in the morning)

Predominant wind Directions

Month	Direction	Month	Direction
January	NE, E	July	W, SW
February	NE, E	August	W, SW
March	NW, W	September	W, NW
April	NW, W	October	NE, N
May	NW, W	November	NE, N
June	W, NW	December	NE, N

3.3 METEOROLOGICAL SCENARIO

Regional meteorological scenario helps to understand the trends of the climatic factors. It also helps in determining the sampling stations in predicting the post project environmental scenario. Meteorological Scenario exerts a critical influence on Air Quality as the pollution arises from the interaction of atmospheric contaminants with adverse meteorological conditions such as temperature inversions. Atmospheric stability and topographical features like hills, canyons and valleys.

The critical weather elements that influence air pollution are wind speed, wind direction, temperature, which together determines atmosphere stability. Hence it is an indispensable part of any air pollution studies and required for interpretation of base line information.

Wind speed and direction data recorded during the study period is useful in identifying the influence of meteorology on the air quality of the area. The meteorological data was collected during four seasons of the study period March 2005 to February 2006 at the site by installing a weather station.

Wind Speed, Wind Direction, Temperature and Relative Humidity were recorded on hourly basis for the total study period. Wind roses on sixteen -sector basis (N, NNE, NE, NEE, E, SEE, SE, SSE, S, SSW, SW, SWW, W, NWW, NW and NNW). The daily recorded data was processed and divided in to three 8 hourly blocks viz. 01-08 hours, 09-16hours and 17-24 hours and then the 01-24 hours average data was also calculated during study period.

3.3.1 Wind Pattern during Summer Season

The detailed analysis of the wind pattern during different periods for summer season is given in Table3.2a to 3.2d and the wind roses of the same are given in Figure 3.1a & b. The predominant wind direction is considered as the direction from which wind was blowing for major part of the duration of study.

(a) Wind Pattern during 01 - 08 hours:

The most predominant wind (blowing from) direction recorded during this period of time was NW with a percentage frequency recording of 17.84% of the total time. The next dominant wind direction was found to be NNW with a percentage frequency recording of 12.80 % of the total time followed by N with a percentage frequency recording of 9.53% of the total time.

(b) Wind Pattern during 09 - 16 hours:

The predominant wind direction during this period was found to be from NW with a percentage frequency recording of 11.82% of the total time. The next dominant direction was N from which winds were recorded for 8.01% of the total time. The other directions and their frequencies are E with (8.69%), NNW (8.83%) during the monitoring period.

(c) Wind Pattern during 17 - 24 hours:

Close observation of the wind rose for this period reveals that WNW direction prevailed predominantly for 11.44% of the total time. The other predominant directions recoded are NW and N with percentage frequency distribution of 11.31 % and 7.62% of the total time. During the rest of the time the winds were found to be blowing from all other directions.

(d) Wind Pattern during 01 - 24 hours:

A glance at the average 24-hour wind rose diagram for summer season reveals that NW direction was most predominant direction with percentage frequency of 13.6% of the total time, followed by NNW and N with percentage frequencies of 9.52% and 8.39% of the total time. The winds in the range of 1-5 KMPH recorded for period of 86.79 % and calms recorded for 8.58% of the total time. The winds above 15 KMPH were not recorded.

Table 3.2a
Wind Percentage Frequency Distribution Table – Summer (00-08 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	9.53	0.00	0.00	0.00	0.00	9.53
NNE	6.81	0.41	0.00	0.00	0.00	7.22
NE	2.72	0.27	0.00	0.00	0.00	2.99
ENE	1.22	0.00	0.00	0.00	0.00	1.22
E	7.08	0.27	0.00	0.00	0.00	7.36
ESE	1.49	0.00	0.00	0.00	0.00	1.49
SE	1.36	0.00	0.00	0.00	0.00	1.36
SSE	0.81	0.00	0.00	0.00	0.00	0.81
S	4.08	0.14	0.00	0.00	0.00	4.22
SSW	4.63	0.00	0.00	0.00	0.00	4.63
SW	3.67	0.13	0.00	0.00	0.00	3.81
WSW	2.58	0.13	0.00	0.00	0.00	2.72
W	4.22	0.13	0.00	0.00	0.00	4.35
WNW	5.58	0.13	0.00	0.00	0.00	5.72
NW	15.39	2.45	0.00	0.00	0.00	17.84
NNW	12.39	0.40	0.00	0.00	0.00	12.80
Calms						11.85
Total	83.65	4.49	0.00	0.00	0.00	100

Table 3.2b
Wind Percentage Frequency Distribution Table – summer (09-16 hours)

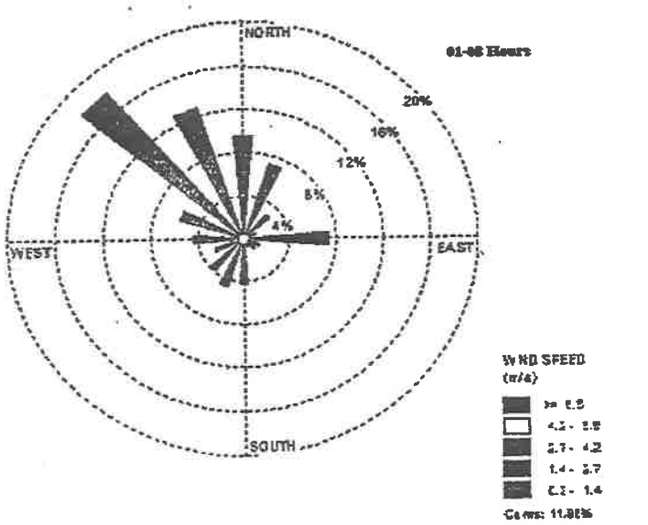
Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	7.61	0.41	0.00	0.00	0.00	8.01
NNE	4.89	0.00	0.00	0.00	0.00	4.89
NE	5.02	0.00	0.00	0.00	0.00	5.02
ENE	1.22	0.00	0.00	0.00	0.00	1.22
E	8.69	0.00	0.00	0.00	0.00	8.69
ESE	5.29	0.00	0.00	0.00	0.00	5.29
SE	4.07	0.41	0.00	0.00	0.00	4.48
SSE	5.97	0.00	0.00	0.00	0.00	5.97
S	6.38	0.00	0.00	0.00	0.00	6.38
SSW	4.48	0.81	0.00	0.00	0.00	5.29
SW	4.34	1.08	0.00	0.00	0.00	5.43
WSW	3.53	0.27	0.00	0.00	0.00	3.80
W	6.11	0.27	0.00	0.00	0.00	6.38
WNW	5.70	1.08	0.00	0.00	0.00	6.79
NW	9.37	2.03	0.41	0.00	0.00	11.82
NNW	8.01	0.81	0.00	0.00	0.00	8.83
Calms						1.63
Total	90.76	7.20	0.41	0.00	0.00	100

Table 3.2c
Wind Percentage Frequency Distribution Table – Summer (17-24 hours)

Wind speed in Kmph (m/s)						
Direction	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	7.62	0.00	0.00	0.00	0.00	7.62
NNE	2.58	0.41	0.00	0.00	0.00	2.99
NE	1.36	0.27	0.00	0.00	0.00	1.63
ENE	1.63	0.00	0.00	0.00	0.00	1.63
E	4.76	0.00	0.00	0.00	0.00	4.77
ESE	6.81	0.00	0.00	0.00	0.00	6.81
SE	5.44	0.00	0.00	0.00	0.00	5.45
SSE	3.81	0.00	0.00	0.00	0.00	3.82
S	3.40	0.27	0.00	0.00	0.00	3.68
SSW	7.22	0.00	0.00	0.00	0.00	7.22
SW	3.54	0.00	0.00	0.00	0.00	3.54
WSW	3.67	0.00	0.00	0.00	0.00	3.67
W	5.17	0.00	0.00	0.00	0.00	5.17
WNW	11.03	0.41	0.00	0.00	0.00	11.44
NW	10.89	0.00	0.41	0.00	0.00	11.31
NNW	6.95	0.00	0.00	0.00	0.00	6.94
Calms						12.28
Total	8596	1.36	0.41	0.0	0.00	100

Table 3.2d
Wind Percentage Frequency Distribution Table – Summer (01-24 hours)

Wind speed in Kmph (m/s)						
Direction	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	8.25	0.13	0.00	0.00	0.00	8.39
NNE	4.76	0.27	0.00	0.00	0.00	5.03
NE	3.03	0.18	0.00	0.00	0.00	3.22
ENE	1.36	0.00	0.00	0.00	0.00	1.36
E	6.65	0.09	0.00	0.00	0.00	6.94
ESE	4.53	0.00	0.00	0.00	0.00	4.53
SE	3.62	0.13	0.00	0.00	0.00	3.76
SSE	3.53	0.00	0.00	0.00	0.00	3.53
S	4.62	0.13	0.00	0.00	0.00	4.76
SSW	5.44	0.27	0.00	0.00	0.00	5.71
SW	3.85	0.41	0.00	0.00	0.00	4.26
WSW	3.26	0.13	0.00	0.00	0.00	3.40
W	5.17	0.13	0.00	0.00	0.00	5.30
WNW	7.44	0.54	0.00	0.00	0.00	7.98
NW	11.88	1.49	0.27	0.00	0.00	13.66
NNW	9.11	0.40	0.00	0.00	0.00	9.52
Calms						8.58
Total	86.79	4.35	0.27	0.00	0.00	100



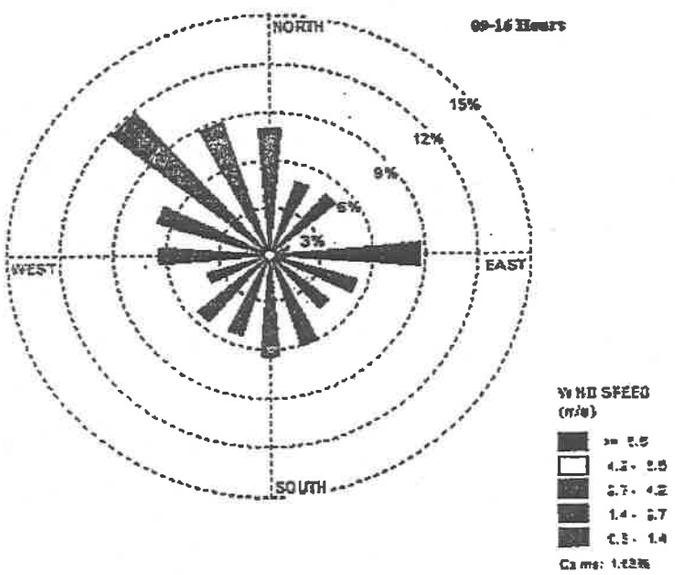


Figure 3.1a
Average Wind Rose for summer 01-08 hrs & 09 – 16 hrs

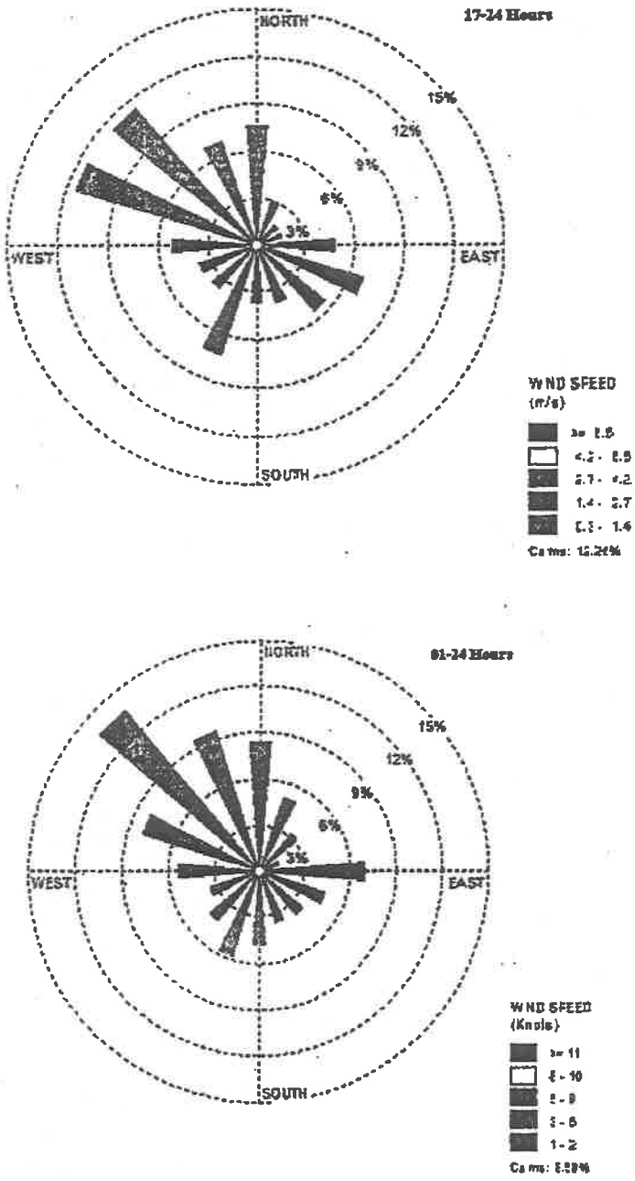


Figure 3.1b
Average Wind Rose for summer 17-24 hrs & 01 – 24 hrs

3.3.2 Wind Pattern during Monson Season

The detailed analysis of the wind pattern during different periods of monsoon season is given in Table3.3a to 3.3d and the wind roses of the same are given in Figure 3.2a & b.

(a) Wind Pattern during 01 - 08 hours:

The most predominant wind direction recorded during this period of time was SW with a percentage frequency recording of 14.30% of the total time. The next dominant wind direction was found to be SSW with a percentage frequency recording of 14.16% of the total time followed by WNW with a percentage frequency recording of 9.62% of the total time.

(b) Wind Pattern during 09 - 16 hours:

The predominant wind direction during this period was found to be from SW with a percentage frequency recording of 14.70% of the total time. The next dominant direction was SSW from which winds were recorded for 12.64% of the total time. The other dominant directions and their frequencies are WNW with (9.75%), WSW (9.34%) during the monitoring period.

(c) Wind Pattern during 17 - 24 hours:

Close observation of the wind rose for this period reveals that SSW direction prevailed predominantly for 13.05% of the total time. The other predominant directions recoded are SW and WNW with percentage frequency distribution of 12.77 % and 11.63% of the total time. During the rest of the time the winds were found to be blowing from all other directions.

(d) Wind Pattern during 01 - 24 hours:

A glance at the average 24-hour wind rose diagram for monsoon season reveals that SW direction was most predominant direction with percentage frequency of 13.92% of the total time, followed by SSW and WNW with percentage frequencies of 13.23% and 10.30% of the total time. Most of the time wind speeds were in the range of 5-10 KMPH , speeds upto 20 KMPH were recorded, where as the calms were observed for period of 10.22 % of the total time.

Table 3.3a
Wind Percentage Frequency Distribution Table – Monson (00-08 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.00	5.91	0.82	0.00	0.00	6.74
NNE	0.00	1.37	0.14	0.00	0.00	1.51
NE	0.00	1.24	0.14	0.00	0.00	1.37
ENE	0.00	0.00	0.00	0.00	0.00	0.00
E	0.00	3.03	0.41	0.00	0.00	3.43
ESE	0.00	1.24	0.27	0.00	0.00	1.51
SE	0.00	2.75	0.82	0.14	0.00	3.71
SSE	0.00	2.33	0.27	0.28	0.00	2.88
S	0.00	3.30	0.41	0.00	0.00	3.71
SSW	0.00	12.1	1.65	0.41	0.00	14.16
SW	0.00	11.8	1.65	0.82	0.00	14.30
WSW	0.00	8.25	0.82	0.14	0.00	9.21
W	0.00	8.11	0.27	0.14	0.00	8.52
WNW	0.00	8.52	0.82	0.28	0.00	9.62
NW	0.00	6.32	01.4	0.00	0.00	6.46
NNW	0.00	1.79	0.28	0.00	0.00	2.06
Calms						10.73
Total	0.00	78.13	8.94	2.20	0.00	100

Table 3.3b
Wind Percentage Frequency Distribution Table – monsoon (09-16 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.00	5.21	0.41	0.27	0.00	5.90
NNE	0.00	1.23	0.13	0.00	0.00	1.37
NE	0.00	1.51	0.13	0.00	0.00	1.65
ENE	0.00	0.13	0.0	0.00	0.00	0.13
E	0.00	3.70	0.13	0.00	0.00	3.85
ESE	0.00	1.23	0.13	0.00	0.00	1.37
SE	0.00	1.78	0.13	0.00	0.00	1.92
SSE	0.00	4.67	0.13	0.00	0.00	4.81
S	0.00	4.12	0.82	0.27	0.00	5.22
SSW	0.00	11.54	0.41	0.69	0.00	12.64
SW	0.00	13.32	1.10	0.27	0.00	14.70
WSW	0.00	8.10	1.10	0.13	0.00	9.34
W	0.00	6.73	0.55	0.41	0.00	7.69
WNW	0.00	8.79	0.82	0.13	0.00	9.75
NW	0.00	6.59	0.55	0.00	0.00	7.14
NNW	0.00	2.61	0.27	0.13	0.00	3.02
Calms						9.48
Total	0.00	81.31	6.86	2.34	0.00	100

Table 3.3c
Wind Percentage Frequency Distribution Table – monsoon (17-24 hours)

Wind speed in Kmph (m/s)						
Direction	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.00	4.39	0.96	0.41	0.00	5.77
NNE	0.00	0.69	0.13	0.00	0.00	0.82
NE	0.00	2.19	0.41	0.13	0.00	2.74
ENE	0.00	0.13	0.00	0.00	0.00	0.13
E	0.00	3.57	0.27	0.13	0.00	3.99
ESE	0.00	1.23	0.13	0.00	0.00	1.37
SE	0.00	2.20	0.00	0.13	0.00	2.34
SSE	0.00	2.20	0.27	0.27	0.00	2.74
S	0.00	4.53	0.41	0.13	0.00	5.08
SSW	0.00	11.68	1.23	0.13	0.00	13.05
SW	0.00	11.40	0.96	0.41	0.00	12.77
WSW	0.00	8.10	0.82	0.27	0.00	9.21
W	0.00	7.28	0.82	0.27	0.00	8.37
WNW	0.13	10.71	0.54	0.13	0.00	11.63
NW	0.00	7.56	0.27	0.00	0.00	7.82
NNW	0.00	1.64	0.13	0.00	0.00	1.78
Calms						10.44
Total	0.13	79.53	7.42	2.47	0.00	100

Table 3.3d
Wind Percentage Frequency Distribution Table – Monsoon (01-24 hours)

Wind speed in Kmph (m/s)						
Direction	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.00	5.17	0.73	0.23	0.00	6.13
NNE	0.00	1.09	0.13	0.00	0.00	1.23
NE	0.00	1.64	0.22	0.05	0.00	1.92
ENE	0.00	0.09	0.00	0.00	0.00	0.09
E	0.00	3.43	0.27	0.05	0.00	3.75
ESE	0.00	1.23	0.18	0.00	0.00	1.42
SE	0.00	2.24	0.32	0.09	0.00	2.65
SSE	0.00	3.07	0.22	0.18	0.00	3.48
S	0.00	3.98	0.54	0.13	0.00	4.67
SSW	0.00	11.77	1.09	0.41	0.00	13.23
SW	0.00	12.18	1.24	0.50	0.00	13.92
WSW	0.00	8.15	0.92	0.18	0.00	9.25
W	0.00	7.37	0.55	0.27	0.00	8.20
WNW	0.45	9.34	0.73	0.18	0.00	10.30
NW	0.00	6.82	0.32	0.00	0.00	7.14
NNW	0.00	2.02	0.23	0.04	0.00	2.29
Calms						10.22
Total	0.45	79.66	7.74	2.33	0.00	100

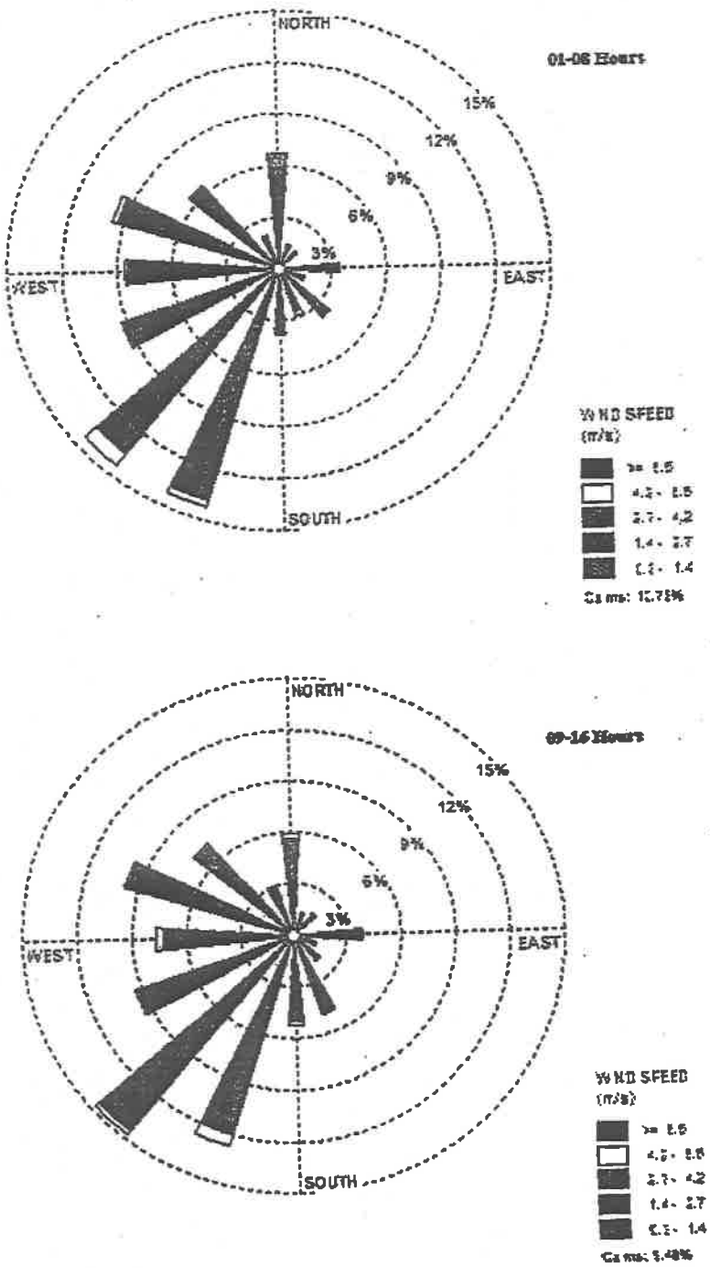


Figure 3.2a
Average Wind Rose for Monsoon 01-08 hrs & 09 – 16 hrs

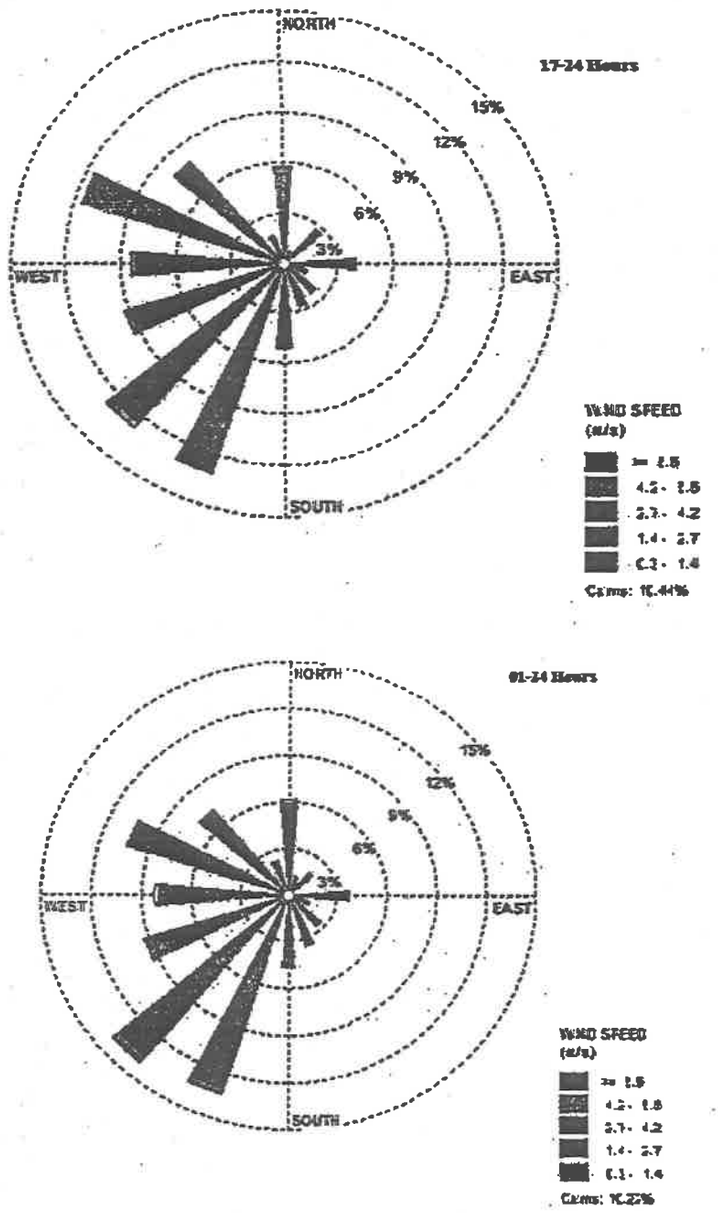


Figure 3.2b
Average Wind Rose for Monsoon 17-24 hrs & 01 – 24 hrs

3.3.3 Wind Pattern during Post Monson Season

The detailed analysis of the wind pattern during different periods of post monsoon season is given in Table3.4a to 3.4d and the wind roses of the same are given in Figure 3.3a & b.

(a) Wind Pattern during 01 - 08 hours:

The most predominant wind direction recorded during this period of time was N with a percentage frequency recording of 22.42% of the total time. The next dominant wind direction was found to be NW with a percentage frequency recording of 13.34% of the total time followed by WNW with a percentage frequency recording of 6.33% of the total time.

(b) Wind Pattern during 09 - 16 hours:

The predominant wind direction during this period was found to be from N with a percentage frequency recording of 22.52% of the total time. The next dominant direction was NW from which winds were recorded for 14.14% of the total time. The other dominant directions and their frequencies are NNW with (8.51%), NNE (5.35%) during the monitoring period.

(c) Wind Pattern during 17 - 24 hours:

Close observation of the wind rose for this period reveals that N direction prevailed predominantly for 22.39% of the total time. The other predominant directions recoded are NW and NNW with percentage frequency distribution of 15.117 % and 8.37% of the total time. During the rest of the time the winds were found to be blowing from all other directions.

(d) Wind Pattern during 01 - 24 hours:

A glance at the average 24-hour wind rose diagram for post monsoon season reveals that N direction was most predominant direction with percentage frequency of 22.44% of the total time, followed by NW and NNW with percentage frequencies of 14.20% and 8.38% of the total time. Most of the time wind speeds were in the range of 5-10 KMPH , speeds above 20 KMPH were also recorded, where as the calms were observed for period of 11.82 % of the total time.

Table 3.4a

Wind Percentage Frequency Distribution Table – Post Monson (00-08 hours)

Direction	Wind speed in Kmph (m/s) 1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.55	18.98	247	0.41	0.00	22.42
NNE	0.13	4.67	1.10	0.13	0.00	6.05
NE	0.00	4.53	0.13	0.27	0.13	5.08
ENE	0.00	1.51	0.41	0.13	0.00	2.06
E	0.00	2.88	0.82	0.00	0.00	3.71
ESE	0.00	1.92	0.00	0.00	0.00	1.92
SE	0.00	0.96	0.13	0.27	0.00	1.37
SSE	0.00	1.10	0.55	0.13	0.00	1.79
S	0.00	3.16	0.41	0.41	0.00	3.99
SSW	0.00	2.47	0.41	0.00	0.00	2.89
SW	0.27	3.71	0.13	0.00	0.00	4.13
WSW	0.00	1.23	0.00	0.00	0.00	1.24
W	0.00	1.92	0.68	0.27	0.00	2.89
WNW	0.13	5.36	0.41	0.41	0.00	6.33
NW	0.00	11.55	0.68	0.55	0.55	13.34
NNW	0.13	7.70	0.41	0.00	0.00	8.25
Calms						12.52
Total	1.24	73.72	8.80	3.02	0.68	100

Table 3.4b

Wind Percentage Frequency Distribution Table – Post Monsoon (09-16 hours)

Direction	Wind speed in Kmph (m/s) 1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.13	18.68	2.74	0.96	0.00	22.52
NNE	0.00	4.94	0.27	0.13	0.00	5.35
NE	0.00	4.53	0.54	0.00	0.00	5.08
ENE	0.13	2.06	0.00	0.00	0.00	2.19
E	0.00	4.53	0.13	0.13	0.00	4.80
ESE	0.13	0.96	0.13	0.13	0.00	1.37
SE	0.13	1.51	0.00	0.00	0.00	1.64
SSE	0.00	2.61	0.00	0.00	0.00	2.61
S	0.27	3.57	0.27	0.13	0.00	4.25
SSW	0.00	3.98	0.13	0.68	0.00	4.80
SW	0.00	3.15	0.54	0.00	0.00	3.71
WSW	0.13	1.37	0.00	0.00	0.00	1.51
W	0.00	2.06	0.41	0.00	0.00	2.47
WNW	0.00	4.25	0.27	0.00	0.00	4.53
NW	0.00	12.63	0.68	0.82	0.00	14.14
NNW	0.13	7.69	0.41	0.27	0.00	8.51
Calms						10.44
Total	1.09	78.57	6.59	3.29	0.00	100

Table 3.4c

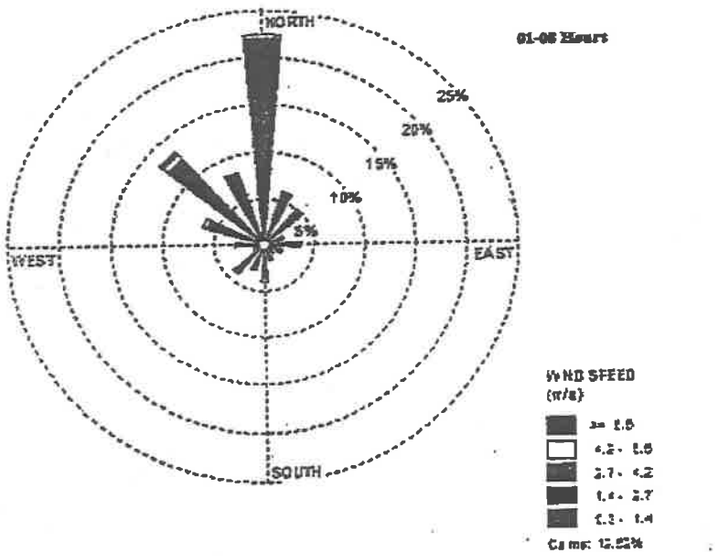
Wind Percentage Frequency Distribution Table – Post Monsoon (17-24 hours)

Direction	Wind speed in Kmph (m/s) 1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.68	19.50	1.78	0.27	0.13	22.39
NNE	0.00	3.84	0.00	0.00	0.00	3.84
NE	0.00	4.67	0.68	0.27	0.00	5.63
ENE	0.13	0.96	0.13	0.13	0.13	1.51
E	0.00	3.15	0.27	0.00	0.00	3.43
ESE	0.00	1.37	0.00	0.13	0.00	1.51
SE	0.00	1.23	0.13	0.27	0.00	1.65
SSE	0.00	2.60	0.27	0.41	0.00	3.30
S	0.00	3.15	0.27	0.41	0.00	3.84
SSW	0.00	1.09	0.13	0.00	0.13	1.37
SW	0.00	3.70	0.13	0.00	0.00	3.85
WSW	0.00	2.19	0.00	0.27	0.00	2.47
W	0.00	2.47	0.27	0.00	0.00	2.74
WNW	0.00	5.21	1.09	0.13	0.00	6.46
NW	0.68	12.36	1.51	0.54	0.00	15.11
NNW	0.00	7.82	0.41	0.13	0.00	8.37
Calms						12.50
Total	1.51	75.41	7.14	3.02	0.41	100

Table 3.4d

Wind Percentage Frequency Distribution Table – Post Monsoon (01-24 hours)

Direction	Wind speed in Kmph (m/s) 1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.45	19.05	2.33	0.54	0.04	22.44
NNE	0.04	4.48	0.45	0.09	0.00	5.08
NE	0.00	4.58	0.45	0.18	0.04	5.26
ENE	0.09	1.51	0.18	0.09	0.04	.192
E	0.00	3.52	0.41	0.04	0.00	3.99
ESE	0.04	1.42	0.04	0.09	0.00	1.60
SE	0.04	1.23	0.09	0.18	0.00	1.56
SSE	0.00	2.10	0.27	0.18	0.00	2.57
S	0.09	3.29	0.32	0.32	0.00	4.03
SSW	0.00	2.51	0.22	0.22	0.04	3.02
SW	0.09	3.52	0.27	0.00	0.00	3.89
WSW	0.04	1.60	0.00	0.09	0.00	1.74
W	0.00	2.15	0.45	0.09	0.00	2.70
WNW	0.04	4.94	0.59	0.18	0.00	5.77
NW	0.22	12.18	0.96	0.64	0.18	14.20
NNW	0.09	7.74	0.41	0.13	0.00	8.38
Calms						11.82
Total	1.28	75.90	7.51	3.11	0.36	100



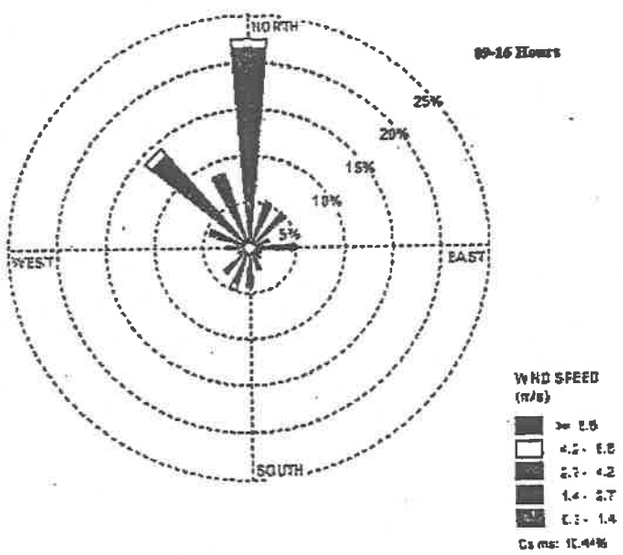
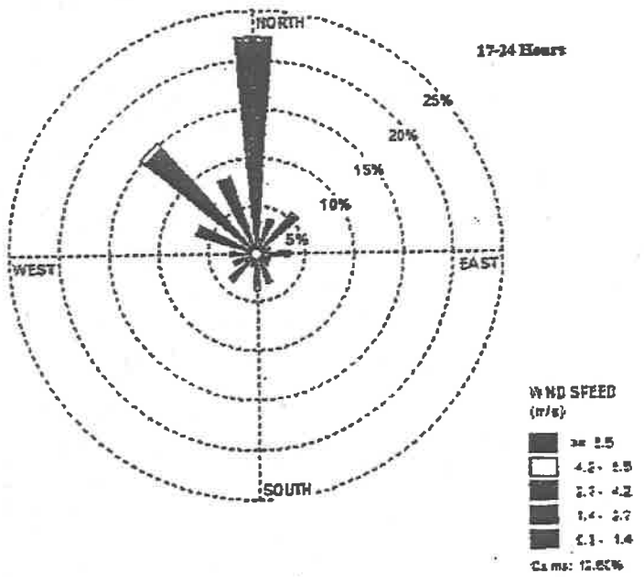


Figure 3.3a
Average Wind Rose for Post Monsoon 01-08 hrs & 09 – 16 hrs



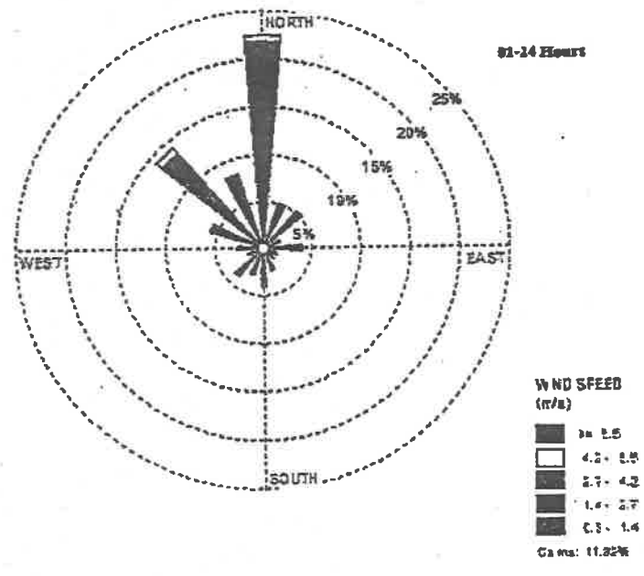


Figure 3.3b
Average Wind Rose for Post Monsoon 17-24 hrs & 01 – 24 hrs

3.3.4 Wind Pattern during Winter Season

The detailed analysis of the wind pattern during different periods of winter season is given in Table3.5a to 3.5d and the wind roses of the same are given in Figure 3.4a & b.

(a) Wind Pattern during 01 - 08 hours:

The most predominant wind direction recorded during this period of time was N with a percentage frequency recording of 14.72% of the total time. The next dominant wind direction was found to be E with a percentage frequency recording of 9.16% of the total time followed by S with a percentage frequency recording of 9.03% of the total time.

(b) Wind Pattern during 09 - 16 hours:

The predominant wind direction during this period was found to be from N with a percentage frequency recording of 12.77% of the total time. The next dominant direction was E from which winds were recorded for 9.72% of the total time. The other dominant directions and their frequencies are S with 8.19% and NNE with 7.63% during the monitoring period.

(c) Wind Pattern during 17 - 24 hours:

Close observation of the wind rose for this period reveals that N direction prevailed predominantly for 13.75% of the total time. The other predominant directions recoded are E and S with percentage frequency distribution of 10.28 % and 8.33% of the total time. During the rest of the time the winds were found to be blowing from all other directions.

(d) Wind Pattern during 01 - 24 hours:

A glance at the average 24-hour wind rose diagram for winter season reveals that N direction was most predominant direction with percentage frequency of 13.75% of the total time, followed by E and S with percentage frequencies of 9.72% and 8.52% of the total time. Most of the time wind speeds were in the range of 5-10 KMPH, speeds above 20 KMPH were recorded 0.46% of the total time and 6.43% of the total time in the range of 15-20KMPH, where as the calms were observed for period of 15.09 % of the total time.

Table 3.5a
Wind Percentage Frequency Distribution Table – Winter (00-08 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	1.94	10.83	1.52	0.27	0.13	14.72
NNE	1.38	5.00	0.27	0.27	0.00	6.94
NE	1.11	5.13	0.00	0.27	0.00	6.52
ENE	0.69	4.72	0.27	0.13	0.13	5.97
E	1.38	5.83	1.66	0.27	0.00	9.16
ESE	0.83	3.05	0.27	0.00	0.00	4.17
SE	0.69	2.36	0.41	0.13	0.13	3.75
SSE	0.55	2.08	0.27	0.00	0.00	2.92
S	1.25	7.50	0.27	0.00	0.00	9.03
SSW	0.27	1.38	0.00	0.00	0.00	1.67
SW	0.55	4.72	0.41	0.00	0.00	5.69
WSW	0.55	1.11	0.00	0.13	0.00	1.80
W	1.11	4.86	0.41	0.00	0.13	6.52
WNW	0.13	2.22	0.13	0.00	0.00	2.50
NW	0.27	2.36	0.00	0.00	0.00	2.64
NNW	0.41	2.08	0.41	0.00	0.13	3.05
Calms						12.92
Total	13.19	65.27	6.38	1.52	0.69	100

Table 3.5b
Wind Percentage Frequency Distribution Table – Winter (09-16 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	0.97	10.27	1.25	0.13	0.13	12.77
NNE	0.69	6.11	0.69	0.13	0.00	7.63
NE	0.55	4.86	0.13	0.41	0.00	5.97
ENE	0.55	5.13	0.41	0.00	0.00	6.11
E	0.69	8.61	0.13	0.27	0.00	9.72
ESE	0.27	2.22	0.27	0.00	0.00	2.78
SE	0.41	2.36	0.27	0.00	0.00	3.06
SSE	0.27	2.77	0.00	0.13	0.00	3.19
S	1.38	5.41	0.97	0.27	0.13	8.19
SSW	0.41	0.55	0.27	0.00	0.00	1.25
SW	0.97	4.02	0.55	0.13	0.00	5.69
WSW	0.27	2.08	0.27	0.00	0.00	2.63
W	0.41	4.30	0.13	0.00	0.00	4.86
WNW	0.27	1.94	0.00	0.00	0.00	2.22
NW	0.27	2.22	0.00	0.00	0.00	2.50
NNW	0.69	3.33	0.00	0.27	0.00	4.31
Calms						17.08
Total	9.16	66.25	5.41	1.80	0.27	100

Table 3.5c
Wind Percentage Frequency Distribution Table – Winter (17-24 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	1.25	10.69	1.66	0.13	0.00	13.75
NNE	0.97	4.16	0.41	0.00	0.13	5.69
NE	0.69	5.13	0.13	0.00	0.00	5.97
ENE	0.69	4.44	0.97	0.41	0.00	6.52
E	0.69	8.33	0.97	0.13	0.13	10.28
ESE	0.55	2.91	0.69	0.13	0.00	4.30
SE	0.41	3.47	0.69	0.00	0.00	4.58
SSE	0.69	3.05	0.00	0.00	0.00	3.75
S	1.11	6.66	0.41	0.13	0.00	8.33
SSW	0.27	2.08	0.13	0.00	0.00	2.50
SW	0.00	4.58	0.27	0.27	0.00	5.14
WSW	0.27	1.52	0.27	0.13	0.00	2.22
W	0.00	3.19	0.69	0.00	0.13	4.02
WNW	0.13	2.08	0.00	0.00	0.00	2.22
NW	0.13	1.80	0.00	0.00	0.00	1.94
NNW	0.00	3.05	0.13	0.27	0.00	3.47
Calms						15.28
Total	7.91	67.22	7.50	1.67	0.41	100

Table 3.5d
Wind Percentage Frequency Distribution Table – Winter (01-24 hours)

Direction	Wind speed in Kmph (m/s)					
	1-5 (0.3-1.4)	5-10 (1.4-2.7)	10-15 (2.7-4.2)	15-20 (4.2-5.5)	>20 (>5.5)	Total
N	1.38	10.60	1.48	0.18	0.09	13.75
NNE	1.01	5.09	0.46	0.13	0.04	6.75
NE	0.78	5.04	0.09	0.23	0.00	6.15
ENE	0.64	4.76	0.55	0.18	0.04	6.20
E	0.92	7.59	0.92	0.23	0.04	9.72
ESE	0.55	2.73	0.41	0.04	0.00	3.75
SE	0.50	2.73	0.46	0.04	0.04	3.80
SSE	0.50	2.63	0.09	0.04	0.00	3.29
S	1.25	6.52	0.55	0.13	0.04	8.52
SSW	0.32	1.34	0.13	0.00	0.00	1.80
SW	0.50	4.44	0.41	0.13	0.00	5.51
WSW	0.37	1.57	0.18	0.09	0.00	2.22
W	0.50	4.12	0.41	0.00	0.09	5.14
WNW	0.18	2.08	0.04	0.00	0.00	2.31
NW	0.23	2.12	0.00	0.00	0.00	2.36
NNW	0.37	2.82	0.18	0.18	0.04	3.61
Calms						15.09
Total	10.09	66.25	6.43	1.66	0.46	100

Table 3.8c

Ambient SO_2 levels in the study area- µg/m³

Location	Season	Min	Percentiles					Max	AM
			10th	30 th	50 th	80 th	95 th		
Project site	Winter	6.5	7.0	7.5	7.9	8.3	9.0	9.4	7.8
	Summer	6.0	6.0	6.1	6.2	6.8	7.0	7.3	6.6
	P.Mon	6.5	6.8	6.9	7.6	7.8	8.6	8.8	7.4
Tadsoli	Winter	6.8	7.8	8.1	8.6	9.0	9.6	9.9	8.7
	Summer	6.0	6.2	6.2	6.3	6.6	7.4	7.7	6.7
	P.Mon	6.3	6.7	7.3	7.5	8.0	8.4	8.5	7.7
Chikhalwardha	Winter	7.0	7.0	7.1	7.3	8.2	9.4	9.9	8.2
	Summer	6.0	6.0	6.2	6.3	7.0	7.3	8.0	6.8
	P.Mon	6.5	7.2	7.9	8.0	8.4	9.0	9.7	8.3
Unkdea	Winter	6.0	6.8	7.5	8.0	8.3	9.1	9.8	8.1
	Summer	6.0	6.0	6.0	6.2	6.7	7.6	7.9	6.7
	P.Mon	6.5	6.7	6.9	7.0	7.6	9.0	9.4	7.7
Umri	Winter	6.2	6.3	6.5	7.0	7.0	9.3	9.5	7.6
	Summer	5.2	6.2	6.4	6.6	7.0	8.0	8.9	6.9
	P.Mon	6.0	6.1	6.4	6.6	7.0	9.0	9.1	7.3
Chinchkher	Winter	6.9	6.9	7.0	7.2	8.0	9.2	9.6	8.1
	Summer	6.0	6.1	6.5	6.8	7.0	8.0	9.2	7.0
	P.Mon	6.6	6.8	6.9	6.9	7.0	8.9	9.3	7.5
Sindkher	Winter	6.9	7.2	8.0	8.0	8.5	9.3	9.8	8.4
	Summer	4.2	5.3	5.5	6.0	6.2	7.0	7.3	6.2
	P.Mon	6.5	6.9	7.2	7.5	7.6	8.4	9.2	7.7
Sawail	Winter	6.4	7.3	7.4	8.0	8.5	9.0	9.6	8.2
	Summer	6.0	6.0	6.0	6.1	6.2	7.2	8.0	6.5
	P.Mon	6.4	7.0	7.6	7.8	8.0	9.0	9.1	8.0
Palsni	Winter	6.2	7.8	8.0	8.1	8.5	9.2	9.4	8.4
	Summer	6.0	6.0	6.0	6.2	6.5	7.3	8.5	6.7
	P.Mon	6.0	6.9	7.7	7.9	8.3	9.0	9.2	8.1
Manjari	Winter	6.3	7.5	7.7	8.0	8.2	8.9	9.1	8.1
	Summer	6.0	6.0	6.2	6.2	6.4	7.3	7.9	6.6
	P.Mon	6.5	6.8	7.0	7.2	7.4	7.9	8.5	7.4

Table 3.8d

Ambient NOx levels in the study area- µg/m³

Location	Season	Min	Percentiles					Max	AM
			10th	30th	50th	80th	95th		
Project site	Winter	10.3	10.4	10.8	12.0	12.6	13.9	15.8	12.4
	Summer	10.0	10.0	10.0	10.1	11.0	12.2	12.3	11.1
	P.Mon	9.9	10.3	10.3	10.5	12.0	13.9	15.8	12.0
Tadsoli	Winter	11.0	11.5	11.8	12.0	13.0	14.0	15.7	13.0
	Summer	10.0	10.2	10.6	11.5	12.3	13.4	14.5	12.0
	P.Mon	11.5	11.8	12.2	12.3	12.3	13.4	14.0	12.5
Chikhalwardha	Winter	10.2	10.5	11.0	12.4	14.3	18.3	19.2	14.3
	Summer	9.0	9.7	10.2	10.8	11.0	12.4	13.2	11.1
	P.Mon	8.9	9.5	10.1	10.3	12.4	15.7	18.3	12.6
Unkdea	Winter	10.0	10.2	10.2	11.0	12.2	13.6	16.2	12.0
	Summer	8.0	9.9	10.2	10.2	11.0	12.2	13.0	10.9
	P.Mon	8.5	10.0	10.2	10.2	10.6	12.5	14.4	11.0
Umri	Winter	11.0	11.0	11.6	12.0	12.3	15.0	15.5	12.8
	Summer	9.8	10.2	10.4	10.6	11.1	12.8	14.2	11.4
	P.Mon	10.6	10.6	10.6	11.0	11.9	13.1	14.2	11.8
Chinchkher	Winter	11.3	12.0	12.0	12.5	14.0	15.9	16.8	14.0
	Summer	9.5	10.3	11.0	11.4	12.2	14.8	15.3	12.4
	P.Mon	11.0	11.6	12.0	12.0	13.6	14.6	15.5	13.2
Sindkher	Winter	10.0	10.3	10.9	11.2	12.1	17.3	18.3	13.3
	Summer	9.6	10.4	10.9	11.0	11.7	12.2	15.0	11.6
	P.Mon	10.0	10.3	10.9	11.2	12.0	14.1	16.3	12.0
Sawail	Winter	8.9	10.4	10.4	11.1	12.2	16.4	17.4	12.5
	Summer	9.0	10.0	10.4	11.0	11.3	12.2	14.3	11.4
	P.Mon	9.4	10.4	10.6	11.1	12.4	14.2	16.7	12.2
Palsni	Winter	10.3	10.7	12.0	12.4	14.0	16.5	18.3	13.8
	Summer	9.2	10.4	11.0	11.2	12.0	13.9	14.2	11.9
	P.Mon	9.3	11.0	11.4	12.4	13.5	15.2	16.5	13.1
Manjari	Winter	9.8	11.3	12.5	12.6	14.5	16.6	17.3	14.1
	Summer	9.0	11.0	11.1	11.9	12.3	14.8	15.9	12.5
	P.Mon	8.9	9.6	11.2	12.5	13.5	15.4	16.0	12.9

Table 3.9
National Ambient Air Quality Standards
Central Pollution Control Board (CPCB) June'95, India

Pollutants	Time weighted average	Concentration in Ambient Air			Method of Measurement
		Industrial Area	Resi. Rural & Other areas	Sensitive Areas	
Sulphur Dioxide (SO_2)	Annual Average *	80 µg/m³	60 µg/m³	15 µg/m³	1. Improved West and Geakemethod
	24 hours**	120 µg/m³	80 µg/m³	30 µg/m³	2. Ultraviolet fluorescence
Oxides of Nitrogen (NO_2)	Annual Average *	80 µg/m³	60 µg/m³	15 µg/m³	1. Jacob & Hochheiser modified (Na - Arsenite) Method
	24 hours* 8	120 µg/m³	80 µg/m³	30 µg/m³	2. Gas Phase Chemiluminescence
Suspended Particulate Matter (SPM)	Annual Average *	360 µg/m³	140 µg/m³	70 µg/m³	High Volume sampling, (Average flow rate not less than 1.1 m³ /minute
	24 hours**	500 µg/m³	200 µg/m³	100 µg/m³	
Respirable Particulate Matter (size > 10 mm) (RPM)	Annual Average *	120 µg/m³	60 µg/m³	50 µg/m³	Respirable particulate matter sampler
	24 hours**	150 µg/m³	100 µg/m³	75 µg/m³	
Lead (Pb)	Annual Average *	1.0 µg/m³	0.75 µg/m³	0.50 µg/m³	AAS Method after sampling using EPM 2000 or equivalent filter paper.
	24 hours**	1.5 µg/m³	1.00 µg/m³	0.75 µg/m³	
Carbon Monoxide (CO)	8 hours**	5.0 µg/m³	2.0 vg/m³	1.0 µg/m³	Non dispersive infrared spectroscopy
	1 hour	10.0 µg/m³	4.0 µg/m³	2.0 µg/m³	

* Annual arithmetic mean of minimum of 104 measurements in a year taken twice a week 24 hourly at uniform interval

** 24 hourly / 8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not on two consecutive days

Note :

1. National Ambient Air Quality Standard : The levels of air quality with an adequate margin of safety, to protect the public health, vegetation and property.
2. Wherever and whenever two consecutive values exceeds the limit specified above for the respective category, it would be considered adequate reason to institute regular / continuous monitoring and further investigations.
3. The State Government / State Board shall notify the sensitive and other areas in the respective states within a period of six months from the date of Notification of National Ambient Air Quality Standards.

[S.O. 384 (E), Air (Prevention & Cont. of Pollution) Act, 1981 dated April 11, 1994].

3.4.2 Regional Scenario

On observation of the processed values of summer season given above reveals the following:

3.4.2.1 Pollutant: Suspended Particulate Matter & Respirable Particulate Matter

Suspended Particulate Matter / Respirable Particulate Matter in general terms is the particulate matter in suspension in ambient ait. It includes dust, smoke, fly ash, carbonaceous matter, trace metals like lead, cadmium, mercury, etc.

Sources:

In general some of the important sources of suspended particulate matter are mines, quarries, pottery and ceramic factory stacks, power plants and cement plants.

The following sources of suspended particulate matter in the study area are identified:

1. Dust Emissions due to Quarrying and Transportation of earth for construction work.
2. Emissions due to vehicular movement
3. Dust generation from ground
4. Fire wood burning

Effects:

Excessive exposure to dust causes breathing related diseases as it effects the lungs. Excessive concentration of smoke and dust also reduces the visibility. Particulate matter affects the plants by settling on the leaves and preventing natural growth. The chemical matter in the dust will affect the structures due to slow reaction over a period of time.

SPM & RPM Levels in the study area:

During the study period, the minimum level of SPM recorded was 43µg/m³ at Tadsoli during winter season and maximum of 95µg/m³ at Umri during summer. The 95th percentile ranged between 57µg/m³ at project site during winter to 89.4µg/m³ at Umri during summer season. The average values were in the range of 51.5 µg/m³ to 74.4 µg/m³.

The RPM levels were varying between 12.0 µg/m³ at Palsni during winter season to 31.0 µg/m³ at Umri during summer season. Where as the 95th percentile was varying between 18.3 µg/m³ at Tadsoli and Sawali villages during winter season to 28.8 µg/m³ at Umri village during summer period. The average values were ranging between 16.2 µg/m³ to 24.0 µg/m³.

However at almost all stations the maximum SPM and RPM values observed during winter were less than other two seasons, where as the summer values were higher than other two seasons.

The 24 hourly average values of SPM and RPM were compared with the national ambient air quality standards and it was found that most of the sampling stations recorded values much lower than the applicable limit of 200µg/m³ and 100 µg/m³ for residential areas.

3.4.2.2 Pollutant: Sulfur Dioxide

Sulfur dioxide gas is an inorganic gaseous pollutant. Sulfur dioxide emissions are expected to be emitted wherever combustion of any fuel containing elemental sulfur takes place. The sulfur in the fuel will combine with oxygen to form sulfur dioxide. Sulfur trioxide and sulfuric acid mist are the other important pollutants in the sulfur group.

Sources:

In general some of the important sources of sulfur dioxide are Power stations, sulfuric acid plants, oil refining, boilers in utilities in any industry and domestic use of coal. The following sources of Sulfur dioxide in the study area are identified:

1. Emissions from domestic burning of fuel

Effects:

Information in the literature has indicated that the presence of sulfur dioxide in the photochemical smog reaction enhances the formation of visibility enhancing aerosols.

Sulfur dioxide in atmosphere is significant because of its toxicity. Sulfur dioxide is capable of producing illness and lung injury. Further it can combine with water in the air to form toxic acid aerosols that can corrode metal surfaces, fabrics and the leaves of plants. Sulfur dioxide is irritating to the eyes and respiratory system. Excessive exposure to sulfur dioxide causes bronchial asthma and other breathing related diseases as it affects the lungs.

SO_2 Levels in the study area:

During study period, the minimum and maximum level of SO_2 recorded was 4.2 $\mu g/m^3$ at Sindkher during summer and 9.9$\mu g/m^3$ at Chinchkher and Tadsoli during winter period. The 95th percentile ranged between 7.0 $\mu g/m^3$ at Project site and Sindkher during summer period to 9.6 $\mu g/m^3$ at Tadsoli during winter period. The average values in the study area were in the range of 6.2 $\mu g/m^3$ to 8.7$\mu g/m^3$.

However at almost all stations the maximum SO_2 values observed during summer were less than other two seasons, where as the winter values were higher than other two seasons.

Regional Scenario with respect to SO_2:

The 24 hourly average values of SO_2 were compared with the national ambient air quality standards and it was found that most of the sampling stations recorded values much lower than the applicable limit of 80$\mu g/m^3$ for residential areas. As the study area is far from the developed towns, and industries the SO_2 values were much below the standards. The SO_2 values in the residential areas can be attributed to domestic burning of coal and other sulfur containing fuel.

3.4.2.3 Pollutant: Oxides Of Nitrogen

Oxides of nitrogen are also an inorganic gaseous pollutant like Sulfur dioxide. Oxides of nitrogen emissions are expected to be emitted wherever combustion at high temperatures takes place. Nitrous oxide and nitric acid mist are the other important pollutants in the inorganic nitrogen group.

Sources:

In general some of the important sources of oxides of nitrogen are acid manufacture, Boilers (utilities) in any industry and Auto exhaust. In a metropolitan town NO_x levels are predominantly due to automobile emissions.

The following sources of oxides of nitrogen in the study area are identified:

1. Emissions from domestic burning of coal.
2. Emissions from automobiles.

Effects:

Oxides of nitrogen have far greater significance in photochemical smog reaction than any of the other inorganic gaseous contaminants. NO_x in the presence of sunlight will undergo reactions with a number of organic compounds to produce all the effects associated with photochemical smog. NO_x has inherent ability to produce deleterious effects by themselves like toxicity. It acts as an asphyxiate when in concentrations great enough to reduce the normal oxygen supply from the air.

NO_x Levels in the study area:

During study period, the minimum NO_x recorded was 8.0 $\mu g/m^3$ at Unkdea during summer and 19.2 $\mu g/m^3$ at Chikhalwarda during winter. The 95th percentile ranged between 12.2 $\mu g/m^3$ at project site, Unkdea, Sindkher, Sawali during summer to 18.3$\mu g/m^3$ at Chikhalwada during winter period. The average value were in the range of 10.9 $\mu g/m^3$ to 14.3 $\mu g/m^3$. However at almost all stations the maximum NOx values observed during summer were less than other two seasons, where as the winter values were higher than other two seasons.

Regional Scenario with respect to NO_x:

The 24 hourly average values of NO_x were compared with the national ambient air quality standards and it was found that most of the sampling stations recorded values much lower than the applicable limit of 80$\mu g/m^3$ for residential areas as the proposed site is far away from towns and industrial areas.

3.4.2.4 Carbon Dioxide

The Carbon dioxide values observed at all monitoring locations during the study period was less than 1 ppm.

3.5.0 NOISE ENVIRONMENT

Noise can be defined as unwanted sound or sound in the wrong place at the wrong time. It can also be defined as any sound that is undesirable because it interferes with speech and hearing, is intense enough to damage hearing or is otherwise annoying. The definition noise as unwanted sound implies that it has an adverse effect on human beings and their environment, including land, structures, and domestic animals. Noise can also disturb natural wildlife and ecological systems.

Sound is mechanical energy from a vibrating surface and is transmitted by a cycling series of compressions and rarefactions of the molecules of the materials through which it passes. Sound can be transmitted through gases, liquids, and solids. Noise impacts can be of concern during the construction and the operational phases of projects. Noise should also be considered in relation to present and future land use zoning and policies.

Construction noise can be a significant source of community noise. Of concern are impacts on people near the construction site performing activities which are totally unrelated to construction activities (e.g. area residents, office workers, school children, staff, etc.) Factors which are important in determining noise levels that will potentially impact such populations include distance from the noise source, natural or man-made barriers between the source and the impacted population, weather conditions which could potentially absorb, reflect, or focus sound (such as wind speed, direction, temperature inversions), and the scale and intensity of the particular construction phase (excavation, erection, or finishing).

The impact of noise from any activity on surrounding community depends on

- Characteristics of noise sources (instantaneous or continuous in nature). It is well known that a steady noise is not as annoying as one that is continuously varying in loudness.
- Time of the day at which noise occurs, for example loud noises at night in residential areas are not acceptable because for sleep disturbance.
- The location of noise source with respect to noise sensitive areas determines the loudness and period of noise exposure.

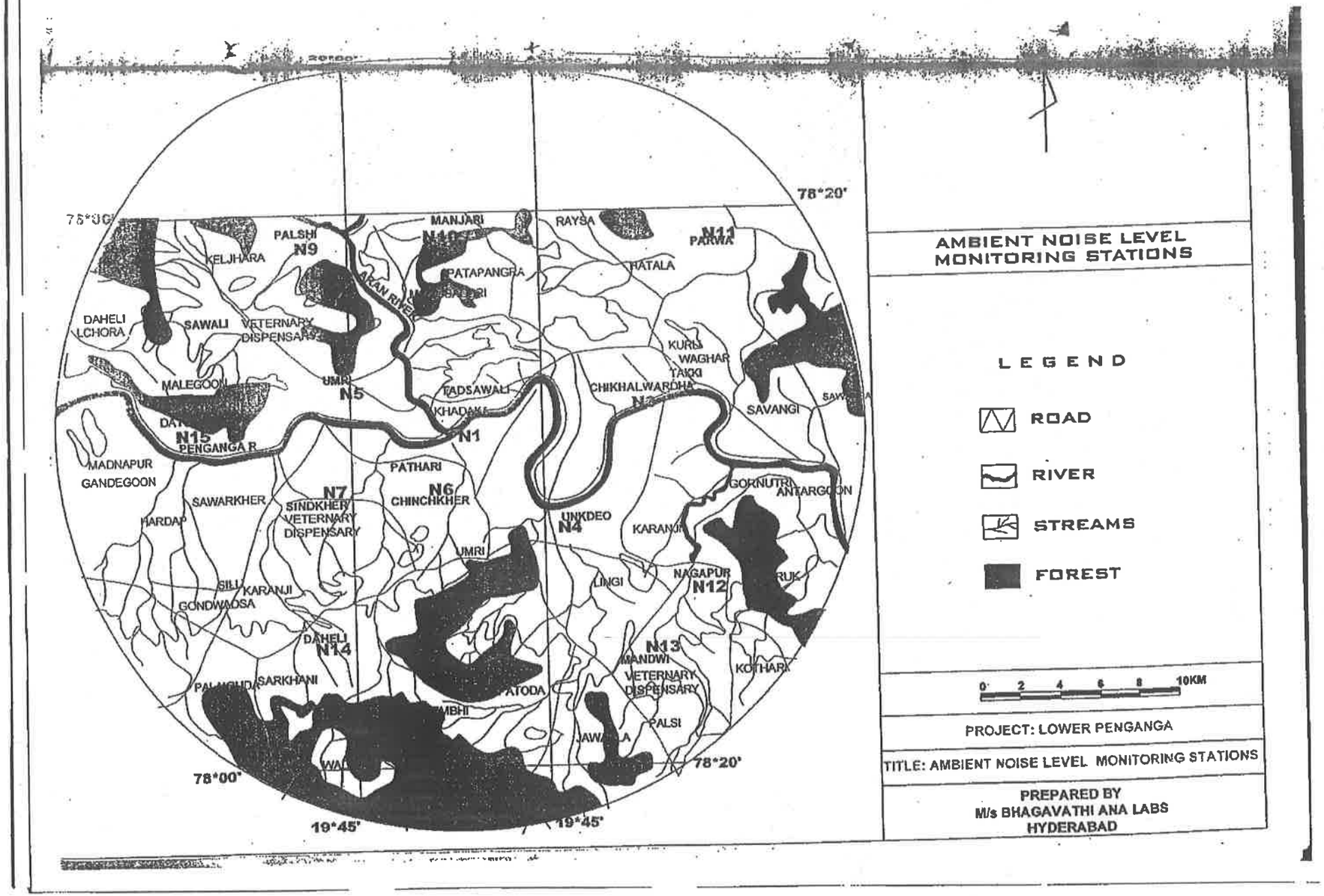
The Environment / health impacts of noise can vary from noise induced hearing loss (NIHL) to annoyance depending on loudness of noise levels and tolerance levels of individual.

3.5.1 Sources of Noise

The main sources of noise in the study area are domestic activities and vehicular traffic. The area being underdeveloped and virgin without any major industrial activities, other than domestic activities there are no noise generating sources. The main occupation of the villagers in the study area is agriculture.

3.5.2 Noise Levels in the Study Area

Baseline noise levels have been monitored at fifteen locations within the study zone of about 30 km with the barrage site as its center, using a spot noise measurement device. At random noise level measurement locations were identified for assessment of existing noise level status, keeping in view the land use pattern, residential areas in villages, schools, bus stands, etc., the day levels of noise have been monitored during 6 AM to 9 PM and the night levels during 10 PM to 5 AM. The noise monitoring stations are shown in Table 3.10 and presented in Figure 3.6.


78°20'
78°00'
19°45'
PALSHI
N9
MANJARI
N10
RAYSA
N11
PARWA
KELJHARA
PATAPANGRA
HATALA
DAHELI
LCHORA
SAWALI
VETERNARY
DISPENSARY
WAN RIVER
KURLI
WAGHAR
TAKLI
MALEGOON
UMRI
N5
TADSAWALI
CHIKHALWARDHA
N2
SAVANGI
KHADAKI
N1
N15
PENGANGA R
MADNAPUR
GANDEGOON
PATHARI
N7
N6
CHINCHKHER
SAWARKHER
SINDKHER
VETERNARY
DISPENSARY
HARDA
UNKDEO
N4
KARANJI
GORNUTRI
ANTARGOON
UMRI
SILU
KARANJI
GONDWADSA
LINGI
NAGAPUR
N12
RUK
DAHELI
N14
N13
MANDWI
VETERNARY
DISPENSARY
KOTHARI
SARKHANI
ATODA
PALSI
JAWALA
WAI
AMBIENT NOISE LEVEL
MONITORING STATIONS
LEGEND
ROAD
RIVER
STREAMS
FOREST
0 2 4 6 8 10KM
PROJECT: LOWER PENGANGA
TITLE: AMBIENT NOISE LEVEL MONITORING STATIONS
PREPARED BY
M/s BHAGAVATHI ANA LABS
HYDERABAD

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Table 3.11a
Noise Levels in the Study Area (dB(A))

Time - Hrs	Project site				Tadsoli				Chikhalwardddha			
	Win	Sum	Mon	PM	Win	Sum	Mon	PM	Win	Sum	Mon	PM
1	36	35	37	36	38	36	38	37	38	37	39	40
2	36	36	37	37	38	36	38	39	40	38	39	40
3	36	35	39	37	38	37	39	39	40	35	39	41
4	37	36	40	39	39	37	39	40	40	38	39	41
5	40	37	40	41	39	37	40	40	40	38	40	42
6	42	38	41	41	40	40	40	40	40	39	41	42
7	42	40	43	45	41	42	44	43	44	41	44	47
8	43	41	46	45	45	47	45	44	45	45	48	48
9	44	42	47	46	44	49	45	46	45	45	48	49
10	44	44	47	46	46	50	46	48	46	45	47	50
11	45	45	47	46	47	51	48	50	46	46	47	51
12	48	46	49	47	50	51	49	50	49	47	50	51
13	50	47	52	48	51	49	50	51	49	49	51	52
14	52	48	50	52	53	48	52	53	48	50	52	53
15	53	49	50	52	52	46	53	51	51	50	52	54
16	49	50	53	53	49	46	53	51	51	43	54	51
17	49	50	53	50	49	45	52	50	53	42	54	50
18	48	49	54	52	48	46	50	49	54	43	55	49
19	48	48	49	51	45	45	50	49	50	41	51	45
20	49	49	45	45	46	47	49	49	48	42	49	44
21	45	47	44	45	45	45	46	46	48	42	47	45
22	40	45	42	41	41	40	42	40	40	39	40	40
23	38	40	42	41	40	40	40	40	40	38	39	40
24	38	38	39	39	40	37	39	39	39	37	39	40
Day Eq -Ld	48.2	47.0	49.6	49.0	48.3	47.6	49.5	49.1	49.2	45.6	50.7	48.2
Night Eq-Ln	36.9	38.9	39.3	38.4	38.7	37.3	38.9	38.7	39.0	37.0	38.6	36.9
D&N Eq -Ldn	47.8	47.7	49.5	48.8	48.4	47.5	49.3	49.0	49.1	46.1	50.1	49.8

Table 3.11b

Noise Levels in the Study Area {dB(A)} during study period

Time - Hrs	Unkdea				Umri				Chinchkher			
	Win	Sum	Mon	PM	Win	Sum	Mon	PM	Win	Sum	Mon	PM
1	38	31	35	35	36	36	38	38	35	32	36	36
2	39	31	37	36	37	37	38	40	35	33	37	38
3	40	32	37	36	38	37	39	40	38	30	38	39
4	39	32	40	37	38	37	40	40	38	33	39	39
5	40	32	40	38	39	40	41	41	39	33	40	40
6	42	35	40	40	41	42	41	41	39	34	42	40
7	45	37	44	42	44	47	44	45	44	36	44	45
8	45	42	45	45	45	47	46	46	46	40	45	45
9	46	44	48	46	45	49	46	46	46	40	47	45
10	46	45	48	45	46	50	45	46	46	40	48	45
11	47	46	50	47	46	50	47	48	48	41	48	48
12	50	46	51	49	47	53	48	50	50	42	50	45
13	52	44	52	50	49	51	48	51	52	44	50	45
14	53	43	50	52	50	51	50	51	50	45	52	48
15	53	41	51	52	51	51	53	54	50	45	50	50
16	51	41	50	50	52	51	54	52	48	49	48	52
17	50	40	47	49	52	49	53	50	48	50	45	52
18	49	41	45	48	51	49	50	49	46	38	46	50
19	46	42	45	45	50	45	50	47	45	36	46	48
20	47	42	44	46	48	44	48	45	44	37	44	45
21	45	42	42	42	44	44	45	44	42	37	40	45
22	39	37	39	40	39	40	41	40	40	34	39	39
23	38	35	38	38	39	39	40	40	39	33	39	38
24	38	32	38	38	39	38	39	38	39	32	36	38
Day Eq -Ld	49.1	42.7	48.2	48.0	48.6	49.2	49.3	49.0	47.6	43.4	47.6	47.8
Night Eq-Ln	38.2	32.9	37.4	36.9	37.5	37.3	38.8	38.9	37.5	32.0	37.3	37.7
D&N Eq -Ldn	48.8	42.8	47.9	47.6	48.3	48.7	49.2	49.0	47.5	43.0	47.5	47.8

Table 3.11c

Noise Levels in the Study Area {dB(A)} during study period

Time - Hrs	Sindkher				Sawail				Palsni			
	Win	Sum	Mon	PM	Win	Sum	Mon	PM	Win	Sum	Mon	PM
1	35	31	35	35	36	36	35	36	35	32	34	35
2	35	32	35	36	36	37	35	36	35	32	36	36
3	36	32	36	36	37	36	36	37	36	33	38	36
4	36	32	36	36	37	37	38	38	36	33	39	37
5	36	35	37	36	38	40	38	38	37	33	40	38
6	36	37	37	36	40	41	40	40	37	36	41	40
7	40	42	40	39	40	45	42	41	40	38	43	43
8	43	42	42	40	44	46	43	43	42	43	45	44
9	43	44	42	43	46	47	45	43	42	45	45	46
10	44	45	45	43	46	49	46	46	45	46	46	46
11	45	45	48	47	47	48	47	47	45	47	47	47
12	46	48	48	48	50	47	49	48	46	47	48	49
13	48	46	47	50	50	45	50	50	50	45	50	50
14	47	46	48	51	52	46	52	51	49	44	51	52
15	48	46	48	49	52	47	53	52	49	42	52	51
16	46	46	48	48	53	49	54	50	50	42	52	50
17	45	44	46	46	48	49	53	50	50	41	49	47
18	45	44	44	46	47	51	50	48	49	42	47	49
19	45	40	43	45	45	51	48	48	47	43	45	46
20	44	39	43	42	45	49	47	46	46	43	45	45
21	44	39	40	41	42	47	45	45	43	43	43	41
22	35	35	36	38	39	39	40	39	40	38	39	40
23	35	34	36	36	39	40	38	38	39	36	38	38
24	35	33	37	36	37	40	37	37	37	33	35	36
Day Eq -Ld	45.0	44.2	45.4	46.3	48.3	47.9	49.4	47.9	47.0	43.7	48.0	47.8
Night Eq-Ln	34.7	32.3	35.3	35.6	36.9	37.6	36.8	36.8	36.7	33.9	36.8	36.6
D&N Eq -Ldn	44.9	43.7	45.4	46.1	47.9	47.8	48.7	47.6	46.9	43.8	47.6	47.4

Table 3.11d

Noise Levels in the Study Area {dB(A)} during study period

Time - Hrs	Manjari				Parwa (near Vet Dispensary				Nagapur			
	Win	Sum	Mon	PM	Win	Sum	Mon	PM	Win	Sum	Mon	PM
1	35	33	35	36	34	30	34	35	32	30	32	33
2	36	34	37	36	34	30	36	35	33	30	33	34
3	37	31	37	36	36	30	36	36	33	30	35	34
4	38	34	39	38	36	30	37	36	35	31	35	35
5	39	34	40	37	37	32	37	37	37	31	35	35
6	39	35	42	38	38	34	40	37	38	32	37	36
7	40	37	46	40	40	39	41	41	40	34	38	40
8	42	41	47	42	42	39	44	43	40	39	40	41
9	45	41	47	43	42	41	46	45	43	41	42	44
10	45	41	48	45	45	42	46	45	44	42	44	46
11	46	42	48	46	46	42	47	47	46	43	46	47
12	46	43	50	46	46	45	49	47	48	43	46	47
13	48	45	52	47	49	43	50	50	48	41	47	47
14	48	46	50	49	50	43	51	52	49	40	50	48
15	50	46	50	50	52	43	52	52	52	44	50	49
16	52	39	50	52	53	43	50	50	52	48	48	50
17	52	38	48	52	48	41	49	48	50	49	47	47
18	50	39	46	50	49	41	49	48	47	38	45	45
19	49	37	46	48	46	37	46	45	47	39	45	46
20	48	38	45	46	46	36	45	45	45	39	45	46
21	46	38	45	45	43	36	43	45	40	39	44	44
22	39	35	40	41	40	33	38	40	38	34	37	38
23	38	34	38	38	38	33	35	36	37	32	35	37
24	38	33	36	36	37	32	35	36	36	32	35	37
Day Eq -Ld	48.0	41.6	48.2	47.7	47.7	41.2	47.9	47.7	47.4	42.7	45.9	46.2
Night Eq-Ln	36.9	33.0	37.1	37.1	36.3	30.8	35.5	36.1	34.8	30.9	34.2	35.2
D&N Eq -Ldn	47.6	42.1	47.8	47.5	47.3	41.1	47.2	47.2	46.7	42.2	45.4	45.9

Table 3.11e

Noise Levels in the Study Area {dB(A)} during study period

Time - Hrs	Mandawi (near Hospital)				Daheli (near bus stop)				Datodi (near forest)			
	Win	Sum	Mon	PM	Win	Sum	Mon	PM	Win	Sum	Mon	PM
1	32	30	33	34	33	35	35	33	34	33	33	33
2	33	30	33	34	34	35	35	34	34	34	33	33
3	33	31	34	35	34	36	36	34	36	33	35	35
4	35	31	35	36	34	36	36	34	36	34	35	35
5	36	31	36	36	35	37	36	34	38	37	36	37
6	38	31	36	36	36	38	37	36	38	38	37	36
7	41	33	38	39	41	40	39	40	41	42	41	40
8	41	37	40	42	41	42	42	41	41	43	41	41
9	41	37	42	42	42	44	42	41	45	44	43	41
10	43	37	45	44	43	45	46	43	47	44	43	42
11	43	38	47	44	43	46	47	45	48	43	47	45
12	45	39	47	46	44	48	47	46	49	42	47	46
13	45	41	48	48	45	49	48	46	50	42	47	48
14	47	42	50	49	47	51	49	46	50	43	49	49
15	48	42	50	50	48	52	50	50	48	44	50	50
16	49	48	48	51	50	52	51	52	48	44	51	51
17	50	46	48	51	50	51	51	50	49	44	48	51
18	48	45	46	49	48	50	49	47	46	45	47	48
19	47	33	45	47	48	48	47	47	47	45	47	47
20	45	34	44	47	45	46	46	46	45	42	44	45
21	45	34	44	45	46	45	42	45	45	40	42	44
22	37	32	39	40	40	42	40	39	39	36	38	39
23	36	32	38	36	36	39	37	37	36	37	37	36
24	36	32	38	36	36	38	37	35	36	37	36	36
Day Eq -Ld	45.9	41.4	46.3	47.2	46.1	48.3	47.3	46.7	47.1	43.1	46.6	46.9
Night Eq-Ln	34.3	30.6	35.8	35.8	35.4	37.4	36.3	35.1	36.6	34.6	35.1	35.2
D&N Eq -Ldn	45.4	41.1	46.1	46.8	45.9	48.0	47.0	46.2	46.6	43.7	46.1	46.4

Table 3.12
Ambient Air quality standards with respect to noise-
Central Pollution Control Board (CPCB) June'95, India

SCHEDULE - III
AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Area Code	Category of Area	Limits in dB(A) Leq	
		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

Note :

1. Day Time is recorded in between 6 a.m. and 9 p.m.

2. Night time is recorded in between 9 p.m. to 6 a.m.

3. Silence zone is defined as areas upto 100 meters around such premises as hospitals, educational institutions and courts. The silence zones are to be declared by the Competent Authority.

   Use of vehicular horns, loudspeakers and bursting of crackers shall be banned in these zones.

4. Mixed categories of areas should be declared as one of the four above mentioned categories by the Competent Authority and the corresponding standards shall apply.

Table 3.13
OSHA NOISE EXPOSURE LIMITS FOR THE WORK ENVIRONMENT

Noise	Permissible exposure Hours and Minutes
85	16 hrs
87	12 hrs 6 min
90	8 hrs
93	5 hrs 18 min
96	3 hrs 30 min
99	2 hrs 18 min
102	1 hr 30 min
105	1 hr
108	40 min
111	26 min
114	17 min
115	15 min
118	10 min
121	6.6 min
124	4 min
127	3 min
130	1 min

Note: Exposure above or below the 90 dB limit have been "time Weighted" to give what OSHA believes are equivalent risks to a 90 dB eight-hour exposure

3.5.3 Regional Scenario

The high values of noise observed in some of the rural areas are primarily owing to vehicular traffic and other anthropogenic activities.

Assessment of day and night noise levels in and around the project area reveal that noise levels are ranging between 30 to 55 dB(A) during four seasons of the study period. The lower value was recorded at two locations (Chinchkher, Parwa) during summer season. Where as the higher value was recorded at one location at Chikhalwardha during monsoon season, which is present near village road.

The day equivalents during the study period was in the range of 41.2 dB(A) at Parwa (VD) during summer season to 50.7 dB(A) at Chikhalwardha during

monsoon period. Where as the night equivalents were in the range of 30.6 dB(A) at Mandawi during summer season to 39.7 dB(A) at Chikhalwardha during monsoon period.

From the results it can be seen that the Night equivalents were with in the ambient air standards value of 45 dB(A) in all villages during entire study period, the day equivalents were also within in the Ambient air standards value of 55 dB(A). The high value observed at some locations compared to other locations may due to presence of local traffic on the village roads and other anthropogenic activities.

3.6.0 WATER ENVIRONMENT

The study of water environment aspect in the ecosystem both surface water and ground water samples were collected from different sources within the study area for impact assessment study. Some important physical and chemical parameters including heavy metals were considered for depicting the baseline status of the study area.

3.6.1 Water quality assessment

Selected water quality parameters for water resources within 30 km of the study area have been used for describing the water environment and assessing the impacts on it. Studies on water Environment aspects of ecosystem play an important role in preparation of Environmental Impact Assessment and identify sensitive issues and take appropriate actions. To assess the water quality impacts, water resources in the impact area have been grouped into 2 classes.

a. Surface water resources including rivers, streams, tanks.
b. Ground water resources in the deeper strata of the ground.

Surface water sampling was carried out from Penganga upstream, Penganga down stream after confluence of Aran river, Aran River.

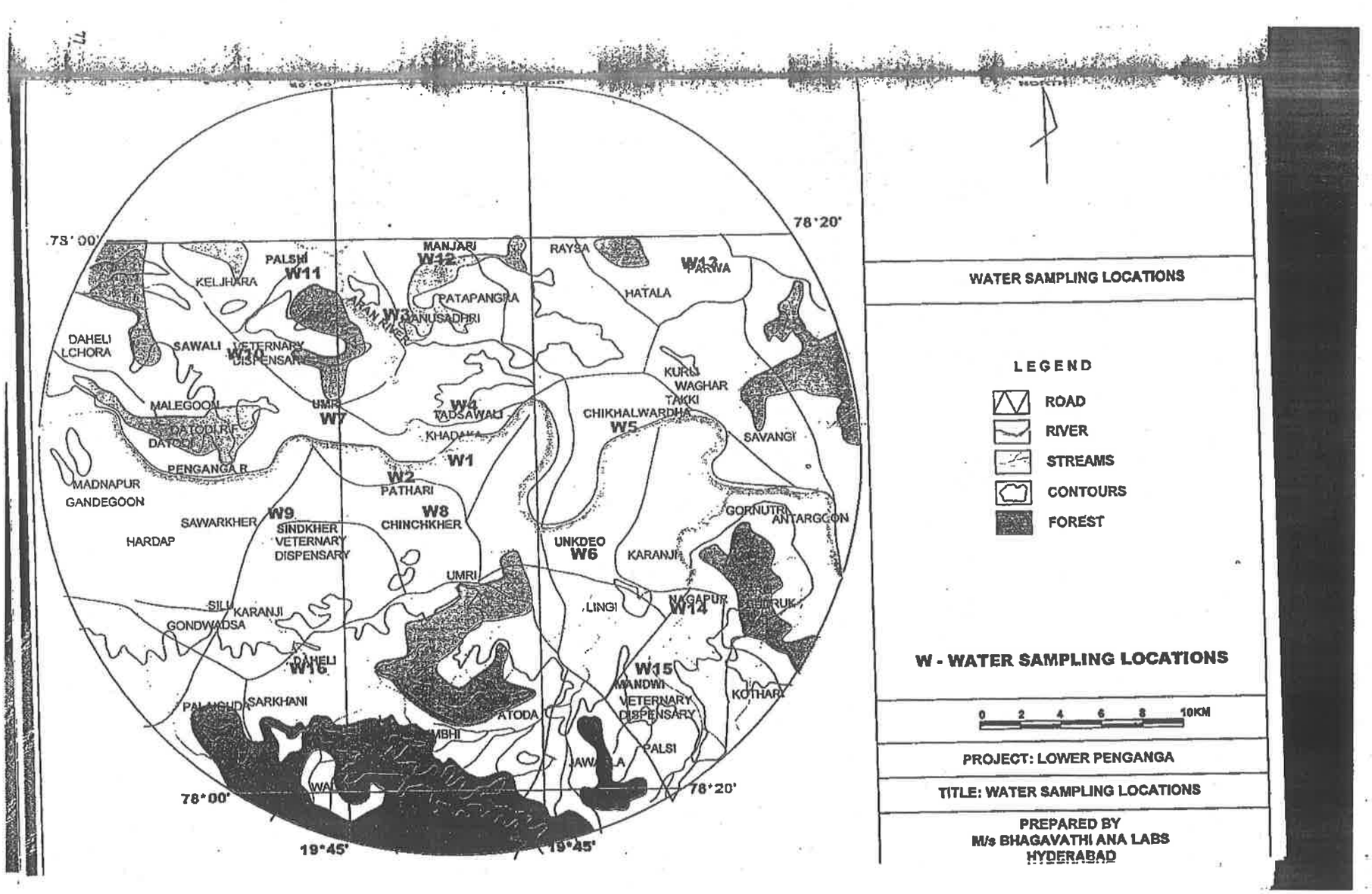
About 13 ground water samples were collected from the study area to assess the water quality during the study period. The samples were drawn from the hand pumps being used by the villagers for their domestic needs.

Based on the water sources in the project area 16 water samples were collected and subjected to detailed analysis. Sampling locations for water samples are shown in Figure 3.7 and the details of the locations are given in Table 3.14.

Table 3.14
Water Quality Monitor Location Details

S. No.	Location	Source	With respect to Project site	
			Direction	Distance in Km
W1	Penganga River (Tadsoli) After confluence Aran	Surface	–	–
W2	Penganga River (Pathari)	Surface	W	2
W3	Aran River (Aita)	Surface	NNW	3
W4	Tadsoli	Ground	NNE	2.0
W5	Chikhalwardha	Ground	ENE	7.0
W6	Unkdea	Ground	SE	7.5
W7	Umri	Ground	S	7.0
W8	Chinchkher	Ground	SW	5.5
W9	Sindkher	Ground	WSW	9.0
W10	Sawail	Ground	WNW	14.0
W11	Palsni	Ground	NW	13.0
W12	Manjari	Ground	N	11.0
W13	Parwa	Ground	NE	17.0
W14	Nagapur	Ground	SE	14.0
W15	Mandawi	Ground	SSE	14.0
W16	Daheli	Ground	SW	12.5

The water samples collected from the above locations were analyzed for important major and minor ions, and the analytical results of the water samples were compared with IS 10500 drinking water standards and also studied its suitability for irrigation purposes and the results are shown in Tables 3.15a to f.



WATER SAMPLING LOCATIONS

LEGEND

- ROAD
- RIVER
- STREAMS
- CONTOURS
- FOREST

W - WATER SAMPLING LOCATIONS

0 2 4 6 8 10KM

PROJECT: LOWER PENGANGA

TITLE: WATER SAMPLING LOCATIONS

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Table 3.15a Water Quality – Surface Waters

			Penganga Upstream				Confluence of Aryan River				Aryan River			
S.No	Parameter	Unit	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5	5	5	5	5	5	5	5	5
2	pH		7.30	7.25	7.45	7.52	7.70	7.80	8.00	8.24	7.59	7.82	7.63	7.54
3	Turbidity	NTU	5	5	5	5	5	5	5	5	5	5	5	5
4	Elec. Cond	µS/cm	524	435	468	521	495	385	425	480	600	421	437	475
5	Total Dissoilved Solids	mg/l	328	286	299	315	305	235	273	310	390	281	300	315
6	Alkalinity as CaCO3	mg/l	184	165	170	190	145	136	156	185	235	160	162	155
7	Chlorides as Cl	mg/l	37	28	30	31	35	30	32	30	20	23	25	35
8	Sulphates as SO4	mg/l	20	12	15	18	20	15	20	24	20	12	13	22
9	Nitrate as NO3	mg/l	2	2	2	2	2	1	1	1	11	6	7	2
10	Phosphates as PO4	mg/l	0.03	0.06	0.05	0.05	0.03	0.02	0.03	0.04	0.02	0.03	0.02	0.01
11	T. Hardness as CaCO3	mg/l	180	138	148	171	142	113	124	183	231	153	160	155
12	Calcium as Ca	mg/l	52	35	41	45	40	32	33	48	64	38	44	41
13	Magnesium as Mg	mg/l	12	12	11	14	10	8	10	15	17	14	12	12
14	Sodium as Na	mg/l	35	26	26	31	40	22	27	25	24	12	26	31
15	Potassium as K	mg/l	5	5	4	4	3	3	4	3	1	2	3	5
16	Flouride as F	mg/l	0.5	0.55	0.45	0.65	0.5	0.4	0.5	0.45	0.6	0.51	0.58	0.63
17	Iron as Fe	mg/l	0.25	0.2	0.17	0.18	0.03	0.05	0.1	0.15	0.12	0.07	0.06	0.02
18	Boron as B	mg/l	0.1	0.05	0.04	0.08	0.05	0.04	0.05	0.04	0.05	0.09	0.07	0.1
19	SAR		1.6	1.4	1.3	1.5	2.1	1.3	1.5	1.1	1.0	0.6	1.3	1.5
20	Percent Sodium		44	43	42	43	54	44	47	36	31	25	40	45
21	RSC		0.08	0.55	0.43	0.38	0.07	0.45	0.64	0.05	0.08	0.18	0.04	0.05
22	DO	mg/l	5.10	5.80	5.80	5.60	5.10	5.30	5.80	5.80	5.20	5.45	5.60	5.90
23	BOD	mg/l	2.00	1.00	1.00	1.00	3.00	2.00	2.00	1.00	2.00	2.00	2.00	1.00
24	COD	mg/l	8	4	5	4	10	3	5	8	7	6	6	6

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Table 3.15b

Water Quality – Ground waters

			Tadsoli				Chikhalwardha				Unkdea			
S.No	Parameter	Unit	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5	5	5	5	5	5	5	5	5
2	pH		7.30	7.35	7.44	7.04	7.90	7.65	7.82	7.43	7.30	7.65	7.73	7.42
3	Turbidity	NTU	5	5	5	5	5	5	5	5	5	5	5	5
4	Elec. Cond	µS /cm	990	750	765	950	1455	1105	1208	1340	845	680	725	790
5	Total Dissoilved Solids	mg/l	627	469	502	620	885	701	745	870	535	405	449	510
6	Alkalinity as CaCO3	mg/l	335	230	290	320	435	305	334	285	324	255	267	290
7	Chlorides as Cl	mg/l	60	54	54	46	140	95	104	107	47	25	34	34
8	Sulphates as SO4	mg/l	31	16	18	27	33	33	45	77	21	21	25	22
9	Nitrate as NO3	mg/l	35	25	42	68	112	45	56	186	25	15	25	31
10	Phosphates as PO4	mg/l	0.01	0.04	0.05	0.01	0.04	0.04	0.05	0.04	0.04	0.05	0.03	0.01
11	Total Hardness as CaCO3	mg/l	353	256	287	380	421	335	363	433	327	229	271	313
12	Calcium as Ca	mg/l	108	79	88	112	115	94	102	108	84	55	65	80
13	Magnesium as Mg	mg/l	20	14	16	24	32	24	26	39	28	22	26	27
14	Sodium as Na	mg/l	52	35	40	44	110	75	88	98	39	33	40	38
15	Potassium as K	mg/l	5	5	4	1	6	10	8	20	6	3	4	2
16	Flouride as F	mg/l	0.6	0.55	0.55	0.7	0.65	0.7	0.85	1.1	0.65	0.75	0.84	1.2
17	Iron as Fe	mg/l	0.02	0.14	0.15	0.1	0.03	0.03	0.08	0.12	0.03	0.05	0.1	0.1
18	Boron as B	mg/l	0.05	0.05	0.04	0.09	0.1	0.08	0.09	0.11	0.1	0.07	0.08	0.07
19	SAR		1.7	1.3	1.5	1.4	3.3	2.5	2.8	2.9	1.3	1.3	1.5	1.3
20	Percent Sodium		38	36	37	33	52	47	50	47	33	38	38	34

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21 RSC	Meq/lt	-0.37	-0.52	0.07	-1.20	0.28	-0.60	-0.59	-2.95	-0.05	0.52	-0.08	-0.45

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Table 3.15c

Water Quality– Ground waters

S.No	Parameter	Unit	Umri.				Chinchkher				Sindkher			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5	5	5	5	10	5	5	5	5
2	pH		8.00	7.67	7.78	7.57	7.20	7.45	7.39	7.08	7.50	7.67	7.82	7.44
3	Turbidity	NTU	5	5	6	6	5	5	5	10	5	5	6	5
4	Elec. Cond	µS /cm	950	785	805	820	955	805	826	860	850	659	735	720
5	Total Dissoilved Solids	mg/l	598	497	500	530	602	495	504	570	536	398	435	460
6	Alkalinity as CaCO3	mg/l	298	267	270	275	355	286	295	360	345	265	285	300
7	Chlorides as Cl	mg/l	45	35	40	28	49	44	46	27	32	25	29	21
8	Sulphates as SO4	mg/l	30	25	26	27	26	25	23	20	21	16	18	24
9	Nitrate as NO3	mg/l	44	15	25	81	5	10	15	6	14	9	12	4
10	Phosphates as PO4	mg/l	0.02	0.03	0.05	0.01	0.05	0.05	0.04	1.1	0.05	0.04	0.05	0.01
11	Total Hardness as CaCO3	mg/l	363	296	312	361	354	316	325	374	298	241	273	312
12	Calcium as Ca	mg/l	82	65	68	76	85	68	70	78	76	43	51	68
13	Magnesium as Mg	mg/l	38	32	34	41	34	35	36	43	26	32	35	34
14	Sodium as Na	mg/l	44	30	32	24	36	32	38	26	34	35	29	22
15	Potassium as K	mg/l	6	4	5	1	4	5	6	2	4	4	5	1
16	Flouride as F	mg/l	0.65	0.75	0.65	0.6	1.1	0.95	0.55	0.6	0.8	0.94	0.68	0.75
17	Iron as Fe	mg/l	0.25	0.18	0.18	0.18	0.15	0.13	0.14	0.8	0.15	0.12	0.09	0.12
18	Boron as B	mg/l	0.05	0.04	0.05	0.07	0.05	0.06	0.08	0.12	0.1	0.04	0.04	0.06
19	SAR		1.4	1.1	1.1	0.8	1.2	1.1	1.3	0.8	1.2	1.4	1.1	0.8
20	Percent Sodium		34	30	30	22	30	30	33	23	32	38	31	23
21	RSC	Meq/lt	-1.31	-0.58	-0.83	-1.72	0.02	-0.60	-0.60	-0.28	0.93	0.48	0.23	-0.23

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Table 3.15d

Water Quality- Ground waters

S.No	Parameter	Unit	Sawail				Palsni				Manjari			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5	5	5	5	5	5	5	5	5
2	pH		7.90	8.05	8.02	7.54	7.30	7.67	7.89	8.50	7.45	7.68	7.83	7.50
3	Turbidity	NTU	5	5	5	5	5	5	5	5	5	5	5	5
4	Elec. Cond	µS /cm	850	715	720	730	623	405	415	420	880	705	735	740
5	Total Dissoilved Solids	mg/l	502	465	472	470	398	265	269	270	578	458	469	480
6	Alkalinity as CaCO3	mg/l	298	275	261	270	221	145	154	165	302	254	260	260
7	Chlorides as Cl	mg/l	49	35	35	23	45	35	30	18	40	38	24	21
8	Sulphates as SO4	mg/l	31	25	24	34	15	10	9	14	24	15	18	22
9	Nitrate as NO3	mg/l	19	24	28	35	10	2	5	3	5	10	17	65
10	Phosphates as PO4	mg/l	0.01	0.03	0.05	0.01	0.05	0.03	0.2	0.01	0.02	0.04	0.05	0.02
11	Total Hardness as CaCO3	mg/l	343	275	267	315	213	142	155	163	347	279	305	331
12	Calcium as Ca	mg/l	72	60	70	66	42	30	32	30	82	75	82	84
13	Magnesium as Mg	mg/l	39	30	22	36	26	16	18	21	34	22	24	29
14	Sodium as Na	mg/l	35	31	38	25	39	22	23	21	34	25	23	18
15	Potassium as K	mg/l	4	3	5	1	5	4	3	3	5	5	3	1
16	Flouride as F	mg/l	0.9	0.85	0.74	0.6	1	0.8	0.65	0.4	0.6	0.75	0.8	0.55
17	Iron as Fe	mg/l	0.2	0.15	0.09	0.15	0.25	0.16	0.12	0.12	0.15	0.09	0.12	0.1
18	Boron as B	mg/l	0.1	0.08	0.08	0.07	0.1	0.08	0.09	0.05	0.05	0.04	0.05	0.07
19	SAR		1.2	1.1	1.4	0.9	1.6	1.1	1.1	1.0	1.1	0.9	0.8	0.6
20	Percent Sodium		30	32	37	25	43	39	38	35	29	27	24	19
21	RSC	Meq/lt	-0.89	0.00	-0.11	-0.90	0.15	0.07	-0.02	0.05	-0.89	-0.50	-0.90	-1.42

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Table 3.15e

Water Quality– Ground waters

			Parwa				Nagapur				Mandawi			
S.No	Parameter	Unit	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5	5	5	5	5	5	5	5	5
2	pH		7.20	7.35	7.83	7.97	8.13	7.64	7.82	7.81	8.20	7.92	7.86	7.66
3	Turbidity	NTU	5	5	5	5	10	5	5	5	5	5	10	5
4	Elec. Cond	µS /cm	735	556	606	610	775	596	634	670	750	635	678	700
5	Total Dissoilved Solids	mg/l	443	339	398	390	456	386	421	430	456	378	412	450
6	Alkalinity as CaCO3	mg/l	275	186	218	230	236	185	198	220	285	221	234	270
7	Chlorides as Cl	mg/l	45	45	32	28	49	36	34	25	56	37	43	32
8	Sulphates as SO4	mg/l	22	15	18	20	35	21	22	23	12	19	21	31
9	Nitrate as NO3	mg/l	6	4	11	12	36	25	33	60	15	10	7	2
10	Phosphates as PO4	mg/l	0.05	0.02	0.03	0.01	0.04	0.05	0.04	0.01	0.05	0.06	0.03	0.01
11	Total Hardness as CaCO3	mg/l	233	180	217	262	268	242	249	292	231	198	220	323
12	Calcium as Ca	mg/l	55	42	45	48	67	55	58	60	64	54	63	84
13	Magnesium as Mg	mg/l	23	18	25	34	24	25	25	34	17	15	15	27
14	Sodium as Na	mg/l	45	35	32	20	41	23	25	21	55	45	44	14
15	Potassium as K	mg/l	4	5	3	2	6	2	2	1	3	4	3	2
16	Flouride as F	mg/l	0.6	0.65	0.7	0.5	1	0.9	0.73	0.55	1	0.75	0.7	0.6
17	Iron as Fe	mg/l	0.15	0.09	0.07	0.15	0.2	0.13	0.15	0.15	0.05	0.09	0.12	0.15
18	Boron as B	mg/l	0.05	0.08	0.03	0.01	0.05	0.07	0.07	0.06	0.05	0.04	0.05	0.07
19	SAR		1.8	1.6	1.3	0.8	1.5	0.9	1.0	0.8	2.2	2.0	1.8	0.5
20	Percent Sodium		45	44	38	25	39	29	30	24	50	48	46	16
21	RSC	Meq/lt	0.83	0.12	0.03	-0.63	-0.63	-1.13	-1.02	-1.43	1.08	0.47	0.28	-1.05

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Table 3.15f
Water Quality

S.No	Parameter	Unit	Daheli			
			Sum	Mon	Pmon	Win
1	Colour	Hazen Units	5	5	5	5
2	Ph		7.50	7.65	7.78	7.34
3	Turbidity	NTU	5	5	5	5
4	Elec. Cond	µS /cm	895	705	736	790
5	Total Dissoilved Solids	Mg/l	554	456	486	510
6	Alkalinity as CaCO3	Mg/l	325	256	265	290
7	Chlorides as Cl	Mg/l	51	35	41	27
8	Sulphates as SO4	Mg/l	30	20	21	26
9	Nitrate as NO3	Mg/l	13	24	32	50
10	Phosphates as PO4	Mg/l	0.01	0.04	0.05	0.01
11	Total Hardness as CaCO3	Mg/l	375	276	314	362
12	Calcium as Ca	Mg/l	90	72	79	88
13	Magnesium as Mg	Mg/l	36	23	28	34
14	Sodium as Na	Mg/l	25	26	23	18
15	Potassium as K	Mg/l	5	4	3	1
16	Flouride as F	Mg/l	0.5	0.65	0.6	0.55
17	Iron as Fe	Mg/l	0.05	0.09	0.1	0.12
18	Boron as B	Mg/l	0.05	0.05	0.09	0.08
19	SAR		0.8	1.0	0.8	0.6
20	Percent Sodium		22	28	24	18
21	RSC	Meq/lt	-1.00	-0.40	-0.98	-1.43

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Table 3.16

India Standard-Drinking water –Specification- IS 10500:1991

Bureau of India Standards (BIS)

(AMENDMENT NO. 1 JANUARY 1993)- (First Revision) IS 10500: 1991

S. No.	Substance or Characteristic	Requirement (Desirable Limit)	Undesirable Effect outside the Desirable Limit	Permissible Limit in the Absence of Alternate Source	Methods of Test (Ref to IS)	Remarks
1	2	3	4	5	6	7
Essential Characteristics						
I	Color, Hazen units, Max	5	Above 5, consumer acceptance decreases	25	3025 (Part 4) : 1983	Extended to 25 only if toxic substances are not suspected, in absence of alternate sources
Ii	Odor	Unobjectionable	-	-	3025 (Part 5) : 1983	a. Test cold and when heated b. Test at several dilutions
Iii	Taste	Agreeable	-	-	3025 (Parts 7 & 8) : 1984	Test to be conducted only after safety has been established
Iv	Turbidity, NTU, Max	5	Above 5, consumer acceptance decreases	10	3025 (Part 10) : 1984	-
V	pH value	6.5 to 8.5	Beyond this range the water will affect the mucous membrane and / or water supply system	No relaxation	3025 (Part 11) : 1984	-
Vi	Total hardness (as $CaCO_3$) mg/l, Max	300	Encrustation in water supply structure and adverse effects on domestic use	600	3025 (Part 21) : 1983	-
Vii	Iron (as Fe) mg/l, Max	0.3	Beyond this limit taste/	1.0	32 of 3025 :	-

			appearance are affected, has adverse effect on domestic uses and water supply structures, and promotes iron bacteria		1964	
Viii	Chlorides (as Cl) mg/l Max	250	Beyond this limit, taste, corrosion and palatability are affected	1000	3025 (Part 32) : 1988	-
Ix	Residual, free chlorine, mg/l in	0.2	-	-	3025 (Part 26) : 1986	To be applicable only when water is chlorinated. Tested at consumer end. When protection against viral infection is required, it should be Min 0.5 mg/l.
X	Fluoride (as F), mg/l Max	1.0	Fluoride may be kept as low as possible. High fluoride may cause fluorosis	1.5	23 of 3025 : 1964	-
						Desirable Characteristic
Xi	Dissolved solids mg/l Max	500	Beyond this palatability decreases and may cause gastro intestinal irritation	2000	3025 (Part 16) : 1984	-
Xii	Calcium (as Ca), mg/l Max	75	Encrustation in water supply structure and adverse effects on domestic use	200	3025 (Part 40) : 1991	-
Xiii	Magnesium (as Mg), mg/l Max	30	Encrustation to water supply structure and adverse effects on domestic use	100	16, 33, 34 of IS 3025 : 1964	-

Xiv	Copper (as Cu), mg/l Max	0.05	Astringent taste, discoloration and corrosion of pipes, fitting and utensils will be caused beyond this.	1.5	36 of 3025 : 1964	-
Xv	Manganese (as Mn) mg/l Max	0.1	Beyond this limit taste/ appearance are affected, has adverse effect on domestic uses and water supply structures	0.3	35 of 3025 : 1964	-
Xvi	Sulphate (as SO_4) mg/l Max	200	Beyond this causes gastro intestinal irritation when magnesium or sodium are present.	400 (see col 7)	3025 (Part 24) : 1986	May be extended up to 400 provided (as Mg) does not exceed 30
Xvii	Nitrate (as NO_2), mg/l Max	45	Beyond this methaemoglobin emia takes place	100	3025 (Part 34) : 1988	-
xviii	Phenolic compounds (as C_6H_5OH) mg/l Max	0.001	Beyond this, it may cause objectionable taste and odor	0.002	54 of 3025 : 1964	-
Xix	Mercury (as Hg) mg/l Max	0.001	Beyond this, the water becomes toxic	No relaxation	(see Note) Mercury ion analyzer	To be tested when pollution is suspected
Xx	Cadmium (as Cd), mg/l Max	0.01	Beyond this, the water becomes toxic	No relaxation	(See Note)	To be tested when pollution is suspected
Xxi	Selenium (as Se), mg/l Max	0.01	Beyond this, the water becomes toxic	No relaxation	28 of 3025 : 1964	To be tested when pollution is suspected
Xxii	Arsenic (as As), mg/l Max	0.05	Beyond this, the water becomes toxic	No relaxation	3025 (Part 37) : 1988	To be tested when pollution is suspected
xxiii	Cyanide (as	0.05	Beyond this limit,	No	3025	To be tested

	CN), mg/l Max		the water becomes toxic	relaxation	(Part 27) : 1986	when pollution is suspected
xxiv	Lead (as Pb), mg/l Max	0.05	Beyond this limit, the water becomes toxic	No relaxation	(see Note)	To be tested when pollution is suspected
Xxv	Zinc (as Zn) mg/l Max	5	Beyond this limit it can cause astringent taste and an opalescence in water.	15	39 of 3025 : 1964	To be tested when pollution is suspected
xxvi	Anionic detergents (as MBAS) mg/l Max	0.2	Beyond this limit it can cause a light froth in water	1.0	Methyl eneblu e extracti on metho d	To be tested when pollution is suspected
xxvii	Chromium (as Cr^{6+}) mg/l Max	0.05	May be carcinogenic above this limit	No relaxation	38 of 3025 : 1964	To be tested when pollution is suspected
xxviii	Polynuclear aromatic hydrocarbons (as PAH)mg/l	-	May be carcinogenic	-	-	-
xxix	Mineral oil mg/l Max	0.01	Beyond this limit undesirable taste and odour after chlorination take place	0.03	Gas chroma tograp h ic metho d	To be tested when pollution is suspected
Xxx	Pesticides mg/l Max	Absent	Toxic	0.001	-	-
xxxi	Radioactive materials a. Alpha emitters Bq/l, Max b. Beta emitters pci/l, Max	- -	- -	0.1 1	58 of 3025 : 1964 - -	-
xxxii	Alkalimity mg/l Max	200	Beyond this limit taste becomes unpleasant	600	13 of 3025 : 1964	-
xxxiii	Aluminum	0.03	Cumulative	0.2	31 of	-

	(as Al) mg/l Max		effect is reported to cause dementia		3025 : 1964	
xxiv	Boron (as Bo) mg/l Max	1	-	5	29 of 3025 : 1964	-

Note : Atomic absorption spectrophotometric method may be used.

Irrigation Water Classification

Salinity Class	EC µmohos at 25°C	Remarks
C1 Low	Less than 250	Suitable for most crops on most soils
C2 Moderate	250 – 750	Suitable in most cases with moderate drainage
C3 Med. to high	750 – 2250	May be used for salt tolerant crops on adequately drained soils
C4 High	2250 – 5000	May be used with very tolerant plants, and with excess leaching
C5 Very High	5000 – 20000	
Sodium Class	**SAR**	
S1 Low	Less than 10	no harmful effects from sodium
S2 Moderate	10 – 18	an appreciable sodium hazard in fine-textured soils of high CEC, but could be used on sandy soils with good permeability
S3 High	18 – 26	harmful effects could be anticipated in most soils and ammendments such as gypsum would be necessary to exchange sodium ions.
S4 Very High	More than 26	Generally unsatisfactory for irrigation
Residual Sodium Carbonate (RSC) (meq/liter)		
	Less than 0	None
Safe	0 to 1.25	low, with some removal of calcium and magnesium from irrigation water.
Marginal	1.35 to 2.50	medium, with appreciable removal of calcium and magnesium from irrigation water.
Unsuitable	Over 2.5	high, with most calcium and magnesium removed leaving sodium to accumulate
Percent sodium	40 to 60	Desirable values

Permissible limits of Boron			
Boron class	Sensitive crops	Semi tolerant crops	Tolerant crops
Excellent	<0.33	<0.67	<1.0
Good	0.33 to 0.67	0.67 to 1.32	1.0 to 2.0
Permissible	0.67 to 1.0	1.33 to 2.00	2.0 to 3.0
Doubtful	1.0 to 1.25	2.00 to 2.50	3.0 to 3.75
Unsuitable	>1.25	>2.5	>3.75

3.6.2 Regional Scenario

Water sources are ample in the study area. A total of 16 samples were collected from the study area 13 samples are from ground water sources and 3 are from the surface water samples.

3.6.2.1 Irrigation suitability

As the proposed project is an irrigation project the analysis results were also compared with the existing irrigation standards.

The quality of water used for irrigation should receive adequate attention. Irrigation water regardless of its source, always contains some soluble salts in it. Apart from the total concentration of the dissolved salts, the concentration of some of the individual salts and especially of those, which are most harmful to the crops, is important in determining the suitability of water for irrigation. The constituents usually determined for irrigation water are electrical conductivity for total dissolved salts, soluble sodium percentage, sodium absorption ratio, the boron content, pH, cations such as calcium, magnesium, sodium, potassium and anions like carbonates, bicarbonates, sulphates, chlorides and nitrates.

The continual use of poor quality water for irrigation builds up high salinity in the soil and may cause permanent damage. To avoid such damage it is advisable to test the water quality and take due care to manage such water for crop production.

The quality of irrigation water can be improved by adding certain substances, such as sulphuric acid or sulphur to reduce the pH to the desired level. Gypsum, which is available commercially, can be applied to the soil or mixed with water where poor quality water, containing high concentration of sodium salts, is used for irrigation. The permeability of soils can be improved by incorporating organic matter into them to facilitate the leaching down of the salts beyond the root zone.

Traditionally, certain water quality criteria have been used in determining the suitability and sustainability of natural waters for irrigation.

a) TDS / Electrical Conductivity

The total dissolved solids tolerance limit as per Indian standards is 2100 mg/l. Plant growth is affected by actual salt concentration present in the soil (root zone) rather than in the irrigant itself. Thus it is worthwhile to remember that an irrigant as such has no inherent quality, it must be evaluated in terms of the local soil, climate and crops proposed to be grown. Water that may be suitable in one region may not be suitable in another region depending upon the conditions mentioned above. As per US Salinity Laboratory water quality based on electrical conductance is been divided in four categories low, medium, high and very high.

In the study area during study period the EC of surface waters is varying between 385 to 600 micromhos/cm and falling under C2 moderate class, the surface waters are suitable for most crops with moderate drainage. The EC of the groundwater is varying between 405 to 1455 micromhos/cm, in all four seasons 3 samples had shown EC less than 750 micromhos/cm, where as three seasons 4 samples, 2 seasons and one season 1 sample each. In 13 locations out of 52 samples collected during the study period 27 where in moderate region and remaining samples were in medium to high class, the groundwater can be used only for salt tolerant crops on adequately drained soils.

b) Sodium Absorption Ratio / Percent Sodium

Soil structure is considerably affected in the long run by the sodium content in the irrigation water. Sodium enters into cation exchange relationships with clay particle in the soil, and tends to break down the clays. This in turn tends to reduce the soil porosity, which is important for air and water movement. A 5-10%, reduction in porosity can seriously impede growth. Thus, the sodium content of irrigants is of primary importance and is generally assessed in terms of its relative content compared to that of other cations like calcium, magnesium and potassium by determining the sodium absorption ratio (SAR) or the percent sodium.

In the study area the SAR value is ranging between 0.60 to 2.07 in surface waters and 0.48 to 3.3 in ground waters showing that all samples are falling under low sodium hazard category, showing no harmful effects from sodium. The percent sodium is varying between 25 to 54 in surface waters and 16 to 52 in ground waters, whereas the desirable value of percent sodium is around 40 to 60.

c) Residual Sodium Carbonate (RSC)

A large amount of bicarbonate tends to precipitate out the calcium, as calcium carbonate from water and soil. Magnesium enters the exchange complex of the soil, replacing the precipitated calcium. Ordinarily, magnesium does not replace calcium to any great extent but, if calcium is precipitated as it is released, the reaction proceeds to completion.

As calcium and magnesium are lost from the soil water, the relative proportion of sodium is increased, with an attendant increase in sodium hazard. The hazard is generally evaluated in terms of the residual sodium carbonate.

Based on the RSC value the water is classified into three groups (safe, marginal, unsuitable). The RSC values in the study area are varying between 0.04 to 0.64 meq/l in surface waters and between -2.95 to 1.08 meq/l in the ground water showing that all the samples are falling under the safe group.

d) Boron

Although boron is necessary in small quantities for plant growth, it can be an important phytotoxic substance if it occurs in toxic concentrations in natural irrigation waters. Very few other substances occur in toxic concentrations in natural waters and, hence it is necessary to check for boron in assessing irrigation water quality. Based on the boron concentration the irrigation water is grouped into four categories for three different crops (sensitive crops, semi tolerant crops and tolerant crops). In the study area the boron value is varying between 0.04 to 0.10 mg/l in surface waters and 0.01 to 0.12 mg/l in ground water samples collected in various seasons of the study period, all the samples are falling in excellent category suitable for all type of crops as per boron values.

Based on the above discussions it can be mentioned that surface water is suitable for all crops, where as the ground waters are suitable for few crops only.

3.6.1.2 Drinking Water Suitability

Ground Water Samples

- The pH limit fixed for drinking water samples as per IS 10500 is 6.5 to 8.5 beyond this range the water will affect the mucus membrane and or water supply system. The pH values for all the samples collected in the study area during study period were found to be within the limits. During the study period, the pH was varying from 7.04 to 8.50; the higher value (above 8.0) were recorded only in five samples at few places during various seasons.

- The desirable limit for total dissolved solids as per IS 10500 is 500 mg/l where as the permissible limits in absence of alternate source is 2000 mg/l, beyond this palatability decreases and may cause gastro intestinal irritation. In water samples collected from the study area, the total dissolved solids are varying from 265mg/l to 885 mg/l. The TDS of all the samples were with in the permissible limit of 2000 mg/l. However 33 samples out of 52 samples analyzed in various seasons of the study period was below 500 mg/l and the higher values of TDS was recorded during summer months in all locations.

- The desirable limit for chloride is 250mg/l as per IS10500 where as the permissible limit of the same is 1000 mg/l beyond this limit taste, corrosion and palatability are affected. The Chloride levels in the water samples collected in the study area were ranging from 18 mg/l to a maximum of 140mg/l. From the above results it can be said that all the samples were well with in the desirable limits.

- The desirable limit as per IS10500 for hardness is 300 mg/l where as the permissible limit for the same is 600 mg/l beyond this limit encrustation in water supply structure and adverse effects on domestic use will be observed. In the samples collected from the study area, the hardness is varying from 142mg/l to 433 mg/l. Only 25 samples out of 52 samples collected from 13 locations during four seasons are falling under desirable limit where as rest of the samples are within permissible limit. None of the samples are above the permissible limits.

- Fluoride is the other important parameter, which has the desirable limit of 1 mg/l and permissible limit of 1.5 mg/l. However the optimum content of fluoride in the drinking water is 0.6 to 1.5 mg/l. if the fluoride content is less than 0.6 mg/l it causes dental carries, above 1.5 mg/l it causes staining of tooth enamel, higher concentration in range of 3 – 10 mg/l causes fluorosis. In the study area the fluoride value were in the range of 0.4 mg/l to 1.2mg/l. In most of the samples the Fluorides values were found to be within the desirable limits.

Surface Water Samples

- The pH of the samples collected from surface water sources were varying from 7.25 to 8.24. Total Dissolved Solids was varying between 235 to 390 mg/l. The hardness, chlorides and fluoride values observed in the surface waters were well with in the desirable limits.

Overall all the samples collected from the study area were found to be fit for human consumption, however the hardness & TDS in some samples seem to be above desirable limit but well within the permissible limits.

Heavy metals analyzed viz, lead, cadmium, chromium, copper and zinc in the water samples were below detection limits and the detection limits of heavy metals on AAS are Lead (0.05 mg/l), Cadmium (0.002 mg/l), Chromium (0.02mg/l), Copper (0.01 mg/l), Zinc (0.005 mg/l)

3.7 LAND ENVIRONMENT

Soil is one of the basic natural resources for producing food, fiber and fodder. For sustained use of soil resource, it is imperative to know the nature, characteristics, extent and distribution of different soils, their qualities, productive capacity and suitability for alternative land uses.

This chapter is dedicated to the study of the baseline status of the soils in the 10 km study area around the barrage site.

Studies on land and biological aspects of eco-system is important for Environment Impact Assessment to identify sensitive issues and take appropriate action to maintain "Ecological Homeostasis" in the early stages of development of the project. The objective of this session is to define the present environment in which the proposed action is to occur, to evaluate all possible eventualities, to ensure that all negative impacts are minimized and to demonstrate that the proposed project has been appropriately announced to all interested parties so that their concerns are addressed.

In order to understand the factors governing the Eco-system both abiotic and biotic factors have been described.

3.7.1 Geology

The proposed site for construction of earth dam across the Penganga River at 19° 54′ 30″ and 78° 12′ 13″ consists of dark grey, fine grained and closely jointed basalts from the foundation. The rocks dip at 100° in the down stream directions. The low down stream dip and the occurrence of this layer of weather rock at RL 225.15 m in the river bed (possible separating two trap flow) may cause sliding. The necessity to determine the extension of this weathered rock has been stressed and suitable exploration outlined for this purpose. Since the rock level is shallow in the greater part of the earth dam length cutoff can be taken down to the rock surface.

At the dam site the Penganga river flows in easterly direction through a 10 m deep and 190 m wide gorge. The left bank of the gorge exposes yellowish kankery soil (river deposit) down to the river bed level while the right bank exposes closely joined basalt (which dip at 10° in the down stream (easterly). The left flank

is entirely covered with black and yellowish kankary soil while on the right flank closely jointed basalt is exposed for a length of about 100m from river edge.

3.7.2 Physiography

Topographically, the entire State of Maharashtra represents an easterly-sloping plateau. The Sahyadri and the Satpura are the main mountain ranges. From the Sahyadri in the west, which attains a variable height (600-1646 m. amsl) to the Wardha-Wainganga plain in the east showing occasional low trends (less than 100 m. amsl), the plateau represents a variety of features. West of the Sahyadris is a longitudinal coastal strip separated from the Western Ghats by an escarpment (600 m.) and presents lowlands where the heights range from sea level to 350 m. amsl.

Thus, the physical features of the state can be grouped under three broad divisions i.e. (i) the Konkan Coastal Plain, (ii) the Western Ghats and (iii) the Maharashtra Plateau

a) Konkan Coastal Plain

The narrow coastal plain in the west stretches N-S to a distance of about 500 km. The northern part of this is relatively flat with occasional hillocks. Numerous streams originating on the Sahyadrian scarp, meander their way to the sea. Around Mumbai, the coast is dotted with a number of off-shore islands. East of Mumbai, falling in the Ulhas Basin, is a flat plain. This plain also has some outliers of the Western Ghats, the most well-known being the Matheran hills (700 m. amsl).

Almost all the rivers originating from the Western Ghats descend to the coast. These are controlled and guided by fractures and lineaments and forming deep gorge upto 200 m. The estuaries of these rivers are submerged and the tidal impact is felt as far as 25 km. inland.

The coast is bordered by cliffs. At places, these cliffs are as high as 60-70 m. plunging into the sea. At other places, littoral terraces or line of dunes occur behind the beach. In the South Konkan extending upto Sindhudurg district, there are no coastal plains as found in the North Konkan.

b) Western Ghats

The Sahyadris, commonly known as the Western Ghats, represent the western edge of the Deccan Plateau. Here, the basaltic plateau reaches a height varying from 800 to more than 1600 m. amsl. The western edge of the plateau ends abruptly with an escarpment descending to a coastal lowland. The escarpment at places is more than 600 m. and looks like a wall. The Western Ghat escarpment, in all probability, is a fault escarpment. The general height of the Ghats at the coast ranges between 800 and 1600 m. amsl. However, wherever the crest line is breached by headward erosion of the easterly-flowing streams, the continental divide lowers itself to even less than 700 m. (Lonawala). The highest point of the Sahyadris in Maharashtra is Kalsubai (1646 m. amsl.).

The Sahyadris are the main source of all the major rivers, not only of Maharashtra but the whole of Deccan Plateau. The most important of these, the Godavari and the Krishna, have their sources in the. Western Ghats. The river Godavari originates near Nasik while the Krishna near Mahabaleshwar. A number of off-shoots project from the main axis of the Western Ghats eastwards. The Sahyadris are reduced to a saddle wherever they have been dissected by headward erosion of plateau streams and rise to form mountainous high plateaus and peaks where the projecting spurs join them.

The Sahyadri mountains are also the sites of deep valleys and deep ravines due to which numerous irrigation and hydro-electric projects have been commissioned. The rainfall is also high due to which there is luxurious growth of plants and the entire range is covered by forest, much of it in denuded state.

c) Maharashtra Plateau

East of the Sahyadris extends the Maharashtra Plateau for a distance of more than 700 km. It comprises numerous small plateaus and valleys. The main plateau shows declining heights, both towards the eastern and northern periphery of the State. In the extreme eastern part, especially east and south of Nagpur, the average height varies from 250 to 300 m. amsl, though occasional residual hills are as high as 450 m. amsl. The Umrer hills and the Chimur hills, forming the divide between the Wardha and the Wainganga rivers, attain a height of 418 and 450 m. amsl respectively.

The Tapi-Purna valley, an east-west furrow in the Deccan table land, extends over a distance of more , than 300 km. and shows a variation in height ranging between 200 and 300 m. amsl. The entire valley is asymmetrical in cross-profile and is covered with alluvium. It stands in sharp contrast to the barren Deccan plateau in the south and the Satpura hills in the north. The broad valleys of the Bhima, the Godavari and the Krishna are separated by flat-topped divide which project eastward from the Sahyadrian Range

The height of the plateau varies between 450 and 700 m. amsl. The valleys are broad, bordered by 100 -200 m. high escarpment. Down these escarpments (Ghats) are the Piedmont, gently sloping areas and merges with the terraces on either side of the streams. Extensive flat-topped hills are seen everywhere and even major water divides are flat-topped.

Topographically, there are two more areas in Maharashtra which attain considerable heights i.e. "the Satmala-Ajanta chain" that forms the southern rim of the Tapi trough and the other is "the Melghat- Gawilgarh hills" which is sandwiched in the Tapi-Purna fork. In the Satmala-Ajanta scarp face, the famous Ajanta Caves are located. The Satmala-Ajanta chain branches off from the Saptashringi peak, close to the Sahyadris, with progressively decreasing heights.

The Melghat complex overlooks the Tapi valley in the north and the Purna valley in the south. The highest point of the plateau is Chikaldara (1016 m. amsl), which, incidentally, is a hill-station.

d) Major Lineaments in the Study area

The Godavari lineament with NW-SE trend extends over the Deccan Trap terrain. The Kadam lineament has given rise to northerly dips in Deccan Traps in Yavatmal district. The Upper Godavari lineament extends in WNW-ESE direction from west of Nasik to near Parbhani in the east. This lineament cuts across the lava flows and is characterised by the Quaternary tectonic movements. The Ghod lineament is a set of fracture in lava flows. The Varna lineament trends in a NW-SE direction and is considered as a fault affecting the Deccan Traps.

3.7.3 Soil

Soil may be defined as a thin layer of earth' crust which serves as natural medium for the growth of plants. It is unconsolidated mineral matter that has been subjected to, and influenced by, genetic and environmental factors – parent material, climate, organisms and toporgraphy all acting over a period of time. Soil differs from the parent material in the morphological, physical, chemical and biological properties. Also soils differ among themselves in some or all the properties, depending on the differences in the genetic and environmental factors. Thus some soils are red, some are black, some are deep and some are shallow, some are coarse textured and some are fine textured. They serve as reservoir of nutrients and water for crops, provide mechanical anchorage and favorable tilth. The components of soils are mineral material, organic matter, water and air, the proportions of which vary and which together for a system for plant growth, hence the need to study the soils is perspective.

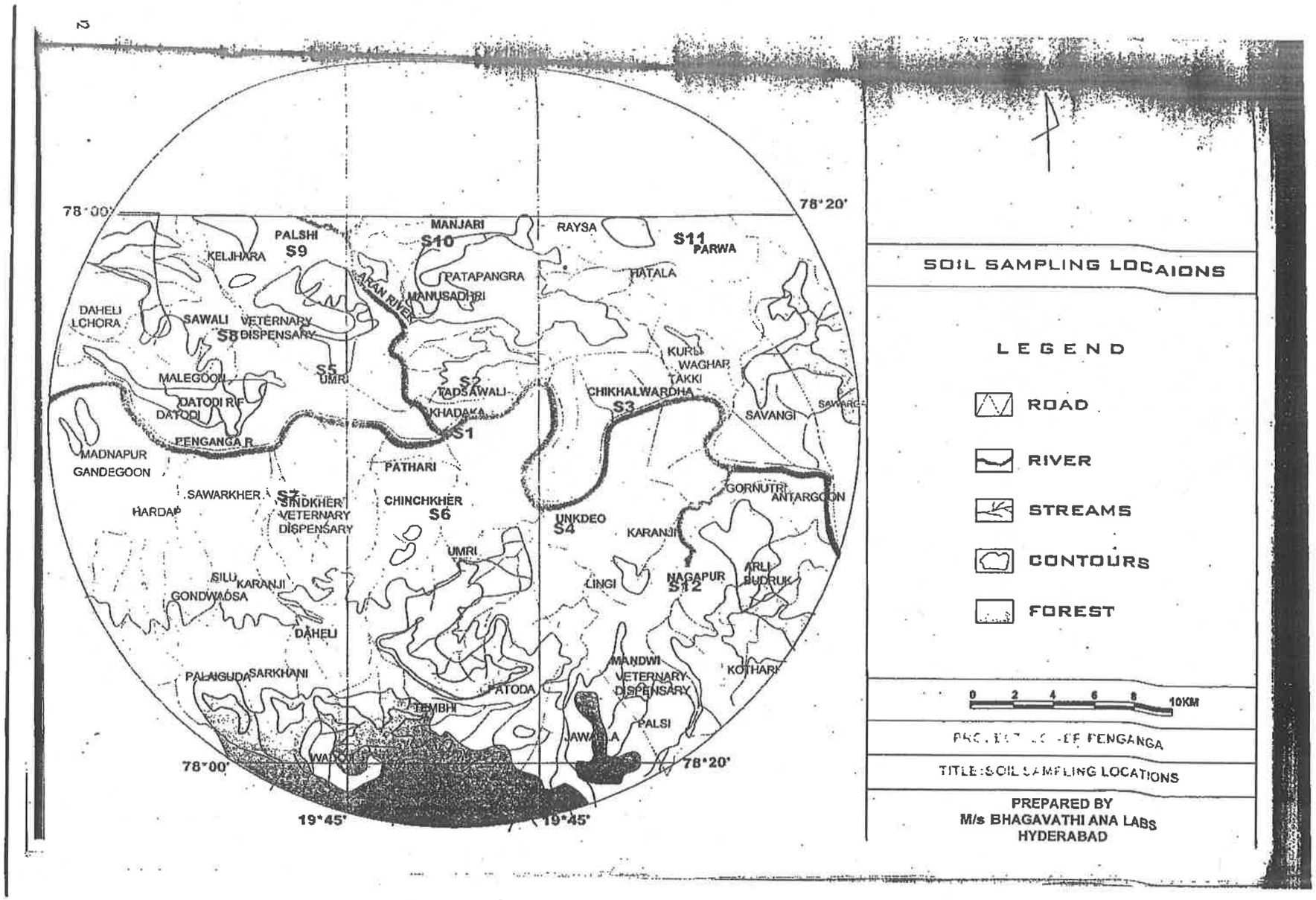
In Maharashtra the soils derived from the deccan trap occupy quite a large area. On the uplands and slopes, soils are light coloured, thin and poor. On the low lands and in valleys, deep and relatively clayey black soils are found. Along the ghats, the soils are very coarse and gravelly. In the valleys of the Tapti, the Narmada, The Godavari and the Krishna rivers, heavy black soil is often 6 meters deep. The sub soil contains a good amount of lime. Out side the deccan trap area, the black cotton soil predominates.

The soils of Maharashtra state, can be broadly classified as coarse shallow soils, medium black soil, deep black (also known as black cotton soils), clayey loams, lateritic soils, and coastal alluvium .

The cultivable soils are spread over the entire Yavatmal District. To understand the physico chemical characteristics of the soil in the study area about 12 samples were collected during study period and were analyzed for various parameters. The soil sampling locations are given in Table 3.17 and shown in Figure 3.8 and the results are depicted in Table 3.18 a to c.

Table 3.17
Soil sampling locations

S. No.	Location	With respect to Project site	
		Direction	Distance in km
1	Project Site	–	–
2	Tadsoli	NNE	2.0
3	Chikhalwardha	ENE	7.0
4	Unkdea	SE	7.5
5	Umri	S	7.0
6	Chinchkher	SW	5.5
7	Sindkher	WSW	9.0
8	Sawail	WNW	14.0
9	Palsni	NW	13.0
10	Manjari	N	11.0
11	Parwa	NE	17.0
12	Nagapur	SE	14.0


78°00'
78°20'
19°45'
PALSHI
S9
MANJARI
S10
RAYSA
S11
PARWA
KELJHARA
PATAPANGRA
HATALA
ARAN RIVER
MANUSADHRI
DAHELI
LCHORA
SAWALI VETERNARY
DISPENSARY
S8
KURLI
WAGHAR
TAKKI
S5
UMRI
S2
TADSAWALI
CHIKHALWARDHA
S3
MALEGOON
DATODI RF
DATODI
KHADAKA
SAVANGI
S1
PENGANGA R
MADNAPUR
GANDEGOON
PATHARI
GORNUTRI
ANTARGOON
SAWARKHER
S7
SINDKHER
VETERNARY
DISPENSARY
CHINCHKHER
S6
HARDAP
UNKDEO
S4
KARANJI
UMRI
SILU
KARANJI
GONDWADSA
LINGI
NAGAPUR
S12
ARLI
BUDRUK
DAHELI
MANDWI
VETERNARY
DISPENSARY
KOTHARI
PALAIGUDA
SARKHANI
PATODA
TEMBHI
PALSI
JAWALA
WADOI
SOIL SAMPLING LOCAIONS
LEGEND
ROAD
RIVER
STREAMS
CONTOURS
FOREST
0 2 4 6 8 10KM
PROJECT : EIA OF PENGANGA
TITLE : SOIL SAMPLING LOCATIONS
PREPARED BY
M/s BHAGAVATHI ANA LABS
HYDERABAD

792

792

270

Table 3.18a
Soil Quality in the Study Area

S.No	Parameter	Unit	1. Pro. Site				2. Tadsoli				3. C'wardha			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour		Brown				Brown				Light brown			
2	Texture		Sandy clay				Clay				Clay			
3	pH (1:2 water extract)		7.75	7.92	8.23	8.31	7.45	7.77	7.58	8.04	7.60	7.30	7.91	8.17
4	EC (1:2 water extract)	µS/cm	234	248	210	170	330	198	210	220	256	163	175	180
5	Org. Carbon	%	0.54	0.65	0.62	0.60	0.35	0.44	0.52	0.64	0.45	0.53	0.59	0.69
6	Ava. Nitrogen as N	kg/ha	198	297	305	310	205	331	298	340	145	278	326	390
7	Ava. Phosphorus as P	kg/ha	35	46	54	64	33	47	62	76	35	46	63	77
8	Ava. Potassium as K	kg/ha	425	589	627	830	314	347	381	410	695	763	826	980
9	Calcium as Ca	ppm	8243	6956	6999	7040	8356	7267	7567	7800	8895	7652	8135	8560
10	Magnesium as Mg	ppm	1145	989	1023	1090	1415	1234	1287	1310	886	695	756	830
11	Sodium as Na	ppm	267	221	245	280	223	164	178	180	156	98	126	150
12	Chlorides as Cl	ppm	98	40	55	43	75	45	48	50	119	40	78	43
13	Boron as B	ppm	0.45	0.34	0.43	0.53	0.65	0.45	0.51	0.58	0.56	0.76	0.56	0.76
14	Bulk density	g/cc	[illegible]				[illegible]				[illegible]			

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Table 3.18b
Soil Quality in the Study Area

S.No	Parameter	Unit	4.Unkdea				5.Umri				6.C'hkher			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour		Brown				Brown				Dark Brown			
2	Texture		Sandy clay				Sandy clay				Clay			
3	pH (1:2 water extract)		7.37	7.67	7.97	8.44	7.05	7.38	7.92	8.2	7.56	7.81	8.02	8.09
4	EC (1:2 water extract)	µS/cm	223	135	165	140	245	119	138	110	560	315	338	370
5	Org. Carbon	%	0.46	0.53	0.65	0.57	0.36	0.44	0.51	0.55	0.34	0.45	0.56	0.64
6	Ava. Nitrogen as N	kg/ha	120	187	210	290	156	267	279	270	203	289	404	330
7	Ava. Phosphorus as P	kg/ha	38	42	52	49	14	26	34	44	52	65	71	78
8	Ava. Potassium as K	kg/ha	675	730	801	830	145	225	321	370	345	456	564	560
9	Calcium as Ca	Ppm	8113	6890	7129	7360	9245	7689	8026	8800	9356	7567	8012	8160
10	Magnesium as Mg	Ppmz	1123	876	902	970	1034	825	887	970	1020	767	812	920
11	Sodium as Na	Ppm	315	198	203	210	198	98	112	120	221	124	145	180
12	Chlorides as Cl	Ppm	76	43	65	36	67	20	37	28	87	34	65	85
13	Boron as B	Ppm	0.62	0.35	0.45	0.52	0.43	0.45	0.61	0.50	0.62	0.34	0.45	0.76
14	Bulk density	g/cm3	1.35	1.26	1.32	1.22	1.30	1.33	1.28	1.24	1.32	1.36	1.25	1.23

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Table 3.18c
Soil Quality in the Study Area

S.No	Parameter	Unit	7.Sindkher				8.Sawail				9.Palsni			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour		Reddish brown				Light brown				Brownish			
2	Texture		Sandy clay				Clay				Clay			
3	pH (1:2 water extract)		7.25	8.10	8.23	8.35	7.80	8.02	8.13	8.31	7.34	7.93	8.01	8.02
4	EC (1:2 water extract)	µS/cm	182	97	112	98	459	317	336	370	456	287	298	300
5	Org. Carbon	%	0.36	0.45	0.67	0.53	0.24	0.48	0.65	0.75	0.54	0.35	0.51	0.65
6	Ava. Nitrogen as N	kg/ha	167	213	245	250	135	225	345	460	137	236	310	360
7	Ava. Phosphorus as P	kg/ha	12	23	43	32	14	56	64	96	12	34	63	84
8	Ava. Potassium as K	kg/ha	145	217	332	370	677	879	976	1080	780	809	983	1020
9	Calcium as Ca	ppm	9235	7801	7984	8720	8887	6654	7612	7600	9873	7689	8672	9040
10	Magnesium as Mg	ppm	876	672	782	780	2107	1234	1342	1510	1124	798	872	1070
11	Sodium as Na	ppm	224	178	182	220	247	128	167	190	81	98	116	160
12	Chlorides as Cl	ppm	76	34	35	21	112	67	85	92	145	45	62	64
13	Boron as B	ppm	0.65	0.57	0.45	0.58	0.87	0.65	0.45	0.82	0.45	0.55	0.65	0.69
14	Bulk density	g/cm3	1.36	1.41	1.26	1.27	1.36	1.42	1.38	1.24				

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Table 3.18d
Soil Quality in the Study Area

S.No	Parameter	Unit	10.Manjari				11.Parwa				12.Nagapur			
			Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win	Sum	Mon	Pmon	Win
1	Colour		Light Brown				Reddish brown				Brownish			
2	Texture		Sandy Clay				Sandy clay				Loam			
3	pH (1:2 water extract)		7.56	7.83	7.99	8.11	7.51	7.81	8.12	8.19	7.32	8.02	8.11	8.24
4	EC (1:2 water extract)	µS/cm	326	187	195	160	342	134	139	150	356	234	256	200
5	Org. Carbon	%	0.18	0.22	0.43	0.34	0.44	0.60	0.55	0.60	0.36	0.45	0.62	0.72
6	Ava. Nitrogen as N	kg/ha	132	176	173	180	176	198	135	290	112	234	335	430
7	Ava. Phosphorus as P	kg/ha	15	16	21	25	12	46	62	72	12	45	67	92
8	Ava. Potassium as K	kg/ha	356	254	287	460	138	453	546	670	645	689	713	720
9	Calcium as Ca	Ppm	8126	7123	7267	7360	9123	7893	8075	8480	9981	7893	8159	9280
10	Magnesium as Mg	Ppmz	1145	897	903	1120	1321	1108	1187	1220	1675	1321	1346	1460
11	Sodium as Na	Ppm	185	124	142	160	226	124	214	210	76	138	198	230
12	Chlorides as Cl	Ppm	98	56	62	43	45	49	54	36	115	65	75	43
13	Boron as B	Ppm	0.43	0.35	0.42	0.38	0.35	0.43	0.36	0.65	0.44	0.56	0.61	0.68
14	Bulk density	g/cm3	1.25	1.32	1.29	1.28	1.40	1.35	1.31	1.26	1.36	1.42	1.45	1.21

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Table 3.18e
Soil Quality in the Study Area

S.No	Parameters	Units	1	2	3	4	5	6	7	8	9	10	11	12
1	Copper as Cu	ppm	0.76	0.8	0.45	0.65	0.62	0.58	0.46	0.52	0.46	0.82	0.76	0.91
2	Manganese as Mn	ppm	5.00	5.00	4.5	6.5	4	6.3	4.6	5.3	4.3	6.2	5.6	5.8
3	Zinc as Zn	ppm	0.84	0.96	0.89	1.3	0.78	1.1	1.3	0.85	0.65	0.73	0.65	0.54
4	Chromium as Cr	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
5	Lead as Pb	ppm	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

1	Project Site	7	Sindkher
2	Tadsoli	8	Sawail
3	Chikhalwardha	9	Palsni
4	Unkdea	10	Manjari
5	Umri	11	Parwa
6	Chinchkher	12	Nagapur

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Table 3.19

Rating Chart of the Soil Test Data

(Indian Council of Agricultural Research, New Delhi)

Nutrient	Units	Low	Medium	High
Organic Carbon (as measure of available Nitrogen)	%	Below 0.5	0.5 - 0.75	Above 0.75
Available Nitrogen (N)	kg/ha	Below 280	280-560	Above 560
Available Phosphorus (P)	kg/ha	Below 10	10-25	Above 25
Available Potassium (K)	kg/ha	Below 110	110-280	Above 280

pH			
Acidic	Normal to saline	Tending to become alkaline	Alkaline
Below 6.0	6.0-8.5	8.6-9.0	Above 9.0
Total Soluble salts (Conductivity in Millimhos/cm)			
Normal	Critical for germination	Critical for growth of the sensitive crops	Injurious to mos crops
Below 1.0	1.0-2.0	2.0-4.0	Above 4.0

3.7.4 Regional Scenario

The analytical results of the soil samples collected during the study period a summarized below.

The pH of the soil is an important property; plants cannot grow in low and hi pH value soils. The normal range of the soils in 6.0 to 8.5 is called as normal saline soils. Most of the essential nutrients like N, P, K, Cl and SO_4 are availal for plant at the neutral pH except for Fe, Mn and Al which are available at low p range. The soils having pH below 7 are considered to be acidic from the practic standpoint, those with pH less than 5.5 and which respond to liming may considered to qualify to be designated as acid soils. On the basis of p measurements, the degree of soil acidity may be indicated. The pH values in t study area are varying from 7.05 at Umri during summer season to 8.44 at Unke during winter season indicating that the soils are falling in normal to saline cla However lower values were observed during summer season where as high values were observed during winter season in most of the locations.

Based on the electrical conductivity the soils are classified into 4 groups (Normal, Critical for germination, Critical for growth of the sensitive crops, Injurious to most crops). The electrical conductivity in the study area is varying from 97 to 560 micromhos/cm indicating that most of the soils falling under Normal category and none in the other three classes. However if the salt content increases due to continuous irrigation the same has to be controlled by leaching or controlling the water table elevation. Leaching is accomplished by applying more water than the soil will hold within the root zone. Large rainfall events, applying additional irrigation water or both will carry some of the salts below the root zone. Water table control can be accomplished by planting a deep rooted crop, such as alfalfa, or installing subsurface drainage. Deep ditches and tiling are methods of subsurface drainage that have been used successfully to control the level of the water table in many parts of the world.

The organic matter influences the soil in respect to colour, physical properties, supply of available nutrients and adsorptive capacity. The micro flora like bacteria, fungi, algae, actinomycetes, and micro fauna like protozoa, nematodes, macro fauna like earthworms, ants etc. play an important role in formation of organic matter. The plants and animals grown in weathered material and the organic residues left behind decay with time and become an integral part of the soil. The main source of soil organic matter is plant tissue. Animals are subsidiary source of soil organic matter. Organic matter though forming a small part of mineral soils, plays a vital role in the productivity and conditioning of soils. It serves as source of food for soil bacteria and fungi which are responsible for converting complex organic materials into simple substances readily used by the plants. The intermediate products of decomposition of fresh organic matter help to improve the physical condition of the soil. The addition of organic matter also improves the working quality of friability of the soil. In association with clay and calcium, it helps to form the aggregates of soil particles to produce the crumb structure. Applied in adequate quantity, organic matter serves as a mulch. The organic content in the study area is varying from 0.18 to 0.75 %, which indicates that out of 48 samples collected from 12 locations during study period 20 samples are falling under low category and the remaining 28 samples are falling under medium category.

Soils having larger particles are usually heavier in weight per unit volume than those with smaller particles. True density of a soil is based on the individual densities of soil constituents and according to their proportionate contribution.

The bulk density or a apparent density is the weight per unit volume of dry soil as a whole, i.e., particle and pore space, and hence it is lower than the true density. In most mineral soils the true density varies with in the narrow limits of about 2.5 to 2.7 and the apparent density between 1.4 to 1.8. However in the study area the bulk density was varying between 1.18 to 1.45 g/cm^3.

The other important parameters for characterization of soil for irrigation are N,P,K. Nitrogen, Phosphorus and Potassium are known as primary nutrients, Calcium, Magnesium and sulphur as secondary nutrients. The primary and secondary nutrient elements are known as major elements. This classification is based on their relative abundance, and not on their relative importance.

Nitrogen encourages the vegetative development of plants by imparting a healthy green colour to the leaves. It also controls, to some extent, the efficient utilization of phosphorus and potassium. Its deficiency retards growth and root development, turns the foliage yellowish or pale green, hastens maturity, causes the shriveling of grains and lowers crop yield. The older leaves are affected first. An excess of nitrogen produces leathery (and sometimes crinkled), dark green leaves and succulent growth. It also delays the maturation of plants, impairs the quality of crops like barley, potato, tobacco, sugarcane and fruits increases susceptibility to diseases and causes "lodging" of cereal crops by inducing an undue lengthening of the stem internodes. The Available Nitrogen value in the study area is varying from 112 to 460 kg/ha. Out of 48 samples collected from 12 locations during study period 29 samples are falling in low category with respect to Available Nitrogen and remaining samples are falling under medium category.

Phosphorus influences the vigour of plants and improves the quality of crops. It encourages the formation of new cells, promotes root growth (particularly the development of fibrous roots), and hastens leaf development, the emergence of ears, the formation of grains, and the maturation of crops. It also increases resistance to disease and strengthens the stems of cereal plants, thus reducing their tendency to lodge. It offsets the harmful effects of excess nitrogen in the plant. When applied to leguminous crops it hastens and encourages the development of nitrogen fixing nodule bacteria. If phosphorus is deficient in the soil, plants fail to make a quick start, do not develop a satisfactory root-system remain stunted and sometimes develop a tendency to show a reddish or purplish discolouration of the stem and foliage owing to an abnormal increase in the sugar content and the formation of anthocyanin. However the deficiency of this

element is not so easily recognized as that of nitrogen. It has also been observed that cattle feeding on the produce of phosphorus deficient soils become dwarfed, develop stiff joints and lose the velvety feel of the skin. Such animals show an abnormal craving for eating bones and even soil itself. In the study area Available Phosphorus value is varying from 12 to 96 kg/ha. Out of 48 samples collected from 12 locations during study period9 samples are falling under medium category and remaining in high category with respect to available phosphorus.

Potassium enhances the ability of the plants to resist diseases, insect attacks, and cold and other adverse conditions. It plays an essential part in the formation of starch and in the production and translocation of sugars, and is thus of special value to carbohydrates rich crops, e.g. sugarcane, potato and sugar beet. The increased production of starch and sugar in legumes fertilized with potash benefits the symbiotic bacteria and thus enhances the fixation of nitrogen. It also improves the quality of tobacco, citrus, etc. With an adequate supply of potash, cereals produce plump grains and strong straw. But an excess of the element tends to delay maturity, though not to the same extent as nitrogen. Plants can take up and store potassium in much larger quantities than what is needed for optimum growth and this excess uptake is known as luxury consumption. With the maturity or death of plants, potassium is washed out from the plant body readily. Vegetables and legumes are particularly heavy consumers of potassium. The deficiency of potassium produces the characteristic ringing of alfalfa leaves with rows of small white spots, reddish brown discolouration of cotton leaves, the drying, scorching and curbing of leaf margins of potato, and intraveinal chlorosis and firing along the edges of maize leaves. The older leaves are affected first. The Available Potassium value in the study area is varying between 138 to 1080 kg/ha indicating that 6 samples are falling under medium category and remaining samples are falling in high category with respect to Available Phosphorus.

Boron helps in cell development by its influence on polysaccharide formation. It regulates translocation of sugars across membranes and polyphenolase activity. Boron in the study area is varying from 0.34 to 0.87 ppm.

3.8 FLORA & FAUNA

3.8.1 Flora

The study of flora in the impact area to find out the baseline status and to predict the impacts due to the project forms an integral part of impact assessment studies. These studies are critical in case of industrial projects, where gaseous emissions, effluent discharges and solid waste disposals can possibly have impact on the flora of the region. Scientific data revealing injury to plants due to emissions of gaseous pollutants like sulfur dioxide is established beyond doubt.

Present project being an irrigation project, more than adverse effect, it will have a positive impact on the flora of the region. Excepting for the submergence area where certain amount of greenery is expected to be lost, flora in all other areas especially the command area will have a beneficial impact.

3.8.1.1 Categorization of Study Area

The district of Yavatmal is situated in Maharashtra and is part of the region popularly called as Vidharba. This region includes other districts like, Akola, Amaravati, Bhandara, Buldana, Chandrapur, Gadchiroli, Nagpur and Wardha.

The total forest area in this district is about 23%. The natural forests are found to occur almost throughout the district intermingled with teak plantations. The pure patches of teak forests are luxuriant on the banks of river Penganga in Kharbi range. In all, there are about 579 taxa of angiosperms under 365 genera and 98 families. The district is rich in economically important species, which yield fibre, essential oils, dyes, tannins, etc. apart from a number of timber yielding plants. The flora also includes about 126 locally used medicinal herbs

The study area consists of Agriculture lands mostly surround project area. The most commonly seen trees in the surroundings of the project area and in study area are given in Table 3.21.

Table 3.21
Flora in study area

Botanical name	Commercial name
Anogeisalls Latifolia	Dhavda
Acacia nilotica.	Babul, karijali,Gobli
Acaciua Senegal	Sundra,Mugli
Acacia sundra.	Safed Babul
Acacia intia.	Korinda, Kanjige
Acacia catechu.	Kaggali
Alangium lamarcki.	Ankola, Ankale
Aegle marmelos.	Bel, Bilpathre
Azadirachta indica.	Neem,Bevu
Albizzia amara.	Narlinga, Chujjalu,Tulgli
Albizia lebbek.	Siris, Bage
Anona squamosa	Sharifa, seethaphal
Bassia latifolia.	Mokhab, Gante, Moka
Bauhini racemosa.	Ari basavanapada
Boswallia serrata.	Anduk,Dhupa
Bridelia homitoniam.	Pankotkam
Buchanania lanzan	Chirongi
Boswe & lia serrato	Salai
Lannea grandis	Moi or lulovna
Terminalia Tomentosa	Ain
Mitiagyna parrifolia	Kalam
Celastrus Sengalansig	Dehti
Gymnosponia montona	Henkal
Careya arborea.	Buda, Darmi, Kaval
Canthium.	Balasu, kare
calycopteris floribunda.	Bonta, Tiga, Enjarige, Neerballi
Calastrus senegalensis.	Danthi, Kubja
Chloroxylon swietenia.	Satinwood Hugagallu
Cryuptolepis bunchanani.	Pala, Tiga
Carissa carandas	Karunda
Cochlospermum religiosum.	Kaduburga, bettadevare
Casuarina equisetifolia.	Jangli saroo

Diospyros melanoxylon.	Abnus, Tupra, thumbri
Dalbergia sissoo	Sissoo
Delechandron faicata.	Woodi, oddi
Delonix regia.	Gulmohar
Dichrostachys cinera.	Yetlur Eradukaraddu
Diospyros meaanoxy	Illinta
Flasourtia ramoutehi	Mutielka
Randis dumetorum	Menga
Zizyphus jujllba	Bor
Dendrocaldtalls strictus	Bamboo
Ficus infectoria.	Banda Jir
Ficus bengalensis	Bur, Ala
Ficus religiosa.	Arali ,Aswatha
Feronia limonia.	Wood apple
Flacourtia ramontchi.	Muli, Elka, Mulluthitti
Garuga pirnata Gargu,	Godda
Grewia species.	Janna
Gyrocarpus Americana Polike,	Kadubende
Grewia tiliaefolia	Tada, Thandesalu , Deman
Gardenia Gummifera.	Dika,Malli, Chitmit
Gardenia resinifera.	Karinga
Gmelina arborea.	Gumertak, shivane
Hymenodictyon excelsum	Bundaru
Haradwickia birnata.	Eppa, kamara,Anjan, Karachi
Holoptelea integrifolia.	Tapasi
Ixora arborea. Korvi, ponna.	Ixora parviflora
Kigelia pinnata	Sausage tree
Kimenia Americana	Nakkeru
Limonia acidissima.	Tora, Yelka, Naibela
Lantana camara.	Shisha, kammari
Lagerstroemia parviflora.	Channangi
Lannea coromandalica	Gojjal , Mohi
Mangifera indica.	Mango, Aam, Mavu
Madhuca indica.	Mohva,mahua,kadippe
Morrinda tinctoria.	Togar,Moogilli, kadikumbala
Nyctanthes arbortristis.	Aarsinghar, Karsha

Pterecarpus marsupium	Bija-sal, Honne
Pongamia pinnata.	Karanji, Honge, (Pongamia glabr)
Phoenix sylvestris .	Sendhi, Euchalu,Wilde, date tree
Prosopis chilensis.	Bellary jaliz. (Prosopis juliflora)
Randia dumetorum.	Manga, kare
Samania saman.	Rain tree
Santalum album.	Saddal
Sapindus emarginata.	Rita ,Soapnut
Semecarpus anacardium.	Bhilwa, marking nut , Geru
Schrebera swietenoides.	Mokhab, Gante, moka
Strychnos mum-vomica.	Kuchala,Nanjina
Strychnos potatorum.	Nirmali , Chilla
Streglus asper	Bajar, Danthi
Stermlia urens.	Kempundale, Bhutale
Stephegyne parviflora	Betaganpu, Kongu
Soymida febrifuga.	Somi,Some,Sombi
Solamum indicum.	Kolsa
Syzygium cumini.	Jamun, Nerale
Tamarindus indica.	Imli,Hunse
Tectona grandis	Sagwani, Teak
Terminalia bellarica.	Tani, Tare
Terminalia arjuna.	Yermaddi, Toremathi
Terminalia chebula.	Halda, Alale
Terminalia tomentosa.	Halamaddı, mathi
Woodfordia floribunda.	Jagi
Wrightia tinctoria	Pala-kordnsha, hale, Nelli
Zizyphus xylocarpus	Gotti,Gotte
Zizyphus oenoplia	Parki, sopimuthe
Cryphole pis Buchanan	Karuta
Gymnemacylvestria	Kavali
Buteo sperba	Palasbel
Schima sulcatum	Paonya
Heteropogan contonus	Kusal
Schima nervosum	Sheds
Cymbopogan martmu	Roshegrass

The phytosociological study in the surrounding area has been undertaken and the details of the study is given in Annexure.

3.8.2 Fauna

The impacts of a project is not only felt by the mankind and the perceivable environment around the project site, But the most important elements of the environment like the vegetation and the animal & bird life will also get effected.

The general perception of the environment pollution to mankind is altering of the properties of only the elements of the environment with which he has direct interaction on continuous basis, like water, air, land etc. In reality environment is such a vast area that there is no end to the list of elements of the environment. Fauna is one of the most important elements. Fauna also have the right to clean environment as much as human beings have. Hence the study of impact of a project on the fauna of the area also forms an important part of the impact assessment studies.

It is a known fact that the human life depends on the flora and fauna as much as it depends on the air and water. They play important role in maintaining the diversity. They form an important link in the food pyramid and also play stellar role in natural cleaning of the environment.

3.8.2.1 Fauna in the Study Area

Based on the occurrence and area of movement, fauna can be classified into two categories.

- φ Domestic fauna
- φ Wild fauna.

a) Domestic Fauna

Domestic fauna can be best described as the animals, which are being looked after by the people and move around in the areas infested by human beings. But out of the total species available in the world, only a few species have been domesticated till now. Other animals are not seen in places where human movement is more and are termed as wild animals as they live in forests.

The commonly observed fauna in the study area near by villages is listed out in Table 3.22 Common avifauna is listed out in Table 3.23.

Table 3.22
Common Fauna In The Study Area

Sl.No	Common Name	Sl.No	Common Name
1	Dog	10	Pig
2	Cat	11	Horse
3	Rat	12	Donkey
4	Buffalo	13	Goat
5	Cow	14	Sheep
6	Reptiles	15	Rabbit
7	Duck	16	Monkey
8	Hen	17	Squirrel
9	Bed bugs	18	Cockroaches

Table 3.23
Common Avifauna In The Study Area

Sl.No	Common Name	Sl.No	Common Name
1	Sparrows	13	Owls
2	Crows	14	Wood Pecker
3	Eagles	15	Pheasants
4	Parrots	16	House flies
5	Pigeons	17	Honey bees
6	Duck	18	Dragon flies
7	Peacocks	19	Mosquitoes
8	Peahens	20	Butterflies
9	Cuckoos	21	Crane
10	Vultures	22	Doves
11	Quails	23	Bulbuls
12	Hawks		

3.5.2.2 Wild Fauna

Wild fauna is observed mostly in forest areas and national parks, where the human movement is restricted.

The study area consists of reserved forests in all directions, among them important one is Datodi RF 10 km W, and others are Manjari RF 7.5 km N, Unkdeo RF 5 km SE and Umri RF 5 km S.

In Maharashtra state the project site lies in the Yavatmal district of Vidarbha region.

The Avian and Reptilian Fauna present in the neighboring forest of study area are given in Table 3.24.

Table 3.24
Fauna in neighboring forests of study area

S. No	Wild animals	Schedule	S. No	Avian fauna.	Schedule
1	Panthers	I	1	Jungle fowls	IV
2	Wild boars	II	2	Partridges	IV
3	Foxes	II	3	Peacocks	I
4	Deers		4	Vultures	IV
5	Jackals	II	5	Kites	IV
6	Bears	II	6	Grey partridge	IV
7	Sambars	III	7	Pea-fowl	
8	Rabbits		8	Red-wattle lapwing	
			9	Pigeon	IV
1	Snakes		10	Doves	IV
2	Naja naja (Nag)	I	11	Rose ringed parakeet	
3	Bungarus cacruleus (Manyar)	IV	12	Koel	IV
4	Vipera russelli (Kawadya)	II	13	Grow pheasant	
5	Echis carinatus	IV	14	Green bee eater	
6	Typhlops (Gandool)	IV	15	Hoopoe	
7	Python molurus	II	16	King fisher	IV
8	Eryx conicus	IV	17	Wood peckers	IV
9	Ptyas mucosus	II	18	Wag tail	
10	Natrix piscator	II	19	Black drongo	IV
11	Natrix stolata	II	20	Indian myna	IV
12	Lycodoll alilicus	IV	21	Indian robin	
			22	House sparrow	IV

3.9 LAND USE/LAND COVER

Land use Land cover studies are made as part of the environmental impact assessment studies to study if any impact is felt on the land use pattern of the study area due to the proposed project. Land use land cover studies are important in an irrigation project as it involves definite change in the land cover due to submergence.

3.9.1 Forest Area:

This area includes lands classed as forests under any legal enactment dealing with all forests or administered as forests whether state owned or private and whether wooded or maintained as potential forest land. On the contrary due to availability of the irrigation facilities, People of the entire command area will be motivated and encouraged to go for agriculture with renewed enthusiasm increasing the green cover in the study area.

3.9.2 Barren, Uncultivable and Non Agricultural Lands:

This area includes the area of barren and uncultivable lands put to non-agricultural purpose like village sites, roads, water, rocks and hills etc.

3.9.3 Crop Land Ecosystem:

This is also known as 'man made ecosystem 'or artificial ecosystem' because man tries to control biotic community and physical environment. The most important of these is an artificial force from man to maintain uniformity in the species composition of the producers, in addition to maintain a moisture level of the soil and replenishing nutrients at times. In such an ecosystem the animals also tend to be limited in diversity. In this ecosystem a particular animal species finds enough food and multiplies and become a pest. Here usually single species dynamics assumes a great prominence. The area falls under predominantly agriculture oriented. Rainfed farming and bore well irrigation characterize the agriculture in the area. The predominant crops grown in the study area is jowar and cotton. The existing crop pattern on the basis of data collected from Yavatmal collectrate is as follows.

Table 3.26

Existing cropping pattern

Total Command Area- 160050 ha

S. No	Crop	% of cropped area	Area in ha	Productivity in quintal/ha
1	Cotton	50	80025	10
2	Jowar (Hybrid)	28	44814	28
3	Tur	13	20805	8
4	Paddy drilled	1	1600	35
5	Mug	5	8003	7
6	Udid	3	4802	8
	Total	100	160050	96

Most of the rainfall is received from southwest or northeast monsoon period during which the main kharif crops are grown. The crop yield is moderate to poor based on the irrigational facilities.

In this cropland eco-system in addition to the crop raised, a number of weeds like Cynodon dactylon, Launaea nudicaulis, Euphorbia hirta, Cyperus rotundus, Digetaria sp. and Alysicarpus sp, contribute to the primary production and also cause damage to the crops. Insecticidal and pesticidal diseases are common.

The cropping pattern is based mainly on the climatic zone of the region giving and due regards to the soil of the area. The cash crops like chillies, turmeric, kharif & rabi vegetables as wells as oil seeds like sunflower are proposed to be introduced once adequate and timely supply of water is assured. The crop pattern for this project is approved by the Director of agriculture, Government of Maharashtra vide letter no. IRR/L.P.P/A.G.59/232 dt 19.03.96

Table 3.27

Proposed cropping pattern

Season	No	Name of crop	Percentage of cropped area	Productivity in quintal/ha
a) Two seasons	1	Cotton (medium staple)	20	20
	2	Chilles	04	8
	3	Turmeric	03	95
b) Kharif seasonal Irrigated	1	Hybrid Jowar	20	45
	2	Ground nut	15	25
	3	Sunflower	05	12
	4	Vegatables	10	150
c) Kharif seasonal un irrigated		pulses & fodder	23	10
		Total	100	365
d) Rabi Season	1	Wheat	05	25
	2	Rabbi Jowar	10	45
	3	Gram	10	20
	4	Sunflower	15	12
	5	Saffolwer	05	20
	6	Vegetable	10	150
		Total	65	272

3.9.4 Terrestrial Ecosystem:

The project is situated adjacent to the Tadsoli village in Ghatanji Tehsil, Yavatmal District. Most of the population in these area use fire wood some use Kerosene, LPG and cow dung cakes as fuel. The land in the surrounding villages is cultivated for Cotton, Maize, Jowar, Bajra, Sugarcane, and occasionally red gram. The study area is plain and have some reserved forests. There is no suitable habitat for more diversification of flora. However, one can see plant species that have wide ecological amplitude. There is no important germplasm that need to be conserved or preserved. Similarly there are no important medicinal plants that are uncommon to other areas.

Other than domestic animals and few reptiles no suitable habitat is found for wild animals except interiors of reserved forests. Similarly no migration route for any

fauna is observed in this direction There are no endangered or endemic species observed in the study area.

3.9.5 Conclusion:

The area under submergence upto RL 262 m measuring 15951.10 ha. This area lies in Kinwat Taluka of Nanded district and Pusad, Arni, and Ghatanji Taluka of Yavatmal district of Maharashtra. The details of the land under submergence is as in Table 3.28.

Table 3.28
Details of the land under submergence

S.NO	Taluka wise land	Area (ha.)
1	Kinwat	6171.56
2	Mahagaon	550.52
3	Arni	7408.12
4	Ghatanji	1820.90
	Total	15951.10
	Type of Land	
1	Government land	500.10
2	Forest Land	746.67
3	Private land	14704.33
	Total	15951.10

The change in the land use and land cover in the study area due to the project is to the extent of above-mentioned area, which will be submerged under water.

Other than the submergence area, which will have slight impact, over all, the project will have a positive impact on the land use/land cover, as provision of the irrigation facilities will give boost to the agriculture in the region. People will be even encouraged to cultivate the barren land. There are no national parks and wild life sanctuaries in the study area.

Hence it can be concluded that the project will not have any adverse impact on the land use/ land cover pattern of the area.

3.10 SOCIO ECONOMIC ASPECTS

Any developmental activity will have impact on the socio-economic conditions of the population in the region and thereby on the quality of life. In case of an Irrigation project, this is more relevant as the project is aimed at the overall socio economic development of the region with the participation of Government, local bodies and the population. Socio-Economic Impact Assessment helps to get an idea of changes on social, economic and cultural status of the villagers due to the implementation of the project. Baseline data for occupational status and health amenities existing in the study area has been collected by personal interaction with the villagers in the study area. The resettlement and rehabilitation plan is dealt in a separate chapter. This chapter details the socio economic conditions in the study area in general.

3.10.1 Reconnaissance:

Detailed socio-economic survey was carried out with in 10 km radius of the proposed barrage site to assess the baseline status. Focus of study was mainly on the Yavatmal district and particularly Ghatanji taluqa as the project will have major impact on the Ghatanji taluqa in Yavatmal district. Selected villages falling under the 10 km radius of the project site have been studied for the socio-economic profile. The following parameters have been selected.

1. Population
2. Housing
3. Occupational structure
4. Education & Literacy
5. Transport & Communication
6. Amenities
7. Economy

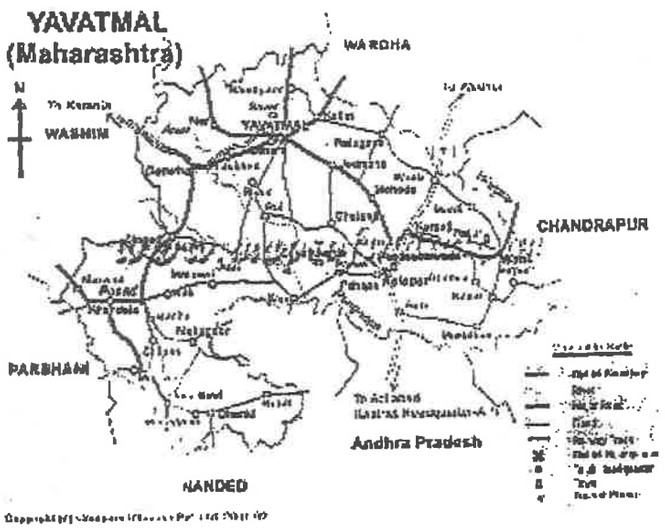
The information on the above parameters was collected from the villages in the study area by means of personal interaction with the villagers and head of the village. Secondary information was also collected from the district and taluqa handbooks. The statistical information pertaining to the Yavatmal and its neighboring district Nanded covered in the study area are taken from the Central Integrated Pest Management Centre site.

The taluqas getting affected by submergence are listed in Table 3.29

Table 3.29
Taluqas Covered in Study Area

S. No	Taluqa	District	State
1	Arni	Yavatmal	Maharashtra
2	Ghatanji	Yavatmal	Maharashtra
3	Managaon	Yavatmal	Maharashtra
4	Kinwat	Nanded	Maharashtra
5	Mahur	Nanded	Maharashtra
6	Some part of	Adilabad	Andhra Pradesh

The District maps of the two districts covered in the study area are shown as Figure 3.11.



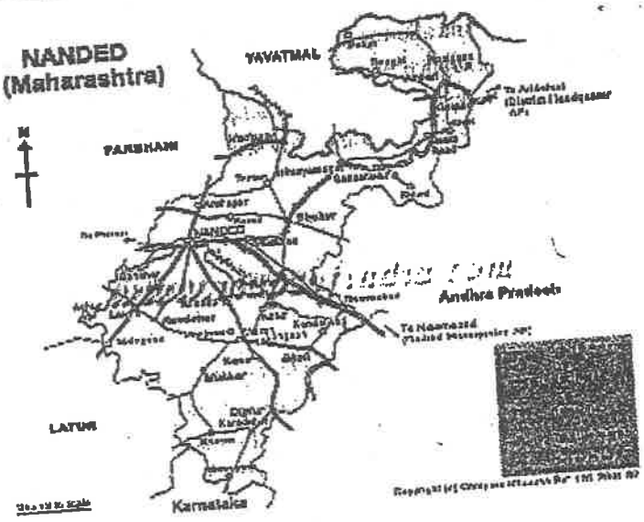


Figure 3.11
Map showing Yavatmal and Nanded district

3.10.2 Salient Observations:

- The study area is moderately populated, as it happens to cover most of the rural side of Maharashtra without touching the urban areas.
- The literacy rate in the rural areas is low to medium with lot of children seen working in the agricultural fields although schools are available in almost all the villages.
- Most of the population in the study area belongs to the category of Main workers, which includes Cultivators, Agriculture Laborers, workers those engaged in Household industries, Construction activities and other allied activities.
- Most of the houses in the villages are electrified.
- Main sources of water supply are the rivers, hand pumps and tanks in few villages.
- Market facilities are available in most of the villages. But the farmers prefer to sell their produce in near by towns.

- φ Communication facilities in the villages are poor, some of the villages having branch post offices and some of them having telephones. Police stations exist in all taluqa headquarters.
- φ There are no archeologically sensitive in the study area.

3.10.3 Population:

The study area is moderately populated, as most of the study area is rural in nature.

As per the census of 2001 the population of Yavatmal and Nanded districts are 2,460,482 and 2,868,158 with population density being 181 persons/km² and 272 persons/km² respectively. The sex ratio (females/1000 males) in Yavatmal is 942 and where as in Nanded is 943. The total urban and rural population of Yavatmal is 459,448 and 2,001,034 respectively where as the total urban and rural population of Nanded is 688,857 and 2,179,301 respectively.

3.10.4 Housing:

The term "House Hold" is defined in census as a group of persons who live together and would take their food from a common kitchen. Housing requirements directly depend on expected household sizes. If for instance, five persons per dwelling unit is normal, then the number of houses required can be calculated at least ten years in advance directly from this. Consideration is needed to be given for any possibility of residential sprawl and the area of land, which might be affected because of the subsequent impacts on agriculture and other activities.

Expansion of commercial and industrial activities will also have implications on land use. Considering the existing density, the demand for houses is not so alarming as there is lot of migration of the village population towards the more urbanized areas.

3.10.5 Power and Energy:

Most of the villages in the study area are electrified. But the power supply is not continuous and is erratic. Most of the households use traditional chullas with fuels like wood, coal, agricultural waste, cow dung cakes and balls etc. However it was observed that economically middle class and higher class people including

the employed class use LPG and kerosene stoves for cooking purposes. There are no signs of tapping renewable energies like solar energy, wind energy and wave energy.

3.10.6 Agriculture:

The main occupation of the area is agriculture. The area is having two main cropping seasons viz. kharif (June- September) and Rabi (October-Feb). The area is massively dependent on rainfall, which is average but erratic. Due to insufficient irrigation facilities, the productivity of land is moderate to low. The lands under the influence of the rivers and nallahs have good yields. Agriculture being mostly dependent on the vagaries of nature (Monsoon) the proposed irrigation project will be boon to the farmers of the region.

Most of the villagers hold agriculture lands and the rest who do not own an agricultural field normally work in fields.

a) Crops grown:

Traditionally in Maharashtra, the agriculture has been rain-fed, as limited area enjoyed assured irrigation. The main cropping season is Kharif coinciding with south west monsoon i.e. June to October and Rabi season extending from November to February coinciding with post monsoon and winter rains. Summer crops are grown only in areas with perennial irrigation. Later the surface irrigation and ground water irrigated areas increased and the Maharashtra has become a frontline state as regards to horticulture and sugar cane production. The state of Maharashtra is famous for Orange, Banana, Pomegranate, Grapes, Cheeku and Anjeer etc. production both in quality and quantity which are greatly depending on ground water based irrigation sources. However, sugar cane crops are mostly receiving surface irrigation.

The crops are grown mainly under rainfed condition. There are two distinct cropping seasons, Kharif and Rabi. The major crops grown in Yavatmal are Sugarcane, Wheat, Cotton, Grounnut. In Nanded district the principal kharif crops are jowar and cotton. Other kharif crops being paddy, tur, mung, urid, etc. The principal Rabi crops are Jowar & Wheat. Sugarcane and Bananas are grown throughout the year.

The horticulture cultivation in the districts is Banana and Sweet Lime (Mosambi). Nanded district is a major producer of banana, the other major horticulture produces of the district are Custard apple, Oranges, etc.

The probability of occurrence of all categories of drought in Vidarbha region varies from 10 per cent (Hinganghat, Wardha district) to 25 per cent of the years (Digras, Yavatmal district), Moderate drought conditions ranges from 8 per cent (Digras) to 23 per cent of the years (Arvi), while severe drought conditions were experienced in most parts of Vidarbha region. However, around Shegaon it is 7 per cent of the years. Only around Shegaon acute drought conditions occurred for one per cent of the years. Thus, the frequency of occurrence of drought in this region ranges from once in 10 years (Hinganghat) to once in four years (Digras).

b) Manures and Fertilizers:

Major part of the command area is under rain fed cultivation. As such use of chemical fertilizers is not as per recommendation, however all the farmers use FYM and compost. Only farmers growing sugarcane maize and vegetables by lifting River water use chemical fertilizers as per recommendation.

c) Livestock and Agricultural Implements:

The major live stock based activities in the district are dairy farming, poultry farming and goat rearing. For the promotion of these activities, the Animal Husbandry Department and the State Government & Zilla Parishad provide veterinary facilities, training facilities in dairy, poultry and goat farming and financial assistance under self employment schemes

Cattle, Buffaloes, sheep and goat form the major portion of livestock. The plough animal is still the bullock. Cows and buffaloes are reared for milk purpose. Few farmers also rear sheep, goat and poultry. Wooden plough still continues to be the most important implement, though improved implements like mould board ploughs are under use. Tractors play an important role in modern agriculture. Tractor drawn ploughs, discs, harrows and seed cum fertilizers drills, bound farmers are gaining popularity amongst the farmers. Recently many harvesting machines for threshing paddy, jowar and wheat are being used.

3.10.7 Occupation:

The agriculture and allied activities is the predominant occupation of the residents. A glance across the villages in the study area reveals that most of the women folk and children are also engaged in the agriculture. The area is not developed industrially. Hence the villagers have no other option than the agriculture.

Event though the lands are fertile, due to erratic pattern of rainfall and absence of assured irrigation supply the cultivators experience great distress and just manage to raise one crop whenever conditions are favorable. Thus full exploitation of the land resources available to reap maximum and assured harvest is not possible. There is, therefore an obvious need for supplying large and assured irrigation facilities to stabilize the erratic kharif out put and to encourage the practice of growing a second and even a third crop which can greatly add to the general food output of this deficit state. Further with development of irrigation in this area, a number of agro industries are expected to develop.

There are no major or medium scale industries. Some household activities like jaggery preparation, atta chekky etc are seen in the villages other than the agriculture.

The details of the industries (live and stalled projects) in the area are given in **Table 3.30.**

Table 3.30
Details of the industries in the Study area

Company	Project	Industry
Yavatmal District		
Government of India	Administrative Building	Business Complexes
Jai Chandika Sugar Mills Pvt.	Sugar	Sugar
Lloyds Steel Industries	Coal Mining Kumbarkhani UG	Coal
Raymond	Denim	Cloth & Denim
Shri Amruteshwar Sugar Factory	Sugar	Sugar
Vidarbha Irrigation Devp. Corpn.	Bembla River (Irrigation)	Irrigation
Western Coalfields	Coal Mining Nirguda OC	Coal
Nanded District		
Bhavani Sugars	Sugar	Sugar
Government of Maharashtra	Hospital (Loha)	Hospitals
	Bridge (Yeli)	Roadways
	Road Upgradation (Hadgaon)	Roadways
Jai Mahaveer Sugar Mills	Sugar	Sugar
Kai Bapurao Patil Khatgaonkar Sugars	Sugar	
Mauli Sugar Mills	Sugar	
Sangameshwar Foods & Fats	Sugar	
Shree Hanuman Sugar & Industries	Sugar	
Shree Sai Sugars	Sugar	

3.10.8 Education and Literacy

A person who can read and write with understanding in any one language is termed as "Literate". The percentage of literacy is not very high in the study area. The literacy percentage is increasing day by day owing to increase in the education institutions and also the increase in education options. The children from the surrounding villages are sent to the towns for schooling and higher education.

The literacy percentage in the districts of Yavatmal is 74.06% and Nanded is 68.32 % as per 2001 census. There are no engineering and medical colleges in the study area. However students from the villages go to colleges in Yavatmal, Ghatanji, Wani, Pandarkawda, Umarkhed, Pusad, Digras, Darwha in Yavatmal district and Nanded, Mudkhed, Waghala, Loha, Kandhar, etc in Nanded district for doing professional courses.

3.10.9 Medical Amenities

People in general appear to be healthy in villages compared to the people in the urban areas. The Yavatmal district has a network of government run health facilities consisting of the district hospital offering tertiary level care, with rural hospitals at the secondary level and primary health centers, sub-centres and dispensaries providing basic healthcare to the rural population, Nearly 20% of the villages have such primary health facilities (1991) covering nearly 42% of the rural population. The district has 2.29 beds per 1000 population in medical institutions in the urban areas (1991). The Nanded district has 4 PHCs with no dispensary and referral hospitals, it also has two government hospitals.

Most of the villages have medical facilities and due to improvement in transport and communication have access to the hospitals in the nearby towns. There is no dearth of private medical practitioners in the near by towns.

3.10.10 Transport & Communication

National highway no 7 Benaras-Nagpur-Hyderabad passes through the district. It also has number of state highways passing through the district. Of the total of 1,836 inhabited villages, 958 (52.18%) covering 71.75% of the rural population have access to transport services. In Yavatmal district 20% of the villages covering 43.56% of the rural population have postal facilities. The district has 19 post offices for a population of 100,000.

The total road length in the Nanded district as on March 1998 is 7670 kms. Major district roads is about 1647 kms and 853 kms is of other district roads. The length of village roads is about 3891 kms. About 2338kms of road length in the district is tarred. 4397 kms are stone, metal roads and 945 kms of road length in the district is made of other materials. The road length per 100 sq.km is 73.03 km, which is above the State figure of 62.08 kms per 100 sq.km. Major goods and Passenger

Transportation from and to the city is done by road. Maharashtra State Road Transport Corporation caters mainly to the passenger traffic need of the district. The MSRTC operates bus services to most cities of Maharashtra and also to the neighbouring States of Andhra Pradesh and Karnataka. As on 31.3.97, out of the 1515 of inhabited villages all weather roads are available only in 1116 villages.

The total net work in the Nanded district is fairly developed. There are about 459 Post Offices and 27 Telegraph Offices in the District. In addition there are about 51 Sub-Post Offices. In the rural area, 5 new branch post offices were opened in the current financial year. All the gram panchayats in the district has telephone link. As at the end of March 1998 about 22806 telephones have been installed in the district

3.10.11 Culture:

People of various cultures are residing in this area. The percentage of Hindus is dominating in the rural areas followed by Muslims and Christians. Each religion has its own share in this overall cultural development. No communal problems have been noticed in the villages. There are no major facilities in the rural areas to show case the culture. However the culture and traditions come to fore during the major fairs and festivals.

The Socio economic details of the two districts in brief are given in Table 3.31 and 3.32. The socio economic details of the tehsils covered in the study area from Yavatmal district are given in Table 3.33.

Table 3.31

Socioeconomic details in brief of Yavatmal District

Yavatmal

Population (2001 census): 2,460,482 **Literacy rate (2001):** 74.06%

Below poverty line: 34% **Infant mortality rate (IMR):** 16

Getting there >>

Air: Nagpur is the nearest airport (139 kms), linked to Mumbai (776 kms). Other airports in the vicinity are Aurangabad (288 kms) and Pune (475 kms).

Rail: Connected by rail, with a station at Yavatmal (narrow gauge line).

Road: State highways and roads from the district headquarters at Yavatmal link all 16 tehsils (subdistricts) and major towns. National highway No 7 passes through the district.

:: Physical

Geographical location: Between 19°26' and 20°42' North latitudes and 77°18' to 79°98' East longitudes in eastern part of the state

Area: 13,584 sq km

Adjoining districts: North and northeast: Amravati and Wardha districts; east: Chandrapur; south: Nanded district and Adilabad district of Andhra Pradesh; west and southwest: Akola and Parbhani districts

Major urban centres: Yavatmal, Wani, Pandarkawda, Ghatanji, Umarkhed, Pusad, Digras, Darwha

Major crops: Sugarcane, wheat, cotton, groundnut

Major rivers: Penganga, Wardha, Arna, Pus, Kuhi, Waghari

Total no. of sub-districts: 16

:: Demography (2001 census)

Population: 2,460,482

Density of population (persons/sq km): 181

Men: 1,267,117

Women: 1,193,365

Total rural population: 2,001,034

Total urban population: 459,448

% of Scheduled castes: 10.92 %

% of Scheduled tribes: 21.46 %

Sex-ratio (females/1000 males): 942

:: Social development indicators (2000-01)

Below poverty line: 34%

Infant mortality rate (IMR): 16

Maternal mortality rate: 0.7

Birth rate: 18.1

Death rate: 4.5

:: Climate

Max temp in °C: 44.2°C
Min temp in °C: 4.8°C
Average rainfall in mm: 1029 mm

Economy

Industries: Ginning and pressing, handmade paper, weaving, oil mills, nylon ropes
Industrial centres: Waghapur, Digras, Darwha, Pophali, Pusad, Umarkhed, Wani, Rajur, Patanbori, Umari, Ralegaon, Babhulgaon
Main markets: Lohara, Pusad, Wani, Darwha, Digras, Umarkhed, Ghatanji
Main banking centres: Yavatmal Wani, Darwha, Digras, Ghatanji, Kelapur

Disaster vulnerability

Flood: Heavy floods in 1994
Earthquake: Yes
Cyclone: No
Drought: Yes
Relief machinery: Drilling rigs: 11 (GSDA: 10, private: 1), mobile X-ray units 1 (Health dept); mobile trauma care units 1

Medical facilities

Hospitals: 7 government hospitals; Ambulances- 3 (government), 1 (private)
Health facilities: The district has a network of government-run health facilities consisting of the district hospital offering tertiary level care with rural hospitals at the secondary level and primary health centres, sub-centres and dispensaries providing basic healthcare to the rural population. Nearly 20% of the villages have such primary health facilities (1991) covering nearly 42% of the rural population. The district has 2.29 beds per 1,000 population in medical institutions in the urban areas (1991).
Blood banks: 3 (government)

Language

Language: The principal language is Marathi but the tribal populations speak tribal dialects such as Banjara and Gond.

Food

Food: Roti and sabji (vegetables)

Transportation and communication

Post and telegraph services: Nearly 20% of the villages, covering 43.65% of the rural population, have postal facilities. The district has 19 post offices for a population of 100,000
State highways passing through the district and road services: National Highway No 7, Benaras--Nagpur—Hyderabad passes through the district. The following state highways pass through: Akola--Mangarulpir--Digras, Nagpur--Bori—Ardhapur--Tuljapur; Yavatmal--Murtijapur--Anjangaon—Baitul Yavatmal--Badnera; Darwha--Pusad--Umarkhed—Yavatmal--Deogaon--Dhamangaon; Wani--Shirpur--Shindola Yavatmal-Karanja--Varora--Kanapa and DeulgaonRaja--Washim--

Pusad--Mandvi--Pandharkaoda road. Of the total of 1,836 inhabited villages, 958 (52.18%) covering 71.75% of the rural population, have access to transport services.

Important railway stations and railway services: Yavatmal, Darwha, Larkher

:: Voluntary agencies

Hirachand Ratanchand Munot Trust

Yevatmal Indian Red Cross Society

Yevatmal Shatkari Samajik Nyas

Pusad Hanuman Vyayam Shala & Krida Mandal

Yevatmal Lions Club
Wani

:: Culture and Religion

Fairs and festivals: Major fairs held in the district are: the Ghanti Baba at Digras and the Shri Ranganath Swami at Wani. The other annual fairs are: the Shri Chintamani at Kalamb, the Maroti Maharaj fair at Ghatanji, the Datta Jayanti at Mahur, the Jambhora and Mahashivratri at Wani, Tapona, Pusad and Mahagaon.

Religious places: Kalamb, Arni, Ghatanji, Jugad, Wani, Kapeshwar

History: Yavatmal was the main town of Berar. In 1347 it was included in the dominion of Alauddin Bahamani Shah, founder of the Bahamani dynasty. In 1572 the ruler of Ahmednagar annexed the district. In 1596, Chand Bibi the Queen of Ahmednagar, ceded it to the Mughals. After the death of Aurangzeb, the Mughal king in 1707, it passed on to the Marathas. In 1738 Raghuji Bhosala became the ruler of Nagpur and he held the district as part of his kingdom. In 1853, the British East India Company took over Berar. In 1863, Yavatmal became part of East Berar district and later of Southeast Berar district, which were districts of the Central Provinces (CP). After independence in 1956 with the reorganisation of states, Yavatmal was transferred from Madhya Pradesh (CP) to Bombay state, and in 1960, with the formation of Maharashtra, it became a district of that state.

Table 3.32

Socioeconomic details in brief of Nanded District

Nanded

Population (2001 census): 2,868,158 **Literacy rate (2001):** 68.32%

Below poverty line: 37% **Infant mortality rate (IMR):** 10

Getting there >>

Air: Aurangabad is the nearest airport (260 kms). Aurangabad airport is linked to Mumbai. Pune is another airport located close by

Rail: Connected by rail (broad gauge and metre gauge line) with a station at Nanded. Osmanabad is 216 kms away. Pune 456 kms and Mumbai 595 kms away.

Road: All 16 tehsils (subdistricts) and major towns are linked by road from the district headquarters at Nanded.

Physical

Geographical location: Between 18°15' to 19°55' North latitude and 77° to 78°25' East longitudes

Area: 10,332 sq km (3.41 % of the state)

Adjoining districts: North: Yavatmal district; southeast: Latur district, northwest: Parbhani district; east and southeast: Adilabad and Nizamabad districts of Andhra Pradesh; south: Bidar district of Karnataka

Major urban centres: Nanded, Mudkhed, Waghala, Loha, Kandhar, Mukhed, Deglur, Bilol, Kondalwadi, Dharmabad, Umri, Hadgaon, Kinwat

Major crops: Sugarcane, banana, cotton

Major rivers: Godavari, Manjra, Penganga

Total no. of sub-districts: 16

Demography (2001 census)

Population: 2,868,158

Density of population (persons/sq km): 272

Men: 1,476,301

Women: 1,391,857

Total rural population: 2,179,301

Total urban population: 688,857

% of Scheduled castes: 18.15 %

% of Scheduled tribes: 11.84 %

Sex-ratio (females/1000 males): 943

Social development indicators (2000-01)

Below poverty line: 37%

Infant mortality rate (IMR): 10

Maternal mortality rate: 1.0

Birth rate: 11.2

Death rate: 2.7

Climate

Max temp in °C: 41°C

Min temp in °C: 11°C

Average rainfall in mm: 1022 mm

Economy

Industries: Woodcutting, ginning and pressing, oil mills, sugar industries

Industrial centres: Nanded, Deglur, Umari, Dharmabad, Naygaon Bazare

Main markets: Nanded, Mudkhed, Waghala, Loha, Kandhar, Mukhed, Deglur, Biloli, Kondalwadi

Main banking centres: Dharmabad, Naygaon Bazar, Mukhed, Deglur, Biloli, Kondalwadi

:: Disaster vulnerability

Flood: History of frequent floods due to heavy rainfall and release of water from irrigation projects

Earthquake: Yes

Cyclone: Likelihood of cyclones because of proximity to Andhra Pradesh

Drought: Yes

Relief machinery: Earth-moving equipment: 29 (SE Mech Circle); drilling rigs: 1 (GSDA, Nanded); mobile cranes: 1 (SE Mech Circle); wireless sets: 148

:: Medical facilities

Hospitals: 2 government hospitals

Health facilities: There are only 4 PHCs in the district with no dispensary and referral hospitals.

Blood banks: 1 (government), 1 (private)

:: Language

Language: Marathi, and occasionally Hindi.

:: Food

Food: Rotis made of millets are the staple food of the people. Rice is sometimes eaten.

:: Transportation and communication

Post and telegraph services: 466 post offices, 34 telegraph offices

State highways passing through the district and road services: 1271 kms of state highway; State Transport (bus) depots: 9

Important railway stations and railway services: 208 kms of railway line; 4 stations with mail/express halts: Nanded, Mudkhed on broad gauge, Umri, Dharmabad on metre gauge. Important stations are at Nanded, Mugat, Murkhed, Bhokar,Eaglepur Dhanura, Kinwat

:: Voluntary agencies

Sai Sevabhavi Trust
Nanded Gramodaya. At Suknoor
Post Barahali, Mukhed

Mahesh Rural & Urban Development Trust
Nanded Mahesh Rural & Urban Development Trust
Nanded

Social Democrats Organisation of
Multipurpose Research & Training Development
Nanded

Chetna Jun Vikas Mandal
Hira Nagar, Barahali
Mukhed

:: Culture and Religion

Fairs and festivals: Pausha Pournima (January) every year, Mahashivratri, during the

month of February

Religious places: Nandeo Malegaon, Mahur, Unkeshwar, Gortha

History: NA

Table 3.33 - Socio Economic details Tehsil wise in study area of Yavatmal district as per Census 2001

NAME-Tehsil	TRU	1	2	3	4	5	6	7	8	9	10	11	12
Digras	Total	26404	134928	69822	65106	21722	11272	10450	11387	5850	5537	17846	9237
Digras	Rural	19357	95750	49561	46189	16251	8422	7829	8026	4125	3901	15255	7883
Digras	Urban	7047	39178	20261	18917	5471	2850	2621	3361	1725	1636	2591	1354
Pusad	Total	54976	285458	147458	138000	47347	24573	22774	28726	14444	14282	40003	20591
Pusad	Rural	42429	218292	112869	105423	37519	19466	18053	21182	10708	10474	37115	19136
Pusad	Urban	12547	67166	34589	32577	9828	5107	4721	7544	3736	3808	2888	1455
Mahagaon	Total	32020	158230	81779	76451	27827	14434	13393	15282	7828	7454	22520	11576
Mahagaon	Rural	32020	158230	81779	76451	27827	14434	13393	15282	7828	7454	22520	11576
Mahagaon	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Arni	Total	30169	139861	72074	67787	22078	11464	10614	12674	6441	6233	25729	13156
Arni	Rural	30169	139861	72074	67787	22078	11464	10614	12674	6441	6233	25729	13156
Arni	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Ghatanji	Total	27304	125214	64249	60965	18075	9273	8802	10658	5517	5141	38259	19416
Ghatanji	Rural	23281	105867	54099	51768	15631	7962	7669	8328	4317	4011	36037	18210
Ghatanji	Urban	4023	19347	10150	9197	2444	1311	1133	2330	1200	1130	2222	1206
Zari-Jamani	Total	16187	72239	36639	35600	10445	5377	5068	4202	2134	2068	29383	14830
Zari-Jamani	Rural	16187	72239	36639	35600	10445	5377	5068	4202	2134	2068	29383	14830
Zari-Jamani	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Wani	Total	42259	193713	99846	93867	25706	13343	12363	17136	8773	8363	26576	13576
Wani	Rural	29093	129204	66669	62535	17248	8956	8292	9312	4825	4487	21338	10884
Wani	Urban	13166	64509	33177	31332	8458	4387	4071	7824	3948	3876	5238	2692

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Table 3.33 - Socio Economics details Tehsil wise in study area of Yavatmal district as per Census 2001 (Cont.)

NAME-Tehsil	TRU	13	14	15	16	17	18	19	20	21	22	23	24
Digras	Total	8609	80966	48632	32334	53962	21190	32772	57385	35260	22125	50392	33016
Digras	Rural	7372	52968	32815	20153	42782	16746	26036	45721	25651	20070	39372	23732
Digras	Urban	1237	27998	15817	12181	11180	4444	6736	11664	9609	2055	11020	9284
Pusad	Total	19412	171053	104086	66967	114405	43372	71033	119605	70875	48730	103420	65148
Pusad	Rural	17979	121864	76684	45180	96428	36185	60243	100853	55331	45522	85566	50100
Pusad	Urban	1433	49189	27402	21787	17977	7187	10790	18752	15544	3208	17854	15048
Mahagaon	Total	10944	87308	54308	33000	70922	27471	43451	76473	42650	33823	65117	38449
Mahagaon	Rural	10944	87308	54308	33000	70922	27471	43451	76473	42650	33823	65117	38449
Mahagaon	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Arni	Total	12573	82093	49700	32393	57768	22374	35394	64928	38419	26509	56174	35581
Arni	Rural	12573	82093	49700	32393	57768	22374	35394	64928	38419	26509	56174	35581
Arni	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Ghatanji	Total	18843	76369	45262	31107	48845	18987	29858	62664	35497	27167	48996	30346
Ghatanji	Rural	17827	62073	37207	24866	43794	16892	26902	55638	30392	25246	42471	25437
Ghatanji	Urban	1016	14296	8055	6241	5051	2095	2956	7026	5105	1921	6525	4909
Zari-Jamani	Total	14553	40410	24236	16174	31829	12403	19426	39880	20962	18918	34445	18802
Zari-Jamani	Rural	14553	40410	24236	16174	31829	12403	19426	39880	20962	18918	34445	18802
Zari-Jamani	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Wani	Total	13000	132021	75217	56804	61692	24629	37063	87300	54769	32531	73812	49656
Wani	Rural	10454	85122	49133	35989	44082	17536	26546	67382	38335	29047	56394	34594
Wani	Urban	2546	46899	26084	20815	17610	7093	10517	19918	16434	3484	17418	15062

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Table 3.33 - Socio Economics details Tehsil wise in study area of Yavatmal district as per Census 2001 (Cont.)

NAME-Tehsil	TRU	25	26	27	28	29	30	31	32	33	34	35	36
Digras	Total	17376	13099	9188	3911	26068	13759	12309	487	368	119	10738	9701
Digras	Rural	15640	12477	8603	3874	23514	12200	11314	339	249	90	3042	2680
Digras	Urban	1736	622	585	37	2554	1559	995	148	119	29	7696	7021
Pusad	Total	38272	29984	18649	11335	48500	24845	23655	1200	747	453	23736	20907
Pusad	Rural	35466	29278	18000	11278	46388	23691	22697	860	552	308	9040	7857
Pusad	Urban	2806	706	649	57	2112	1154	958	340	195	145	14696	13050
Mahagaon	Total	26668	25984	15537	10447	31104	15875	15229	712	481	231	7317	6556
Mahagaon	Rural	26668	25984	15537	10447	31104	15875	15229	712	481	231	7317	6556
Mahagaon	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Arni	Total	20593	19519	13306	6213	28846	15538	13308	474	362	112	7335	6375
Arni	Rural	20593	19519	13306	6213	28846	15538	13308	474	362	112	7335	6375
Arni	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Ghatanji	Total	18650	18857	12106	6751	22192	11477	10715	643	466	177	7304	6297
Ghatanji	Rural	17034	18402	11738	6664	19913	10283	9630	493	359	134	3663	3057
Ghatanji	Urban	1616	455	368	87	2279	1194	1085	150	107	43	3641	3240
Zari-Jamani	Total	15643	16004	8931	7073	14663	6753	7910	391	297	94	3387	2821
Zari-Jamani	Rural	15643	16004	8931	7073	14663	6753	7910	391	297	94	3387	2821
Zari-Jamani	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Wani	Total	24156	23479	14100	9379	21283	10253	11030	908	702	206	28142	24601
Wani	Rural	21800	23128	13826	9302	20682	9938	10744	658	546	112	11926	10284
Wani	Urban	2356	351	274	77	601	315	286	250	156	94	16216	14317

Table 3.33 - Socio Economics details Tehsil wise in study area of Yavatmal district as per Census 2001 (Cont.)

NAME-Tehsil	TRU	37	38	39	40	41	42	43	44	45	46	47	48
Digras	Total	1037	6993	2244	4749	1218	370	848	5189	1497	3692	111	30
Digras	Rural	362	6349	1919	4430	1202	360	842	4884	1404	3480	78	18
Digras	Urban	675	644	325	319	16	10	6	305	93	212	33	12
Pusad	Total	2829	16185	5727	10458	2105	581	1524	12382	4070	8312	299	85
Pusad	Rural	1183	15287	5231	10056	2076	577	1499	12144	3946	8198	194	61
Pusad	Urban	1646	898	496	402	29	4	25	238	124	114	105	24
Mahagaon	Total	761	11356	4201	7155	2104	789	1315	8234	2822	5412	297	87
Mahagaon	Rural	761	11356	4201	7155	2104	789	1315	8234	2822	5412	297	87
Mahagaon	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Arni	Total	960	8754	2838	5916	1433	436	997	6595	1915	4680	140	40
Arni	Rural	960	8754	2838	5916	1433	436	997	6595	1915	4680	140	40
Arni	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Ghatanji	Total	1007	13668	5151	8517	1872	725	1147	10596	3663	6933	199	69
Ghatanji	Rural	606	13167	4955	8212	1839	714	1125	10352	3614	6738	174	65
Ghatanji	Urban	401	501	196	305	33	11	22	244	49	195	25	4
Zari-Jamani	Total	566	5435	2160	3275	839	340	499	4207	1533	2674	99	57
Zari-Jamani	Rural	566	5435	2160	3275	839	340	499	4207	1533	2674	99	57
Zari-Jamani	Urban	0	0	0	0	0	0	0	0	0	0	0	0
Wani	Total	3541	13488	5113	8375	1696	454	1242	8860	2653	6207	180	83
Wani	Rural	1642	10988	3741	7247	1678	450	1228	8316	2556	5760	122	67
Wani	Urban	1899	2500	1372	1128	18	4	14	544	97	447	58	16

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Table 3.33 - Socio Economics details Tehsil wise in study area of Yavatmal district as per Census 2001 (Cont.)

NAME-Tehsil	TRU	49	50	51	52	53	54	55
Digras	Total	81	475	347	128	77543	34562	42981
Digras	Rural	60	185	137	48	50023	23910	26119
Digras	Urban	21	290	210	80	27514	10652	16862
Pusad	Total	214	1399	991	408	165853	76583	89270
Pusad	Rural	133	873	647	226	117439	57538	59901
Pusad	Urban	81	526	344	182	48414	19045	29369
Mahagaon	Total	210	721	503	218	81757	39129	42628
Mahagaon	Rural	210	721	503	218	81757	39129	42628
Mahagaon	Urban	0	0	0	0	0	0	0
Arni	Total	100	586	447	139	74933	33655	41278
Arni	Rural	100	586	447	139	74933	33655	41278
Arni	Urban	0	0	0	0	0	0	0
Ghatanji	Total	130	1001	694	307	62550	28752	33798
Ghatanji	Rural	109	802	562	240	50229	23707	26522
Ghatanji	Urban	21	199	132	67	12321	5045	7276
Zari-Jamani	Total	42	290	230	60	32359	15677	16682
Zari-Jamani	Rural	42	290	230	60	32359	15677	16682
Zari-Jamani	Urban	0	0	0	0	0	0	0
Wani	Total	97	2752	1923	829	106413	45077	61336
Wani	Rural	55	872	668	204	61822	28334	33488
Wani	Urban	42	1880	1255	625	44591	16743	27848

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834
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Table 3.33 - Socio Economics details Tehsil wise in study area of Yavatmal district as per Census 2001 (Cont.)

1	No_HH	Number of House holds	28	MAIN_CL_F	Main Cultivators – Female
2	TOT_P	Total Population	29	MAIN_AL_P	Main Agricultural Labourers - Total
3	TOT_M	Total Male Popultation	30	MAIN_AL_M	Main Agricultural Labourers - Male
4	TOT_F	Total Female Population	31	MAIN_AL_F	Main Agricultural Labourers - Female
5	P_06	Population age group 0-6	32	MAIN_HH_P	Main House Hold - Total
6	M_06	Male Population age group 0-6	33	MAIN_HH_M	Main House Hold - Male
7	F_06	Female Population age group 0-6	34	MAIN_HH_F	Main House Hold - Female
8	P_SC	Schedule caste – Total	35	MAIN_OT_P	Main Others - Total
9	M_SC	Schedule caste – Male	36	MAIN_OT_M	Main Others - Male
10	F_SC	Schedule Case – Female	37	MAIN_OT_F	Main Others - Female
11	P_ST	Schedule Tribe – Total	38	MARGWORK_P	Marginal workers – Total
12	M_ST	Schedule Tribe – Male	39	MARGWORK_M	Marginal workers – Male
13	F_ST	Schedule Tribe – Female	40	MARGWORK_F	Marginal workers - Female
14	P_LIT	Literates - Total	41	MARG_CL_P	Marginal Cultivators - Total
15	M_LIT	Literates - Male	42	MARG_CL_M	Marginal Cultivators - Male
16	F_LIT	Literates – Female	43	MARG_CL_F	Marginal Cultivators - Female
17	P_ILL	Illiterates – Total	44	MARG_AL_P	Marginal Agricultural Labourers - Total
18	M_ILL	Illiterates - Male	45	MARG_AL_M	Marginal Agricultural Labourers - Male
19	F_ILL	Illiterates - Female	46	MARG_AL_F	Marginal Agricultural Labourers - Female
20	TOT_WORK_P	Total Workers	47	MARG_HH_P	Marginal House Hold - Total
21	TOT_WORK_M	Total Workers - Male	48	MARG_HH_M	Marginal House Hold - Male
22	TOT_WORK_F	Total Workers – Female	49	MARG_HH_F	Marginal House Hold - Female
23	MAINWORK_P	Main Workers - Total	50	MARG_OT_P	Marginal Others - Total
24	MAINWORK_M	Main workers – Male	51	MARG_OT_M	Marginal Others - Male
25	MAINWORK_F	Main Workers – Female	52	MARG_OT_F	Marginal Others - Female
26	MAIN_CL_P	Main Cultivators - Total	53	NON_WORK_P	Non workers – Total
27	MAIN_CL_M	Main Cultivators – Male	54	NON_WORK_M	Non Workers – Male
			55	NON_WORK_F	Non Workers – Female

SOCIO-ECONOMIC PROFILES OF PROJECT AFFECTED PERSONS

3.11 Preamble

The proposed Land Acquisition (LA) for the project is likely to affect many land owners due to the compulsory land acquisition and relocation of the affected families, presently residing in various villages within the project area. The land owners of the project affected area, whose lands are proposed for acquisition, are referred as the Project Affected Person (PAP). These project affected persons of the project area classified into the following two types:

- Homestead affected PAPs who would be displaced from their present residential site; and
- Only Land affected PAPs.

The Rehabilitation and Resettlement is one of the most sensitive issues of any project involving land acquisition, because of the simple fact that the oustees may lose their total land holding for the project and may become landless. Thus, the project, which is presumably intended to benefit the people of the project area, may tend to injure the very people, who contribute for the success of the project by giving up their lands. The common approach of many such projects, where there are no direct benefits from the project, has been to compensate the project affected persons with monetary compensation that too only to the extent of land directly lost by the landowners.

3.11.1 Project Affected Person (PAF's) due to Land Acquisition

The total land requirement for the Penganga River Project is about 15951.10 ha, of which about 14693.33 ha belong to the private landowners 510.10 ha is under the ownership of Government of Maharashtra & the remaining 746.67 ha is under the ownership of forest department. The land acquisition has been proposed from 46 villages of the project affected area which includes 32 fully affected villages which would be submerged due to the inundation of the reservoir and 14 partially affected villages whose lands would be partially affected while their houses are

not affected. In all the villages about 16328 private land units consisting of homesteads and agricultural lands have been proposed for acquisition for various components of the project.

VIDC has identified about 8136 houses in 32 fully & 14 partially affected villages of the project area, which would be required to be demolished and resettled elsewhere in the resettlement colonies. The land ownership records show that the PAFs are having multiple land ownership patterns. The summary of the project affected villages due to private land acquisition is presented in Table 3.34.

Table 3.34
DATIALS OF PROJECT DISPLACED FAMILIES UNDER LAND ACQUISITION

S. No	Particulars as per Land Records	Land and Homestead Oustees
1	Fully Affected Villages	32
2	Partially Affected Villages	14
3	Total Villages Affected	46
4	Affected Houses and Homesteads	8136
5	Affected Land Units	About 12000
6	Only Land Affected Families	About 6500
7	Total Homestead and Land Affected Families (PAFs)	8136

The data related to the Project Affected Persons, whose lands are proposed for acquisition for the project, have been collected from VIDC, who initially identified the PAFs based on the land records of respective revenue villages of the project affected area, where the land acquisition has been proposed.

Altogether about 12000 private land units/plots will be acquired for all the components of the project. The proposals for acquisition include the following categories:

- Irrigated Agricultural Lands

- Dry lands
- Homestead Lands

Village-wise number of plots proposed for acquisition for all the project components is presented in Table 3.35.

TABLE-3.35

VILLAGE-WISE NUMBER OF LAND PLOTS PROPOSED FOR ACQUISTION

Sr. No.	Villages Name	Taluk	District	No. of Houses	Population	Affected
1	Khadka	Arni	Yavatmal	197	1009	Fully
2	Chimta	Arni	Yavatmal	41	178	Fully
3	Ayata	Arni	Yavatmal	222	1076	Fully
4	Jalandri	Arni	Yavatmal	23	102	Fully
5	Kawatha (BK)	Arni	Yavatmal	117	523	Fully
6	Umari	Arni	Yavatmal	346	1523	Fully
7	Gudha	Arni	Yavatmal	42	194	Fully
8	Amboda	Arni	Yavatmal	186	835	Fully
9	Palasi	Arni	Yavatmal	226	1034	Fully
10	Kapeshwar	Arni	Yavatmal	147	589	Fully
11	Sakhara (Tanda)	Arni	Yavatmal	170	833	Fully
12	Warud (Tuka)	Arni	Yavatmal	100	507	Fully
13	Datodi	Arni	Yavatmal	197	871	Fully
14	Dhanora (Rani)	Arni	Yavatmal	396	1410	Fully
15	Bilayata	Ghatanji	Yavatmal	97	486	Fully
16	Manusdari	Ghatanji	Yavatmal	181	745	Fully
17	Yerul	Ghatanji	Yavatmal	61	259	Fully
18	Ratnapur	Ghatanji	Yavatmal	124	648	Fully
19	Kopri	Ghatanji	Yavatmal	96	440	Fully
20	Kapsi	Ghatanji	Yavatmal	18	86	Fully
21	Kawatha (Kh)	Ghatanji	Yavatmal	127	574	Fully
22	Yedsi	Ghatanji	Yavatmal	70	216	Fully
23	Koli (Kh)	Ghatanji	Yavatmal	153	691	Fully

24	Kawatha (Bz)	Arni	Yavatmal	398	858	Partially
25	Mukindpur	Arni	Yavatmal	123	545	Partially
26	Sadoba Sawali	Arni	Yavatmal	655	3102	Partially
27	Donwada	Arni	Yavatmal	80	300	Partially
28	Zopalwadi	Arni	Yavatmal	107	437	Partially
29	Sakur	Arni	Yavatmal	155	647	Partially
30	Ghoti	Ghatanji	Yavatmal	359	1828	Partially
31	Dahisawali	Mahalgaon	Yavatmal	230	1049	Partially
32	Dhanwad (Dhanoda)	Mahalgaon	Yavatmal	233	1106	Partially
33	Bhosa	Mahalgaon	Yavatmal	317	1374	Partially
34	Anantwadi	Mahalgaon	Yavatmal	122	542	Partially
35	Sindkhed	Mahur	Nanded	294	1347	Fully
36	Bond-gavhan (Chaufula)	Mahur	Nanded	120	535	Fully
37	Karalgaon	Mahur	Nanded	61	265	Fully
38	Vasram Naik (Tanda)	Mahur	Nanded	177	958	Fully
39	Wadsa	Mahur	Nanded	296	1580	Fully
40	Padsa	Mahur	Nanded	239	1261	Fully
41	Ner	Mahur	Nanded	46	196	Fully
42	Khambala	Kinwat	Nanded	275	1417	Fully
43	Pathari	Kinwat	Nanded	160	907	Fully
44	Rampur	Kinwat	Nanded	112	609	Partially
45	Dhanora (Sindkhed)	Kinwat	Nanded	60	276	Partially
46	Chinchkhed	Kinwat	Nanded	180	841	Partially
	Total			8136	36809	

proposed for acquisition through a comprehensive socio-economic household surveys.

The outcome of this study would enable Penganga River Project to review the changes that are likely to result after implementation of the project, and take necessary measures for negating the likely impacts due to the land acquisition for the project, if any in future in the best interests of the project authorities as well as the PAF's from whom the land would be acquired and the neighbouring communities around the proposed project area.

This study highlights the need for rehabilitation measures to be undertaken to minimize the anticipated losses due to the land and property acquisition for the project and introducing some income-restoration and income-generation schemes after the land acquisition.

VIDC has already identified the land required for various components of the project and also identified the landowners through the field surveys conducted by them. The land acquisition for the project would be done under the provisions of the Land acquisition Act 1994.

3.11.4 Objectives of the Surveys

For establishing the prevailing socio-economic conditions of the PAF's, comprehensive socio-economic household surveys have been conducted in the entire project affected villages where the land acquisition has proposed. These surveys have primarily been conducted with the following objectives:

- To identify the number of Project Affected Families (PAF's) that will be affected by the project due to the Land and Property Acquisition;
- To study the demographic profiles, literacy levels of the PAF's;
- To generate detailed baseline information on the socio-economic status and occupational structure of PAPs affected by the project, in terms of workers and non-workers;
- To study the landholding and land-use pattern of PAPs in terms of irrigated and un-irrigated area and assess the extent of land lost by them for the project.

3.11.2 Project Affected Person (PAPs)

The land units/plots proposed for the project consist of the following types of lands:

- Irrigated Agricultural Lands
- Dry lands
- Homestead Lands
- Streams
- Roads
- Government Lands

All the water bodies such as streams and tanks are under the ownership of Government of Maharashtra. The ownership of many vacant and grazing lands is vested with Government of Maharashtra.

3.11.3 Socio-Economic Status of the Project Affected persons

The land and property acquisition for the project may alter the socio-economic conditions of the land losers and the displaced families and will have some impact on their standard of living of the affected families after the land acquisition for the project. In order to establish the prevailing baseline socio-economic conditions of the project affected persons before land acquisition for the project and to generate the required information for developing a meaningful and satisfactory Resettlement and Rehabilitation Action Plan the data from the submergence area has been collected.

The required data has been collected using a variety of techniques such as household surveys, discussions with land owners, Government departments, NGOs, etc. The tasks covered in these components are:

- Identification of all the families who would lose their houses and other assets on account of land acquisition for the project, by verification of land ownership records of the Revenue Department of Government of Maharashtra; and
- Collection of demographic and socio-economic data of all the available PAF's who are currently deriving livelihood and residing on the land

- To study the cropping pattern and crop yields from the affected lands;
- To assess the baseline conditions on housing, infrastructure facilities, immovable assets like agricultural and non-agricultural lands and movable assets such as agricultural implements, livestock etc;
- To assess the average income and expenditure pattern of affected households;
- To study the infrastructure facilities available in the villages affected by the proposed project;
- To assess various types of losses arising out of the project to assess the quantum of land lost/affected by each affected household in the project area;
- To identify vulnerable families and indigenous groups who are likely to be affected most, due to the proposed project;
- To enquire about the major problems faced by the PAF's and their expectations for better life after LA for the project;
- To know the expectations of PAF's from the project and the RRAP
- To identify the requirements of PAF's for their better future after the land acquisition;
- Knowing their preferences in selecting appropriate income restoration schemes that may be introduced among the PAF's for regaining their lost income due to land acquisition, which will be used in developing the RRAP;
- To identify appropriate income restoration schemes for those PAF's, who may not be in a position to identify their priorities in selection of income restoration scheme; and
- For developing an appropriate RRAP for mitigating all the adverse affects that are likely to result due to the project and acceptable to most of the PAF's.
- To have a feedback from PAF's for developing suitable measures for their socio-economic upliftment after LA for the project.

3.11.5 Indicators of Socio-Economic Development

In this study the enquiry was focused on the following main indicators of the socio-economic development.

Family

In the survey it is focused to find out the number of families affected through land acquisition by VIDC. The study may indirectly throw some light on the social aspects that may change due to land acquisition, migration, rehabilitation, etc. due to the project.

Income, Expenditure and Standard of Living

Perhaps the most important effect of land acquisition would be on the income, expenditure and standard of living of the affected families. This has been studied in detail for understanding the present situation and recommending various improvement measures for the economic upliftment of the PAF's after the LA.

Aspiration for Better Life

What are the people's perceptions for better life and will the land acquisition change their life for the better or worse? This aspect has also been covered in this study.

3.11.6 Methodology Adopted for the Surveys

A comprehensive questionnaire was designed to cover concrete details on all the above aspects from each affected family. Though free flow of sharing the ideas is desirable in such studies, in order to keep uniformity a questionnaire was found necessary to guide the interview process.

The household survey was the most appropriate method of data collection, for the following reasons:

The land acquisition would have its impact on the entire family and not merely on the family head or any individual;

For undertaking various measures to improve the socio-economic standards, the family has to be focused as a viable unit and not individuals as land losers.

Household was thus found more meaningful unit of inquiry for the collection of information. Hence, instead of interviewing as individual alone, they were interviewed in the context of their families. This has also made it possible to understand the impacts with varying family characteristics.

Informal group discussions for eliciting the required information were the other methods adopted for the study. These were planned for verifying the trends of developments in historical perspective, socio-political issues involved, perceptions of people on the project and seeking their qualitative explanations for the socio-economic development in the project affected area.

Definition of Project Affected Families (PAF)

For this study, a 'Family' or 'Household' is defined as a group of person who are affected to the project commonly live together and take their meals from a common kitchen and stay under the same roof, unless the exigencies of work would prevent them from doing so. Accordingly a household may comprise persons related by blood or unrelated persons or both.

Another important parameter considered in this study is to define a household in terms of land ownership records of the Revenue Department, which reveals the name of landowner of each plot and the total extent of land proposed for acquisition in each survey number or sub-division number. VIDC collected the land records of the PAP's from the respective districts before initiating the land acquisition process hence these details have been deployed for the present study.

In many cases, though the members of a family live together and stay in the same house while sharing the same kitchen, the ownership of land units has been registered with more than one member of the family. This may be due to many reasons such as security in the old age, fear of land grabbing by close relatives in case of death of the family head and fear of losing the land through Land Ceiling

Act, etc. If partition of landholdings taken place at the household level, however, not registered with the appropriate authorities, it has been considered that the land belonged to the person in whose name the land is being held. In all cases, every individual land loser in whose name the land unit was registered has been considered, as a Project Affected Person (PAP) irrespective of the number of landholdings he is losing through land acquisition. Wherever there is more than one PAP in the same family, however sharing the same kitchen along with others, these are clubbed together as one Project Affected Family (PAF). The demographic and socio-economic aspects of all members of the PAF's have been studied with reference to the entire family, instead of considering each PAP as a separate family.

In this survey serious efforts were made to contact all the PAF's falling in all the villages affected by Land Acquisition and Property Acquisition. The survey has generated a comprehensive database on PAF's baseline conditions with regards to their social, religious, economic aspects including landholding pattern, livelihood and their perception and opinion about the project.

3.11.7 Socio-Economic Household Surveys

In the Socio-Economic Household Survey all the identified and available PAF's have been contacted for establishing their baseline socio-economic conditions, the analysis of which is presented in the subsequent sections.

There are many landlords who have lands in the project area, however reside in other areas away from the study area. Some households did not respond due to a variety of reasons, which include their unwillingness to part with their lands due to compulsory land acquisition for the project.

In each selected household, the head of the family or any available adult member having knowledge about all particulars of the family were interviewed. Most questions were addressed to him/her. However, in the process of interviewing, wherever possible all the family members were also included since, the questionnaire was such designed that the "family" as a unit for the inquiry.

For carrying out the socio-economic surveys of the PAF's, the field investigators were recruited from the local area based on the criteria of ability to communicate and take notes during interview, mobility and a minimum qualification of graduation. The selected candidates were given training, on how to conduct interviews and code the responses. Senior supervisors having adequate experience in supervising the surveys have been deployed during the survey period. The collected data was verified periodically on a sampling basis.

The socio-economic details of PAF's and their dependants were generated through a detailed socio-economic survey questionnaire, specially designed for this project. This Socio-Economic Survey Questionnaire specially designed for this project. The questionnaire was pre-tested through a pilot survey in the field, prior to conducting the detailed survey. Based on findings of the pre-testing, the questionnaire was modified and finalized and canvassed in the survey. The questionnaire covered the following aspects:

- Family size and status
- Religion/caste
- Migration
- Sex ratio
- Literacy levels
- Special skills possessed
- Occupational structure
- Land ownership pattern
- Crop Yields
- Irrigation facilities
- Asset ownership pattern
- Shelter profile
- Infrastructure facilities
- Health status
- Presents Income Generation Schemes following by PAFs
- Aspirations of People for better life after Land Acquisition
- Preferences for Income Generation Schemes
- Training needs of PAF's for Income Generation
- Choice of Resettlement sites by the DF's

- General suggestions for the overall development of the region in view of the VIDC.

In addition to the above, inventory of public/common infrastructure or social resources e.g. schools, religious places, etc. was undertaken through interactions with the PAF's and the community by means of consultations.

3.11.8 Problems Faced in Data Collection

Some problems were faced in the socio-economic survey process and many limitations have been contemplated during the surveys in the project area. Some of the problems faced during surveys and the limitations of the conducted surveys are as follows:

- The surveys have been carried out to know the perceptions of the PAF's and affected communities about the project and to know their perceptions about the proposed project. These conducted surveys provide only the tentative baseline socio-economic conditions, hence cannot be considered as legal;
- The consultants have carried out the surveys in absence of any Government of Maharashtra authority along with them; hence the PAF's were initially hesitated to respond to the interviews. With more and more efforts and persuasions, a considerable number of PAF's have been convinced and they provided the data by the PAF's, this cannot be considered as correct and be treated as tentative or adhoc data;
- In many cases the actual names and family names of PAF's varied substantially from those recorded in the Government of Maharashtra land records. In such circumstances, the PAF's by name have been interviewed though their family names varied;
- In a considerable number of cases, the land ownership records have not been updated even after partition of the erstwhile joint family and even after transfers of properties to their descendents;
- In some cases the original landowner though not surviving, still remains the landowner in revenue records. In some cases there are many stakeholders for such lands after the expiry of the original

landowner and the actual he or stakeholder is not clearly known. However, for this stage, the original landowner on whose name the plot was registered in the revenue records, has been considered, though he is not a surviving member;

- The project would involve in acquisition of lands as well as residential and other structures and also include demolition of all the existing houses and permanent structures in all the villages getting submerged due to the reservoir formation. Some house owners are aware that their houses would be demolished for the project, hence not provided the information to the interviews.
- Some of the PAF's who would be totally rendered landless and not having education or skills are under the opinion that they would be rendered homeless and landless after the land acquisition, hence rejected to respond to this survey;
- Since the people knew that the survey is launched by VIDC, their responses were prejudiced by their annoyance and in some cases with inflated land prices, exaggerated income levels and strong demands for handsome compensation and very high expectations from the VIDC;
- Almost all the PAF's have mentioned that they possess only the small plot of land, which is being proposed by VIDC for acquisition, though the PAF's might have multiple landholdings;
- It was very difficult to make people to reveal about their income generating activities. Almost all PAF's responded that they are not gaining any benefits from the Government poverty alleviation schemes, though in reality some of them are receiving the advantages due to these schemes. They wanted to use the opportunity of giving interview only for demanding permanent employment in Government of Maharashtra and exorbitant compensation for their agricultural and homestead lands including houses;
- Many PAF's are absentee landlords while staying in various towns, away from the project affected areas. Hence these could not be contacted in the survey;

3.11.9 Presentation of the Collected Data

In this survey serious efforts have been kept to contact and interview all the affected families of the project villages for registering their baseline demographic and socio-economic conditions and perceptions about the project. Though all the PAF's residing in the project villages were contacted, some PAF's have rejected to provide information due to their own reasons or having some legal problems in sharing the landholdings with their other joint family members. There are many landowners simply owning land in the project villages but permanently reside in far away places. These absentee landlord families do not have any demographic and socio-economic implications on the project area, except for the receipt of compensation for the loss of land and trees, wherever applicable. Hence, these absentee landlords were not covered in the survey.

Based on the land records and the surveys conducted by them in the project affected villages, VIDC authorities have identified about 8136 project affected families requiring displacement and resettlement elsewhere.

In this survey all the available PAF's in 46 villages have been contacted for their interviews and eliciting the information required for the RRAP. Due to many reasons, explained in detail in the above sections, the information of only 8136 families affected by the LA and property acquisition was elicited. The experience in the field surveys revealed that there is no difference between the socio-economic conditions of the house and homestead affected PAF's and only the land affected PAF's, hence the analysis of the surveys has been carried out while combining both the categories as a single entity. The collected data through this household survey has been analysed in terms of percentages, as applicable to the RRAP of the project and presented in the following sections.

3.11.10 Socio-Economic Profiles of the Project Affected Families (PAF)

The socio-economic aspects of the 8136 PAF's as revealed by the survey have been presented in the following sections.

a) Religious Groups

Religious are systems of theological beliefs and dogmas and are deficient in the rational contents. However, religion provides a vital basis for identity and

community formation. The family and social ties are developed on the basis of religion. The religious system is however inadequate to provide security and justice but people seek them through communal identities and therefore no secular system can be built. Members of every community have to associate with those of other communities to promote their class, professional and cultural interests through institutionalised religion and by organizations of workers, peasants, occupational groups that by providing common forum can retain autonomy and bring peace and harmony in village life.

Majority of the PAF's of the project area are Hindus working out to about 79.89 % of the total families followed by Buddhists who worked to about 12.68% of the PAF's, Muslims with 7.42% of the total households and Christians with about 0.01% of he total PAF's. The religious structure of the PAF's of the project area is presented in Table 3.36 and graphical representation is done in Figure 3.12.

TABLE 3.36

RELIGIOUS STRUCTURE

S. No.	Religion	No. of PAF's	Percent PAF's
1	*Hindu*	6500	79.89
2	Buddhism	1032	12.68
3	Islam	603	7.42
4	Christianity	1	0.01
5	Others	0	0.00
	Total	8136	100

b) Caste Characteristics

Castes are endogamous groups and the occupations of each class are traditionally determined. Membership to a caste is obtained by birth and there is a vast difference among castes about social formalities, social intercourse, rituals, customs and traditions. The marital status, family pattern, occupation and expenditure patterns, gender concepts, concepts about the size of the family, pattern of housing and participation in the village life are influenced by traditions, conventions and by caste councils. Multi-caste groups and sub-groups inhabit the project area. The different classes of castes found in the study area are grouped

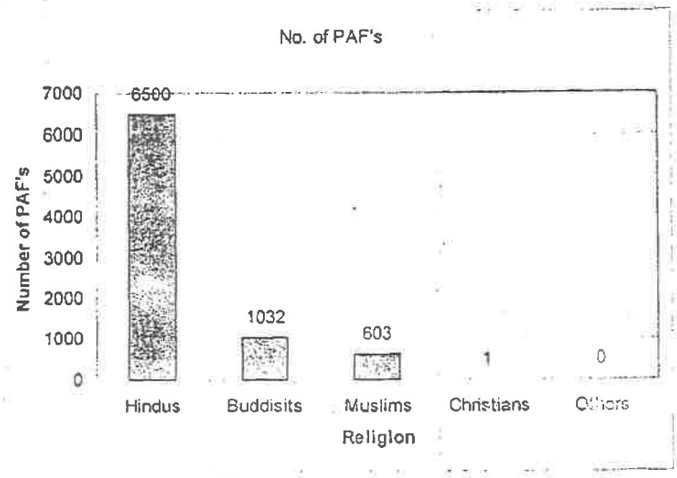
General or Forward Castes, Scheduled Castes (SC), Scheduled Tribes (ST) and Other Backward Class (OBC).

It has been observed that the surveyed population in mainly constituted by the Other Backward Castes (OBCs) & Schedule Tribes followed by Scheduled castes households, Scheduled Tribes who constituted to about 30.09 %, which is very close to other backward class community. Percentage of the General or forward caste is significant compared to other. From this it indicates that the submergence of the project comprises mostly backward class community. The distribution of households as per their caste structure is presented in Table 3.37 and graphical representation of the same in done in Figure 3.12.

TABLE 3.37

CASTE STRUCTURE OF PAF's

S. No.	Caste	No. of PAF's	Percent PAF's
1	General	866	10.64
2	Other Backward Class	2787	34.26
3	Scheduled Caste	1274	15.66
4	Scheduled Tribe	2448	30.09
5	Other	761	9.35
	Total	8136	100



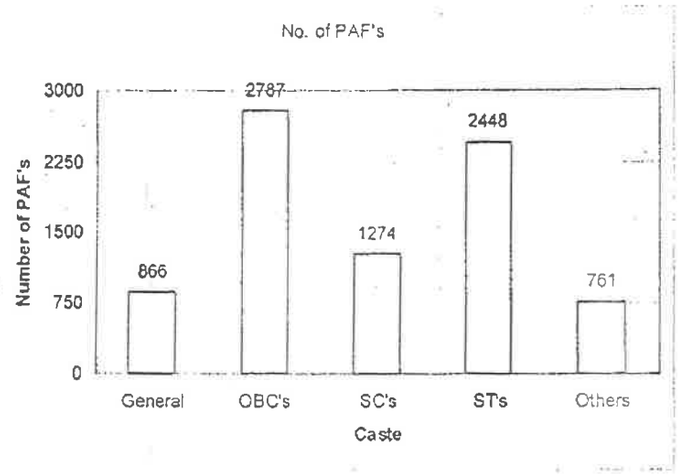


Figure 3.12
Graphical representation of Religion and Caste

c) Migration Pattern

The migration aspects of the available PAFs reveal that all of them are residents of the project area villages who have been residing in their present locations since generations.

Many households have lands in the villages, however settled out side the submergence area. It is reported that most of them out-migrated due to their employment or business to other parts of the state or country. From the survey it was found that their was both out migration and in migration. Around 155 families were in migrated and around 56 families were out migrated from the proposed submergence area. Once the project comes up their can be further in migration of some more families due to availability of new jobs.

d) Family Size

The 8136 families covered in the household survey have a population of 36809 members indicating as average family size (the number of persons per family) of 4.52 persons per each family. The families having 4-5 persons were the highest with an 45.82 % of the total families followed by families of 2-3 persons with an 22.15%. Families having single person were the least with a 3.79%. The distribution of families in the project villages by their sizes is presented in Table 3.38. The Graphical representation of the same is shown in Figure 3.13

TABLE 3.38

FAMILY SIZE

S. No.	Family Size	No. of PAFs	Percent PAFs (%)
1	1	309	3.79
2	2 to 3	1802	22.15
3	4 to 5	3728	45.82
4	6 to 7	1754	21.56
5	8 or above	543	6.68
	Total	8136	100

e) Family Type

The type of family such as single person family, nuclear, joint and extended family has been studied to know the prevailing family pattern in the study area. A nuclear family is a family consisting of husband, wife, unmarried children and dependant parents. It is noticed that the joint families are the most predominant family type in the study. The family type in the study area is as discussed below:

In the study area the joint families are the predominant type with about 60.09 % of the total families followed by nuclear families which work out to about 34.97 %. Single person families worked out to be 3.79 % of the total families. The extended families were reported to be only about 1.15 % of the total PAFs of the project villages. The break-up of the family type is presented in Table 3.39. The Graphical representation of the same is shown in Figure 3.13

TABLE 3.39

FAMILY TYPE

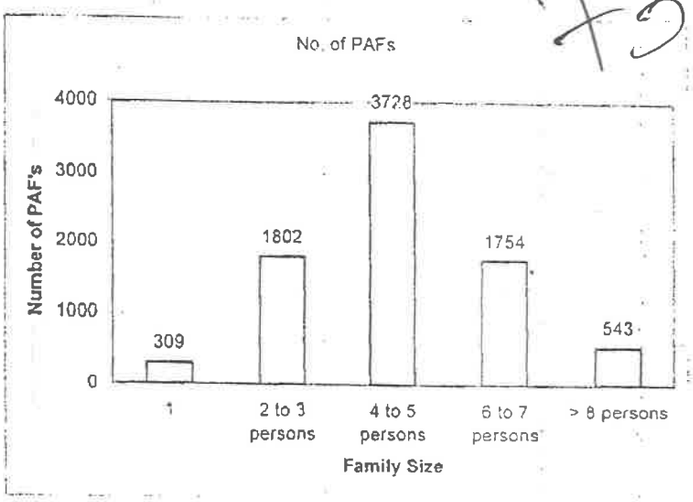
S. No.	Type of Family	No. PAFs	PAFs%
1	Single person	309	3.79
2	Nuclear	2845	34.97
3	Joint	4889	60.09
4	Extended	93	1.15
	Total	8136	100

f) Composition of Sex

The composition of people by sex indicates the ratio of male and female. In the study area, the composition of sex among the PAFs is almost same as other parts of the Country. It can be observed that the total males and females among the PAFs are 50.61% and 49.39 % respectively. The sex ratio, which is computed as the number of female per 1000 males, is about 975, which is a common phenomenon in Maharashtra state. The details are given in the Table 3.40 graphical in Figure 3.14.

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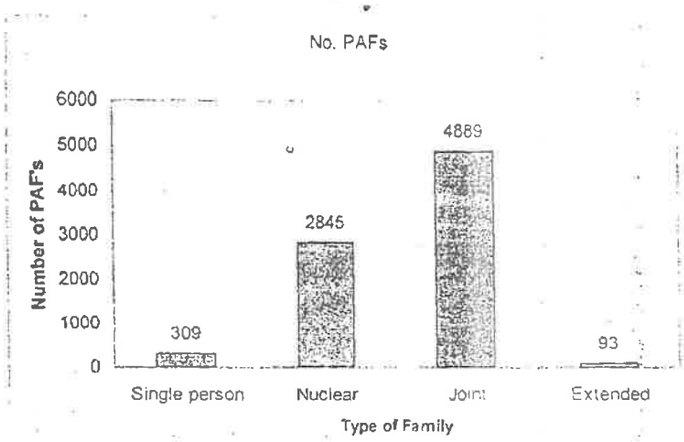


Figure 3.13
Graphical representation of Family size and Family Type

TABLE 3.40
SEX RATIO

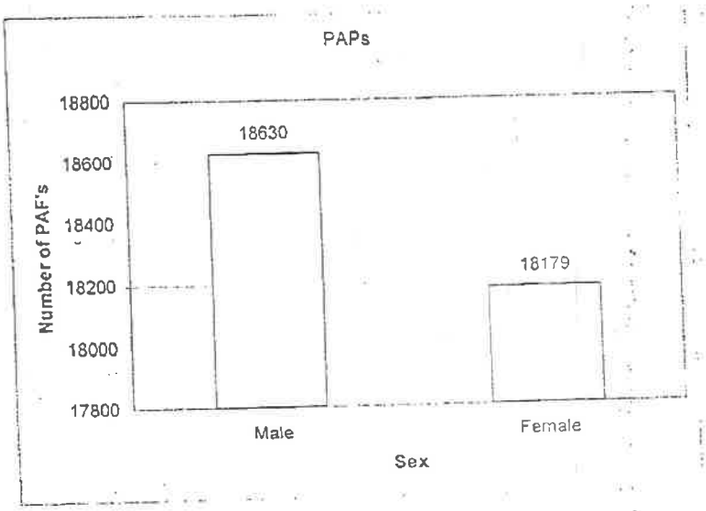
S. No.	Category	PAPs	PAPs %
1	Male	18630	50.61
2	Female	18179	49.39
	Total	36809	100
	Sex ratio	975	

Activity pattern of the PAPs

The activity pattern of the PAPs indicate that around 46.42% of the population are workers working in various activities like Cultivators, agricultural labour and other services like post office, transport workers, milk vendors, etc. However majority of the workers are agricultural labour. The un-employed persons are around 11.97% who get work only few days in the year and they say they do not have proper job, some are educated persons who does not want work as agricultural labour. Children or students are around 16.74% of the total population. Where as household workers and self employment (Shops, cottage industries, milk vendors, welding shops, tailors, etc) are around 14.47%. Remaining 10.39% are old persons, house wifes, mental retarded persons, etc. The activity patter of the study area is presented in Table 3.41 and graphical presentation is given in Figure 3.14.

TABLE 3.41
ACTIVITY PATTERN OF THE STUDY AREA

S. No.	Category	PAPs	PAPs %
1	Workers (Cultivators, Agricultural labour, Service)	17086	46.42
2	Household workers, self employment,	5327	14.47
3	Unemployed	4407	11.97
4	Students	6164	16.75
5	Others (old persons, house wifes, etc.)	3825	10.39
	Total	36809	100



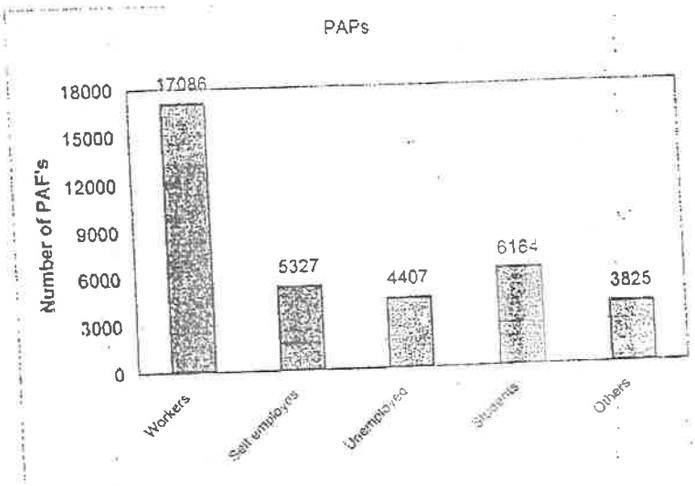


Figure 3.14
Graphical representation of Sex Ratio and Activity Pattern

h) Literacy Levels

The level of education is measured with reference to Literacy rates in general male literacy rate and in particular female literacy rate. The percentage of literacy among the male PAPs is found to be 63.90 %, which is quite normal in the villages of Maharashtra, and literacy level among Female PAPs is found to be around 43.30 %. This percentage of literacy among the females is less when compared to males. To improve the literacy rates among the PAPs new schools should be started during R&R program implementation. Should also encourage local NGOs to educated elderly persons of the area by starting night schools. The detail about literacy is presented in Table No. 3.42

TABLE 3.42

LITERACY LEVELS

S. No.	Category	PAPs			Literate PAPs %
		Total	Literate	Illiterate	
1	Male	18630	11905	6725	63.90
2	Female	18179	7872	10307	43.30
	Total	36809	19777	17032	

i) Type of Land Ownership

The land ownership pattern of the PAFs has been studied. It is revealed that the cultivation most important occupation of the PAFs. Most of the PAFs possess lands in the villages where they reside. Some of them own lands in other villages also. The land ownership of PAFs has been studied based on the socio-economic survey as well as the land records, wherever available. It is noticed that most landowners have given misleading information on landownership pattern, particularly about their landownership in other villages. This may be due to the fear of receiving less benefit if he/she discloses the actual landholding sizes, which is considerably large in some cases.

The land ownership pattern has been studied with reference to irrigated and unirrigated lands, orchards, fallows and the areas not suitable for cultivation. Some of the land units have been reported as fallows or lands not suitable for

cultivation. The land ownership pattern of the PAFs reveals that most of the PAFs have small size landownership. About 13.71 % PAFs have land in the range of 0.5 to 1 Ha, 49.05 % have land between 1 to 2 Ha, about 27.47 % PAFs own between 2 to 5 Ha land, and 5.18 % PAF have more than 5 Ha land. The Landownership pattern of the PAFs is presented in Table 3.43 and graphically shown in Figure 3.15.

TABLE 3.43

LANDOWNERSHIP PATTERN BEFORE ACQUISITION

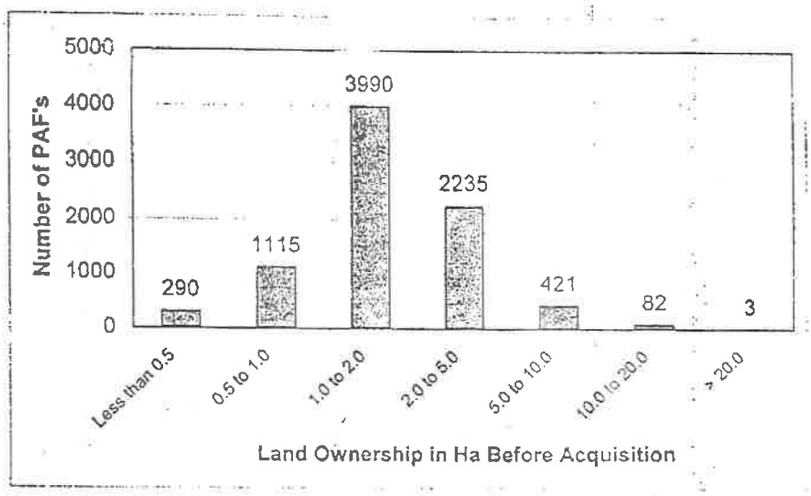
S. No.	Land Ownership (Ha.)	Total PAFs	% PAFs
1	Less than 0.5	290	3.56
2	0.5 to 1.0	1115	13.71
3	1.0 to 2.0	3990	49.05
4	2.0 to 5.0	2235	27.47
5	5.0 to 10.0	421	5.18
6	10.0 to 20.0	82	1.00
7	> 20.0	3	0.03
	Total	8136	100.00

The cropping pattern of the affected landholdings reveals cotton, soya bean, maize, pulses and vegetables are the predominant crops grown in the cultivated areas during the Kharif season. Who ever having irrigation sources such as well and pumping equipment irrigate their lands even during Rabi season. The orange orchards are also used for growing crops between the plantations. The landownership pattern of the PAPs which is likely to be changed after the land acquisition for the proposed project is as given in Table 3.44 and graphically presented in Figure 3.15.

TABLE 3.44

LANDOWNERSHIP PATTERN AFTER ACQUISITION

S. No.	Land Ownership (Ha.)	Total PAFs	% PAFs
1	Nil	3310	40.68
2	< 0.5	202	2.48
3	0.5 to 1.0	521	6.41
4	1.0 to 2.0	2315	28.45
5	2.0 to 5.0	1524	18.74
6	5.0 to 10.0	240	2.95
7	10.0 to 20.0	23	0.28
8	> 20.0	1	0.01
	Total	8136	100.00



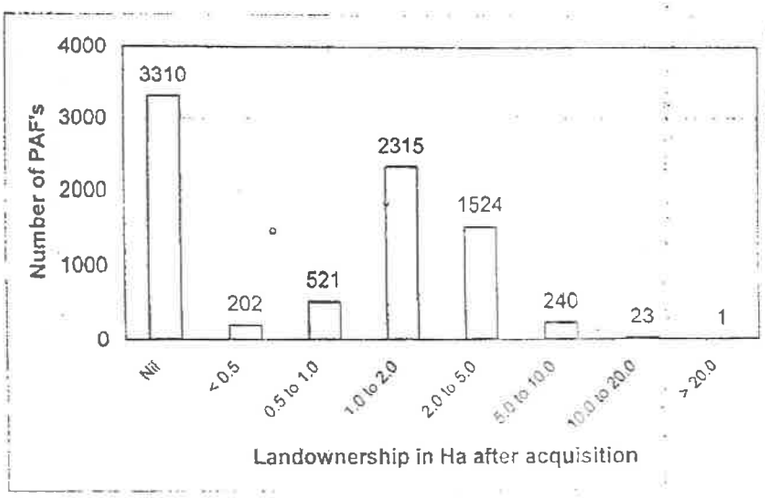


Figure 3.15
Graphical representation Landownership pattern before and after acquisition

j) Irrigation Facilities

Rainfall is the only major source of irrigation water available in the area. The Penganga River and wells and tube wells scattered here and there are the other sources for irrigation to a minor extent. However there is no canal irrigation, lift irrigation in the project area. The proposed dam with both lift and canal irrigation will change the entire agricultural activities in the projects command area.

k) Asset Ownership Pattern

The assets possessed by the PAFs have been studied with reference to the immovable assets like house, land, cattle-shed and movable assets like pump and motor, etc. This asset ownership not only includes the affected land, houses and other built up structures and also all the assets located outside the project area. The asset ownership pattern of the PAFs is given in Table 3.45

TABLE 3.45

ASSET OWNERSHIP PATTERN

S. No	Asset	PAFs	% PAFs
1	House	8136	100.00
2	Land	4407	54.16
3	Cattle shed	2447	30.07
4	Electric pump and motor	877	10.78
5	Livestock	2896	35.57

From the above table it can be said that all the PAFs have house (hut, Kawelu, pucca house, etc.) About 54.16 % PAFs are owning agricultural lands, about 35.57 % of the PAFs have livestock while only 30.07 % PAFs have cattle sheds in their possession and around 10.78% of PAFs have electric pumps and motors.

l) Shelter Profile

The survey revealed that all the houses in the project affected area are of poor quality and katcha houses. Very few semi-pucca houses are owned by the PAFs and pucca houses are rarely seen. The PAFs revealed that the previously issued Section 4 (1) Notification of the LA Act has been preventing them from the reconstruction of their houses, are carrying out any major improvement measures to their houses. The PAFs know that they need to shift from their present houses that would be demolished after land acquisition, they are not putting any efforts in spite of the fact that they are facing many problems due to poor housing.

Most of the houses have accommodation consisting of 2 or 3 rooms. It is noticed that the rich and middle-income group PAFs own slightly big and good-houses, and the poor own small and low quality huts only. Almost all the houses are built with mud while rarely the houses are built using bricks and cement. The house ownership pattern indicates that 100% PAFs live in their own houses and no one has reported that he resides in a rental house.

Most of the houses have 2, 3 or more rooms and very few houses have more than 5 rooms. The single room houses work out to about 22.38 % of the total houses and the double room houses work out to about 39.88 % of the houses in the study area. The houses having 3 rooms work out to about 29.48 % of the total houses and about 8.26 % houses have 4 or more rooms. The pattern of number of rooms in dwellings is shown in Table 3.46.

TABLE 3.46

NUMBER OF ROOMS IN HOUSES

S. No.	No. of Rooms	PAFs	PAFs %
1	1 Room houses	1821	22.38
2	2 Rooms houses	3244	39.88
3	3 Rooms houses	2399	29.48
4	4 Rooms and above houses	672	8.26
	TOTAL	8136	100

m) Income Pattern of PAFs

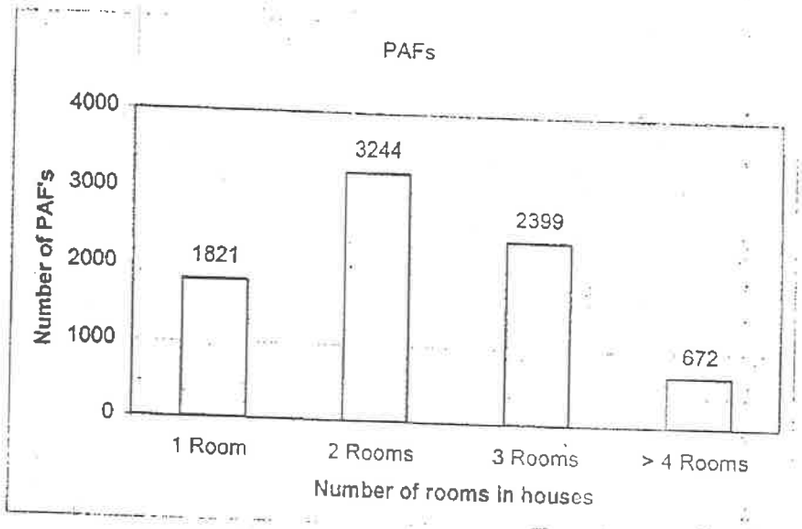
The households earn their livelihood from various means. Their main Income comes from cultivation and agricultural labour followed by self-employment such as petty business, dairy, poultry etc. Agriculture is the most predominant income generating activity in the project area, followed agricultural labour. The annual income pattern of the PAFs from all the sources is presented in Table 3.47

TABLE 3.47

INCOME PATTERN OF PAFs

S. No.	Income Range (Rs)	PAFs	PAFs %
1	Less than 5000	847	10.41
2	5000 to 10000	2421	29.76
3	10000 to 20000	3010	36.99
4	20000 to 50000	1278	15.71
5	Above 50000	580	7.13
	Total	8136	100.00

From the above table, it can be seen that about 10.41 % PAFs have a family income of less than Rs. 5000 per annum. About 29.75 % PAFs have income between Rs. 5000 to 10000 per annum. About 36.99 % PAFs have the annual family income of Rs. 10000 to 20000 and about 15.71 % PAFs have annual income of between 20000 to 50000 per annum. About 7.13 % PAFs have more than Rs. 50000 income per annum. After the project is commissioned there will be change in income patter of the study area.



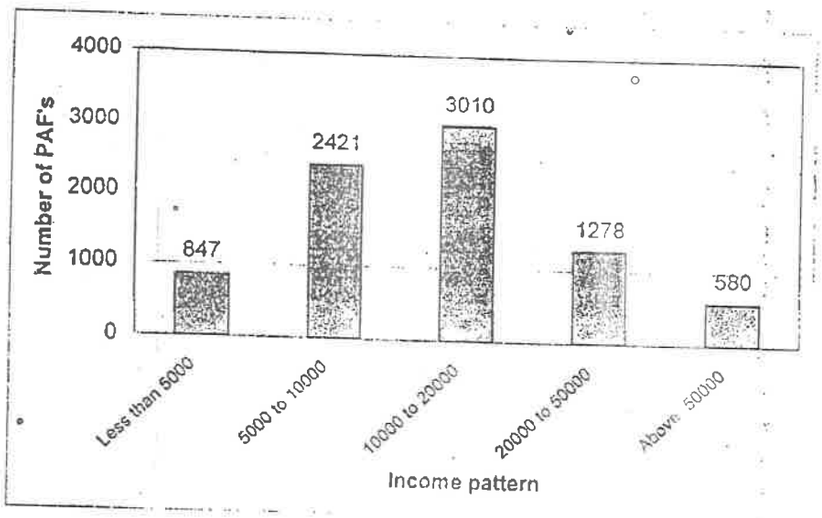


Figure 3.16
Graphical representation Number of rooms and Income pattern

n) Infrastructure Facilities

The factor which influence the quality of various variables is the provision basic of infrastructure facilities which has long term effect primarily on the economic conditions and secondarily on social factors, thus indicating their influence on the basic value system and standard of living of people. The standard of living is either elevated or degraded as a result of changes brought about by basic infrastructure particularly in the rural sector.

About 72.97 % PAFs do not have a separate kitchen in their houses and use the living room and store rooms for cooking. Most houses do not have any toilet facility and use the available open spaces outside the villages for defecation. Only 23.57 % PAFs have constructed bathrooms. Public latrines are totally absent in the area. The infrastructure facilities available with the PAFs are presented in Table 3.48

TABLE 3.48

INFRASTRUCTURE FACILITIES

S. No.	Facility	PAFs	% PAFs
1.	Kitchen	2199	27.02
2.	Bath room	1918	23.57
3.	Toilet	982	12.06
4.	Electricity	2967	36.46

o) Expenditure Pattern

The expenditure pattern of the PAFs has been studied to ascertain the dominant expenditure incurred by them. It is revealed that the food expenditure followed by clothing and medicines are the most predominant heads of expenditure. Very small fraction of their income is spent on education and other activities like smoking, alcohol, etc.

p) Expectations from the Project

Questions regarding the requirements of PAFs with reference to the proposed land acquisition, and compensation thereof were asked with some emphasis on the income generating schemes. Almost all the PAFs indicated their preferences for employment in the government jobs against the loss of their agricultural and homestead lands including their houses, and better compensation as per the present market value in the region. Some persons asked land to land compensation in command area, some asked compensation has to be made in lumpsum, so that they can invest the money in purchasing the land elsewhere.

q) Training Needs of PAFs

The proposed RRAP will give some opportunities to the PAFs losing their houses and substantial extent of land for the project for restoring their lost income through income generation schemes with the monetary compensation paid to them by the VIDC. In the survey almost all PAFs could not ascertain their training requirements, as this concept is totally new to them. Very few enlightened PAFs indicated their requirements, which include technical training for operation of light industrial machinery and guidance to start industrial workshops, garages, petty business shops, etc.

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ANNEXURE-20 · C

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CHAPTER IV

IDENTIFICATION AND PREDICTION OF IMPACTS

CHAPTER IV
IDENTIFICATION & PREDICTION OF IMPACTS

4.0 PREAMBLE

Identification of impacts is one of the important analytical stages of EIA procedure, identification of impact guides prediction and evaluation of possible impacts. A number of methodologies are available for identification of impacts.

The basic purpose of identification of impacts is to aid in making proper decisions in regards to consequence of impacts. Thus the degree of extensiveness and intensity of consequences based on value judgments have to be generalized while identifying impacts. Environmental impact normally leads to a chain of reactions. The identified impacts for various components of environment viz., air, noise, water, land, socioeconomic are discussed as follows:

4.1 IDENTIFICATION OF IMPACTS

4.1.1 Air Environment

There are no industrial sources in the vicinity of the proposed project site. The Ambient air quality (AAQ) of surrounding project site was observed during the study period and found to be well within the CPCB limits. Practically there is minimum pollution as there are no industries and even the vehicular traffic is not considerable.

- At the time of construction of barrage and other allied works, there will be movement of substantial quantity of soil and debris, which would produce large quantity of unstable material. There will be some fugitive dust raised from leveling operations.
- Structural works and erection work will also result in dust pollution.
- Material storage and handling due to movement of vehicles and trucks may marginally increase dust pollution.
- In the campsite, the labour activities such as cooking using firewood may affect the air quality.

- φ The climatic status of the study area is more or less consistent with the regional meteorology. As regards the status of ambient air quality, the conditions shall not change, as this will be the only project in that area.

4.1.2 Water Environment

The creation of the reservoir will alter the normally free flowing condition of the river. The operation of the project will cause a fluctuation of the reservoir water level. This may create marginal environmental problems. Regulation of the reservoir will significantly modify the seasonal flow patterns, volumes in the downstream of the site. The flows in the river tend to be more stabilized all around the year. The fluctuations will be with much narrower ranges along the downstream. Improved flood prevention and control are also envisaged.

- φ Water quality may be affected by aquatic weeds, biomass decay, turbidity and pollution from agricultural, industrial and human waste.
- φ Proliferation of waterweeds can increase disease vectors, affect water quality and fisheries and clog irrigation structures.
- φ There is possibility of debris, dust, etc., during construction, which gets in contact with water and thereby polluting it.
- φ Due to water storage, related diseases arising due to parasites may crop up, primarily from irrigation and associated canals.
- φ If the water table is at a higher elevation, which tends to make water logging and causes harm to plant growth due to capillary rise. In such cases the ground water and surface water could be put to effective use for irrigation.
- φ The storage of water can create conditions that foster and spread water borne diseases such as schistosomiasis and malaria.

4.1.3 Noise Environment

Construction activities are expected to produce noise levels in the range of 60-80 dB(A). The noise produced during the construction will have a significant impact on the existing ambient noise levels. Which is temporary in the nature.

- Barrage construction, Erection of lift pumps, electrical fittings and foundation work will involve land excavation, filling and concrete works, which affect the environment by noise and dust pollution.
- Adverse impact on noise pollution due to the construction activity and vehicular traffic at the project site.

4.1.4 Land Environment

- The project site is not a forest area nor a restricted mining area and the construction activity would not affect the land use. However there will be slight change in land use with respect to the submergence of some villages and forest land.
- During construction phase, the topsoil erosion will take place due to the activities such as site preparation and construction of roads. This problem is limited to a very small portion of the project site and only during construction period.

4.1.5 Socio-Economic Environment

Submergence area due to proposed dam is 15951 Ha. Project affected persons (PAPs) are to be rehabilitated as per Maharashtra Resettlement Act of project displaced persons 1986.

- For the project-affected persons, the greatest loss would be their historical and cultural links with land and home.
- About 8136 families would be affected by the proposed project, thus requiring relocation.
- However there would be positive impact on the displaced population as they are compensated with the land in the command area.
- There will be overall development of the socio-economic status of the villagers in the command area.

4.1.6 Human Health

- The health infrastructure is rather weak in the area. Accidents during construction work could be a constant threat for the labour community.

- The storage reservoirs can create conditions, which foster spread of water borne diseases such as schistosomiasis and malaria.

4.1.7 Flora and Fauna

The formation of reservoir due to the proposed barrage is most suitable for development of native species of fish. The Fisheries Department should participate in developmental activities such as fish farming. The proposed reservoir would tend to attract fauna during the evenings and nights. The reservoir area could also provide habitats for migratory birds, not available at present. To encourage migratory bird visits and to maintain the biodiversity at proposed reservoir, suitable arrangements may be made.

The initial construction works at the project site involves site clearance, cutting, filling and leveling. The removal of vegetation from the soil and loosening of the topsoil generally causes soil erosion. However, such impacts would be primarily confined to the project site during initial periods of the construction phase and would be minimized through adoption of mitigative measures like paving and surface treatment, water sprinkling and appropriate plantation program.

The constructional activities lead to inward migration of a huge labour force in the area and thus there would be pressure on trees in the area due increase in fuel demand. Due care has been taken for providing the fuel to the labours. The increased vehicular traffic coupled with higher noise level due to various constructional activities will drive away the fauna from the project site to the neighboring area. But after completion of the project these fauna and the birds and migratory birds will turn back to the reservoir, as there is ample water and plantation.

4.1.8 Topography & Climate

The major topographical changes would be due to the construction of dam and creation of reservoir. The water spread will be confined to the river valley. The impact on the topography will be irreversible considering the construction of the dam and water spread.

The dam may contribute to minor changes in micrometeorological conditions (weather pattern) on local scale at the project site. The main affected parameters

are local winds, evapo-transpiration, atmospheric temperature, relative humidity and atmospheric visibility. The evaporation process at such a water body will naturally decrease the daytime ambient air temperature at project site. The existence of the large water body will also decrease night temperature in the project region. Under calm conditions sticky weather prevails on the banks of the reservoir due to higher relative humidity. There will be marginal increase in frequency of occurrence of fog in the project area, which affects reduction in visibility at the project site.

4.1.9 Aquatic Life

The Penganga River rises in the Ajantha range a little to the South west of Buldhana town. It is a major tributary of the Wardha River. The river is deeply entrenched and has a meandering course. The Penganga forms the southern district boundary throughout its long sinuous course. The river changes twice from one longitudinal valley to a parallel longitudinal valley northwards by marking big 'S' shaped curves. The Pus, Arha, Aran, Waghavi and Kunj are the major tributaries of the Penganga River within the district.

The river Penganga a major tributary of the Wardha river in the Godavari basin drains upto the dam site reaches cultivable and forest lands in Buldhana, Parbhani, Akola, Yavatmal and Nanded districts in Maharashtra and passes through Andhra Pradesh. The river Penganga originates near village Madha in Buldhana district at an altitude of 685.7 m.

Since the river originates from hilly areas of Maharashtra and purely dependent on the rainfall in the catchment area covering Maharastra, River Penganga contain water for greater part of the year.

Aquatic life thrives in continuous flowing rivers and sea waters, where the water quality and the quantity will be almost same through out the year. However in non perennial rivers, the aquatic life develops in a very limited way during monsoon and soon fades away after the monsoon.

From the above considerations, it can be inferred that there can be no exotic or endangered or sensitive aquatic life in the Penganga river. However aquatic life can be maintained in the post project scenario, wherein the water will be stored through out the year due to the construction of the barrage.

4.2 PREDICTION OF IMPACTS

Prediction of impacts is the most important component in evaluating the environmental impact Assessment for any river valley project. Generally, in environmental studies, the prediction of impacts is carried out under worst conditions to minimize and reduce the environmental attributes. The predictions thus calculated are superimposed over the baseline (pre-project) status of environmental quality around the project site to derive the post-project status of environment of the region.

4.2.1 Air Environment

During the construction phase, air quality in the vicinity of the project area is likely to be affected temporarily, due to dust and exhaust gases generated by the construction operations and heavy vehicular traffic. The air emissions from the proposed project will be SPM, SO_2 , and NO_x Pollutants will not exceed the standards stipulated by Ministry of Environment and Forests (MoEF). SPM levels are expected to rise during excavation and mud handling operations. Spraying of water in regular intervals would suppress the dust to a considerable extent. The regular wetting of the dug up material could be arranged to reduce the dust. Therefore, there is not much impact on ambient air quality of the study area. Only minute impact will be there due to proposed activity. However to minimize the air quality pollution in the study area all necessary precautions will be adopted including development of a greenbelt around the project area wherever possible to keep the air in the area clean.

4.2.2 Noise Environment

Noise pollution is anticipated during the construction phase due to the operation of various construction related machinery. The effect of noise on the nearest inhabitants due to construction activity will be negligible. However, as a safety measure on site workers near the noise generating equipment shall be provided with noise protection devices like earmuffs. All necessary precautions will be taken while operating construction equipment as instructed by the manufacturers, like providing silencers, mounting on rubber pads, etc. The construction activity will be restricted to daytime only.

4.2.3 Water Environment

Water pollution is anticipated during the construction phase due to various activities such as cleaning of mechanical vibrators, mixers etc. From the health point of view, the employees of the proposed barrage construction site shall be provided with clean water for their consumption and use. The proposed construction sites shall be provided with sufficient and suitable sanitation facilities to allow proper standards of hygiene. These facilities would be connected to a septic tank and shall be well maintained to have least impact on the environment. The wastewater from the kitchens will be used for gardening purposes.

4.2.4 Land Environment

Since the main barrage construction will be done across the riverbed, there will be change in present land use. The construction of the embankments on both sides to contain water will also alter the land use. The land on either side of the river earmarked for the construction of the embankments is presently barren without any agriculture and some part of the land is of forest category. The barrage site does not require any leveling of the ground. However excavation for the foundation works is required at the barrage site. The details of the land required for the project is given in Table 4.1.

The land use pattern in the project area will also change due to the submergence resulting from the barrage construction across the river. About 46 villages are going to be affected out of this 34 villages are coming under full submergence and 12 villages under partial submergence.

Apart from the houses and agricultural land, reserved forest and wild flora along the riverbank will also get submerged. However the flora does not contain any endangered species and the volume is also not considerable. The species encountered are most common to the region and are mostly wild growing ones.

Table 4.1

Details of the Land Required - Ha

Land required	Government	Private	Forest	Total
Submergence	500	14704	747	15951
Canal	144	2186	251	2581
Allied works	-	294	-	294
Total	644	17184	998	18826

4.2.5 Socio-Economic Environment

The construction and the catchment area treatment activities would provide employment to skilled, semi-skilled and unskilled labour as supervisors and masons and post construction period would provide employment opportunities in the environment management related areas. After construction of the project, recreation facilities, tourist hotels, picnic spots, water spots etc., will be developed to attract the tourists, which will give opportunities for the local people to develop socio-economically.

The project proponents should also take care of the fuel needs for cooking for the project labour. Otherwise they will indulge in felling of trees for firewood.

There would be a positive impact on the socio economic conditions of the people in the command area of the project. Due to the availability of the irrigation facilities, the villagers will bring even the barren lands in the command area under cultivation. Good yield of crops due to irrigation will give higher returns improving the socio economic conditions of not only the owners of the lands, but also the agriculture labour due to increase in the employment potential.

No impact is expected on the culture of the people in the study area, as they are not exposed to any foreign culture. However some small temples, which have prominence in the culture and traditions of the people are also expected to get submerged. These temples are also proposed to be shifted to safer places along with the project-affected people.

4.2.6 Health Environment

At the present, only Malaria, an endemic disease is prevalent in some villages of the study area. To control this, a malarial control will be suggested at headquarters of the District. Further, there is also scope for the increase of Anopheles mosquitoes due to large quantities of the stored water due to the formation of the entire reservoir. Catchment is well drained, and the impounded area will have water quality monitoring, faunal habitat development activities, besides pisciculture, all leading to a constant check on water quality. During construction period, about maximum of 2,000 additional population of labour would need health coverage, seasonally and emergencies. There is need to setup a regular dispensary at near by submerged villages. Regular visits of doctors to the site from the PHCs and district hospitals would be necessary in addition to manning the dispensary on regular basis.

4.2.7 Impacts due to Irrigation:

Impacts of irrigation vary with types of irrigation and it should not be assumed that the latest techniques of irrigation would have lesser impacts. They may significantly increase energy consumption and lead to social problems due to reduced employment in agriculture. They may also vary according to the stage of implementation. For example, during the construction period there may be specific health and other social risks due to influx of migrant workers living in temporary and unsanitary accommodation. Later, with the progress of project cumulative impacts may begin to present serious environmental constraints to sustainability.

4.2.8 Ecology

The submergence area is required to be cleared off by removing natural vegetation which otherwise may result in creating obnoxious condition in the reservoir. Oxygen depletion entrapment of nutrients etc. could change the species composition and reduces the species diversity in reservoir. Creation of water body will help in creating an environment suitable for breeding of migratory birds. Shrubs and bushes surround the dam site, which provides suitable conditions for nesting and breeding of aquatic and migratory birds.

Aquatic life thrives in continuous flowing rivers and sea waters, where the water quality and the quantity will be almost same through out the year. However in non perennial rivers, the aquatic life develops in a very limited way during monsoon and soon fades away after the monsoon.

From the above considerations, it can be inferred that there can be no exotic or endangered or sensitive aquatic life in the Penganga river. However aquatic life can be maintained in the post project scenario, wherein the water will be stored through out the year due to the construction of the barrage. Reservoir fisheries would create socio-economic benefit to the resettled land losers and those in the downstream area, which can depend on reservoir fisheries as supplementary occupation.

4.2.9 Aquatic Life

The project will have a positive impact on the aquatic environment on the upstream and since this is a barrage project and the gates of the barrage if proposed to be kept open during the monsoon once the minimum storage level reaches the inflow into the project will be let out downstream without affecting the natural flows. Hence the conditions after implementation of the project will also be same as the pre project conditions.

The list of the aquatic life observed in the river are given in Table 4.2

Table 4.2

General Fishes in the study area

Sr. No.	Local Name	Scientific Name
1	Tam	Labeo Fimbriatus
2	Rahoo	Barbus tor.
3	Karooti	Labeo calbasu.
4	Kanwa	Barbus sp.
5	Boori	Cirrhina reba.
6	Kolus	Barbus kolus.
7	Yellshal	Chela sp.
8	Peora	Aspidoparia morar.
9	Potiac	Barbus sarana.
10	Geehul	Barilius sp.
11	Muril	Nemachilus sp.
12	Kaneri	Rasbora daniconicus.
13	Chapti	Rohtee sp.
14	Murrel (Phooll Marrel)	Chana Marulius.
15	Koli murrel	Chana Striatus.
16	Dokh	Chana punctatus,
17	Bao	Catla catla.
18	Patola	Notopterus notopterus.
	Cat Fishes	
19	Seengal	Mystus seenghala.
20	Khidla	Baganius bagarius.
21	Koolr	Mystus aor.
22	Pathar chatu	Glassogoblus giuris
23	Bekdi	Pseudotropis sp.
24	Selan	Selurdla sp.
25	Katrna	Rita sp.
26	Ghegra	Rita hostala.
27	Baloo	Wallagonia attu.
28	Tomboo	Anguilla bengalensis.
29	Gangaoli	Callichrous bimaculatus
30	Baam	Mastecembalus armetus.
31	Maroof	Clarius magur.
32	Singhi	Heteropneusteus fossilis.
	Prawns and Shrimps	
33	Ghod zinga	Palemon malcomsonii
34	Mutechkal zinga	Palaemon carcinii.
35	Matechkal zinga	Acctes indicus.

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CHAPTER V

SEISMOTECTONICS

CHAPTER V
SEISMOTECTONICS

Major irrigation project takes years of planning and tons of money to take a final shape. It is not just a physical structure built to stop the water in its relentless march, it also represents the aspirations of scores of beneficiaries in the form of irrigation water availability, it represents the Governments commitment for regional development, it represents the care of the rulers towards the people, it represents the foresight of the planners to satisfy the requirements of the future generations. All this efforts can be reduced to a naught in few minutes of nature's fury. Earthquakes have the potential to shake the best of the structures. There would be large scale devastation downstream of the project in case of sudden collapse of the barrage and also will leave a deep impact on the beneficiaries of the project. Hence seismic studies forms an important part of the project planning.

SEISMIC ZONES IN INDIA

The issue of seismic hazard in India has been addressed by scientists as early as 1956 when a 3 zone; Severe, Moderate, Minor hazard map of India was produced. This map was based on a broad concept of earthquake distribution and geotectonics. The severe hazard zones are roughly confined to plate boundary regions i.e the Himalayan Frontal Arc in the north, the Chaman fault region in the north west and the Indo-Burma border region in the north east. The lower hazard zone is confined to Indian shield region in the south and the moderate hazard zone confined to the transitional zone in between the two.

Since then, many versions of the seismic zoning map of India have been brought out. The Bureau of Indian Standards, which is the official agency for publishing seismic hazard maps and codes in India, produced a six zone map in 1962, a seven zone map in 1966, a five zone map in 1984 and a four zone map in 2000 which is currently valid. The four zone seismic map of India is shown as Figure 5.2.

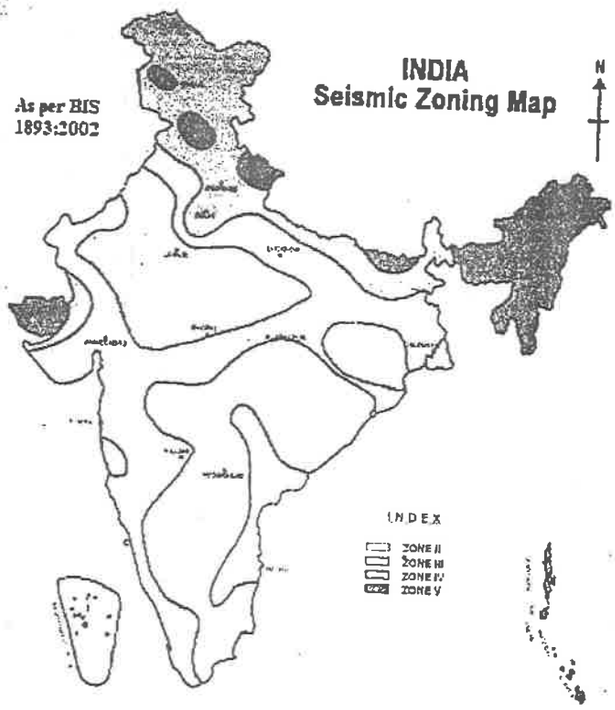


Figure 5.2
Four Zone Seismic Map of India

From the zoning map it can be observed that the project area falls in zone II, which means that the area has very low damage risk. The statewise seismic zones classification is shown in Table 5.2. The study area is under low damage vish.

Table 5.3
STATEWISE SEISMIC ZONATIONATE

STATES & U.Ts	INTENSITY MSK	SEISMIC ZONE
Andaman & Nicobar	MSK IX or more	Zone V
Arunachal Pradesh	MSK IX or more	Zone V
Assam	MSK IX or more	Zone V
Bihar	MSK V to IX or more	Zone V
Gujarat	MSK VI to IX or more	Zone II, III & V
Himachal Pradesh	MSK VIII to IX	Zone IV & V
Jammu & Kashmir (Jk)	MSK VIII to IX	Zone IV & V
Manipur	MSK IX or more	Zone V
Meghalaya	MSK IX or more	Zone V
Mizoram	MSK IX or more	Zone V
Nagaland	MSK IX or more	Zone V
Tripura	MSK IX or more	Zone V
Uttar Pradesh	MSK V to IX or more	Zone II, III, IV, V
West Bengal	MSK VI to IX or more	Zone II, III, IV, V
Chandigarh	MSK VIII	Zone IV
Delhi	MSK VIII	Zone IV
Haryana	MSK VI to VIII	Zone II, III & IV
Maharashtra	MSK V to VIII	Zone II, III & IV
Punjab	MSK VI to VIII	Zone II, III & IV
Rajasthan	MSK V to VIII	Zone II, III & IV
Sikkim	MSK VIII	Zone IV
Andhra Pradesh	MSK V to VII	Zone II & III
Daman & Diu	MSK VII	Zone III
Karnataka	MSK V to VII	Zone II & III
Kerala	MSK VI to VII	Zone II & III
Madhya Pradesh	MSK V to VII	Zone II & III
Orissa	MSK V to VII	Zone II & III
Tamil Nadu	MSK V to VII	Zone II & III

The Maximum Intensity on Modified Mercalli Scale considered for the Four Zones are

MSK IX or more	in Zone V	Very High Damage Zone
MSK VIII	in Zone IV	High Damage Risk Zone
MSK VII	in Zone III	Moderate Damage Risk Zone
MSK VI	in Zone II.	Low Damage Risk Zone

SUMMARY IS 1893:2002 - CRITERIA FOR EARTHQUAKE RESISTANT DESIGN OF STRUCTURES

This standard deals with earthquake resistant design of structures and is applicable to buildings; elevated structures; bridges; dams etc. It also gives a map which divides the country into five seismic zones based on the seismic intensity. IS 1893:1984 was initially published in 1962 as 'Recommendations for Earthquake Resistant Design of Structures' and then revised in 1966. As a result of additional seismic data collected in India and further knowledge and experience gained the standard was revised in 1970, 1975 and then in 1984.

Consequent to the publication of this standard on account of earthquakes in various parts of the country including that in Uttar-Kashi and Latur and technological advancement in the field, the sectional committees decided to revise the standard into five parts which deals with different types of structures:

Part 1 : General provisions and Buildings
Part 2 : Liquid retaining Tanks – Elevated and Ground Supported
Part 3 : Bridges and Retaining Walls
Part 4 : Industrial Structures Including Stack Like Structures
Part 5 : Dams and Embankments

Part 1 contains provisions that are general in nature and applicable to all structures. Also, it contains provisions that are specific to buildings only. It covers general principles and design criteria, land combinations, design spectrum, main attributes of buildings, dynamic analysis, apart from seismic zoning map and seismic coefficients of important towns, map showing epicenters, map showing tectonic features and lithological map of India.

Revision of Part 1 is made in 2002. Other parts of the standard are also under consideration of committee.

Following are the major and important modifications made in this revision:

- The seismic zone map is revised with only four zones, instead of fire. Erstwhile Zone I has been merged to Zone II and hence Zone I does not appear in the new zoning; only Zones II, III, IV and V do. The

killari area has been included in Zone III and necessary modifications made, keeping in view the probabilistic Hazard Evaluation. The Bellary isolated zone has been removed. The parts of eastern coast area have shown similar hazard to that of the killari area, the level of Zone II has been enhanced to Zone III and connected with Zone III of Godawari Graben area..

- This revision adopts the procedure of first calculating the actual force that may be experienced by the structure during the probable maximum earthquake, if it were to remain elastic. Then the concept of response reduction due to ductile deformation or frictional energy dissipation in the cracks in brought into the code explicitly, by introducing the 'response reduction factor' in place of the earlier performance factor.

- The values of seismic zone factors have been changed; these now reflect more realistic values of effective peak ground acceleration considering Maximum Considered Earthquake (MCE) and service life of structure in each seismic zone.

- A clause has been introduced to restrict the use of foundations vulnerable to differential settlements in severe seismic zones.

Here it is worthwhile to mention that it is not intended in this standard to lay down regulation so that no structure shall suffer any damage during earthquake of all magnitudes. It has been endeavoured to ensure that as far as, possible structures are able to respond, without structural damage to shocks of moderate intensities and without total collapse to shocks of heavy intensities.

CONCLUSION

From the above data it can be inferred that the Proposed Irrigation Project Area falls under low damage risk zone and hence there is minimum threat to the barrage due to the seismic activity. However precautions have been taken for earthquake resistant design of major structures such as dam, jackwell and other important structures such as acqeduct, super passages bridges etc. The horizontal seismic coefficient is taken as 0.05g and vertical seismic coefficient as 0.10g.

Horizontal > Vertical.

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CHAPTER VI

ENVIRONMENTAL MANAGEMENT PLAN

CHAPTER VI
ENVIRONMENTAL MANAGEMENT PLAN

Based on the environmental baseline conditions, planned project activities and impact assessment, the following sections will deal with the environmental management plans being proposed to be implemented to mitigate the adverse impacts on the environment due to the proposed project.

6.0 QUALITY OF LIFE:

The project has both positive and negative impacts on the quality of life. The negative impact is on the villagers, whose lands and houses are coming under the submergence area. The positive impact will be on the quality of life of the villagers of the command area. To minimize the impact on quality of life of the affected people, project authorities have prepared rehabilitation & resettlement package for the affected people in the near by area, so that the affected people will also reap the benefits from the project on completion.

6.1 SOCIO-ECONOMIC CONDITIONS:

6.1.1 Land Acquisition and occupation:

Land acquisition will have impact on the socio economic conditions of the villagers from the affected villages. However since the project authorities are taking care to rehabilitate and resettle the affected population, this impact is negated. The details of the resettlement and rehabilitation are enclosed in a separate chapter. As per the R&R studies compensation to the affected villagers for the value of land, it is recommended that cash compensation should be paid at actual market rates prevalent during the time of settlement of the compensation.

6.1.2 Work force Mobilization:

Local enquiries and discussions with the irrigation engineers at site revealed that the Lower Penganga Project areas would not be able to mobilize more than 15% of the total skilled labor required, However the unskilled labor are adequately

available in the area. The department has calculated that the peak labour strength would be 2000 of which 85% will be unskilled labor and 15% would be skilled. There would be inflow of outside-region labour to an extent of 15%, in the categories of skilled and unskilled labour. The impact in terms of opportunity costs would equal the total amount of wages lost to the region, transport costs plus the costs on local infrastructure. This negative impact can be considered as temporary adverse impact, but in cash terms, the loss would be substantial. The labour flow should be planned in such a way that the required number of local labour joins the construction work. This would mean that the timing of the earthwork should be planned according to seasons, with the most labour intensive work coming up during non-agricultural seasons. Being a single-crop area, November to May is the critical work period as the Rabi crop would also be in progress. Supplementing of outside labour to local labour would help the local people pick up semi-skilled work and it would be possible to replace costly-outside labour in the long run.

6.1.2 Resettlement and Rehabilitation:

This should be a beneficial impact, though it cannot replace the lost 'culture' aspects of the project-affected people. About 7102 families would be affected due to the proposed project. The R&R exercise should therefore justify the project in terms of making their rehabilitated quality of life at least equal to if not greater than the existing quality of life.

The R&R plan is prepared under the guidelines of the Ministry of Welfare, Government of India and the Provisions of MAH. P.A.P. Rehabilitation Act 1999; Government of Maharashtra.

6.1.3 Solid waste management

The increase in population due to congregation of construction labour is expected to be about 8200. The average per capita solid waste generated would be the order of 425 gm/day/person. The solid waste likely to be generated from labour camps shall be the order of 3.5 tonnes/day.

Adequate facilities for collection, conveyance and disposal of solid waste needs to be developed. For solid waste collection, 30 number of masonry storage vats, each

of 2 m^3 capacity should be emptied at regular intervals and the collected waste can then be transported to landfill sites.

Two covered trucks to collect the solid waste from common collection point and transfer it to the disposal site should be put to service. A suitable landfill site should be identified and designed to contain municipal waste from various project township, labour colonies, etc. A total provision of Rs.9.39 million needs to be earmarked for this purpose. The details are given in table-6.1

Table -6.1

Expenditure for Solid waste management

Item	Cost (Rs. million)
Two covered trucks for conveyance of solid waste to landfill site @ Rs.2.5 million/truck.	5.00
Manpower cost for 10 persons @ Rs.5000/month for 5 years including 10%escalation/year	4.39
Total	9.39

6.1.4 Road Construction

The approach roads will have to be constructed as a part of the access to the construction site. Steeply sloping banks are liable to landslides, which can largely be controlled by provision of suitable drainage. The other erosion hazard is that of surface erosion of the bank, which is best controlled by vegetation. However, in a steeply sloping terrain, difficulty lies in growing vegetation on steeply sloping banks. Engineering solutions such as surface drainage, sub-surface drainage, toe protection and rock bolting can be used. Landslides can be stabilized by several methods engineering or bioengineering measures alone or a combination of these. In hilly terrain, road construction often generates significant quantity of wastes due to the stripping of the rocks to make way for the roads. The stripped muck is generally cleared by dumping the material along the slopes. These dumped material finally flow down to the valleys and ultimately finds its way in to the river. The stripped material should be collected and dumped in the designated muck disposal area which will have check dams to prevent the muck to flow

down into the river. After disposal operation is complete at the dump site, dump yard should be contoured and vegetated.

6.1.5 Management of Muck Disposal Sites

The quantity of muck generated is quite high for setting up of various structures. Muck generated from excavation of any project component is required to be disposed in a planned manner so that it takes a least possible space and is not hazardous to the environment.

Suitable retaining walls shall be constructed at muck disposal sited to develop terraces so as to support the muck on vertical slope and for optimum space utilization. Loose muck would be compacted layer wise. The muck disposal area will be developed in a series of terraces of boulder crate wall and masonry wall to protect the area/muck from floodwater during monsoons. In-between terraces, catch water drain will be provided. The terraces of the muck disposal area will be ultimately covered with fertile soil and suitable plants will be planted adopting suitable bio-technological measures.

6.1.6 Greenbelt Development

It is proposed to develop greenbelt around the perimeter of various project appurtenances, selected stretches along the periphery of water spread area, etc. An amount of Rs.4.0 million has been earmarked for Greenbelt Development.

The general consideration involved while developing the greenbelt is:

- Local/native trees growing upto 10m or above in height with perennial foliage should be planted around various appurtenances of the proposed project.
- Planting of trees should be undertaken in appropriate encircling rows around the project site.
- Generally fast growing trees should be planted.

- Since, the tree trunk area is normally devoid of foliage upto a height of 3m, it may be useful to have shrubbery in front of the trees so as to give coverage.

The plantation should be at a spacing of 2.5m x 2.5m. About 1000 trees per hectare should be planted. The selection of species recommended for greenbelt development shall be done in consultation with the state forest department.

6.1.7 Operations:

The operations of the project would be of high socio-economic benefit for the direct ayacutdars. At optimum functioning the Lower Penganga Project would directly benefit 160050 hectares of land under the Irrigable Command Area. This is presumed on the basis of adequate ayacut development.

6.1.8 Ayacut development:

Optimal benefits from the project would flow with appropriate command area development.

6.1.9 Aesthetics:

Due to the project development, aesthetics of the area is going to have a beneficial impact. On completion of the project, it can be developed as a tourist place. To attract the tourist, landscaping and gardens development has to be taken up in all possible places. Water sports and joy rides can be introduced in the reservoir formed due to the project.

6.1.10 Work force mobilization:

Efforts should be made to avoid outside labor making haphazard settlements at the project site and the surroundings. This would prevent adverse landscape and environmental imbalance by the lobour-camps. It is expected that the systematic camps would be located nearer to the reservoir site and these camps will have to be provided with the fuel, on-site cooking, solid waste disposal, and other related activities, which affect the landscape and air quality.

It is suggested that the camps be constructed with prefabricated materials. Temporary sheds or shops for catering food and essential items should be permitted on site, so that labour is prevented to go long ways in search of basic amenities. The campsites should have pits for disposal of solid wastes and specially designated areas for disposal of domestic waste. The contractor must ensure hygiene and sanitation in the campsites. A crèche should be ideally located at the campsite.

A common canteen for the workers should be provided at the project site. LPG cylinders should be provided for cooking food in the kitchens.

6.1.11 Excavations related work

Short-term adverse impacts on the landscape are inevitable. The reservoir bund, the pump house and the canal embankments would be new structures in the landscape. Social forestry or afforestation will not only prevent erosion due to run-off water but would also maintain the biodiversity of the area. It is recommended that cynodon (Garika) grass is ideal for the rear slopes of the embankments. The grass would bind the soils of the bunds and prevent formation of gullies during rainy season.

At the rear side of Earthen embankments and around the pump house complex, useful tree plantations are recommended in 5 to 6 rows of alternating pits. Along the canal embankments, a combination of Jamun, Babul, Neem and Teak could be planted in groves to mix with the orchards. In a period of three to four years the plantations would show up as long lines of groves, which would not only tend to merge with the surrounding view but also recuperate the lost biodiversity. Grove plantation around the pump house would absorb the noise generated from pumping operations.

6.1.12 Health

The health control infrastructure is rather weak in the area. Accidents during construction work could be a constant threat for the labour community. Lack of sanitary conditions in the campsites could also cause epidemics. There is need to set up Medical facilities at reservoir site keeping in view the number of labour. Prefabricated material may be used for construction of Medical facilities. Regular visits of doctors to the site from the PHCs and district hospital from Yavatmal &

Ghatanji would be necessary. Proper First Aid facilities will be made available at all strategic points of camp site and educate the labour for administering first aid in emergencies. The existing PHC of Ghatanji is about 30 km from the project site. The facilities existing in the PHC is adequate to deal with minor health problems, for any major mishaps involving injuries to few people and emergency situations, they will be rushed to Ghananji or Yavatmal after administering the first aid at Tadsaoli.

The increase in water fringe area provides suitable habitats for the growth of vectors of various diseases and they are likely to increase the incidence of water-related diseases. Malaria is one such disease. Malaria control measures which aim at destroying the habitat and interrupting the life cycle of mosquitoes by mechanical or biological or chemical means need to be implemented. The anti-malarial operations can be coordinated by various Primary Health Centres (PHC) in the nearby villages and Hospital at District Headquarters in association with the project proponents.

A detailed health plan is enclosed along with the report.

6.1.13 Culture

For the project-affected persons, the greatest loss would be their historical and cultural links with land and home. Such of the project affected persons (PAP's), who purchase ayacut lands under the project, would over a period of time, get used to a new culture based on canal irrigation (An improvement over their tank-based culture). The important point to note in the R&R exercise would be that 'culture' of the PAP's is agriculture and no amount of structural extensions of new trades, cottage industry, training and asset distribution envisaged in the R&R plan can replace the loss of the present historical land-linkage. Hence, the basis in the R&R exercise should be provided purchasing power for irrigated land or irrigation support to un-irrigated land for all the oustees regardless of their present holdings or capacities and also educate them of the need and benefit that would be accrued by the project to the society. This is the only hope that could convince and persuade the PAPs to part from their present dwellings which would come under submersion of the reservoir and to accept the proposed rehabilitation plans. Every village, which is coming under submersion, has religious places. Hence along with the project affected people, even the religious places have to be resettled in the new areas.

6.1.14 Ecosystem

Since this is an irrigation project and the submergence area does not have any noticeable amount of the green belt, but forest area is involved in the project, the impact on the ecosystem will be noticed. However many positive impacts can be made on the ecosystem with proper planning and implementation of the ecosystem development projects. The reservoir can be utilized to introduce new species of fresh water fishes and measures can be taken to attract fauna to the project site increasing the species diversity in the project area. That means there is an excellent scope for improving the healthy eco-system benefits, which cannot estimated in terms of money but definitely create an economical development of the region in the very near future from the date of inception of the project.

6.1.15 Erosion

The erosion is going to be negligible because of the development of ayacut from viewpoint of the land preparation. However the erosion is a major factor in the irrigation project due to the danger of siltation at the barrage site. By taking proper treatment measures erosion in the catchment area will be controlled.

6.1.16 Catchment Area Treatment:

The catchment area treatment would include cultural (contour cultivation, strip cropping, vegetative filter strips in place of diversion drains with Agave planting) and mechanical (gully control, bunding, stone terracing and bench terracing works) measures. During the construction period and beyond, catchment area treatment work must be carried out in the degraded pockets of the direct catchment area first, followed by the intercepted catchments.

The following management plan has been suggested:

- The R & R act of the Government of Maharashtra should be studied and care should be taken to follow all the norms laid therein.
- All the PAP should be properly enumerated and all individuals above the age 18 irrespective of gender should be treated as PAP.

- Loss of any land, housing, wells and trees in the courtyard incurred by every individual should be recorded for proper compensation.

- Choice for either land in lieu of land lost or comprehension for the land loss in cash should be given to the PAP.

- Compensation cost should be properly worked out based on averaging the revenue records of agriculture production per ha for last 10 years.

- Housing should be provided at the new site for the evacuees, if not, then the cost of existing housing unit should be worked out and compensated appropriately, or the cost of transport of the housing material to the new site should be given.

6.2 Sanitation

Sewage Disposal System

On-site sewage disposal is a necessity in the colony that are not available in the surrounding area. Even when a site has access to a sewer, it may be desirable to treat sewage on site in order to return water to the local soil, or to provide irrigation for non-food plants. A concrete septic tank and soak pit will be made in which anaerobic bacteria provides primary treatment. The effluent from the septic tank discharges either directly to a leach field, or indirectly through an aerobic treatment unit and then to a leach field.

Technical Background

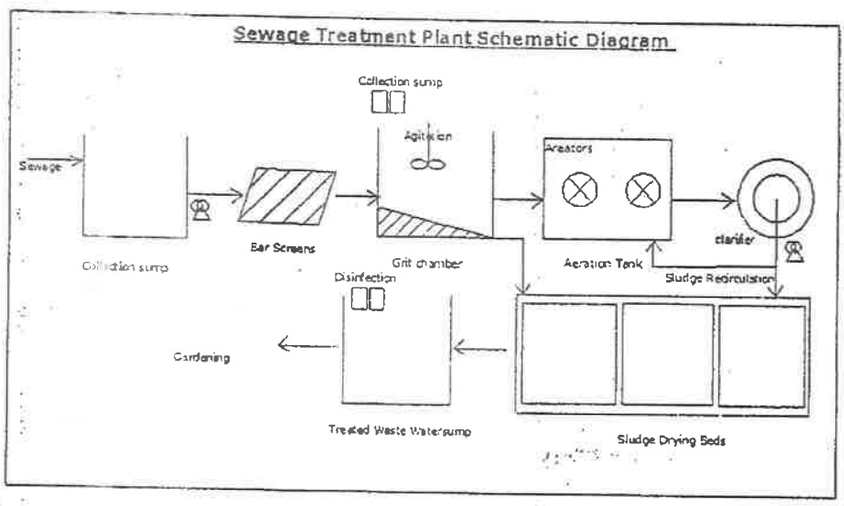
Primary sewage treatment in a septic tank is anaerobic (without oxygen) because any oxygen in the tank is rapidly consumed. While some BOD is removed in the septic tank by anaerobic digestion and settlement, most flows to the leach field. This BOD supports the growth of the microbial biomat that forms at the floor of the leach field trench or bed (or, as claimed by some manufacturers, on the surface of media). A "healthy" (aerobic) biomat contains a variety of micro-organisms that remove many of the undesirable bacteria and viruses in the sewage and that digest most of the remaining BOD. If the effluent BOD is too high (or if the leach

field is poorly aerated), desirable aerobic bacteria and protozoans in the biomat die, replaced by anaerobic bacteria producing a mucilaginous coating that clogs the leach field.

Secondary sewage treatment is designed to remove BOD. This is important where sewage effluent flows to a leach field in tight soils (silts and clays). Reducing BOD reduces the biomat and enables the effluent better to infiltrate tight soils. Most enhanced treatment units actively oxygenate the sewage to reduce BOD.

Design Requirements

All septic systems should be designed by a licensed, experienced designer who is familiar with the various alternative systems and components available in the local area. There are a number of requirements in the design of septic systems, and they experience a number of problems. The sewage from the community septic tanks can be disposed off through Sewage Treatment Plant [STP].
The schematic diagram of STP is shown in a schematic diagram.



6.3 FLORA AND FAUNA

There is 747 ha of forest area in the submergence zone to compensate the loss of forest, afforestation in an area of 1120 ha will be taken for which land has been reserved. The sites for afforestation are identified and suitability has been accorded by Forest Department. Afforestation will be carried out by planting Teak, Shivan, Neem, Dhawda, Tamarind, etc on identified lands with coordination with Forest Department for which the expenditure incurred will be paid by the Irrigation Department. Trees will be planted on either side of canals and all along the acquired land on periphery of reservoir between FTL and MWL. The plantations suggested for maintaining the landscape would be the minimum required in environmental protection measures, to retain the floral pattern in the area. Disturbance to faunal movements would be temporary and the reservoir would tend to attract fauna during the evenings and nights. Precautionary measures should be taken to fence the camps and steps to prevent wild animals from entering in to the camps. The reservoir area could also provide habitats for migratory birds.

6.4 PLAN OF PISCICULTURE:

Fish farming may be encouraged as they are sources of food and economy to the locals. Fish are considered good bio-indicators and would help detect any sudden pollution affecting the reservoir. Some exotic species of the fresh water fish, which can be cultivated in the reservoir, are shown in Figure 6.1.

		
Rohu	Mrigal, Mirga	Pungas
		
Catla, Catal	Hilsa	Glassy Fish

		
Bele	Boal	Catla
		
Gar fish	Gangtengra	Gutum
		
Greyfeatherback	Magur	Meni
		
Necktieloach	Pabdah	Pungas

Figure 6.1
Fresh Water Fishes

6.5 CHANGES IN ENVIRONMENT

6.5.1 Air Quality & Dust Suppression

During construction activity, solid waste generation due to excavations and movement of heavy vehicles is expected. And also fugitive emission of dust due to vehicular movements and the construction activity will worsen the air quality with respect to the suspended particulate matter. But the impact will be temporary and localized at the work areas.

Spraying of water after regular interval would suppress the dust to a considerable extent. Regular wetting of the dug-up material could be arranged to reduce dust from rising. Materials and labour transportation should be kept at a productive minimum. Transportation routes are to be identified and a tar road should be constructed to minimize the dust emissions as well as the wear and tear of the

vehicles. The construction workers working in the dust intensive areas should be provided with dust masks.

6.5.2 Temperature

It is expected that there would be an overall cooling effect of the surroundings due to water storage in the reservoir. There would also be increase in humidity levels in the near vicinity.

6.5.3 Land use

The land use change due to water spread in reservoir and flow in canals would bring in the potential benefits of the Ayacut development programme. The accompanying plantation, along the canal bunds and on the foreshore, would be the only measure, which can help rejuvenate lost biodiversity. The fisheries development programme in the reservoir would maintain water quality and encourage bird-visits in turn introducing new ecological relationships, which can help, rejuvenate lost biodiversity, would build up biomass required for a new land use pattern.

6.5.4 Soils

An overall benefit is shown for soils under ayacut development. There is need to retain biomass productivity by minimizing the use of chemical fertilizers and pesticides.

6.5.5 Materials & Resources:

The component-wise EMP costs proposed in this EIA are as follows:

- φ Land Acquisition, Resettlement & Rehabilitation
- φ Catchment Area Treatment

The following items viz., Labour camp site facilities, Endowments, Plantations, Foreshore habitat development, Pisciculture and Command Area Development, etc., are already covered in environment & ecology of the project cost estimates.

6.6 OPERATIONAL MONITORING

The project authorities would need to place an on-site environmental monitoring unit during construction and operation of reservoir. This unit will maintain a database of the water quality in the reservoirs and groundwater table recordings, soil quality of the project area, implementation of afforestation program, catchment area treatment plan execution, etc.

The undulating nature of the catchment, site terrain and the ayacut region, rule out very serious water logging and salinity conditions. But this would also depend upon the behavior of the reservoir, its leachate patterns and the effectiveness of the protective plantations on bunds. The monitoring unit would have to maintain databases of the groundwater in such a way as to detect sudden rise or falls in salt conditions. Project authorities would have to also check the point regarding the impact control of salinity on the groundwater regime of the area.

There is likelihood of new industries coming up downstream to exploit the proposed new cropping patterns, Sugar mills, pulp, medicinal oil extraction and other agro-industrial enterprises would tend to affect the river water quality and ambient air. These would have to be monitored regularly by the project authorities and the Maharashtra State Pollution Control Board alerted, whenever emission or effluent standards are exceeded. The bioindicators viz., the fish would also help as indicators to pollution of water.

6.7 IMPORTANT BENEFITS FROM THE PROPOSED PROJECT

- The proposed project is coming up in naxal affected backward tribal area.
- Yavatmal is third poorest district of Maharashtra
- The low and erratic rainfall during last few years has caused great distress to the farmers, many have committed suicides, and the proposed project will provide relief to this gloomy scenario by brining overall development of the region.
- The project will enhance the living standard of the poor people by increasing the per capita income.
- The propose project reduces the irrigation backlog of Yavatmal and Chandrapur districts.

- The project will help in developing the small-scale industries and markets for agricultural produce.
- Development can also take place in fisheries, tourism, communication links,
- Due to proposed afforestation development of greenery and wild life of the area can be expected.
- Provision of drinking water to 351 villages and power generation at Canal head of 4 MW.
- It will be helpful in raise trees on both sides of canal and in barren areas.
- Floods during rainy season in Yavatmal district caused great damage to property and loss of life; the flood can be absorbed by the project.
- Floodwater stored in the reservoir can be used for irrigation, drinking and power generation.

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ENVIRONMENTAL MONITORING PROGRAMME

ENVIRONMENTAL MONITORING PROGRAMME

THE NEED

Environmental monitoring is an essential component for sustainability of any water resources project. It is an integral part of any environmental assessment process. Any water resources development project introduces complex inter-relationships in the project area between people various natural resources, biota and the many developing forces. Thus, a new environmental scenario. Hence , monitoring of critical parameters is essential in the project operation phase. An Environmental Monitoring Programme has been designed with the following objectives:

Assess the changes in environmental conditions, if any, during construction and operation of the project.

Monitor the effective implementation of mitigatory measures.

Warning of any significant deterioration in environmental quality so that additional mitigatory measures may be planned in advance.

AREAS OF CONCERN

From the monitoring point of view the important parameters are water quality, land use, ecology, etc. An attempt is made to early warning of indicators of stress on the environment. Suggested monitoring details are outlined in the following sections.

WATER QUALITY

Construction phase

It is proposed to monitor the effluent before and after treatment from septic tanks. The frequency of monitoring could be once per month. Since, 17 septic have been proposed for labour campus, a total of (17 septic tanks x 12 months x 2 samples; i.e. before and

after treatment) 408 samples/year need to be analysed. The parameters to be monitored include pH, Bio-chemical Oxygen demand, Total Suspend Solids and Total Dissolved Solids. The cost of treatment of on e sample is excepted to be Rs. 2,000. Thus, total cost for analysis of 408 samples is excepted to be Rs 0.82 million/year. Considering the construction phase to last for a period of5 years and an escalation cost of 10% every year, the total cost over the entire construction phase works out to Rs.4.98 million. The analysis work can be done by a laboratory recognized by the State Pollution Control Board or the same can be done in house by THDC.

Operation Phase

The surface water quality of the impounded water and river Alaknanda needs to be monitored thrice a year. The proposed parameters to be monitored included pH, temperature, electrical conductivity, turbidity, total dissolved solids, calcium, magnesium, total hardness, chlorides, sulphates, nitrates, DO, COD, BOD, Iron, Zinc and Manganese. The samples sites shall be:

- 1km upstream of reservoir periphery
- Reservoir water.
- 1 and 3 km downstream of the confluence of the tail race discharge.

The total cost of analysis will be Rs.0.09 million per year. This analysis shall be done throughout the entire life of the project. The analysis work can be conducted by a reputed external agency recognized by State Pollution Control Board or the same can be done in house by THDC. During Project operation phase a sewage Treatment Plant (STP) is proposed to be set up tp treat the effluent from the project colony. Once every week, it is envisaged to analyse a sample each before and after treatment from the STP. The parameters to be analysed include pH, Bio-chemical Oxygen demand, Total Suspend Solids and Total Dissolved Solids. The cost of analysis of 104 samples @Rs. 2000 per sample works out to Rs.0.21 million/year. Thus, total cost for analysis in project operation works out to Rs. 0.30 million/year.

The analysis work can be done by a laboratory recognized by the State Pollution Control Board or the same can be done in house by THDC.

AIR QUALITY AND METEOROLOGY

Construction Phase

The ambient air quality monitoring during construction phase can be carried out by an external agency, approved by State pollution Control Board at major construction sites. Every year monitoring is to be done for the following three seasons:

- Winter
- Summer
- Post-monsoon

The frequency of monitoring could be twice a week for four consecutive weeks at each station for each season. The parameters to be monitored are Respirable Particulate Matter (RPM) and Suspended Particulate Matter (SPM) Sulphur dioxide (SO^2) and nitrogen Oxides (NOX).

Every year, ambient air quality is to be monitored for (4 stations x 2days/week x 4weeks x 3 seasons) 96 days. A total cost of Rs.0.38 million/ year @ Rs.4000/day can be earmarked for this purpose. For a project construction phase of 5 years, the total cost required shall be Rs.2.34 million.

A meteorological laboratory can be set up at one of the ambient air quality monitoring stations. Automatic recorders for temperature, humidity, wind sped& direction rainfall needs to be commissioned at the site. An amount of Rs.0.50 million can be earmarked for this purpose.

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NOISE

Construction Phase

Noise emissions from vehicular movement operation of various construction equipment may be monitored during construction phase at major construction sites. The frequency of monitoring could be once every three months. For monitoring of noise generators an Integrating Sound level Meter will be required for which an amount of Rs. 0.05 million needs to be earmarked.

SOIL EROSION AND SILTATION

Project Operation Phase

Soil erosion rates slope stability of embankments of barrage, efficacy of soil conservation measures, need to be closely monitored twice a year. The study can be done by the staff of the proposed Environmental Management Cell. The study should be undertaken throughout the life of the project so as to design the soil erosion prevention measures and also for the rehabilitation/decommissioning of the project.

Following parameters like soil erosion rates, stability of bank embankment would be measured. In addition to above, soil quality at various locations in the catchment area needs to be monitored once every year. The parameters to be monitored are pH, organic matter and texture. A provision of Rs.0.16 million per year has been made for this purpose.

ECOLOGY

Project Operation Phase

Monitoring of aquatic ecology will be essential to achieve sustainable yield of fish. Some of the parameters to be monitored are phytoplanktons, zooplanktons, benthic life and fish composition, etc.

The parameters can be monitored twice every year at the water sampling sites given in section of this chapter. The monitoring can be conducted by a reputed external agency for which an amount of Rs.0.3 million /year can be earmarked. Status of afforestation programmes, greenbelt development, changes in migration patterns of the aquatic and terrestrial fauna species should be studied. The staff at the proposed unit of the

Environmental Management Cell can undertake the work. A provision of Rs. 0.2 million per year can be kept for this purpose.

INCIDENCE OF WATER – RELATED DISEASES

Project Construction Phase

Identification of water-related diseases, adequacy of local vector control and curative measures, status of public health are some of the parameters which should be closely monitored three times a year with the help of data maintained in the government dispensaries/hospitals.

Implementation	: Public Health Department & Department constructed for labour camps
Cost per annum	: Rs. 0.2 million

The total cost required for monitoring over the entire project construction phase of 5 years shall be Rs.1.22 million. The cost also includes escalation @10% every year.

Project Operation Phase

Increased prevalence of various borne diseases and adequacy of local vector control and curative measures need to be monitored. The monitoring can be done three times in a year.

Implementation:	Dispensary at the project site
Cost per annum:	Rs.0.10 million

LANDUSE PATTERN

Project Operation Phase

During project operation phase it is proposed to monitor land use pattern once every year. An amount of Rs.0.03 million /year can be earmarked for this purpose.

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SUMMARY OF ENVIRONMENTAL MONITORING PROGRAMME

The details of environmental monitoring programme are given in table

Summary of Environmental Monitoring Programme during Project Operation Phase

S.No	Items	Parameters	Frequency	Location
1.	Water	Ph, Temperature, EC, Turbidity, Total Hardness, Nitrates, DOCOD, BOD, Iron, Zinc, Manganese	Thrice a Year	1km upstream of dam site Submergence area 1 and 3km down stream of Tail Race discharge
2.	Effluent from Sewage Treatment Plant (STP)	pH, BOD,COD, TSS, TDS.	Once every Year	Before and after treatment from Sewage Treatment Plant (STP)
3.	Erosion & Siltation	Soil erosion rates stability of bank embankment, etc.	Twice a year	-
4.	Ecology	Status of afforestation programmess of green belt development	Once in a year	-
5.	Water related diseases	Identification of water related diseases, sites, adequacy of local vector control measures, etc.	Three times a year	Villages adjacent to project area
6.	Aquatic ecology	Phytoplanktons, zooplanktons, benthic life, fish composition	Once a Year	1km upstream of dam site Submergence area 1 and 3km down stream of Tail Race discharge
7.	Land use	Landuse pattern using satellite data	Once in a year	Catchment area
8.	Soil	pH,EC, texture, organic matter	Once in a year	Catchment area

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COST ESTIMATES
COST FOR IMPLEMENTING ENVIRONMENTAL MANAGEMENT PLAN

The total amount to be spent for implementing of Environmental Management Plan (EMP) is Rs. ~~325.17 million~~. The details are given.
18330.59 Lakh.

Cost for implementing of Environmental Management Plan

S. No	Item	Cost (Rs.Lakhs)
1.	Sanitary facilities in labour camps	5.00
2.	Solid waste collection and disposal system	6.00
3.	Stabilization of muck disposal sites	14.00
4.	Management of impacts due to construction of roads	30.00
5.	Provision for free fuel wood distribution	5.00
6.	Construction of setting tanks	12.00
7.	Landscaping and restoration of construction sites	4.00
8.	Wildlife Conservation	5.00
9.	Public Health Delivery System	20.00
10.	Stabilization of quarry sites	5.00
11.	Sustenance of riverine fisheries	6.00
12.	Green belt development including roadside plantation	10.00
13.	Resettlement and Rehabilitation Plan	15000.00
14.	Treatment of directly draining catchment area	150.00
15.	Monitoring programme during construction phase	10.00
16.	Contingencies	20.00
17.	Afforestation Plan	392.19
18.	Command Area – Drainage system	2636.40
	Total	**18330.59**

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ENVIRONMENTAL MONITORING PROGRAM

The cost required for implementation of the Environmental Monitoring Programme during project construction phase is of the order of Rs.10.00 million. The details are given below.

Cost required for implementation Environmental Monitoring Programme during project construction phase

S.No.	Item	Cost (Rs. million/year)
1.	Effluent quality	4.98
2.	Ambient air quality	2.34
3.	Incidence of water related diseases	1.22
4.	Purchase of material instruments	0.50
5.	Purchase of noise meter	0.50
	Total	**1.16**

The cost required for implementation of the Environmental Monitoring Programme during project construction phase is of the order of Rs.1.16. million/year. A 10% annual price increase may be considered for every year. The details are given in Table.

Cost required for implementation Environmental Monitoring Programme during project construction phase

S. No.	Item	Cost (Rs. million/year)
1.	Water quality	0.30
2.	Soil quality	0.16
3.	Ecology	0.20
4.	Public health	0.20
5.	Land use pattern	0.30
	Total	**1.16**

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Resettlement & Rehabilitation Plan

1.0 PROJECT DESCRIPTION

1.1 Introduction

The Vidarbha Irrigation Development Corporation (VIDC) has been formulated for improving the irrigation potential of Vidarbha region of Maharashtra. VIDC has undertaken a few major, medium and minor irrigation projects based on the extent of catchment areas of respective projects.

The Lower Penganga Project is a major Interstate Irrigation Project between states of Maharashtra & Andhra Pradesh to be constructed across the river Penganga in Godavari basin.

The Principal aim of the project is to provide Irrigation facilities in Yavatmal & Chandrapur district of Maharashtra & Adilabad district of Andhra Pradesh. The project provides assured & substantial Irrigation facilities to the Naxal affected backward regions of both states.

Penganga Project Division of VIDC, Government of Maharashtra is implementing the Penganga River Project at Tadsavali village of Ghatanji Tahasil in Yavatmal district of Maharashtra. Project is a major irrigation scheme to provide irrigation facilities to about 160050 Ha. area in the command area, utilizing 1164.30 Mm^3 of water. The total catchment area of the project is 17983 Sq.Km(6945Sq.miles).

As the project is a major irrigation project, this would involve huge land acquisition, which would affect a large number of Project Affected Persons (PAPs) from many villages of the submergence area, besides their evacuation from the existing settlement and their resettlement in new resettlement colonies. For completion of the ongoing Penganga Major Irrigation Project an Environmental Impact Assessment (EIA), Environment Management Plan, Social Assessment (SA) and Resettlement & Rehabilitation Action Plan (RRAP) are essential.

1.2 Land and Property Acquisition

The land acquisition and involuntary resettlement of the PAFs may give rise to some economic, social, and environmental problems; resulting in dismantling of production systems, loss of productive assets and income sources. This may also result in relocation of people in environments where their productive skills may be less applicable; community structures and social networks are weakened with the dispersion of kin groups and

cultural identity and potential for mutual help are diminished.Involuntary resettlement may cause severe long-term hardship, impoverishment, and environmental damage unless appropriate measures are carefully planned and carried out from the earliest stages of project preparation, taking various policy considerationns into account.

For implementation of the Penganga River Project, land and property acquisition is involved. For the betterment of the Project affected Persons (PAPs) whose land/property/infrastructure is acquired for the projects, the Government of Maharashtra has framed comprehensive Rehabilitation and Resettlement (R&R) policies. This plan emphasizes intergration of R&R measures for the PAPs along with the environmental and social dimensions requiring huge investments and causing displacement of people due to land acquisition.

The legal responsibility of the resettlement of the displaced families rests with the VIDC itself. Besides allocation of homestead plots to the PAFs in the resettlement colonies. VIDC would provide infrastructure facilities such as electricity, water supply, schools, temples etc. in all the resettlement colonies as per the provisions of the **Maharashtra Rehabilitation of the project affected Persons, Act 1986.** It would also provied other rehabilitation measures including providing reservation for the employment in Government of Maharashtra. The aspects related with the Land and Property Acquisition for the Project, are described in detail in **Chapter 2** of this Report.

1.3 Infrastructure and Auxiliary Facilities

The basic requirements for construction of dam and canal are availability of land, water, power and the infrastructure facilities like road and railhead, availability of communication facilities etc. All infrastructure and other auxiliary facilities would be established at respective project locations.

The existing Road Network is likely to be widened and strengthened for operational conveniences of the people in the post-dam construction scenario.

Also because of the proposed projects,health and education facilities, transport and communication facilities, civic amenities would be improved and the quality of life in the area would be enriched.

1.4 Ecological and Environmental Care by VIDC

VIDC follows a well-define environmental policy for arresting and controlling environmental pollution while implementing all possible pollution abutement measures and implementing them with utmost care. In

this direction VIDC undertakes tree plantations in all possible open spaces in the surroundings of the dam for preserving and enriching ecological aspects of the area. The plantations would help in controlling air pollution and act as a wind barrier which also prevents soil errosion.

In nutshell, all above reveals that project is involved in all-round development of the project areas while enriching the socio-economic conditions of people. It would provide adequate compensation to all the affected landowners and makes provision for employment and Resettlement and Rehabilitation benefits to the applicable persons as per the R & R Norms of the Government of Maharashtra.

The submergence area of Penganga project along with its buffer zone of 0.5m. height works out to a maximum FRL of 262 m. spreading over about 15951.10 Ha.

1.5 **Geographical Conditions of the Reservoir Area**

The Penganga submergence area is located in a depression having slopes towards the existing rivers and streams. The entire submergence area is used for cultivation of crops except the area falling under settlements, roads and other developed/built-up areas, and part of it is under forest cover.

The reservoir area studies revealed almost the entire reservoir area other than the built-up areas consisting of agricultural land, orchards forest area and other cultivable areas which at present area kep as current fallows or having small bushes which have grown due to non-cultivation of the area.

In a few places the reservoir periphery passes through existing settlements viz. Zapalwadi, Sadoba Sawali, Kawatha bazar, Mukindpur, Sakur, Ghoti, Bhosa, Dahisawali, Anantwadi, Dhanwad, Wadsa, Ner Chinchkhed. As the area of submergence divides the existing settlement into two,parts i.e. inundated and not affected portion of villages. However due to the anticipated environmental problems that would be associated with living adjacement to the stagnated water bodies such as this reservoir, all the partial affected villages would be shifted from their present locations and resettled in alternate resettlement colonies.

Besides the partially affected settlements in the reservoir periphery the roads and other infrasturcture provided even outside the reservoir periphery would be affected due to submergence on account of severances to them.

The most important link between Ghatanji and Arni via Pahur would be served due to this project. Inorder to provide linkages between this two

important settlement and alternative road outside the periphery of reservoir will be constructed.

1.6 Methodology for the Study

Comprehensive and task specific methodologies have been formulated for various studies related with Baseline Socio-Economic Surveys and Preparation of Resettlement and Rehabilitation Action Plan (RAP) for the PAPs involved in their involuntary resettlement due to the land and property acquisition. The methodology and steps followed for achieving various tasks mentioned in respective sections of the subsequent chapter dealing with Social Assessment (SA) and RRAP.

1.7 Organisation of the Report

Various Components of the study area presented in respective Chapters of this Reports as shown below:

Chapter-1 Introduction
Chapter-2 Salient Features of the Project
Chapter-3 Issues involved in Land Acquisition for Project
Chapter-4 Maharashtra Rehabilitation of Project Affected person Act
Chapter-5 Socio-Economic Surveys of Project Affected persons
Chapter-6 Resettlement and Rehabilitation of PAPs
Chapter-7 Development of Resettlement and Rehabilitation Plan.

2.0 SALIENT FEATURES OF THE PROJECT

2.1 Introduction

The catchment area of the project consists of the submergnece area at the full reservoir level and the entire basin in the upstrem of the dam outside the area of submergence. The catchment arca of the project has been described in the following sub-sections.

2.2 Submergence Area

The area would be submerged at the FRL i.e. 261.50 m. and an additional buffer zone of 0.50 m. height, thus making the maximum FRL of 262.00 m. measures to about 15951Ha. Out of this area, about 66% area falls in Yavatmal District and the remaining 34% area falls in Nanded District. The submergence area is a soccer like depression while gently sloping to the rivers or streams. Almost all the land falling in submergnece zone are cultivable & forest land The ownership pattern of the submergence shows that majority land belongs to the private landowners while some land vests under the government ownership. The land ownership pattern of the submergence area is presented in **Table-2.1.**

TABLE – 2.1.
LAND OWNERSHIP PATTERN OF SUBMERGENCE AREA.

Sr. No.	Details of Land	Area (Ha)	Percent Area (%)
1	Private Land	14704	92.18
2	Government Land	500	3.14
3	Forest Land	747	4.68
	Total	15951	100

2.3 Evacuation of Villages

All the village sites (gaothans) falling in the submergence zone would be evacuated and be resettled in the new resettlement colonies outside the area of submergence. Under Lower Penganga Project 32 Villages would be fully affected due to submergence while 14 villages would be partially affected. The list of affected villages and the population residing in these villages are found as per survey performed is presented in **Table –2-2.**

TABLE – 2.2
FULLY & PARTIALLY AFFECTED SUBMERGENCE VILLAGES

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Sr. No.	Villages Name	No. of Houses	Population
I	**Yavatmal District**		
1	Khadka	197	1009
2	Chimta	41	178
3	Ayata	222	1076
4	Jalandri	23	102
5	Kawatha (BK)	117	523
6	Umari	346	1523
7	Gudha	42	194
8	Amboda	186	835
9	Palasi	226	1034
10	Kapeshwar	147	589
11	Sakhara (Tanda)	170	833
12	Warud (Tuka)	100	507
13	Datodi	197	871
14	Dhanora (Rani)	396	1410
15	Bilayata	97	486
16	Manusdari	181	745
17	Yerul	61	259
18	Ratnapur	124	648
19	Kopri	96	440
20	Kapsi	18	86
21	Kawatha (Kh)	127	574
22	Yedsi	70	216
23	Koli (Kh)	153	691
24	Kawatha (Bz)	398	858
25	Mukindpur	123	545
26	Sadoba Sawali	655	3102
27	Donwada	80	300
28	Zapalwadi	107	437
29	Sakur	155	647
30	Ghoti	359	1828
31	Dahisawali	230	1049
32	Dhanwad (Dhanoda)	233	1106
33	Bhosa	317	1374
34	Anantwadi	122	542
Sr. No.	Villages Name	No. of Houses	Population

2.4

2.5

II	**Nanded District**		
35	Sindkhed	294	1347
36	Bond-gavhan (Chaufula)	120	535
37	Karalgaon	61	265
38	Vasram Naik (Tanda)	177	958
39	Wadsa	296	1580
40	Padsa	239	1261
41	Ner	46	196
42	Khambala	275	1417
43	Pathari	160	907
44	Rampur	112	609
45	Dhanora (Sindkhed)	60	276
46	Chinchkhed	180	841
	Total	**8136**	**36809**

2.4 Severance of Road due to Submergence

About 8 Km length of Sawali-Chikhalwardha road between the dam wall would be submerged due to the submergence of the dam. To facilitate the connectivity of people between Sawali to Chikhalwardha alternate road has to be constructed outside the area of submergence. Some three-phase, low tension electric lines would be served due to the submergence of the area and necessary planning to be made for shifting these electric line to the outside areas of submergence. Adquate financial provision has to be made after actual starting the Rehabilitation process.

2.5 Resettlement and rehabilitation of the Project affected Persons

The land falling in the submergence zone is to be acquired from the land owners under the provisions of the Land Acquisition Act 1894 amended from time to time. Under this provision, the Special land Acquistion Officers proposed to be appointed by the District Collectors of Yavatmal and Nanded for the land Acquision and Resettlement process.

As it is not possible to compensate the Project Affected Families (PAFs) under the option of 'land to land'. Only monetary compensation for the loss of land and built-up structures is being paid to the project Affected Persons (PAPs). The compensation to the land is being paid as per the periodical "awards" declared by the Revenue authorities of the Government of Maharashtra. The resettlement and rehabilitation of the submergence village is to be undertaken as per the Guidelines of the Maharashtra Rehabilitation of Project Affected Persons Act-1999.

2.6 Existing Cropping pattern of the submergence Area

Jawar and Cotton are the most predominant existing crops of the submergence area of the project and are grown in rain-fed conditions, at the mercy of the Rain of Gods. The major part of the submergence are comprises medium to light soils. The existing subsidiary cropping pattern of the submergence area comprises of pulses, wheat.

2.7 Benefit Cost Ratio

For the Benefit cost Ratio Calculatins, the gross crop yield rate for crops is considered as per the rates supplied by the joint Director, Agriculture Department, Amravati and rates of A.P.M.C. Yavatmal. The B.C. ratio of project has been worked out at 1.67 which is quite attractive and shown the Lower Penganga Project is an economically viable and feasible project in spite of excess in the cost estimates. The costs of the project and benefits anticipated from the project are discribed in the respective sections.

2.7.1 Net Annual Benefit After Irrigation.

The net anticipated Benefit from the Project is Rs. 41248.92 lakhs.

From Fisheries

The benefits anticipated due to the fisheries development in the project is estimated to be 5502.00 lakhs.

Benefits From Water Supply Scheme For Domestic Purpose

The benefit anticipated due to the water supply of about 76.29 Mm^3 which includes 67.14 Mm^3 for Maharashtra dn 9.15 Mm^3 , for Andhara Pradesh to the nearing urban and rural settlement.

Lift Irrigation scheme

The proposed Penganga reservoir has been proposed to irrigate some lands throught a lift irrigation schemes. These lift Irrigation scheme are integral part
of the project. The details alrout this as follows.

i) Parwa Lift Irrigation Scheme :-

This lift Irrigation scheme proposed to irrigate total Area of 40050 ha. (I.C.A.) the Irrigation area proposed, has been calculated by flow Irrigation. this area can be increased by adopting new methodology of irrigation like drip irrigation system and the cultivator of this Area has be insist to establish to co-operative society to maintain the scheme thereself.

ii) *Kali Lift Irrigation Scheme*

This lift Irrigation scheme proposed to irrigate total area of 39954 Ha. The Irrigaable area calculated as per Parwa Lift Irrigation Scheme and it can be inereased by installing new Methodology of Irrigation which is discussed as above.

iii) *Mukutban Lift Irrigation Scheme*

This Lift Irrigation scheme proposed to Irrigate total area of 5500 Ha.

3.0 ISSUES INVOLVED IN LAND ACQUISITION FOR LOWER PENGANGA PROJECT

3.1 Preamble

The lower Penganga River Project envisages the construction of Earthen Dam of about 1980 m. long with masonary gated central spillway. The project is permanent in nature and required huge extent of lands for various components of the project such as the dam seat, submergence area, quarries, project offices, etc. This essentially involves acquistion of viallage sites (gaothans) along with their houses and homesteads. This obviously calls for evacuation of the project affected persons from their properties and houses that would be affected due to the land acquisition.

Large-scale land acquisiton along with the acquisition of villages sites, houses and homesteads of PAFs necessitates the resettlement of affected Families in the areas outside the proposed project area. Besides paying the compensation to the land and property losers, certain rehabilitation measures are essential to improve the socio-economic conditions of the affected families, after land acquisiton. On account of its regular land acquistion which hand-in-hand involves resettlement and rehabilitation of the affected families, the Government of Maharashtra has formulated well defined Resettlement and Rehabilitiation (R&R) policies under its Rehabilitation of the Project Affected Persons Act, 1986, consisting of various norms and social guidelines for addressing to the resettlement and rehabilitation aspects of the PAPs. The comperehensive R&R Nornms as per the said Act and applicable to the Lower Penganga River Project are presented in Chapter-4 of this report.

The principal objective of the current Resettlement and Rehabilitation Action Plan (RRAP) is to ensure that the PAFs of the project-affected lands of the Penganga River Project has to received adequate compensation and rehabilitation assistance. This is required for making the PAFs to achieve at least the pre-project income levels, if not to improve their economical status substantially after the land acquisition in the shortest time and retain their potential for further economic growth.

Having identified all the PAFs from the Land Records of the Government of Maharashtra, Which show the landwonership of various plots proposed for the acquisiton. The information regarding socio-economics status of PAF's has been collected from actual survey. In spite of this, Focus group discussions were held with villagers in Khambala village nearby Dam site the discusion mainly based on the opinion and suggestion of PAP's about R x R measures preferances of PAPs for income generation activities were inquired moreover, the compensation regarding Land Acquisition in not

satisfactory and it should be revised. They also suggest that at least one person from PAF's Govt. employment opportunity should be given to them and other topics were discussed during the meeting like Resettlement plan, compensation to houses, quality of work, to avail the home loan at nominal rate of interest. Besides this, Focus Group Discussions (FGD) were held in some major affected villages due to the land and property acquisition by the Lower Penganga River Project for eliciting the opinion and suggestions from the community. In the SEHS and FGDs, the proposed R&R measures of the Government of Maharashtra were discussed in detail and the preferences of PAPs for income generation activities were inquired. The responses from the PAPs and the community have framed the basis for developing there RPA and all applicable suggestion given by them have been incorporated in this RAP, after a critical evaluation of their applicability.

3.2 Land Acquisition of the Project

The land Acquisition for any government project or recognized by the Government as a project of national importance, even under the private sector in India is done through the Land Acquisiton Act 1984, amended from time to time as well as through mutual direct negotiation with the PAFs of the Project area. The required land for public projects in Maharashtra State are also acquired under the provisions of this Act. This Act empowers the Government to acquire immovable properties at a fair and responsible price for public purposes. The LA Act also describes the valuation process, and administrative mechanism for delivering the provisions of the Act.

Penganga River project acquires the lands requried for its project through the Revenue Department of Government of Maharashtra and pays monetary compensation to the PAFs as per the computations done by the Revenue Department under the provisions of this Act.

While initiating the proceedings for land acquisiton a requisition will be made before the Land Acquisition officer (LAO) by VIDC. The chief of VIDC submits the details of all lands, which include the Survey numbers and Sub-Division numbers of the plots proposed for acquisiton and the names of owners of these lands along with cadastral map showing the proposed lands for acquisiton.

The process of land acquisition starts with Section 4 of the LA Act. The District Collector issues necessary notification with respect to the said lands for specified purposes; to be published in 2 newspapers circulated in the locality, of which at least one should be in the regional language. The notice is also to be displayed at a convenient place in the locality. Such a

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notice provides an opportunity to the parties interested in the land to file objections, if any u/s 5A to the proposed acquisition. As per Section 5 of the Act, the LAO visits the land to be acquired for verifications, demarcation etc. and pays the costs/damages to all the persons interested for any damage/loss incurred in such a survey and demarcation etc. The damage so paid may prove insufficient or the persons interested may file objection before the District Collector whose decision in the matter is final.

In order to proceed with the acquisition of the notified land or any portion of it, a declaration section 6 of the Act would be made specifying the precise boundaries of the area to be acquired. Every declaration is published in the official gazette and in 2 daily newspapers with ciruclation in the local area. With the appearance of the declaration section-6 of the Act in the Gazette, Revenue Department of the Government issues orders to the District Collector section-7 of the act to acquired the notified land and / or other immovable properties. The land proposed for acquisition is marked out,measured and planned section-8. Under section-9, notices are issued to the concerned persons stating the intension of the government to take possession of the land and that any claims for compensation are to be made to the District Collector. Finally, the award of compensation is made by the District Collector section-11 of the act after inquiring into objections (if any) in Pursurant to the notice given section-9 to the measurements made section-8. The award Section-11 should be made within 2 years from the date of publication of the declaration, and if no award in made within the specified period, the entire Proceedings of the LA would be lapsed and fresh notifications Section-4 (1) would be initiated. Once the award in passed, the District Collector takes possession of the land, which there upon vests with the Government, free from all encumbrances. However, in case of emergency, Section-17 of the Act empowers the District Collector to take possession of the land even though no award has been made. Such land there upon vests with the Government free from all encumberances.

If the Government acts under section 17(4) of the Act all other formalities are waived and even the right of the persons inerested in the land section-5 A is taken away and the land vests in the Government with the taking over of the possession of the land.

Under Section 18, any person who has not accepted the award made by the District Collector may make an application before the District Collector for

making a reference to the court in the forms specified in the application, provided that :

- Such application is filed within six weeks from the date when the award was made by the District Collector and if the person interested was present of represented before District Collector at the time the award was made :

- In case the person interested was neither present nor represented before the District Collector when he made the award; such application can be made within six weeks from the date of receipt of notice of award section-12(2) of within six months from the date of the award by the District Collector.

Also the amended LA Act 1984 has provision for acquiring land through direct negotiation between the project affected families and the concerned project/Government authority. For all cases, the Government authority is the Revenue Authority.

3.3 Resettlement and Rehabilitation Policy

The R&R policy of the GoM identifieds the following basic categories of issues/impacts in any of its proposed projects where land acquisition and resettlement of the displaced persons are involved :

a) Loss of land
b) Loss of Structure
c) Loss of Standing Crops
d) Loss of means of Livelihood
e) Losses of during transition

VIDC is committed to minimize displacement as a result of its proposed projects. The objective of the R&R policy and the associated entitlement framework is to improve the living standards of the PAPs. The entitlement framework and the benefits under the Lower Penganga River Project R&R policy have been dealt in detail in Chapter-4.

The Cut-off Date for the PAFs loosing their privately owned land and structures thereupon for the project will be the date of Notification under Section 4(1) of the Land Acquisition Act, 1984 (amended in 1994).

4 Categorization of PAFs by Penganga River Project

Penganga River Project has classified the project affected families into two categories as follows :

1. Project Affected Families (PAF), who would be affected due to the acquisition of houses and homesteads in the affected gaothan and would be displaced from their present locations of residences; and
2. Project Affected families (PAF), who would lose only lands while their homesteads are not affected.

Each homeshead affected family is automatically considered as a project affected family, but each project affected family is not a homestead affected family.

3.5 Benefits to PAPs and DPs

The benefits proposed for the PAPs under the R&R policy of the GoM are discribed in the following sections.

Compensation for Lost Assets :

Every PAP is entitiled to the monetary compensation as per the loss of assets, he/she had lost, which is described below.

Land :

The monetary compensation for the lands that are lost by the PAPs would be determined and disbursed under the provisions of the Land Acquisiton Act, 1984 (amended in 1994) and based on the land sale deeds executed with the Sub-Registrar's Officers of the project areas, the legal proceedings will be initiated and completed by the Special Land Acquisition Officers (SLAO), at least of the rank of Tahsildar of the Revenue Department., the legal proceedings ensure the monetary compensation for lands at the most representative price or the price fixed with mutual negotiations with the PAP. The said Act empowers the District Collector to acquire land without being challenged by the PAP at the lower courts and paying the enhanced comepnsation if the situation demands so.

Structures :

The value of structures depends on the measurements of structures, the type of construction and the materials used in construction. The structures would be valued by the Public Works Department of Government of Maharashtra. The PAPs are allowed to recover the building materials from their structures for their re-used.

Trees :

The value of trees, crops etc. would be valuated by the Special Revenue Officials through the respective awards for the land and the compensation would be paid accordingly. In case the owners opt to cut and remove the trees for their own use that is permitted. In such cases no compensation on this account shall be paid.

3.6 Resettlement of Displaced Families

Every displaced family as defined in the R&R policy is eligible for allotment of alternate house site for shelter in the Resettlement Colony and also entitled to the infrashructure and social services provided therein, on a collective basis, under the provisions of the RRAP.

3.7 Rehabilitation of the Project Affected Families

The rehabilitation benefits envisaged under this RRAP takes the form of providing the eligible PAFs, regular employment in the project and temporary jobs through contractors and make access to their training and income generating schems (Self employment schemes)

Economic Rehabilitation :

The PAFs could have access to training, reservation for employment in Gom and income generation opportunities under the R&R Policy.

3.8 Priorities for Resettlement and Rehabilitation Benefits

While the monetary compensation for the loss of assets is under the legal framework of the Land Acquisition Act, the resettlement and Rehabilitation benefits are extended by VIDC to the PAFs on compassionate grounds. The benefits under this plan depend on the categories of the PAFs as explained above, according to the nature and type of assets lost and the magnitude and the severity of the losses.

3.9 Date of Eligibility

The cut-off date for the PAFs loosing their privately owned land and structures thereupon of the project will be the date of Notification under Section 4(1) of the land Acquisiton Act, 1884 (amended in 1994). The date for eligibility of any PAF for the purpose of extending rehabilitation benefits shall be the date of taking over the possession of the properties from the PAF and not the award date.

3.10 Training

The skill levels of the PAFs are low in the area, hence is would be desirable to impart training to the PAPs for their employment opportunities in GoM and also to enable them to sustain on their own. For impacting training to the members of PAFs under self-emplyment scheme envisaged in this plan, the training courses would be organizied by the District Rural Development Agency (DRDA)

3.11 Employment

Penganga River Project would provide employment to the suitable eligible PAFs in its project; however, these are subject to their eligibility and caliber. Efforts would be done by VIDC for providing employment or indirect employment through contractors to the PAPs.

3.12 Conclusion

As the land acquisition for its various schemes are an on going activity, the Gom has devised its R&R Policies with the close-ended R&R programmes. Many of these policies have been proposed for their implementation in the proposed LA and R&R projects of GoM. These R&R schemes would provide a long-term sustainable growth of the project-affected community.

4.0 MAHARASHTRA REHABILITATION OF PROJECT AFFECTED PERSONS ACT

MAHARASHTRA ACT NO. XXX II OF 1990

CHAPTER-1

In Maharashtra "Maharashtra Project Affected Persons Rehabilitation Act 199" is in force since 1st April 2002. In February-2004, Govenrnment of India had adopted National Rehabilitation Policy 2003 for Rehabilitation of Project Affected Persons. As per this policy it is required to form independent Rehabilitation Authority to implement the rehabilitation work & to divert the fund to this authority and get the work done from this authority as per provisions in the policy. It is aimed to increase the participation of PAF's in Rehabilitation work. Maharashtra Government has decided to adopt the policy of "First Rehabilitation & then Construction of Dam". To implement this policy and make the Rehabilitation policy as per Central Government's National Policy M.S. Government vide GR No. RPA 2006/Case No 1(3)/R-1/dt.17/4/06 has decided to give additional benefits, which are as follows.

Financial Assistance for Constructing Cattle Shed

Each PAF having cattle shall get financial assistance of Rs. 3000/- for construction of cattle shed.

Financial Assistance for Construction of Working Shed / Shop

Each PAF comprising of rural artisan / small traders and self employed persons shall get one time financial assistance of Rs 10,000/- for construction of working shed /shop.

Government Job reservation upto 5% on priority

Project Affected Self Employed person will get benefits as per Maharashtra Government Resolution No RPA-2001/case no. 90/R-1dt 14th March 2002.

Tribal Project Affected Persons will be given priority on distribution of alternative land. As far as possible the rehabilitation will be done nearer to the old habitat if he is resettled outside original taluka / district then he will be given additional 25% amount for construction of house/shop.

In case of linear acquisition for canals where in only a narrow stretch of land is being acquired each khatedar will be offered an exgratia amount of Rs.10,000/- no other resettlement and rehabilitation benefits shall be available to them.

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1. (1) This act may be called the Maharashtra Project Affected Persons Rehabilitation Act, 1999.

(2) It extends to the whole of the State of Maharashtra

(3) It shall come into force on such date as the State Government may, by notification in the official gazetted appoint.

(4) a) It shall apply to all irrigation projects of which the area of the affected zone exceeds 50 Hec., or the area of ha benefited zone exceeds 200 Hec of a gaothan is affected.

b) Where, in the opirrion of the State Government, it is necessary and expedient in the public interest to apply into any other project the state government may, by notification in the official gazette, declare that it shall apply in relation to such project as specified in the notification, and there upon the provisions of the act shall apply to such project.

c) Not with standing anything contained in clauses (a) and (b) it shall not apply to a project which is an inter state project.

2. In this act, Unless the context requires otherwise.

(1) "Affected zone", in relation to a project, means the area declared under section 13 to constitute the area of the affected zone under that project;

(2) "Affected" person means-

a) An occupant whose land in the affected zone (including land in the gaothan) is acquired under section 14 for the purposes of a project.

Explanation : For the purposes of this sub-clause, where any agricultural land is recorded in the relevant village records in the name of one of the brothers as a Karta or Manager of a Hindu Joint Family, then every brother (or son or sons of any deceased brother all together as one unit) who has a share is the lands, whether his name is recorded in such village record or not, shall be treated as affected person;.

b) A person who is a tenant is actual possession of land under the relevant tenancy law in the affected zone at the time of acquisition of land:

c) An occupant whose land in the benefited zone is acquired for

construction, extension, improvement or development of canals and their banks under major or medium Irrigation Project or for establishment of a new gaothans within or outside the benefited zone for rehabilitation of persons from affected zone and whose-

i) Residual cultivable holding is reduced to less than 1 Hectare after acquisition; or

ii) Residual holding stands divided into fragment which are rendered unprofitable for cultivation; or

iii) Residual holding is rendered uncultivable.

Explanation: For the purpose of this sub clause the expression "occupant" includes a tenant in actual possession of land under the relevant tenancy law in the benefited zone at the time of acquisition of land.

d) A person, not being an occupant or a person referred to sub-clauses (a), (b), (c) and (d) who for a continues period of not less than 5 years immediately before the date of publication of the notification under Section 4 of the Land Acquisition Act, 1984, has been ordinarily residing or carrying on any trade, occupation or calling or working for gain in gaothan in the affected zone.

(3) "Agricultural laborer" means a person who does not hold any land in the affected zone but who earned his livelihood principally by manual labour on agricultural land for not less than 5 years immediately before the area comprising that land is declared to constitute an affected zone under Section 13, and who has been deprived of earning his livelihood principally by manual labour on that land;

Explanation: for the purpose of determining the 5 years residence in the affected zone, the norms shall be as prescribed-

(4) "Agricultural land" includes land used or usable for horticulture, the raising of crops, grass or garden produce, dairy farming, poultry, farming, breeding of livestock, nursery, growing, medicinal herbs or the grazing of cattle, but does not include land used for cutting of wood only.

(5) "Beneficiary" in relation to a project means whose ever, either individually or as an institution; company, factory gets benefits directly or indirectly from the project;

(6) "Benefited zone" in relation to a project, means the area declared under section 13 to constitute the area of the benefited zone under that project.

(7) "Code" means the Maharashtra Land Revenue Code, 1966;

(8) "Holding" means the total land held by a person as an occupant or tenant, or as both;

Explanation : For the purposes of this clause, while calculating the total land held by a person, the following lands in the benefited zone shall not be taken into consideration namely-

a) The land on which the dwelling house or cattle shed (*gotha*) is erected and such land shall include also the area adjacent thereto comprising land or three meters surrounding such dwelling house or cattle shed (*gotha*);

b) The land on which a well has been dug and is shown as such in the village register of land records (*Village forms VII & XII*);

c) The land which is shown as unarable or uncultivable (*potkharab*) land in the village register of land records (*Village forms VII & XII*) for a continuous period of not less than five years immediately before the year of issue of the notification under Section II;

d) Fifty percent, of the land which is shown as saline (*Khar*) land in the village register of land records (*village from VII and XII*) for a continues period of not less than five years immediately before the year of issue of the notification under Section 11;

(9) "Land pool" means the land referred to in sub-section (1) and (4) of section 14 which may be available for rehabilitation of affected persons;

(10) "Project" means-

a) An irrigation project, that is to say, the construction, extension, improvement or development of any work for the supply of water for the purpose of irrigation;

b) Atomic energy & power project, that is to say, construction, extension improvement or development of any work for the

production or supply of electricity *or* any work conducive to electrical development;

c) A public utility project, that is to say, any work of the construction, extension, improvement or development of public utility including roads other than irrigation project and power project;

d) National park and sanctuary declared under the provisions of the Wild Life Protection Act 1972;

e) An industrial project, that is to say, setting up of production distribution or service industry or providing any service, in relation to then and includes an Industrial Estate;

f) An university project, that is to say, setting up of any university or any teaching, training institution;

g) A chemical project, that is to say, extraction, production and processing of chemicals;

h) A mine project, that is to say, extraction of any mineral from the bed of the earth or river bed;

i) Any composite project of any of the two or more such projects and includes any work of construction, extension, improvement or development which is incidental or supplemental to the execution of a project, such as construction of pump house, lift irrigation scheme, colony etc, and which result in rendering the holders or occupants of land, which may be used for such project, as affected persons and in respect of which a notification is issued under Section 11.

(11) "Project Authority" means an officer in whom overall control and superintendence of the execution of the project vest; and includes and officer whom the State Government may, by a general or special order, designate to be a project authority;

(12) "Prescribed" means prescribed by rules made under this Act;

(13) "Revenue division" means a revenue area which from a division under Section 3 of the code;

(14) "Rules" means rules made under this Act;

(15) "Schedule" means the schedule appended to this Act;

(16) "To cultivate" means to carry on any agricultural operation, and the expression "cultivation" shall be construed accordingly;

(17) "Village Panchayat" means a village panchayat established or deemed to have been established under the Bombay Village Panchayat Act 1958;

(18) Words and expressions used in this Act but not defined shall have the meanings respectively assigned to them in the code.

CHAPTER-II
CHIEF CONTROLLING AUTHORITY, PROJECT AUTHOIRTY, THEIR POWERS AND DUTIES.

3. The Chief Controlling authority, in all matters connected with the rehabilitation of affected persons in a revenue division, shall, subject to the superintendence, direction and control of the State Government, vest in the Commissioner appointed under section 6 of the code.

4. Subject to any general or special order of the State Government, it shall be the duty of the commissioner-

a) To implement the rehabilitation programme within the framework or the policy of the State Government relating to the rehabilitation of affected persons in his division;

b) To co-ordinate and supervise the work of rehabilitation of affected persons in his division;

c) To ensure speedy rehabilitation of affected persons by requiring the Collector or the Project Authority concerned to undertake the work of rehabilitation simultaneously with the work of the project; and to report to him periodically the progress made in the matter of rehabilitation of affected persons and by rendering to them such guidance and assistance as the circumstances of the case may require;

d) To submit periodical reports to the State Govt. regarding the rehabilitation of affected persons in his division;

e) To prepare or cause to be prepared annual budget for providing funds for carrying out the rehabilitation of affected persons in his division;

f) To disburse the grants duly placed at his disposal for rehabilitation of affected persons, to such officers and authorities at such intervals according to their requirements as he may think fit, for carrying out the rehabilitation of affected persons;

g) To ensure the proper utilisation of grants placed at his disposal and carry out test audit;

h) To perform such other functions as the state government may, from time to time, by an order in writing, entrust to him.

5. It shall be the duty of the collector

a) To co-ordinate and supervise the work of rehabilitation of affected persons in his district;

b) To ensure the speedy rehabilitation of affected persons, within the framework of the policy of the state government relating to the rehabilitation of affected persons by requiring project authorities and the

subordinate officers posted to work on the project to attend to the work of rehabilitation as may be assigned to them from time to time;

c) To issue a certificate to a person who is nominated by the project affected person for being employed against the quota reserved for the nominees of the affected persons;

d) To perform such other functions as the State Government or the Commissioner may, from time to time, by an order in writing, entrust to him.

6. It shall be the duty of the Project Authority

a) To carry out such work for providing the necessary civic amenities in the new gaothan or the extension of an existing gaothan, as the case may be, established for rehabilitation of affected persons, as may be entrusted to it by the State Government or the Commission or the Collector;

b) To take measures for the speedy rehabilitation of the affected persons under to overall supervision and guidance of the collector;

c) Subject to any reservations validly made and subject to availability of posts, to give highest priority in class III and Class IV category of service on the project establishment, to one member of the affected family nominated by the affected person, if such member is eligible for such employment according to the recruitment rules for such posts;

Provided that while recruiting a member of the affected family, against such quota, the Project Authority shall, as far as possible, employ not less than 50% of such nominees who are affected by the project under execution, as may be prescribed;

Explanation : For the purposes of this clause the expression "Family" means the spouse, son, married or unmarried daughter or brother or sister, the daughter in law or grand son, or grand daughter (which include son or daughter of the daughter also) of the affected person or adopted son or daughter, who is residing with and is dependent on such affected person.

d) To prepare or cause to be prepared annual budget for providing funds for the civic amenity works to be provided in a new gaothan or extension of an existing gaothan establishment for the rehabilitation of affected persons;

e) To furnish to the Commissioner and to the Collector, during the various stages of planning and execution of the project, information and plans in regards to the affected and benefited zone of the project, as may be required for assessing the extent of land and other facilities required to be provided to the affected persons for their rehabilitation;

f) To execute an agreement with beneficiary to avoid by the provisions of Section 10 as may be prescribed.

7. 1) The State Government may, by notification in the official Gazette and subject to such restrictions and conditions, delegate such of the powers conferred and duties imposed on the Commissioner or the Collector or the project authority by or under this Act to such officers of the State Government or local authority as it may deem proper and expedient.

2) The Commissioner or the Collector may, by order in writing, delegate such of the powers conferred and duties imposed on him by or under this Act.

a) To such officers not below the rank of a Tahsildar; or
b) To such officers of the State Government of local authority as, with the approval of the Commissioner, may be specified in the order.

3) The Project authority may, by order in writing delegate such of the powers conferred and duties imposed on it by or under this act to such officers not below the rank of a Sub Divisional Officer, Deputy Engineer, Assistant Engineer, Assistant Conservator of Forest.

8. For the purposes of this Act, the Collector, the Project Authority and all other officers and servants appointed under this Act shall be subordinate to the Commissioner.

9. For the purposes of assisting it in the speedy rehabilitation of affected persons, the State Government may, from time to time, constitute one or more committees for advising the State Government or any officer connected with the scheme of rehabilitation of the affected persons on such matters as may be referred to it or them.. The composition of such a committee, the regulation of its business, the allowances or fees, if any, to be paid to its members and all matters incidental there to shall be such as the State Government may, from time to time by general or special order, determine.

CHAPTER-III
REHABILITATION OF AFFECTED PERSONS

10. 1) The State Government shall, in accordance with the provisions made by or under this Act, and subject to the availability of sufficient land for the purposes, rehabilitated affected persons from affected zone under an irrigation project, on land in the villages or areas receiving benefit of irrigation from such project.

2) Nothing in section 14 or any other provision of this Act or of any other law for the time being in force shall prevent the State Government from rehabilitating, in accordance with the other provisions made by or under this Act, as many persons as possible from the affected zone under any other project to which the provision of this Act apply or not, including those under any irrigation project who have remained to be rehabilitated:

   a) On land in benefited zone of any irrigation project or, as the case may be, in other villages or areas, acquired for the purpose under the provisions of Section 14; or
   b) On any land from the land pool.

3) The State Government shall provide civic amenities in the prescribed scale and manner in the new gaothan or in the extended part of any existing gaothan established for the purpose of rehabilitation of affected persons and such amenities shall include the following namely-.
   a) Permanent provisions for drinking water in proportion to the population, by open well, bore well, tube well, piped water supply scheme or by any other mode;
   b) School with playground of appropriate level as prescribed by the Education Department of the State Govt. with toilet facilities;
   c) Construction of village panchayat office and chavdi or samaj mandir;
   d) internal metal roads and asphalted approach road of appropriate standard;
   e) An access to the farm lands of the affected persons, if required;
   f) electric supply along with street lights and three phase connections wherever required;
   g) cremation ground with a shade, platform, electric supply, water supply and burial ground as may be required with an approach road;
   h) open built up gutters;
   i) financial assistance for individual latrines and public latrines wherever necessary;
   j) Land for cattles stand with a water cisterns;

k) Land with pick up shed for Maharashtra State Road Transport Corporation bus services;
l) Land for threshing floor, that is to say, Khalwadi;
m) Pasture land (if Govt land is available)
n) Developed land for market;
o) Land for future expansion of gaothan;
p) Land for a secondary school and dispensary or primary health center, bank, post office, garden for children etc. depending on the population of the new gaothan;
q) Land for registered bodies for public purposes in the old gaothan;
r) Land for play ground.

4 In addition to the amenities listed above the State Govt. shall also provide, to an appropriate standard, in the new gaothan having majority of the affected persons, all such other amenities which existed in the old gaothan:

Provided that, the places of public worship shall not be constructed by the Govt., however, the compensation for the places of public worship in the old gaothan shall be awarded to the concerned public trust and if the places of public worships do not belong to any public trust, such places of public worship shall be constructed as provided in the Maharashtra Religious Endowments (reconstruction on resettlement sites) Act 1970.

5. The expenditure on all such amenities in sub sections 3 & 4 above shall be part of the cost of the project.

6. a) In all Class 3 & 4 category of services under the establishment of State Govt. departments, public sector undertakings, local self government, Govt. aided institutions and co-operative societies specified under section 73A of the Maharashtra Co-operative Societies Act 1960 there shall be not less than 5% priority quota for the employment of the nominees of the affected persons

b) The beneficiary, persons, societies, companies, factories, sugar factories, spinning mills assisted by the State Govt. in the form of matching share contribution etc. shall provide employment to not less than 5 % of the cadre strength of Class 3 & 4 or equivalent of no technical employees to the nominees of the affected persons

Provided that, the above priority shall be treated as preference among the open and different reservation categories in *pro-rata* manner

c) The collector shall maintain a register showing a recruitment position in the district and ensure removal of the backlog in recruitment of the

nominees of the affected persons however, at any recruitment of the persons so recruited from among the nominees shall not exceed 50.

11. 1. In respect of a project to which this Act applies, the Commissioner of the revenue division, in which entire or major part of the project lies, shall by notification in the official gazette-

a) Specify, the villages or areas if any, which are likely to be in the affected or benefited zone of such project.
b) Specify, provisionally the area of holding in such villages or areas, if any, to which restrictions specified in section 12 shall apply.

2. Such notification shall be published in the villages or areas which are likely to be affected and benefited zones, by beat of drums and by affixing a copy of the notification in some prominent place or places in the zones, and in the villages chavdi and in the office of the Panchayat, if any, and also in the office of the Tahsildar, the Collector, the Project Authority and the Commissioner.

12. 1) Not withstanding anything contained in any law for the time being in force, no agricultural land in the village or areas specified in the notification under section-11 shall, after publication of that notification in the official gazette and until the collector makes a declaration to the effect that no further land in the benefited zone of any particular village or area there from is required for the purpose of this Act, be-

a) Transferred, whether by way of sale (including sale in execution of a decree of a civil court of an award or order of any other competent authority) or by way of gift, exchange, lease or otherwise;
b) Sub-divided (including sub-division by a decree or order of any court of any other competent authority); or
c) Partitioned (including apparition by a decree or order of any court of any other competent authority); or
d) Converted to non-agricultural purpose; or
e) Improved by making substantial additions and alterations except with the permission in writing of the Commissioner.

2) The Commissioner may refuse to give such permission, if in his opinion, the transfer, sub-division, partition or conversion of land is likely to defeat the object of this Act, or may give such general or special permission, subject to such conditions, if any, as it may deem fit to impose to carry out the object of this Act, including a condition that the grant of such permission shall be without prejudice to the area of land liable to be compulsorily acquired under section 14 on the basis of any holding as it existed immediately before the grant of such permission.

3) Any transfer, sub-division, partition or conversion or improvement of any land made in contravention of sub-section (1) or of any condition imposed under sub-division (2), shall be void and in-operative.

4) Any transfer, sub-division, partition, conversion or improvement of any land, in the villages or areas specified in the notification under section 11 and to which restrictions specified in this section apply, made on or before the date of such notification shall not be taken into consideration for the purposes of sub section (4) of section 14, unless such transfer, sub division, partition, conversion or improvement is made-

a) By meets and bounds and entries in respect thereof are recorded in the relevant village records after due certification; or

c) By decree to that effect and entries in respect thereof are recorded in the relevant village records after due certification or the proceeding are pending before the revenue authorities for recording the entries in respect of the same in the relevant village records.

13. 1) As soon as may be practicable, the Collector shall give a public notice inviting objections or suggestions in respect of the land within his district and falling under clauses under a) & b) of sub section 3 of this section, by publishing in the manner specified in sub section 2 of section 11 and also in the official gazette and in one daily news paper in Marathi language with wide circulation in the local area comprising such village in areas of the affected and benefited zones.

2) any person interested in the land in such areas may submit objections or suggestions, if any to the collector within 30 days from the date on which such public notice is published by beat of drums in the village or area concerned or the date on which it is published in the news paper as aforesaid whenever is later, and the collector, shall with all reasonable dispatch, forward any objections or suggestions so made together with his report in respect thereof to the commissioner and on considering the report and objections and suggestions, if any, the commissioner may pass such orders as he deems fit

3)The commissioner shall not latar than three years in case of major irrigation project and not latar than one year in case of other project from the date of publication of notification under section 11, shall by notification in the official gazette and also by publication of such notification in the manner provided in sub section 2 of section 11 declared-

a) the extent of area which shall constitute the area of affected zone under the project;
b) the extent of the area of benefited zone under the project if the project is an irrigation project,
c) which of the slabs mentioned in the part II of the schedule shall apply to such project for the purpose of acquisition of land in the benefited zone:

provided that it shall be lawful for the commissioner to notify the affected zone and the benefited zone by separate notifications.

4) The Project Authority shall furnish to the collector the detailed map of at least 25 % of the area of the benefited zone in case of a major irrigation project and 100 % of area in case of other project within one year from the date of notification under section 11

5) If at any time during the course of execution of a project, the project authority is satisfied that any change in the areas mentioned in the notification under sub-section (3) is necessary, it shall communicate such charge with reasons and the plans and particulars relating to the change to the commissioner through the Collector.

6) On receipt of the communication under sub-section (5) and the report of the collector, if any, commissioner may, after considering the reasons given by the project authority and in the report, if any, of the collector and making such enquiry, if any, as he thinks fit, make such change in the manner laid down in sub sections (1) , (2) and (3).

7) On publication of the notification as provided for in sub-section (5) or (6) as the case may be the restrictions laid down in sub-section (1) of section (12) shall not apply to lands which are not included in the benefited zone or the affected zone of the project in the villages notified under sub-section (1) of section (11)

14 1)The Commissioner or the Collector authorized by him by general or special order in this behalf may purchase or exchange any land required for carrying out the purposes of the Act :

Provided that, the amount paid under an agreement under this sub-section shall not be less than the amount of compensation payable for the land, had it been acquired in accordance with the provisions of sub-section (2)

2) Subject to the provisions of this section, the Commissioner may for carrying out the purposes of this act, also compulsorily acquire land under the land Acqusition Act, 1894; and the acquisition of any land for any of the said purposes shall be deemd to be a public purpose within the meaning of that Act.

3) The Commissioner may acquire lands included in a gaothan in the affected zone as far as practicable according to the provision of Part I of the schedule.

4) For the purpose of rehabilitating affected persons from the affected zone under an irrigation project, including those under any irrigation project who have remained to be rehabilitated, on land, the Commissioner may acquire land from holdings in the benefited zone of the project according to the slab declared in the notification under sub-section (1) of section 13 and may also acquire, where necessary, land from any other villages or areas, as it may deem fit.

5) All lands acquired under this section shall form part of the land pool

6) An affected person who entailed but does not want alternative land in the benefited zone shall be paid 50 % amount of the value of the land offered to him, such value having been worked out on the basis of the true market value estimated in the prescribed manner on the basis of the land rates determined and issued, at the relevant time in the form of annual statements of rates by the chief controlling authority under the Bombay Stamp (determination of true market value of property) Rules 1995, framed under the Bombay Stamp Act 1958.

15 Subject to the general or special order which the Commissioner may make in this behalf, the Collector shall prepare within six months from the date of notification under sub-section (3) of section (13), the proposals in one or more stages from time to time as the circumstances may require for rehabilitation of the affected persons from the affected zone under a project and publish a notice containing such proposals in the manner laid down in sub section (2) of section 11 for the information of such affected persons.

16 1) An eligible affected person who is desirous of getting land or plot or both in the area shown for the purpose in the scheme published under section 15 may make an application to the collector in the prescribed form for grant of land or plot; and subject to such rules as may be prescribed, it shall be lawful for the collector-

a) To grant land acquired under section 14 to such affected person with the occupancy status of the land held by him earlier;

b) To grant plot of land to such affected person in a new gaothan or extended part of the existing gaothan with the occupancy status of the land held by him earlier and Rs. 10,000/- as a special grant for construction of house on such plots,

In such manner, as far as possible according to the provisions of part III and IV of the schedule and on such terms and conditions, as may be prescribed:
Provided that-

i) If the allotted land under sub clause (a) & (b) of sub-section (1) is an occupant class II, he shall be entitled to conversion of the land to occupant class I after a period of 10 years on payment of premium as may be prescribed;

ii) The affected person referred to in sub clause (d) of clause-2 of section 2 shall be eligible to constructed house on the basis of the Indira Awas Scheme of the State Govt.;

iii) The affected person referred to in sub clause (e) of clause-2 of section 2 shall be eligible only for grant of a plot under clause (b);

iv) Subject to the provisions of sub-section (2) and (3) the occupancy price of the land or plot, as the case may be, granted under clause (a) or (b) except under sub-clause (ii) shall be determined and paid in the manner as may be prescribed.

(2) An affected person eligible for the grant of land or plot under sub-section (1) shall forfeit his right to get the same if-

a) He fails to communicate his willingness to accept the grant of plot made to him, to the collector within a period of 45 day from the date of receipt by him of a notice in that behalf from the collector or

b) He fails to deposit with the collector, towards occupancy price of the land, sixty five percent of the amount of compensation which he has received for his land which is acquired from him in the affected zone, or of the likely cost of the land to be granted to him under sub-section (1), whichever is less, at the time of payment of such compensation to such affected person.

(3) After payment of the amount under clause (b) of sub-section (2), the remaining amount towards the occupancy price payable by the affected person for the land allotted to him shall be recovered

from him free of interest in such manner and installments as may be prescribed;.

Provided that, the first installment of such recovery shall commence one year after the irrigation facility is available to him.

(4) The State Govt. shall pay a special grants to all such affected persons who have deposited an amount as per clause (b) of sub-section (2) of this section, but have not been allotted land in the benefited zone and the rate of the special grant shall be Rs. 400 per menses for the period from the date of actual displacement of the person from the land to the date of allotment of land in the benefited zone.

(5) Nothing in this Act shall prevent the project Authority to lease out to the affected person the land acquired from him till the gorge filling of an irrigation project is taken up and not used for quarrying dam seat etc.

(6) Nothing in this Act shall prevent the Collector to lease out to the affected person the land acquired from him in the benefited zone, which is still in his possession, for whatever reason, till the possession of such land is granted to eligible affected person and such land shall be given only on lease.

17. Where the acquiring body disposes developed land from the land acquired for the purposes of the project, the project affected person would be entitled to 12.5% developed land of the land acquired from him, on payment of amount prescribed by State Govt.

18 The execution of every lay out of a new gaothan or the extension of an existing gaothan, as the case may be in so far as it relates to public utilities, civic and other amenities and services shall be carried out by the respective project authority, or where the Commissioner considers it necessary so to do, it may by an order in writing entrust it to any such agency as it may deem fit. On completion of the said work in all respect and on issue of a certificate in writing by the collector under his hand and seal to that effect, the said works shall, for all purposes, vest in the Zilla Parishad having jurisdiction over the area included in the new gaothan or the extension of an existing gaothan, as the case may be, as if it were a development scheme undertaken by that Zilla Parishad under the provision of the Maharashtra Zilla Parishades and Panchayat Samities Act, 1961.

19 (1) Save as otherwise provided in any other law for the time being in force, where any land held by an affected person in an affected zone is burdened with a mortgage, debt or other encumbrance, such mortgage, debt other encumbrance shall be deemed to be transferred therefore and attach itself to the land, granted to such affected person under section 16, and the mortgage, creditor or, as the case may be, other encumbrancer shall exercise his rights, accordingly.

(2) If the land to which a mortgage, debt or other encumbrance is transferred under sub-section (1) is of less market value than the original land from which it is transferred, the mortgage, creditor or, as the case may be, other encumbrancer shall save as otherwise provided in any other law for the time being in force, be entitled to the payment of such compensation by the affected person owning the land as may be determined by the Collector.

(3) Not withstanding anything contained in sub-section (1) and (2) or in any agreement or in any law for the time being in force, a mortgage, creditor or, as the case may be, encumberancer shall not, for any money advanced or any loan given under such mortgage, debt or encumbrance, whether before or after the commencement of this Act, recover in any manner, whatsoever, on account of interest, a sum greater than the amount of the principal of the money advanced or of the loan.

20. When any land is acquired by the Govt. for the purpose of the project and on which the Govt. or any other Semi-Govt. Authority or body has constructed any offices or any other structures and on the completion of such project, such land with construction thereon no more required by the Govt. or such Authorities or bodies, such land along with the constructions, may be disposed off by the Govt. in the prescribed manner, and subject to such terms and conditions as may be specified by the Govt.

CHAPTER-IV
MISCELLANEOUS

21. (1) If any person knowingly furnished any false information under this Act or obstructs in cultivation of land given to an affected person under this Act, he shall, on conviction, be punished with imprisonment which may extend to three months or with a fine which may extend to five thousand rupees or both.

Provided that, in the absence of special and adequate reasons to the contrary to be mentioned in the judgment of the Court, such fine shall not be less than one thousand rupees.

(2) Whoever abets any offence punishable under this Act or attempts to commit any such offence, shall be deemed to have committed that offence and shall, on conviction, be punished with the punishment provided for such offence under sub-section (1)

(3) Nothing in sub-sections (1) & (2) above shall prevent the Collector from holding a summary enquiry and from removing the obstructions forthwith

(4) If any person refuses or fails to comply with order of the Collector in accordance with sub-section (3) above, he shall be liable to fine upto Rs. 1000 per day till he remove obstructions.

(5) If any beneficiary contravenes the provisions of clauses (a) & (b) of subsection (3) of section 10, the Collector, after conducting a summary enquiry, may order the stoppage of water supply and power supply or stoppage of grant-in-aid, or recall the Govt. share contribution to the beneficiary:

Provided that an appeal may be filed within a period of 15 days against the order of the Collector passed under sub-section (3), (4) or (5) as the case may be, to the Commissioner and the Commissioner shall disposed off the appeal within a period of one month from the date of filing of such appeal

22 Every officer off Government in any Department and every officer or servant of a local authority, when required so to do, shall be bound to assist any Commissioner or Collector or Project authority or any officers or agencies duly authorized for the purpose of carrying out the provisions of the Act.

23 All officers and servants appointed under this Act shall be deemed to be public servants within the meaning of section 21 of the Indian Penal Code.

24 No Civil Court shall have jurisdiction to settle, decide or deal with any question, which is by or under this Act required to be settled, decided or dealt with by the project Authority, Collector, Commissioner or the State Government.

25 No suit, prosecution or other legal proceeding shall lie against the State Government, local authority or any public servant for anything which is in good faith done or purported to be done under this Act.

26 (1) The State Government may, by notification in the official gazette, and subject to the condition or previous publication, make rules for carrying out the purposes of this Act. Such rules may provide for charging fees for any of the purposes of this Act.

(2) Every rule made under this Act shall be laid as soon as it is made before each house of the State Legislature while it is in session for a total period of thirty days, which may be comprised in one session or in two successive session, and if, before the expiry of the session which it is so laid or the session immediately following both Houses agree in making any modification in the rule or both Houses agree that the rule should not be made and notify such decision in the official Gazette, the rule shall, from the date of publication of such notification, have effect only in such modified form or be of no effect, as the case may be, so however, that any such modification or annulment shall be without prejudice to the validity of anything previously done or omitted to the done under that rule.

27. It is hereby declared that this Act is for giving effect to the policy of the state towards securing the principle specified in clause (b) of article 39 of the Constitution of India and the execution of the projects and rehabilitation of the persons affected by the projects and the acquisition therefore of the lands and transferring any such lands to such project affected persons.

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CHAPTER –V
REPEAL AND SAVING

28 (1) On the commencement of this Act, the Maharashtra Resettlement of Project displaced Persons Act, 1986 shall stand repealed :

Provided that, such repeal shall not affect.

(a) The previous operation of the law so repealed or anything duly done or suffered thereunder; or

(b) Any right, privilege, obligation or liability acquired, accrued or incurred under the law so repealed; or

(c) Any penalty, forfeiture or punishment incurred in respect of any offence committed against the Act so repealed; or

(d) Any investigation, proceeding, legal proceeding or remedy in respect of any such right, privilege, obligation, liability, penalty, forfeiture or punishment as aforesaid and any such investigation, proceeding, legal proceeding or remedy may be instituted, continued or enforced, any such penalty, forfeiture or punishment may be imposed as if this act had not been passed:

Provided further that, subject to the proceeding provision and any saving provisions made elsewhere in this Act, anything done, any action taken (including execution of any project and works incidental or supplemental thereto), any rule made or any notification or orders issued under the provisions of the Law so repealed shall, in so far as they are not inconsistant with the provisions of this Act, be deemed to have been done, taken, made or issued under the corresponding provisions of this act, and shall continue to be in force accordingly unless and until expressly or impliedly by anything done,action taken, rules made or notification or orders issued under this Act.

29 If any difficulty arises in giving effect to the provisions of this Act, the state Government may, as occasion arises, by order to anything, not inconsistent with such provisions, which appears to it to be necessary or expedient for the purpose or removing difficulty:

Provided that, no order under this section shall be made by the State Government after the expiry of two years from the date of commencement of this Act.

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SCHEDULE

(See section 13(3)(c) and 14 (3) and (4) and 16 (1))

PART –I

Percentage of houses in gaothan acquired for a project	Extent of land included in gaothan to be acquired
(a) Less than 75 percent of the houses in the gaothan or less than 75 percent of the land are acquired for a project.	(a) Nil
(b) 75 percent of the houses in the gaothan are acquired for a project	(b) all land included in the entire gaothan
(c) Area included in the gaothan is not acquired for a project, but more than 75 percent of the agricultural lands in the village are acquired, and the extent of the remaining are available for cultivation including the galper land available for cultivation by December 15th every year in the village is less than 50 per cent of the cultivated are of the village	(c) all lands included in the entire gaothan
Provided that, if I any particular case of gaothan, the criteria in (a), (b) and (c) above is not fulfilled but the circumstances warrant acquisition of houses or lands, it will be open to Government, in its sole description, to acquired all houses or all lands included in the entire gaothan and in that case the acquisition shall be deemed to have been made for a public purpose.	

Part – II (Contd.....)

Size of the holding	Area to be acquired
SLAB I	
(a) Not more than 1 Hectare and 61 areas	(a) Nil
(b) More than 1Hectare and 61 areas and not more than 2 Hectares and 42 areas	(b) the areas in excess of I Hectare and 61ares but not more 40 areas
(c) More than 2 hectares and 42 areas and not more than 3 Hectares and 23 areas	(c) the area in excess of 2 Hectares and 2 areas but not more than 80 areas
(d) More than 3 hectares and 23 areas and not more than 4 hectares and 4 areas	(d) the area in excess of hectares and 66 areas but not more than 1 hect and 21 areas
(e) More than 4 hectares and 4 areas	(e) The area in excess of 2 hectares

and not more than 4 hectares and 85 areas	83 areas but not more than 1 hectare and 61 areas.
(f) More than 4 hectares and 85 areas and not more than 6 hectares and 47 areas	(f) The area in excess of 3 hectares and 23 areas but not more than 2 Hectares and 42 areas.
(g) More than 6 hectares and 47 areas	(g) All the area in excess of 4 hectares and 4 areas.
SLAB II	
(a) Not more than 2 Hectare and 42 areas	(a) Nil
(b) More than 2 Hectare and 42 areas and not more than 3 Hectares and 23 areas	(b) the areas in excess of 2 Hectare and 42 areas but not more 40 areas
(c) More than 3 hectares and 23 areas and not more than 4 Hectares and 4 areas	(c) the area in excess of 2 Hectares and 83 areas but not more than 80 areas
(d) More than 4 hectares and 4 areas and not more than 5 hectares and 85 areas	(d) the area in excess of 3 hectares and 23 areas but not more than 1 hectare and 21 areas
(e) More than 4 hectares and 85 areas and not more than 5 hectares and 66 areas	(e) The area in excess of 3 hectares and 64 areas but not more than 1 hectare and 61 areas.
(f) More than 5 hectares and 66 areas and not more than 7 Hectares and 28 areas	(f) The area in excess of 4 hectares and 4 areas but not more than 2 Hectares and 42 areas.
(g) More than 7 hectares and 28 areas	(g) All the area in excess of 4 hectares and 85 areas.
SLAB III	
(a) Not more than 3 Hectare and 23 areas	(a) Nil
(b) More than 3 Hectare and 23 areas and not more than 4 Hectares and 4 areas	(b) the areas in excess of 3 Hectare and 23 areas but not more 40 areas
(c) More than 4 hectares and 4 areas and not more than 5 Hectares and 85 areas	(c) the area in excess of 3 Hectares and 64 areas but not more than 80 areas
(d) More than 4 hectares and 85 areas and not more than 5 hectares and 66 areas	(d) the area in excess of 4 hectares and 4 areas but not more than 1 hectare and 21 areas
(e) More than 5 hectares and 66 areas and not more than 6 hectares and 47	(e) The area in excess of 4 hectares and 44 areas but not more than 1 hectare

areas	and 61 areas.
(f) More than 6 hectares and 47 areas and not more than 8 hectares and 9 areas	(f) The area in excess of 4 hectares and 85 areas but not more than 2 Hectares and 24 areas.
(g) More than 8 hectares and 89 areas	(g) All the area in excess of 5 hectares and 66 areas.
SLAB IV	
(a) Not more than 4 Hectare and 4 areas	(a) Nil
(b) More than 4 Hectare and 4 areas and not more than 4 Hectares and 85 areas	(b) the areas in excess of 4 Hectare and 4 areas but not more 40 areas
(c) More than 4 hectares and 85 areas and not more than 5 Hectares and 66 areas	(c) the area in excess of 4 Hectares and 44 areas but not more than 80 areas
(d) More than 5 hectares and 66 areas and not more than 6 hectares and 47 areas	(d) the area in excess of 4 hectares and 85 areas but not more than 1 hectare and 21 areas
(e) More than 6 hectares and 47 areas and not more than 7 hectares and 28 areas	(e) The area in excess of 5 hectares and 25 areas but not more than 1 hectare and 61 areas.
(f) More than 7 hectares and 28 areas and not more than 8 hectares and 89 areas	(f) The area in excess of 5 hectares and 66 areas but not more than 2 Hectares and 24 areas.
(g) More than 8 hectares and 89 areas	(g) All the area in excess of 6 hectares and 47 areas.
SLAB V	
(a) Not more than 4 Hectare and 85 areas	(a) Nil
(b) More than 4 Hectare and 85 areas and not more than 5 Hectares and 66 areas	(b) the areas in excess of 4 Hectare and 85 areas but not more 40 areas
(c) More than 5 hectares and 66 areas and not more than 6 Hectares and 47 areas	(c) the area in excess of 5 Hectares and 25 areas but not more than 80 areas
(d) More than 6 hectares and 47 areas and not more than 7 hectares and 28 areas	(d) the area in excess of 4 hectares and 85 areas but not more than 1 hectare and 21 areas
(e) More than 7 hectares and 28 areas and not more than 9 hectares and 28 areas	(e) The area in excess of 6 hectares and 6 areas but not more than 1 hectare and 61 areas.

(f) More than 8 hectares and 9 areas and not more than 9 hectares and 71 areas	(f) The area in excess of 6 hectares and 47 areas but not more than 2 Hectares and 42 areas.
(g) More than 9 hectares and 71 areas	(g) All the area in excess of 7 hectares and 28 areas.

Provided that, in the case of holdings falling under clause (b) of the Slabs I,II,III,IV, and V no land from such holdings shall be acquired if the acquisition results in reducing the size of the holdings to less than 1 Hectare and 61 Ares, 2 Hectares and 42 Ares, 3 Hectares and 23 Ares, 4 Hectares and 4 Areas and 4 Hectares and 85 Areas, respectively.

Provided that, the land to be acquired according to any slab shall not be less than 20 Ares of consist or an area which, under the provision of the Bombay Prevention of Fragmentation and Consolidation of Holdings Act, 1947, is a fragment incapable of disposal as an independent piece of cultivable land.

PART – III

Area of land of the affected person acquired for the affected zone	Area of land from the benefited zones to be granted to the affected person
1. Not more than 80 areas	Not less than 40 areas but not more than 80 areas
2. More than 80 Ares but not more than 2 Hectares	Not less than 80 areas but not more than 1 Hectare and 20 areas.
3. More than 2 Hectares but not more than 3 hectares and 20 areas.	Not less than 1 Hectare and 20 areas but not more than 1 Hectare and 60 areas.
4. More than 3 hectares and 20 areas	1 hectare and 60 areas.

Provided that, if the number of the members in the family of the affected person exceeds five, additional area of 40 ares for every three additional members may be granted subject to the ceiling of 2 Hectares and 80 Ares.

Provided further that, in the case of grant of dry (*Jirayat*) land from sources other than the benefited zone it shall not be less than 1 hectare and 60 areas.

Provided also that, in any case the total extent of the Holding of the affected person after such grant shall not exceed the economic holding provided by the rules made under the Code for the disposal of Government land.

Provided also that the landless agricultural laborers in the affected zones will be entitled to 40 areas of land in the benefited zone.

PART - IV

Category of the affected person	Area of the plot to be granted in a gaothan	
1. An agriculturist	(a) if the number of members of his family does not exceed five	370 square meters
	(b) if the number of members of his family exceeds five	An additional area of 185 square meters for every three additional members subject to the ceiling of 740 square meters in the aggregate.
2. A non agriculturist	(a) if the number of members of his family does not exceed five	185 square meters
	(b) if the number of members of his family exceeds five.	An additional area of 92.5 square meters for every three additional members subject to the ceiling of 370 square meters in the aggregate.

Explanation : For the purposes of Parts III and IV, the expression " Family" means the spouse, sons, unmarried daughters or sisters, father and mother of the affected person: Provided that all such persons are residing with and are dependent on the affected person.

CHAPTER - 5

5.0 SOCIO-ECONOMIC PROFILES OF PROJECT AFFECTED PERSONS

5.1 Preamble

The proposed Land Acquisition (LA) for the project is likely to affect many land owners due to the compulsory land acquisition and relocation of the affected families, presently residing in various villages within the project area. The land owners of the project affected area, whose lands are proposed for acquisition, are referred as the Project Affected Person (PAP). These project affected persons of the project area classified into the following two types:

- Homestead affected PAPs who would be displaced from their present residential site; and
- Only Land affected PAPs.

The Rehabilitation and Resettlement is one of the most sensitive issues of any project involving land acquisition, because of the simple fact that the oustees may lose their total land holding for the project and may become landless. Thus, the project, which is presumably intended to benefit the people of the project area, may tend to injure the very people, who contribute for the success of the project by giving up their lands. The common approach of many such projects, where there are no direct benefits from the project, has been to compensate the project affected persons with monetary compensation that too only to the extent of land directly lost by the landowners.

5.2 Project Affected Person (PAF's) due to Land Acquisition

The total land requirement for the Penganga River Project is about 15951.10 ha, of which about 14693.33 ha belong to the private landowners 500.10 ha is under the ownership of Government of Maharashtra & the remaining 746.67 ha is under the ownership of forest department. The land acquisition has been proposed from 42 villages of the project affected

area which includes 32 fully affected villages which would be submerged due to the inundation of the reservoir and 14 partially affected villages whose lands would be partially affected while their houses are not affected. In all the villages about 16328 private land units consisting of homesteads and agricultural lands have been proposed for acquisition for various components of the project.

VIDC has identified about 8136 houses in 32 fully & 14 partially affected villages of the project area, which would be required to be demolished and resettled elsewhere in the resettlement colonies. The land ownership records show that the PAFs are having multiple land ownership patterns. The summary of the project affected villages due to private land acquisition is presented in Table 5.1

Table 5.1

DETAILS OF PROJECT AFFECTED FAMILIES UNDER LAND ACQUISITION

S. No	Particulars as per Land Records	Land and Homestead Oustees
1	Fully Affected Villages	32
2	Partially Affected Villages	14
3	Total Villages Affected	46
4	Affected Houses and Homesteads	8136
5	Affected Land Units	About 12000
6	Only Land Affected Families	About 6500
7	Total Homestead and Land Affected Families (PAFs)	8136

The names of the Project Affected Persons, whose lands are proposed for acquisition for the project, have been collected from VIDC, who initially identified the PAFs based on the land records of respective revenue villages of the project affected area, where the land acquisition has been

proposed. Village -wise number of plots proposed for acquisition for all the project component is presented in table 5.2

TABLE-5.2
VILLAGE-WISE NUMBER OF LAND PLOTS PROPOSED FOR ACQUISTION

Sr. No.	Name of affected Village	No. of Plots
I	Yavatmal District	
1	Khadka	197
2	Chimta	41
3	Ayata	222
4	Jalandri	23
5	Kawatha (BK)	117
6	Umari	346
7	Gudha	42
8	Amboda	186
9	Palasi	226
10	Kapeshwar	147
11	Sakhara (Tanda)	170
12	Warud (Tuka)	100
13	Datodi	197
14	Dhanora (Rani)	396
15	Bilayata	97
16	Manusdari	181
17	Yerul	61
18	Ratnapur	124
19	Kopri	96
20	Kapsi	18
21	Kawatha (Kh)	127
22	Yedsi	70
23	Koli (Kh)	153

24	Kawatha (Bz)	398
25	Mukindpur	123
26	Sadoba Sawali	655
27	Donwada	80
28	Zopalwadi	107
29	Sakur	155
30	Ghot	359
31	Dah wali	230
32	Dhan ad (Dhanoda)	233
33	Bhos	317
34	Anantwadi	122
II	**Nanded District**	
35	Sindkhed	294
36	Bond-gavhan (Chaufula)	120
37	Karalgaon	61
38	Vasra k (Tanda)	177
39	Wat	296
40	Pad	239
41	Ner	46
42	Khambala	275
43	Pathari	160
44	Rampur	112
45	Dhanora (Sindkhed)	60
46	Chinchkhed	180
	Total	8136

5.3 Project Affected Person (PAPs)

The land units/plots proposed for the project consist of the follo types of lands:

- Irrigated Agricultural Lands
- Dry lands
- Homestead Lands
- Streams
- Roads
- Government Lands

All the water bodies such as streams and tanks are under the ownership of Government of Maharashtra. The ownership of many vacant and grazing lands is vested with Government of Maharashtra. Although about 500 ha land is under the Government ownership.

5.4 Socio-Economic Status of the Project Affected persons

The land and property acquisition for the project may alter the socio-economic conditions of the land losers and the displaced families and will have some impact on their standard of living of the affected families after the land acquisition for the project. In order to establish the prevailing baseline socio-economic conditions of the project affected persons before land acquisition for the project and to generate the required information for developing a meaningful and satisfactory Resettlement and Rehabilitation Action Plan the data from the submergence area has been collected.

The required data has been collected using a variety of techniques such as household surveys, discussions with land owners, Government departments, NGOs, etc. The tasks covered in these components are:

- Identification of all the families who would lose their houses and other assets on account of land acquisition for the project, by verification of land ownership records of the Revenue Department of Government of Maharashtra; and
- Collection of demographic and socio-economic data of all the available PAF's who are currently deriving livelihood and residing on the land proposed for acquisition through a comprehensive socio-economic household surveys.

The outcome of this study would enable Penganga River Project to review the changes that are likely to result after implementation of the project, and take necessary measures for negating the likely impacts due to the land acquisition for the project, if any in future in the best interests of the

project authorities as well as the PAF's from whom the land would be acquired and the neighbouring communities around the proposed project area.

This study highlights the need for rehabilitation measures to be undertaken to minimize the anticipated losses due to the land and property acquisition for the project and introducing some income-restoration and income-generation schemes after the land acquisition.

VIDC has already identified the land required for various components of the project and also identified the landowners through the field surveys conducted by them. The land acquisition for the project would be done under the provisions of the Land acquisition Act 1894.

5.5 Objectives of the Surveys

For establishing the prevailing socio-economic conditions of the PAF's comprehensive socio-economic household surveys have been conducted in the entire project affected villages where the land acquisition has proposed. These surveys have primarily been conducted with the following objectives:

- To identify the number of Project Affected Families (PAF's) that will be affected by the project due to the Land and Property Acquisition;
- To study the demographic profiles, literacy levels of the PAF's;
- To generate detailed baseline information on the socio-economic status and occupational structure of PAPs affected by the project, in terms of workers and non-workers;
- To study the landholding and land-use pattern of PAPs in terms of irrigated and un-irrigated area and assess the extent of land lost by them for the project.
- To study the cropping pattern and crop yields from the affected land

- To assess the baseline conditions on housing, infrastructure facilities, immovable assets like agricultural and non-agricultural lands and movable assets such as agricultural implements, livestock etc;
- To assess the average income and expenditure pattern of affected households;
- To study the infrastructure facilities available in the villages affected by the proposed project;
- To assess various types of losses arising out of the project to assess the quantum of land lost/affected by each affected household in the project area;
- To identify vulnerable families and indigenous groups who are likely to be affected most, due to the proposed project;
- To enquire about the major problems faced by the PAF's and their expectations for better life after LA for the project;
- To know the expectations of PAF's from the project and the RRAP
- To identify the requirements of PAF's for their better future after the land acquisition;
- Knowing their preferences in selecting appropriate income restoration schemes that may be introduced among the PAF's for regaining their lost income due to land acquisition, which will be used in developing the RRAP;
- To identify appropriate income restoration schemes for those PAF's, who may not be in a position to identify their priorities in selection of income restoration scheme; and
- For developing an appropriate RRAP for mitigating all the adverse affects that are likely to result due to the project and acceptable to most of the PAF's.
- To have a feedback from PAF's for developing suitable measures for their socio-economic upliftment after LA for the project.

5.6 Indicators of Socio-Economic Development

In this study the enquiry was focused on the following main indicators of the socio-economic development.

Family

In the survey it is focused to find out the number of families affected through land acquisition by VIDC. The study may indirectly throw some light on the social aspects that may change due to land acquisition, migration, rehabilitation, etc. due to the project.

Income, Expenditure and Standard of Living

Perhaps the most important effect of land acquisition would be on the income, expenditure and standard of living of the affected families. This has been studied in detail for understanding the present situation and recommending various improvement measures for the economic upliftment of the PAF's after the LA.

Aspiration for Better Life

What are the people's perceptions for better life and will the land acquisition change their life for the better or worse? This aspect has also been covered in this study.

5.7 Methodology Adopted for the Surveys

A comprehensive questionnaire was designed to cover concrete details on all the above aspects from each affected family. Though free flow of sharing the ideas is desirable in such studies, in order to keep uniformity a questionnaire was found necessary to guide the interview process.

The household survey was the most appropriate method of data collection for the following reasons:

The land acquisition would have its impact on the entire family and not merely on the family head or any individual;

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For undertaking various measures to improve the socio-economic standards, the family has to be focused as a viable unit and not individuals as land losers.

Household was thus found more meaningful unit of inquiry for the collection of information. Hence, instead of interviewing as individual alone, they were interviewed in the context of their families. This has also made it possible to understand the impacts with varying family characteristics.

Informal group discussions for eliciting the required information were the other methods adopted for the study. These were planned for verifying the trends of developments in historical perspective, socio-political issues involved, perceptions of people on the project and seeking their qualitative explanations for the socio-economic development in the project affected area.

Definition of Project Affected Families (PAF)

For this study, a 'Family' or 'Household' is defined as a group of person who are affected to the project commonly live together and take their meals from a common kitchen and stay under the same roof, unless the exigencies of work would prevent them from doing so. Accordingly a household may comprise persons related by blood or unrelated persons or both.

Another important parameter considered in this study is to define a household in terms of land ownership records of the Revenue Department, which reveals the name of landowner of each plot and the total extent of land proposed for acquisition in each survey number or sub-division number. VIDC collected the land records of the PAP's from the respective districts before initiating the land acquisition process hence these details have been deployed for the present study.

In many cases, though the members of a family live together and stay in the same house while sharing the same kitchen, the ownership of land units has been registered with more than one member of the family. This may be due to many reasons such as security in the old age, fear of land grabbing by close relatives in case of death of the family head and fear of losing the land through Land Ceiling Act, etc. If partition of landholdings taken place at the household level, however, not registered with the appropriate authorities, it has been considered that the land belonged to the person in whose name the land is being held. In all cases, every individual land loser in whose name the land unit was registered has been considered, as a Project Affected Person (PAP) irrespective of the number of landholdings he is losing through land acquisition. Wherever there is more than one PAP in the same family, however sharing the same kitchen along with others, these are clubbed together as one Project Affected Family (PAF). The demographic and socio-economic aspects of all members of the PAF's have been studied with reference to the entire family, instead of considering each PAP as a separate family.

In this survey serious efforts were made to contact all the PAF's falling in all the villages affected by Land Acquisition and Property Acquisition. The survey has generated a comprehensive database on PAF's baseline conditions with regards to their social, religious, economic aspects including landholding pattern, livelihood and their perception and opinion about the project.

5.8 Socio-Economic Household Surveys

In the Socio-Economic Household Survey all the identified and available PAF's have been contacted for establishing their baseline socio-economic conditions, the analysis of which is presented in the subsequent sections.

There are many landlords who have lands in the project area, however reside in other areas away from the study area. Some households did not respond due to a variety of reasons, which include their unwillingness to part with their lands due to compulsory land acquisition for the project.

In each selected household, the head of the family or any available adult member having knowledge about all particulars of the family were interviewed. Most questions were addressed to him/her. However, in the process of interviewing, wherever possible all the family members were also included since, the questionnaire was such designed that the "family" as a unit for the inquiry.

For carrying out the socio-economic surveys of the PAF's, the field investigators were recruited from the local area based on the criteria of ability to communicate and take notes during interview, mobility and a minimum qualification of graduation. The selected candidates were given training, on how to conduct interviews and code the responses. Senior supervisors having adequate experience in supervising the surveys have been deployed during the survey period. The collected data was verified periodically on a sampling basis.

The socio-economic details of PAF's and their dependants were generated through a detailed socio-economic survey questionnaire, specially designed for this project. This Socio-Economic Survey Questionnaire specially designed for this project. The questionnaire was pre-tested through a pilot survey in the field, prior to conducting the detailed survey. Based on findings of the pre-testing, the questionnaire was

modified and finalized and canvassed in the survey. The questionnaire covered the following aspects:

- Family size and status
- Religion/caste
- Migration
- Sex ratio
- Literacy levels
- Special skills possessed
- Occupational structure
- Land ownership pattern
- Crop Yields
- Irrigation facilities
- Asset ownership pattern
- Shelter profile
- Infrastructure facilities
- Health status
- Presents Income Generation Schemes following by PAFs
- Aspirations of People for better life after Land Acquisition
- Preferences for Income Generation Schemes
- Training needs of PAF's for Income Generation
- Choice of Resettlement sites by the DF's
- General suggestions for the overall development of the region in view of the VIDC.

In addition to the above, inventory of public/common infrastructure or social resources e.g. schools, religious places, etc. was undertaken through interactions with the PAF's and the community by means of consultations.

5.9 Problems Faced in Data Collection

Some problems were faced in the socio-economic survey process and many limitations have been contemplated during the surveys in the

project area. Some of the problems faced during surveys and the limitations of the conducted surveys are as follows:

- The surveys have been carried out to know the perceptions of the PAF's and affected communities about the project and to know their perceptions about the proposed project. These conducted surveys provide only the tentative baseline socio-economic conditions, hence cannot be considered as legal;
- The consultants have carried out the surveys in absence of any Government of Maharashtra authority along with them; hence the PAF's were initially hesitated to respond to the interviews. With more and more efforts and persuasions, a considerable number of PAF's have been convinced and they provided the data by the PAF's, this cannot be considered as correct and be treated as tentative or adhoc data;
- In many cases the actual names and family names of PAF's varied substantially from those recorded in the Government of Maharashtra land records. In such circumstances, the PAF's by name have been interviewed though their family names varied;
- In a considerable number of cases, the land ownership records have not been updated even after partition of the erstwhile joint family and even after transfers of properties to their descendents;
- In some cases the original landowner though not surviving, still remains the landowner in revenue records. In some cases there are many stakeholders for such lands after the expiry of the original landowner and the actual he or stakeholder is not clearly known. However, for this stage, the original landowner on whose name the plot was registered in the revenue records, has been considered, though he is not a surviving member;
- The project would involve in acquisition of lands as well as residential and other structures and also include demolition of all the existing houses and permanent structures in all the villages getting submerged due to the reservoir formation. Some house owners are aware that

their houses would be demolished for the project, hence not provided the information to the interviews.

- Some of the PAF's who would be totally rendered landless and not having education or skills are under the opinion that they would be rendered homeless and landless after the land acquisition, hence rejected to respond to this survey;
- Since the people knew that the survey is launched by VIDC, their responses were prejudiced by their annoyance and in some cases with inflated land prices, exaggerated income levels and strong demands for handsome compensation and very high expectations from the VIDC;
- Almost all the PAF's have mentioned that they possess only the small plot of land, which is being proposed by VIDC for acquisition, though the PAF's might have multiple landholdings;
- It was very difficult to make people to reveal about their income generating activities. Almost all PAF's responded that they are not gaining any benefits from the Government poverty alleviation schemes, though in reality some of them are receiving the advantages due to these schemes. They wanted to use the opportunity of giving interview only for demanding permanent employment in Government of Maharashtra and exorbitant compensation for their agricultural and homestead lands including houses;
- Many PAF's are absentee landlords while staying in various towns, away from the project affected areas. Hence these could not be contacted in the survey;

5.10 Presentation of the Collected Data

In this survey serious efforts have been kept to contact and interview all the affected families of the project villages for registering their baseline demographic and socio-economic conditions and perceptions about the project. Though all the PAF's residing in the project villages were contacted, some PAF's have rejected to provide information due to their own reasons or having some legal problems in sharing the landholdings

with their other joint family members. There are many landowners simply owning land in the project villages but permanently reside in far away places. These absentee landlord families do not have any demographic and socio-economic implications on the project area, except for the receipt of compensation for the loss of land and trees, wherever applicable. Hence, these absentee landlords were not covered in the survey.

Based on the land records and the surveys conducted by them in the project affected villages, VIDC authorities have identified about 8136 project affected families requiring displacement and resettlement elsewhere.

In this survey all the available PAF's in 46 villages have been contacted for their interviews and eliciting the information required for the RRAP. Due to many reasons, explained in detail in the above sections, the information of only 8136 families affected by the LA and property acquisition was elicited. The experience in the field surveys revealed that there is no difference between the socio-economic conditions of the house and homestead affected PAF's and only the land affected PAF's, hence the analysis of the surveys has been carried out while combining both the categories as a single entity. The collected data through this household survey has been analysed in terms of percentages, as applicable to the RRAP of the project and presented in the following sections.

5.11 Socio-Economic Profiles of the Project Affected Families (PAF)

The socio-economic aspects of the 8136 PAF's as revealed by the survey have been presented in the following sections.

a) Religious Groups

Religious are systems of theological beliefs and dogmas and are deficient in the rational contents. However, religion provides a vital basis for

identity and community formation. The family and social ties are developed on the basis of religion. The religious system is however inadequate to provide security and justice but people seek them through communal identities and therefore no secular system can be built. Members of every community have to associate with those of other communities to promote their class, professional and cultural interests through institutionalised religion and by organizations of workers, peasants, occupational groups that by providing common forum can retain autonomy and bring peace and harmony in village life.

Majority of the PAF's of the project area are Hindus working out to about 79.89 % of the total families followed by Buddhists who worked to about 12.68% of the PAF's, Muslims with 7.42% of the total households and Christians with about 0.01% of he total PAF's. The religious structure of the PAF's of the project area is presented in Table 5.3 and graphical representation is done in Figure 5.1.

TABLE 5.3

RELIGIOUS STRUCTURE

S. No.	Religion	No. of PAF's	Percent PAF's
1	Hindu	6500	79.89
2	Buddhism	1032	12.68
3	Islam	603	7.42
4	Christianity	1	0.01
5	Others	0	0.00
	Total	8136	100

b) Caste Characteristics

Castes are endogamous groups and the occupations of each class are traditionally determined. Membership to a caste is obtained by birth and there is a vast difference among castes about social formalities, social intercourse, rituals, customs and traditions. The marital status, family pattern, occupation and expenditure patterns, gender concepts, concepts

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448

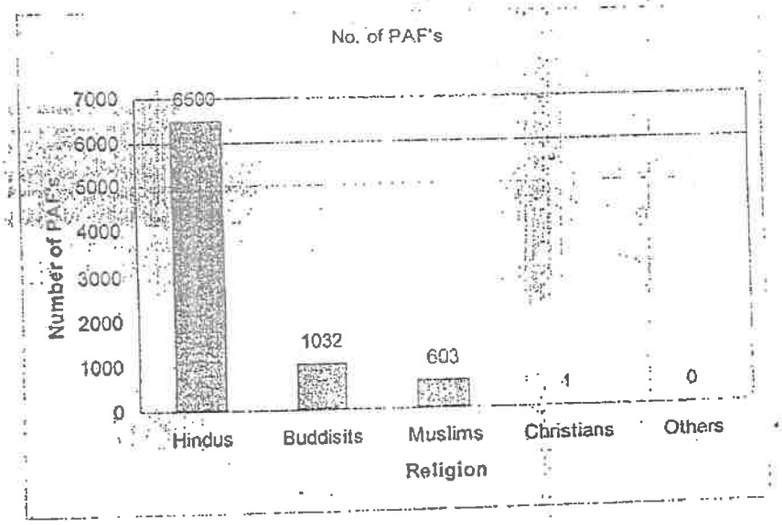
about the size of the family, pattern of housing and participation in the village life are influenced by traditions, conventions and by caste councils. Multi-caste groups and sub-groups inhabit the project area. The different classes of castes found in the study area are grouped General or Forward Castes, Scheduled Castes (SC), Scheduled Tribes (ST) and Other Backward Class (OBC).

It has been observed that the surveyed population in mainly constituted by the Other Backward Castes (OBCs) & Schedule Tribes followed by Scheduled castes households, Scheduled Tribes who constituted to about 30.09 %, which is very close to other backward class community. Percentage of the General or forward caste is significant compared to other. From this it indicates that the submergence of the project comprises mostly backward class community. The distribution of households as per their caste structure is presented in **Table 5.4** and graphical representation of the same in done in **Figure 5.1**

TABLE 5.4

CASTE STRUCTURE OF PAF's

S. No.	Caste	No. of PAF's	Percent PAF's
1	General	866	10.64
2	Other Backward Class	2787	34.26
3	Scheduled Caste	1274	15.66
4	Scheduled Tribe	2448	30.09
5	Other	761	9.35
	Total	8136	100


No. of PAF's
Number of PAF's
7000
6000
5000
4000
3000
2000
1000
0
6500
1032
603
1
0
Hindus
Buddisits
Muslims
Christians
Others
Religion

855

430

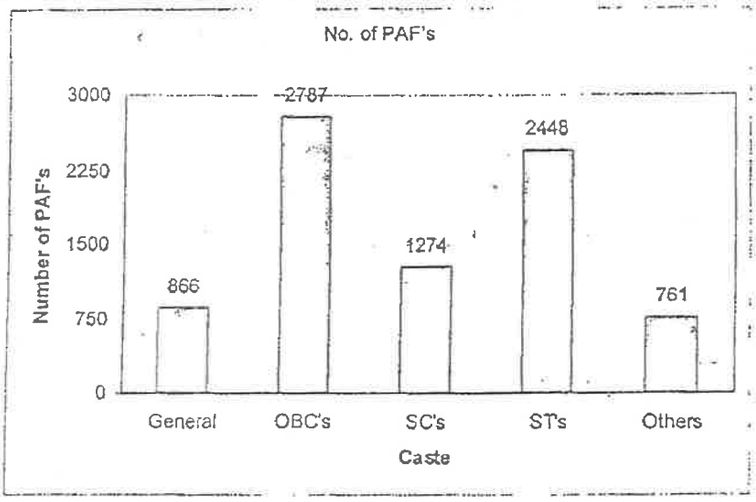


Figure 5.1
Graphical representation of Religion and Caste

a) Migration Pattern

The migration aspects of the available PAFs reveal that all of them are residents of the project area villages who have been residing in their present locations since generations.

Many households have lands in the villages, however settled out side the submergence area. It is reported that most of them out-migrated due to their employment or business to other parts of the state or country. From the survey it was found that their was both out migration and in migration. Around 155 families were in migrated and around 56 families were out migrated from the proposed submergence area. Once the project comes up their can be further in migration of some more families due to availability of new jobs.

b) Family Size

The 8136 families covered in the household survey have a population of 36809 members indicating as average family size (the number of persons

856

per family) of 4.52 persons per each family. The families having 4-5 persons were the highest with an 45.82 % of the total families followed by families of 2-3 persons with an 22.15%. Families having single person were the least with a 3.79%. The distribution of families in the project villages by their sizes is presented in Table 5.5. The Graphical representation of the same is shown in Figure 5.11

TABLE 5.5

FAMILY SIZE

S. No.	Family Size	No. of PAFs	Percent PAFs (%)
1	1	309	3.79
2	2 to 3	1802	22.15
3	4 to 5	3728	45.82
4	6 to 7	1754	21.56
5	8 or above	543	6.68
	Total	8136	100

c) Family Type

The type of family such as single person family, nuclear, joint and extended family has been studied to know the prevailing family pattern in the study area. A nuclear family is a family consisting of husband, wife, unmarried children and dependant parents. It is noticed that the joint families are the most predominant family type in the study. The family type in the study area is as discussed below:

In the study area the joint families are the predominant type with about 60.09 % of the total families followed by nuclear families which work out to about 34.97 %. Single person families worked out to be 3.79 % of the total families. The extended families were reported to be only about 1.15 % of the total PAFs of the project villages. The break-up of the family type is presented in Table 5.6 The Graphical representation of the same is shown in Figure 5.11

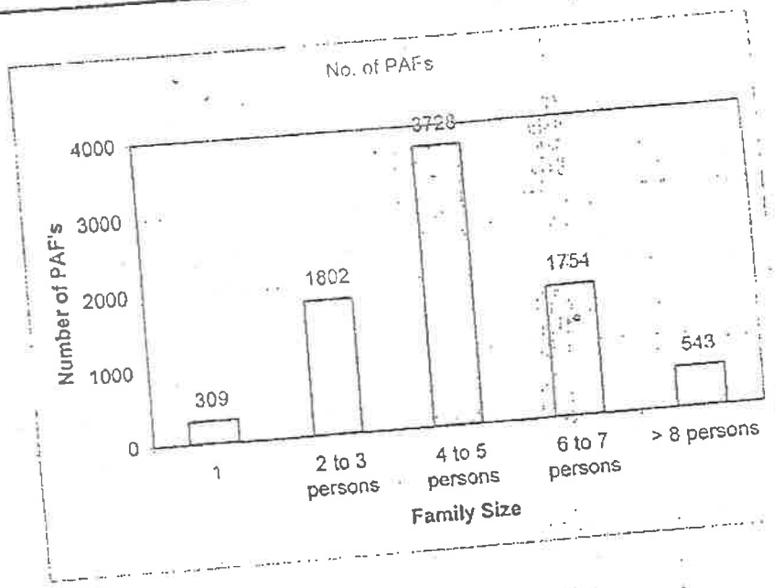
TABLE 5.6

FAMILY TYPE

S. No.	Type of Family	No. PAFs	PAFs%
1	Single person	309	3.79
2	Nuclear	2845	34.97
3	Joint	4889	60.09
4	Extended	93	1.15
	Total	8136	100

d) Composition of Sex

The composition of people by sex indicates the ratio of male and female. In the study area, the composition of sex among the PAFs is almost same as other parts of the Country. It can be observed that the total males and females among the PAFs are 50.61% and 49.39 % respectively. The sex ratio, which is computed as the number of female per 1000 males, is about 975, which is a common phenomenon in Maharashtra state. The details are given in the Table 5.7 graphical in Figure 5.11



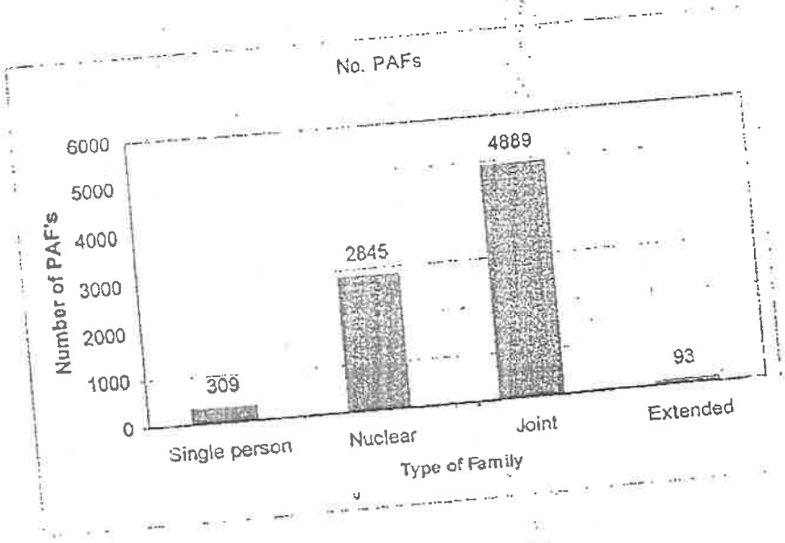


Figure 5.11
Graphical representation of Family size and Family Type

TABLE 5.7

SEX RATIO

S. No.	Category	PAPs	PAPs %
1	Male	18630	50.61
2	Female	18179	49.39
	Total	36809	100
	Sex ratio	975	

g) Activity pattern of the PAPs

The activity pattern of the PAPs indicate that around 46.42% of the population are workers working in various activities like Cultivators, agricultural labour and other services like post office, transport workers, milk vendors, etc. However majority of the workers are agricultural labour. The un-employed persons are around 11.97% who get work only few days in the year and they say they do not have proper job, some are educated persons who does not want work as agricultural labour. Children or students are around 16.74% of the total population. Where as household workers and self employment (Shops, cottage industries, milk vendors, welding shops, tailors, etc) are around 14.47%. Remaining 10.39% are old persons, house wifes, mental retarded persons, etc. The activity patter of the study area is presented in Table 5.8 and graphical presentation is given in Figure 5.12

TABLE 5.8

ACTIVITY PATTERN OF THE STUDY AREA

S. No.	Category	PAPs	PAPs %
1	Workers (Cultivators, Agricultural labour, Service)	17086	46.42
2	Household workers, self employment,	5327	14.47
3	Unemployed	4407	11.97
4	Students	6164	16.75
5	Others (old persons, house wifes, etc.)	3825	10.39
	Total	36809	100

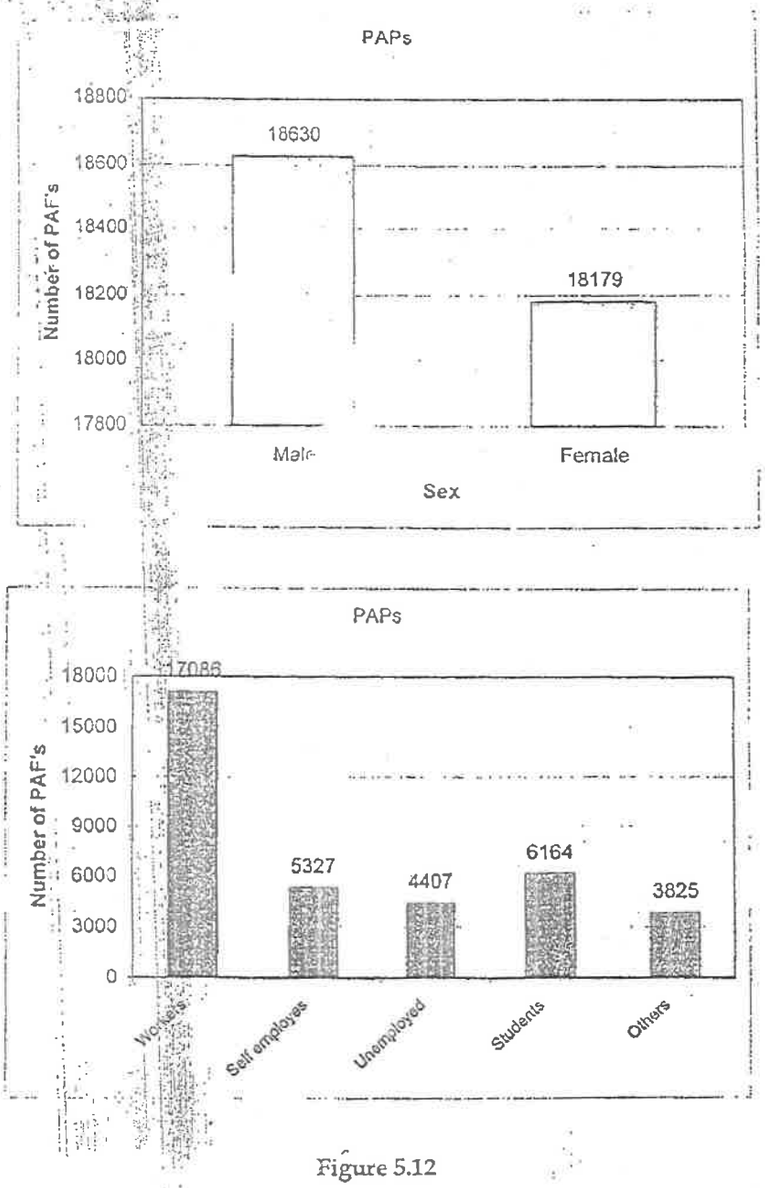


Figure 5.12

Graphical representation of Sex Ratio and Activity Pattern

h) Literacy Levels

The level of education is measured with reference to Literacy rates in general male literacy rate and in particular female literacy rate. The percentage of literacy among the male PAPs is found to be 63.90 %, which is quite normal in the villages of Maharashtra, and literacy level among Female PAPs is found to be around 43.30 %. This percentage of literacy among the females is less when compared to males. To improve the literacy rates among the PAPs new schools should be started during R&R program implementation. Should also encourage local NGOs to educated elderly persons of the area by starting night schools. The detail about literacy is presented in **Table No. 5.10**

TABLE 5.10
LITERACY LEVELS

S. No.	Category	PAPs			Literate PAPs %
		Total	Literate	Illiterate	
1	Male	18630	11905	6725	63.90
2	Female	18179	7872	10307	43.30
	Total	36809	19777	17032	

i) Type of Land Ownership

The land ownership pattern of the PAFs has been studied. It is revealed that the cultivation most important occupation of the PAFs. Most of the PAFs possess lands in the villages where they reside. Some of them own lands in other villages also. The land ownership of PAFs has been studied based on the socio-economic survey as well as the land records, wherever available. It is noticed that most landowners have given misleading information on landownership pattern, particularly about their landownership in other villages. This may be due to the fear of receiving less benefit if he/she discloses the actual landholding sizes, which is considerably large in some cases.

The land ownership pattern has been studied with reference to irrigated and unirrigated lands, orchards, fallows and the areas not suitable for cultivation. Some of the land units have been reported as fallows or lands not suitable for cultivation. The land ownership pattern of the PAFs reveals that most of the PAFs have small size landownership. About 13.71 % PAFs have land in the range of 0.5 to 1 Ha, 49.05 % have land between 1 to 2 Ha, about 27.47 % PAFs own between 2 to 5 Ha land, and 5.18 % PAF have more than 5 Ha land. The Landownership pattern of the PAFs is presented in Table 5.11 and graphically shown in Figure 5.12

TABLE 5.11

LANDOWNERSHIP PATTERN BEFORE ACQUISITION

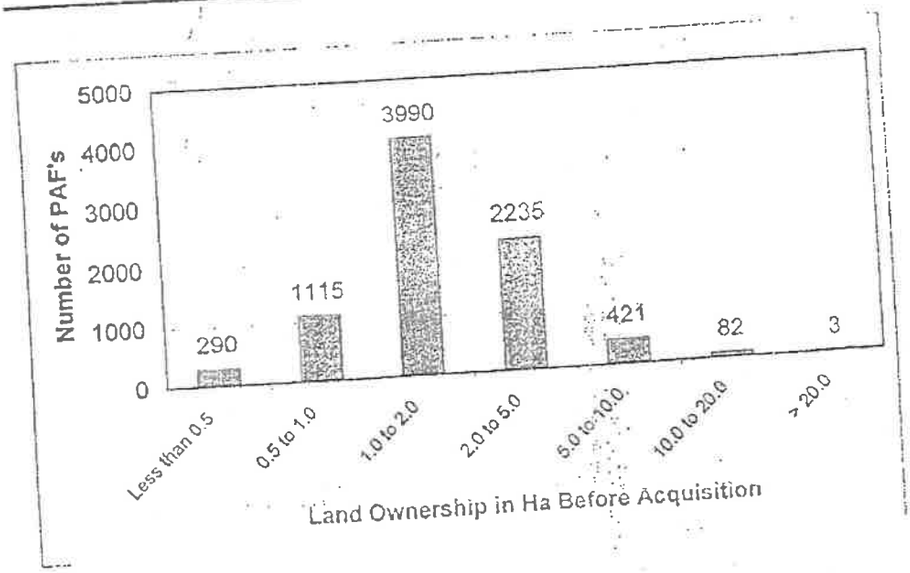
S. No.	Land Ownership (Ha.)	Total PAFs	% PAFs
1	Less than 0.5	290	3.56
2	0.5 to 1.0	1115	13.71
3	1.0 to 2.0	3990	49.05
4	2.0 to 5.0	2235	27.47
5	5.0 to 10.0	421	5.18
6	10.0 to 20.0	82	1.00
7	> 20.0	3	0.03
	Total	8136	100.00

The cropping pattern of the affected landholdings reveals cotton, soya bean, maize, pulses and vegetables are the predominant crops grown in the cultivated areas during the Kharif season. Who ever having irrigation sources such as well and pumping equipment irrigate their lands even during Rabi season. The orange orchards are also used for growing crops between the plantations. The landownership pattern of the PAPs which is likely to be changed after the land acquisition for the proposed project is as given in **Table 5.12** and graphically presented in Figure 5.13

TABLE 5.12

LANDOWNERSHIP PATTERN AFTER ACQUISITION

S. No.	Land Ownership (Ha.)	Total PAFs	% PAFs
1	Nil	3310	40.68
2	< 0.5	202	2.48
3	0.5 to 1.0	521	6.41
4	1.0 to 2.0	2315	28.45
5	2.0 to 5.0	1524	18.74
6	5.0 to 10.0	240	2.95
7	10.0 to 20.0	23	0.28
8	> 20.0	1	0.01
	Total	8136	100.00



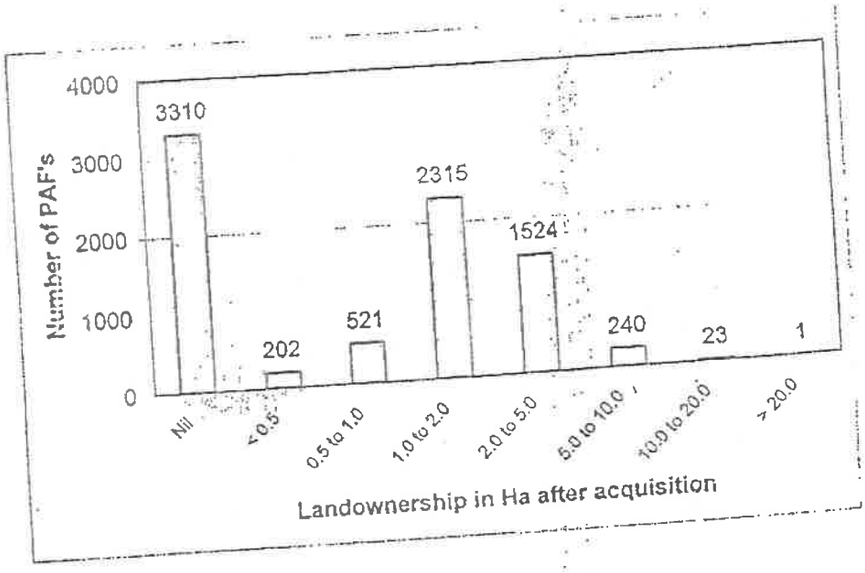


Figure 5.13
Graphical representation Landownership pattern before and after acquisition

j) Irrigation Facilities

Rainfall is the only major source of irrigation water available in the area. The Penganga River and wells and tube wells scattered here and there are the other sources for irrigation to a minor extent. However there is no canal irrigation, lift irrigation in the project area. The proposed dam with both lift and canal irrigation will change the entire agricultural activities in the projects command area.

k) Asset Ownership Pattern

The assets possessed by the PAFs have been studied with reference to the immovable assets like house, land, cattle-shed and movable assets like pump and motor, etc. This asset ownership not only includes the affected land, houses and other built up structures and also all the assets located outside the project area. The asset ownership pattern of the PAFs is given in Table 5.14

TABLE 5.14
ASSET OWNERSHIP PATTERN

S. No	Asset	PAFs	% PAFs
1	House	8136	100.00
2	Land	4407	54.16
3	Cattle shed	2447	30.07
4	Electric pump and motor	877	10.78
5	Livestock	2896	35.57

From the above table it can be said that all the PAFs have house (hut, Kawelu, pucca house, etc.) About 54.16 % PAFs are owning agricultural lands, about 35.57 % of the PAFs have livestock while only 30.07 % PAFs have cattle sheds in their possession and around 10.78% of PAFs have electric pumps and motors.

I) Shelter Profile

The survey revealed that all the houses in the project affected area are of poor quality and katcha houses. Very few semi-pucca houses are owned by the PAFs and pucca houses are rarely seen. The PAFs revealed that the previously issued Section 4 (1) Notification of the LA Act has been preventing them from the reconstruction of their houses; are carrying out any major improvement measures to their houses. The PAFs know that they need to shift from their present houses that would be demolished after land acquisition, they are not putting any efforts in spite of the fact that they are facing many problems due to poor housing.

Most of the houses have accommodation consisting of 2 or 3 rooms. It is noticed that the rich and middle-income group PAFs own slightly big and good-houses, and the poor own small and low quality huts only. Almost all the houses are built with mud while rarely the houses are built using bricks and cement. The house ownership pattern indicates that 100% PAFs live in their own houses and no one has reported that he resides in a rental house.

Most of the houses have 2, 3 or more rooms and very few houses have more than 5 rooms. The single room houses work out to about 22.38 % of the total houses and the double room houses work out to about 39.88 % of the houses in the study area. The houses having 3 rooms work out to about 29.48 % of the total houses and about 8.26 % houses have 4 or more rooms. The pattern of number of rooms in dwellings is shown in Table 5.15

TABLE 5.15

NUMBER OF ROOMS IN HOUSES

S. No.	No. of Rooms	PAFs	PAFs %
1	1 Room houses	1821	22.38
2	2 Rooms houses	3244	39.88
3	3 Rooms houses	2399	29.48
4	4 Rooms and above houses	672	8.26
	TOTAL	8136	100

m) Income Pattern of PAFs

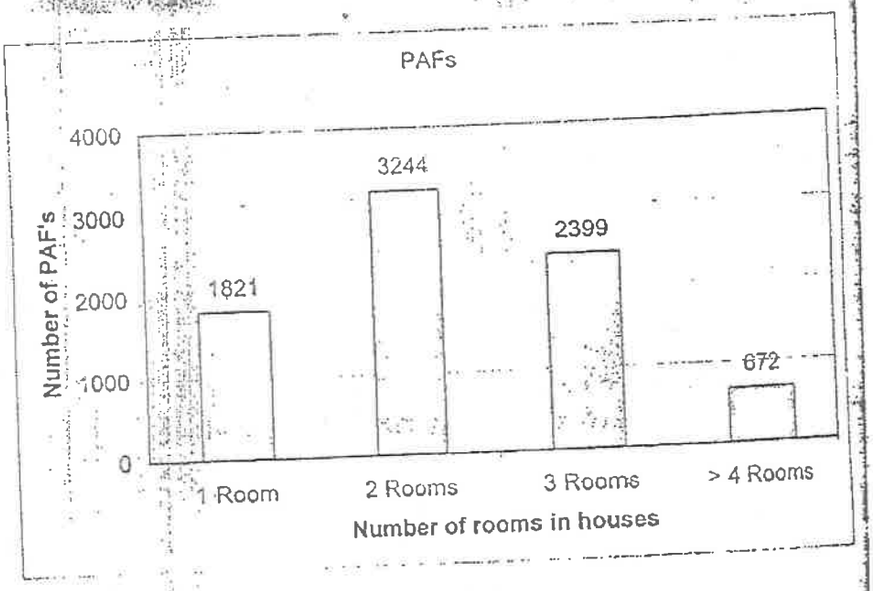
The households earn their livelihood from various means. Their main Income comes from cultivation and agricultural labour followed by self-employment such as petty business, dairy, poultry etc. Agriculture is the most predominant income generating activity in the project area, followed agricultural labour. The annual income pattern of the PAFs from all the sources is presented in Table 5.16

TABLE 5.16

INCOME PATTERN OF PAFs

S. No.	Income Range (Rs)	PAFs	PAFs %
1	Less than 5000	847	10.41
2	5000 to 10000	2421	29.76
3	10000 to 20000	3010	36.99
4	20000 to 50000	1278	15.71
5	Above 50000	580	7.13
	Total	8136	100.00

From the above table, it can be seen that about 10.41 % PAFs have a family income of less than Rs. 5000 per annum. About 29.75 % PAFs have income between Rs. 5000 to 10000 per annum. About 36.99 % PAFs have the annual family income of Rs. 10000 to 20000 and about 15.71 % PAFs have annual income of between 20000 to 50000 per annum. About 7.13 % PAFs have more than Rs. 50000 income per annum. After the project is commissioned there will be change in income patter of the study area.



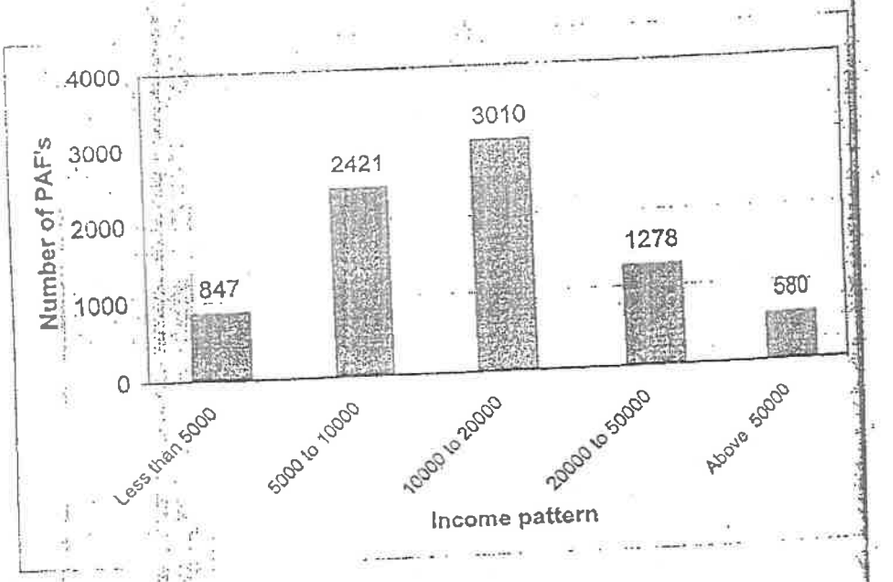


Figure 5.14
Graphical representation Number of rooms and Income pattern

n) Infrastructure Facilities

The factor which influence the quality of various variables is the provision basic of infrastructure facilities which has long term effect primarily on the economic conditions and secondarily on social factors, thus indicating their influence on the basic value system and standard of living of people. The standard of living is either elevated or degraded as a result of changes brought about by basic infrastructure particularly in the rural sector.

About 72.97 % PAFs do not have a separate kitchen in their houses and use the living room and store rooms for cooking. Most houses do not have any toilet facility and use the available open spaces outside the villages for defecation. Only 23.57 % PAFs have constructed bathrooms. Public latrines are totally absent in the area. The infrastructure facilities available with the PAFs are presented in **Table 5.16**

TABLE 5.16

INFRASTRUCTURE FACILITIES

S. No.	Facility	PAFs	% PAFs
1.	Kitchen	2199	27.02
2.	Bath room	1918	23.57
3.	Toilet	982	12.06
4.	Electricity	2967	36.46

o) Income Pattern of PAFs

The households earn their livelihood from various means. They mainly include cultivation and agricultural labour followed by self-employment such as petty business, dairy, poultry etc. Agriculture is the most predominant incoming generating activity in the project area, which generates main income for majority of the population followed by agricultural labour. The annual income pattern of the PAFs from all the sources is presented in **Table-5.17**

TABLE-5.17
INCOME PATTERN OF PAFs

Sr. No.	Income Range (Rs)	PAFs	PAFs %
1)	Less than 5000	847	10.41
2)	5000-10000	2421	29.76
3)	10000-20000	3010	36.99
4)	20000-50000	1278	15.71
5)	Above 50000	580	7.13
	Total	8136	100.00

From the above table, it can be seen that about 10.41 % PAFs have a family income of less than Rs, 5000 per annum. About 29.75 % PAFs have income between Rs. 5000-10000 per annum. About 36.99 % PAFs have the annual family income of Rs. 10,000-20,000 and about 15.71 % PAFs have annual income of between 20000 and 50000 per annum. About 7.13 % PAFs have more than Rs. 50,000 income per annum.

p) Expenditure Pattern of PAF's

The expenditure pattern of the PAFs has been studied to ascertain the dominant expenditure incurred by them. It is revealed that the food expenditure followed by clothing and medicines are the most predominant heads of expenditure. Very small fraction of their income is spent on education and other activities like smoking, alcohol, etc.

q) Expectations from the Project

Questions regarding the requirements of PAFs with reference to the proposed land acquisition, and compensation thereof were asked with some emphasis on the income generating schemes. Almost all the PAFs indicated their preferences for employment in the government jobs against the loss of their agricultural and homestead lands including their houses, and better compensation as per the present market value in the

6.1 Resettlement and Rehabilitation of the Project Affected Persons (PAP's)

The land falling in the submergence zone is proposed to be acquired from the land owners under the provisions of the Land Acquisition Act 1894 amended from time to time. Under this provision, the Special Land Acquisition Officers will appointed by the District Collectors of Yavatmal and Nanded appointed to expediate the procedure of land Acquisition procedure

As it is not possible to compensate the Project Affected Families (PAFs) under the option of 'land to land', only monetary compensation for the loss of land and built-up structures is proposed to pay to the Project Affected Persons (PAPs). The compensation to the land is being paid as per the periodical 'awards' declared by the Revenue authorities of the Government of Maharashtra.

The resettlement and rehabilitation of the submergence villages will be undertaken as per the Guidelines of the Maharashtra Rehabilitation of Project Affected Persons Act-1999.

6.2 Submergence Area of the Project.

The district and tehsil-wise and district wise break of the submerged area is as under :

1. District :- Yavatmal.
   - i) Arni - 6709.13 ha.
   - ii) Ghatanji - 3127.41 ha.
   - iii) Mahagaon - 682.06 ha.

2. District :- Nanded
   - i) Mahur - 3824.61 ha.
   - ii) Kinwat - 1607.89 ha.

6.3 Land Acquisition for the Project

Land Acquistion process for the project has yet to start, after obtaining forest approval to the Project. It will start immediately according to work. Land for Resettlement colonies will be acquired from private land owner as per the demand of affected villages through negotation or compulsary acquistion. The compensation for the land will be paid as per Revenue authorities directives.

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region. Some persons asked land to land compensation in command area, some asked compensation has to be made in lumpsum, so that they can invest the money in purchasing the land elsewhere.

r) Training Needs of PAFs

The proposed RRAP will give some opportunities to the PAFs losing their houses and substantial extent of land for the project for restoring their lost income through income generation schemes with the monetary compensation paid to them by the VIDC. In the survey almost all PAFs could not ascertain their training requirements, as this concept is totally new to them. Very few enlightened PAFs indicated their requirements, which include technical training for operation of light industrial machinery and guidance to start industrial workshops, garages, petty business shops, etc.

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7.0 DEVELOPMENT OF RESETTLEMENT AND REHABILITATION ACTION PLAN

7.1 Introduction

The land proposed for acquisition under the Land acquisiton Act includes a large number of houses laocated in the proposed submergence area of the project. All these PAFs would be required to be resettled in resettlement colonies that would be developed by the VIDC.

The data which have studied for the socio-economic aspect to form some entitlement packages as per the well defined Rehabilitation and Resettlement Policies of Maharashtra Govt.

7.2 Objectives of RP

The Principle objective of the Rehabilitation and Resettlement Plan (RRAP) is to ensure that the PAFs from project-affected lands get adequate compensation and rehabilitation assistance. This would facilitate the PAFs to achieve at least their pre-project income levels, if not to improve their economical status substantially after the land acquisition in the shortes time and retain there potential for further economic growth.

7.3 Key Steps involved in RP

The key steps in developing the RP are :

- Development of an entitlement package that provides details of compensation and rehabilitation assistance to the DFs and PAFs;
- Intergration of RRAP implementation with the project execution;
- Arrangement of an institutation set-up and budget for implementation of the RRAP; and
- Provision for arrangment for monitoring the implementation of the RRAP.

7.4 Criteria for Identifying Land Loss Related Entitlement

Cash compensation will be provided at market value, which allows the PAF to purchuse land elsewhere wherever available on his/her own or invest the compensation in income generation schemes as per his/her choice to earn a regular income.

Though it is desirable to compensate the land loss with alternate land elsewhere for the income restoration it is practically not feasible as the government lands or private surplus lands, which fall under the ceiling limits are not available in the project area. Further, due to the small land holdings, many of the PAFs rely on alternate sources of income.

Due to the latriniscaly small land holding, three is a strong possibility that the proposed project boundary, some times may pass through the middle of a plot, bisecting it into two small fragements. This may leave only small piece of land outside the project boundary, which may not be useful for any economic activity.

7.5 Entitlement Package

Loss of Land

The project requires land and property acquisition from the affected villages.

The Revenue Authorities of Government of Maharashtra, as per the established norms of the Government, would decide the prices of lands. Besides the land acquisition value fixed by the authorities for the proposed land, an additional 30 % solatium would be paid to the PAF as a contingency.

Loss of Structures

Compensation and rehabilitation and resettlement benefits to the PAFs would be extended as per Govt of Maharashtra R&R norms.

Loss of Standing Crops

As per the norms, if any standing crops are damaged at the time of LA appropriate cash compensation will be paid, in case of loss of fruit bearing trees, compensation will be paid as per the norms of the Forest Department, Government of Maharashtra.

Loss of submerge Village Land

The Project area proposed for acquisiton consists of both Government or village common lands as well as private land, in case the proposed government lands for acquisition are not used for grazing there would not be any effect. However, in case the proposed lands include grazing lands, there would be compensated by the VIDC by means of exchange of private lands to the grazing lands.

7.6 Summary of Norms for Entitlement Package

Based on the R&R norms, the entitlement packages have been formulated. These entitlement package norms are summarized Table 7.1

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TABLE – 7.1
R&R NORMS AND ENTITLEMENT PACKAGES

Type of issue/ Impact	Entitlement	Entitlement
Loss of Agricultural land	Land owners losing Lands	As per the principles laid down in the LA Act, which is in practice. The land rate would be finalized based on the norms fixed by the Revenue Department, Government of Maharashtra.
Loss of Homestead Land	Homestead landowners facing demolition of houses and homestead lands	As per the principles laid down in the LA Act, which is in practice. The land rate would be finalized based on the norms fixed by the Revenue Department, Government of Maharashtra.
Loss of Structures	Owners of Structures	Compensation for the house would be decided based on the valuation surveys by the Public Works Department, Government of Maharashtra of Valuation Engineers.
Loss of Trees, Plantations	Owners of trees	Cash compensation for the fruit bearing trees and plantations as fixed by the Horticulture Department, Governement of Maharashtra, the trees of exclusive timber value or other types would be valuated by

		the Forest Department, Government of Maharashtra.
Loss of Standing Crops	Owners of lands with standing crops	The damage to the crops would be ascertained by the Agriculture Department, Government of Maharashtra or through direct negotation with the PAFs.

It needs to be mentioned here that discussions with each PAF should be done as a follow-up by a third party of NGO selected for the implementation of the project, if selected. This will be useful in ascertaining the prefered soulation suiting the individual, considering his/her socio-economic background and ensure adherence to the R&R Policy of Maharashtra.

7.7 **Budget**

VIDC would deposit the entire cost of land, structures and these proposed for acquisition with SLAO who would be specially deputed by the Government of Maharashtra for this project, much before taking the actual possession of land, besides the land costs, adequate funds would be earmarked for implementation of the RRAP.

7.8 **Intergration of RP with Income generating schemes :**

Several rural development schemes such as integrated Rural Developme Programme (IRDO), Training for Rural Youth for Self Employme (TRYCEM), development of Women and Children in Rural Are (DWACRA), Improved toolkits to Rural Artisans Programme, Gan Kalyan Yojna and employment generation schemes such as Jawahar Roj Yojna, Employment Assurance Scheme, Indira Awas Yojna, Jeewandha etc. are being impemented by the Government of India as well Government of Maharashtra for improving the socio-economic conditio of rural people falling below the poverty line, the government provi financial assistance as per the specified norms for each scheme.

The villagers are well aware of the modes operandi of the governm proverty alleviation schemes, which however are limited to the fami Below the Proverty Line, which as been fixed at Rs. 20000/- per annum family. Under its R&R policy towards income restoration schemes it wo

be advisable to extend similar benefits to the interested PAFs by GOM, as most of the PAFs are having knowledge and experience about the schemes directly or directly. This may go hand in hand along with the governement schemes, which would facilitate the overall development of the project area by means of employment generation and income restoration.

7.9 Institutional Arrangement of Implementing the RP

Implementation of the project would require involvement of Public agencies, GOM croporate and the PAFs. The public agencies include the district Collector, Special Land Acquisition Officers (SLAO), and Block Development officer (BDO) besides the appointed members of the Resettlement Action Committee (RAC), which may include a few NGOs. Besides GOM, a few representatives of the PAFs would also be involved in the implementation of the RRAP.

For land acquisition, payment of compensation, introduction of applicable income restoration schemes, project implementation, monitoring and evaluation of the project, various commitees are likely to be constituted. The possible commitees and their roles are described in the following sections.

7.10 Formation of Commitees for the Project

7.10.1 Land Acquisition Committee (LA Committee)

Land acquisiton is the prime responsibility of the SLAO, who is generally the Deputy Collector of the district and will be the Chair Person of this Committee. The SLAO initiates the process of LA and serves notification as per the provisions of the Sections 4 of the LA Act, 1894 and completes all formalitites of LA from time to time. The Land Acquisition Tahasildars and BDOs would assist the SLAO for LA.

The term of LA Committee could be tentatively for a period of about 1-2 years. The LA committee would be headed by the SLAO of Yavatmal district and would co-ordinate/supervise LA for the project. Two Land Acquisition Tahasildars would assist the SLAO, one each from Arni and Ghatanji of Yavatmal and Yavatmal distiricts respectively for the acquisition of land for the project. The SLAO and Land Acquisition Tahsildars would be recruited on deputation basis for a period of about 2 years from the year of starting the acquisiton procedures. The salaries of the LA officers on deputation would be paid by GOM.

The LA Committee will consist of the following members :

1) District SLAO-Chairperson .
2) VIDC Representative-Member Secretary

3) Arni BDO – Member
4) Ghatanji BDO – Member
5) NGO Representative – Member
6) Project Monitoring and Evaluation Consultant – Member

Funcitions of the LA Committee :
The functions of LA committee are :

- Procurement of land required for the project with periodic monitoring and review of LA :
- Ensure timely flow of funds from GOM for release of the LA compensation.
- Review grievances, if any, in LA proceedings.

The Committee will meet as and when required, however at least once a month to review the progress and constraints, if any and take appropriate steps for successful completion of the tasks in hand.

7.10.2 Rehabilitation and Resettlement Committee (R&R Committee)

The R&R Committee will function for 2 Years. The R&R Committee would be formed of GOM officers, and NGO and the Project Evaluation Consultant, whose fees would be paid by GOM. The Government officers such as BDO would be paid honorarium for the sittings, by GOM as per the government norms.

This committee will consist of the following members :

1) Representative of VIDC – Chairperson
2) NGO – Member Secretary
3) District Collectors – Members
4) District Rural Development officers – Members
5) District LAOs – Member
6) Representatives of PAFs – at least one from each Development Block (at least one woman) – Members.

Functions of R&R Committee

- Monitor and review implementation of R&R Plans
- Ensure smooth and timely implementation of R&R programmes by getting approvals as requried.
- Ensure proper utilization of R&R grants and loans by field level assessment of utilization and release R&R grant accordingly.
- Function as a grievance redressal body.
- Take field level decisions on the R&R issues from time to time.

- Provide overal guidance and leadership for smooth resettlement and rehabilitatipn of the PAFs.
- Indentify and implement vocation training measures to the PAFs.
- Act as a co-ordinator between the GOM and different government agencies involved in LA and ER schemes, NGOs, contractors and the PAFs.
- Dovetail the Resettlment Plan of the Project in various development programmes of the government for R&R of PAFs.

The committee will meet once in three months to review the progress and onstraint, if any and take appropriate steps for successful completion of the tasks in hand.

7.11 NGO Services for implementation of RP

Detailing of RRAP will be essential simultaneously with the land acquisiton for immediately after LA from the PAFs, much before undertaking the project construction and implementation of the project. For successful implementation of the RP, and management of LA compensation funds, the services of a reputed and deticated NGO would be desirable.

The NGO would be responsible for the following functions :

- Exploring possiblities of negotiated settlement between the GOM, SLAO and PAFs, if required;
- Assisting PAFs in receiving the compensation for their land, trees and properties, if any acquired for the project;
- Providing necessary support for identifying appropriate vocational training need of PAPs;
- Promoting skills among the PAFs for IGS and assisting in procurement of appliances if IGS;
- Guiding and helping the PAFs with proper training to ensure restoration of their economic status within a shortest possible time;
- Assisting the PAFs in getting benefits from already existing various Government Development Programmes and also ensuring proper linking of the income generating schemes and help the PAF in receiving maximum benefits;
- Ensuring that the assistance money for the PAFs is used for the earmarked specified purposes under the R&R Package;
- Helping PAFs is restoring their lost-income through income generating schemes, as it is not advisable to pay the rehabilitation assistance money directly to the PAF is cash;
- Other responsibilities related socio economic issues raising out of the implementation of the project, if any.

Thus the NGO will assist the PAFs in restoring their lost income, through most suitable income generation schemes based on their skills and imparting vocational training and make optimum use of grants to start of business or industry. The selected NGO would finalize these schemes and implements in consultation with the PAF.

7.12 **Implementation Schedule**

It is primarily the responsibility of VIDC to ensur successful implementation of the project. The construction of the project mainly involves acquisition of private land, adequate instituational arrangements for operational machanism and assistance are necessary for successful implementation of RRAP. Therefore there is need to focus one two main issued.

- Issues related to LA; and
- Issues related to R&R of PAFs

Land acquisition would be primarily the responsibility of the SLAO, Appropriate comepensation toward the land acquisiton would be decided and paid through established procedures and also with negotiation if requried. The procedure therefore would involve interaction and consensus building with the PAFs on an agreeable compensation.

R&R of PAFs is another important element, which will be done with the help of a NGO as discussed above. In this context, it is necessary that a NGO have adequate experience in LA procedures and in implementing income generation schemes. Thus the implementation responsibility through an institutional arrangement would be developed by GOM and the NGO involved.

Land should be taken into prossession by GOM free from all encumbrances for carrying out project activities.

The activites to be taken up on priority basis as a part of initiating the implementation of RRAO are :

i) Issue of notification/s 4(1) of the LA Act for acquiring private properties
ii) Selection and appointing of NGO
iii) Constituting the R&R Implementation and Monitoring Committee
iv) Payment of compensation as per amount agreed through negotiated settlement. This is the responsibility of Special Land Acquisiton officer.

v) Release of grants to the PAFs for income generation schemes of purchase of either land or productive assest. BDO and NGO will work jointly to ensure that grants reach to the genuine persons.

Subsequent to the aspects mentined above, focus will be on the follow-up actions particularly on promoting economic activities and their sustainability. A mid-term evaluation should be carried out the suggest and corrective measures.

Entire payment of compensation for land and initiation of implementing the RP including the IGS will have to be undertaken before the commencement of project construction, on as and where ready basis. A time requirement of 3 months is considered for detailing of the RP from intiating the project activities. It is desirbable to initiate the project a early as possible.

7.13 **Monitoring and Evaluation (M&E)**

Monitoring and evaluation are critical activities of the project implementation and R&R operations. Periodic checking of activity will essential to ascertain that the targets are achived. Monitoring also serves as an early "Warning system" to indicate necessary actions to be taken at appropriate times.

The M&E will be done simultaneously with the implementation of the LA and RRAP. Task for M&E would includes quarterly review of the LA and R&R and annual survey among PAFs, to establish the trend in socio-economic status.

GOM would be responsible for setting up and putting in place a monitoring framework through the R&R Implementation and Monitoring Committee for the implementation of the RP. Since M&E will be simultaneous with the initiation of R&R activities, GOM will develop a prescribed pro-forma for monitoring the project implementation. Such a monitoring system will help in developing quality control and planning for remedial measures to over come implementation problems and build them into programme of activity.

It is desirable that GOM engage an idepended M&E agency, not associated with the project execution to carrying out an evaluation of the project regarding the achievement of RRAP implementation. This evaluation will be undertaken periodically at least once in a year on a sample basis during te project implementation period. The intermediate project evaluation will help to plan corrective measures for proper implementation of the RRAP. Some of the important monitoring indicators, useful in evaluation of the

RRAP are housing condition such as type of house, built up area, number of rooms, possession of other movable and immovable assets, level of infrastructure possessed imployment, income levies and living conditions.

Besides various physical and financial aspects, preparation quarterly progress report on the progress of R&R activities will form an important task of the committee. The committee will meet once in three months to approve plans and monitor implementation of R&R activities. It will advise the project staff at the village level on various aspects of the programmes to make implementation more effective.

GOM would monitor the implementation of RRAP on a continuous basis, the monitoring would include the progress achieved by the NGO, R&R implementing Committee and the achievements of IGS introduced for the PAFS.

The success or failure of RRAP could be evaluated by using the "before and after" approach, which highilights the improved or worsened socio-economic levels, after the implementation of the project, in comparison with baseline socio-economic conditions prevailed before LA. The evaluation will be done one year after initating the RRAP and limitted to the PAFs that covered under IGS. The final evaluation of RRAP will be undertaken 3 years after its initiation.

Co-ordination of various activities related with the RRAP would be the prime responsibility of the Project R&R officer (PRRO) of GOM. The PRRO should have extensive field experience related with the R&R activities, preferably have worked with any NGO or community organization. Knowledge of government procedures is an additional advantage.

A computer orerator will assist the PRRO and maintain all records related with the PAFs, R&R activities and implementation progress. The operator will up-date the R&R database continuosly and prepare review report on implementation of the RP.

7.14 Summerise – Resettlement Package Plan

Rehabilitation of project affected persons is very Challenging & painful job. Even thought of rehabilitation is fearful for project affected persons since their several generations are residing in these villages resulting in development of emotional relations with the soil of their native place. Rehabilitation of PAP being very sensetive activity, it needs to be carried out carefully & also planning should be such that nobody will be a victim of injustice. While planning the project, care is exercised to see that less no of villages will be submerged. Available yield is to be used effectively

so that maximum cultivators will get facility of irrigation. Rehabilitation is unavoidable for the implementation of such multipurpose project which will prove to be a great boon to the farmers.

Total no of villages to be rehabilitated due to submergence of this project is 46, out of which 32 villages are fully affected & 14 villages are partially affected involving 8136 families comprising of 36809 souls. All facilities of rehabilitation will be provided along with the civic amenities in accordance with the rehabilitation Act 1999 of Govt. of Maharashtra so that socio-economic status of the affected persons will not be disturbed. For this purpose, detail measurements of their houses alongwith all infrastructure such as wells, septic tanks, open yard, tubewells etc. are taken & compensation is given to them as per current CSR of P.W.D. Land Compensation is paid with rates visualising sale-deeds in the vicinity of project according to ready reckner available. Compensation for fruit bearing trees is given after consultation with office of horticulture deptt. Valuation of the property is done keeping in view the sense of huminity and seeking the help of project affected persons particularly in this activity.

Place for new gaothan is generally finalised with the consent of project affected persons. In case of certain difficulty alternate sites are also taken in to consideration with the consent of PAP, Generally priority is given to PAP's decission for finalisation of site where the affected village is to be rehabilited.

Govt of Maharashtra is doing excellent rehabilitation of PAP with provision of following 18 various civic amenities.

1) Permanent provision for drinking water, in proporation to the population, by open well, bore well, tube well, piped wter supply scheme or by any other mode.
2) School with play ground of appropriate level as prescribed by the Education Department of the State Govt with toilet facility.
3) Construction of village Panchayat Office and Chavadi or Samaj Mandir.
4) Internal metal roads & asphalted approach road of appropriate standard.
5) An access to the farm lands of the affected persons, if required.
6) Electric Supply along with street lights and three phase connections, wherever required.
7) Cremation ground with a shed, plat-form, electric supply, water supply and burial ground, as may be required with an approach road.
8) Open built-up gutters.

9) Financial assistance for individual latrines and public latrines, wherever necessary.
10) Land for cattle stand with a water cistern.
11) Land with pick up shed for M.S.R.T.C. bus services.
12) Land for threshing floor. that is to say, Khalwadi.
13) Pasture Land (if Govt. Land is available)
14) Developed land for market.
15) Land for future expansion of gaothan.
16) Land for a secondary school and a dispensary or primary health center, bank, post-office, garden for children, etc. depending on the population of the new gaothan.
17) Land for registered boides for public purposes in the old gaothan.
18) Land for Play ground.

In addition to above provisions, additional facilities are also sanctioned on demand of PAP considering their requests sympathitically, During execution of amenties & provisions, changes proposed by PAP are also entertained and alterations are carried out accordingly. In short, opinion of PAP are fully honoured for the purpose of rehabilitation procedure.

In Maharashtra "Maharashtra Project Affected Persons Rehabilitation Act 199" is in force since 1st April 2002. In February-2004, Govenrnment of India had adopted National Rehabilitation Policy 2003 for Rehabilitation of Project Affected Persons. As per this policy it is required to form independent Rehabilitation Authority to implement the rehabilitation work & to divert the fund to this authority and get the work done from this authority as per provisions in the policy. It is aimed to increase the participation of PAF's in Rehabilitation work. Maharashtra Government has decided to adopt the policy of "First Rehabilitation & then Construction of Dam". To implement this policy and make the Rehabilitation policy as per Central Government's National Policy M.S. Government vide GR No. RPA 2006/Case No 1(3)/R-1/dt.17/4/06 has decided to give additional benefits, which are as follows.

Financial Assistance for Constructing Cattle Shed

Each PAF having cattle shall get financial assistance of Rs. 3000/- for construction of cattle shed.

Financial Assistance for Construction of Working Shed / Shop

Each PAF comprising of rural artisan / small traders and self employed persons shall get one time financial assistance of Rs 10,000/- for construction of working shed /shop.

Government Job reservation upto 5% on priority

Project Affected Self Employed person will get benefits as per Maharashtra Government Resolution No RPA-2001/case no. 90/R-1dt 14th March 2002.

Tribal Project Affected Persons will be given priority on distribution of alternative land. As far as possible the rehabilitation will be done nearer to the old habitat if he is resettled outside original taluka / district then he will be given additional 25% amount for construction of house/shop.

In case of linear acquisition for canals where in only a narrow stretch of land is being acquired each khatedar will be offered an exgratia amount of Rs.10,000/- no other resettlement and rehabilitation benefits shall be available to them.

Overall conclusion can be drawn that newly rehabilitied village is well equipped with all facilities Govt. of Maharashtra also bears positive view as far as Rehablitation of the PAP is concerned.

Land owner can get alternative land in lieu of submerged land on remitting certain amount in Collector's Office. For creation of Employment facilities preference is given to unemployed persons in submergence for development of fishery, tourism, small schale industires etc. Financial aid through various financial institutations and NGO is also provided to the unemployed youths in submergence for self employment to improve their financial status.

Keeping in view the possible multicornered development of the backward Vidarbha region & specially the benefits of irrigation to 351 villages coming under command of this project the environmental & social cost of the project do not outweigh the advatages that can be achieved by the execution of this project.

To attend the complints of PAP during rehabilitation, each village will be looked after by two sectional Engineers/A.E.-(2) so that delay in implementation of suggestions of PAP will be avoided.

A time boundd rehabilitation programme is prepared and attached with this report. All facilities of rehabilitation will be provided along with the civic amenities in accordance with the rehabilitation Act. 1999 of Govt of Maharashtra.

7.15 Conclusions

Implementation of the project may create many inconveniences to the PAFs due to loss of land, properties, employment opportunities etc. By disbursing adequate compensation for different losses and introduction of income generating schems with provision of financial assistance in terms of grants, the PAPs are likely to generate income that was prevailing before the land and property acquisition to the project. This project will pay way for promotion of industrial development in the region, which will generate employment opportunities to considerable numbers of local people, most likely the PAFs. With various income generating schemes, many PAFs will be benefited due to this project and their socio-economic conditions would be enriched in future. Hence, this proposed project would be a most beneficial one to the region and nation in general and PAFs of the project in particular.

EXHIBIT L

No. J-12011/28/2012-IA.I
Government of India
Ministry of Environment, Forest & Climate Change
[IA.I – Division]

Indira Paryavaran Bhavan
3rd Floor, Vayu Wing
Jor Bagh Road, New Delhi-3

Dated: 28th May, 2015

To

The Commissioner
P & D of Godavari Basin
I & CAD (PW) Department
Government of Telangana
Basement Floor, Jalasoudha Building
Errummanzil
Hyderabad – 500 082.

Sub: Lower Penganga Irrigation (Interstate) Project in Maharashtra and Adilabad District of Telangana by M/s. Irrigation & CAD Department, Government of Telangana – For Environmental Clearance – regarding.

This has reference to your letter No. Comm/GB/DCE/OT1/AE2/LPP/Vol.VII dated 4.2.2015 and 27.2.2015 on the above mentioned subject.

2. The above referred proposal was considered by the Expert Appraisal (EAC) Committee for River Valley & Hydroelectric Power Projects (RVP & HEP) at its meeting held on 26-27th February, 2015. The comments and observations of EAC of this project may be seen in the minutes of the meeting available on the web-site of this Ministry.

3. This project is an interstate irrigation project between Maharashtra and Andhra Pradesh. The net annual flows at Lower Penganga dam are assessed as 42.67 TMC and to be shared in the ratio of 88:12 between Maharashtra and Andhra Pradesh (i.e. Maharashtra-37.55 TMC & Andhra Pradesh-5.12 TMC). This will create an irrigation potential of gross command area (GCA) of 29,757 ha and culturable command area (CCA) of 19,233 ha in Adilabad District of Andhra Pradesh. The environmental clearance (EC) for Lower Penganga project was accorded on 17.5.2007 for Maharashtra portion. The project proponent (Andhra Pradesh) could not provide information on environmental issues pertaining to Andhra Pradesh at that time.

The project proponent (Andhra Pradesh) made a separate proposal for Lower Penganga for Andhra Pradesh portion. The scoping/TOR clearance for this project was accorded on 28.2.2013 when the Andhra Pradesh was not bifurcated. Now the state is bifurcated into Telangana State and Andhra Pradesh State and the project falls in the bifurcated Telangana State.

The net annual flows at Lower Penganga dam are assessed as 42.67 TMC and to be shared in the ratio of 88:12 between Maharashtra and Telangana. This implies that share of Maharashtra is 37.55 TMC & that of Telangana is 5.12 TMC. The Telangana State's share of water is proposed to be utilized for irrigation & drinking water purpose in the backward Tribal area of Adilabad District.

It is noted that the project envisages construction of an earthen dam across Penganga River on both flanks of concrete dam and canal on left flank. The Telangana canal takes off at CH.11.91 km of left bank canal (LBC) to draw water. The take-off point is at RD 11.91 km from the dam and subsequent canal length of 1.925 km will take water into Telangana border to provide irrigation facility to 19,233 ha of land in Adilabad District. The total land requirement for project is 509.261 ha out of which 8.78 ha is forest land, and 500.48 ha is private land. No submergence is involved. About 3 villages consisting of 4200 families are likely to be affected due to this project. The Tippeswar Wildlife Sanctuary is 2 km away from the link canal. The total cost of the project is about Rs.1111 Crores.

4. Public hearing for the project was conducted on 14.11.2014 at village Jimma, Jainath Mandal in the District Adilabad of Telangana.

5. The Expert Appraisal Committee, after due consideration of the relevant documents submitted by the project proponent and clarification furnished in response to its observations, have recommended grant of Environmental Clearance to the project. Accordingly, the Ministry of Environment, Forest & Climate Change hereby accords necessary environmental clearance to the above project as per the provisions of Environment Impact assessment Notification, 2006 and its subsequent amendment in 2009, subject to compliance of following conditions:

Part A: Specific Conditions

(i) The project proponent has to prepare the R&R benefits & plan for PAFs as per the "Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013"which has come into effect since January, 2014.

(ii) For the land losing households will be as per the National Rehabilitation and Resettlement Policy, 2007 or as per the State Rehabilitation and Resettlement Policy, whichever is more beneficial to project affected persons (PAFs). Adequate publicity of the compensation package of NRRP 2007 shall be given in the affected villages. All R&R issues shall be completed before commissioning of the project.

(iii) The implementation of R&R shall be closely monitored and is to be ensured that all project affected families (PAFs) get adequate & timely compensation before commissioning of the project.

(iv) A Monitoring Committee for R&R shall be constituted which must include representatives of project affected persons including from SC/ST community and at least a woman beneficiary.

(v) All the commitment made during the public hearing shall be fulfilled completely by the State Government in letter and spirit.

(vi) The equipment likely to generate high noise levels during the construction period or otherwise shall meet the ambient noise level standards as notified under the Noise Pollution (Regulation and Control) Rules, 2000, as amended in 2010 under the Environment Protection Act (EPA), 1986.

(vii) Conjunctive use of surface water shall be planned to check water logging as well as to increase productivity.

(viii) Water User Association/s (WUAs)/Co-operative shall be formed and involvement of the whole community for disciplined use of available waters shall be ensured.

(ix) The On Farm Development (OFD) works shall be completed and WUAs (Water User Associations) shall be made functional before commencement of irrigation.

(x) The proposed Compensatory Afforestation in 8.85 ha of area should be taken-up with State Forest Department. Biodiversity Conservation & Management Plan should be implemented with State Forest Department. Allocated grant of Rs.3.09 Crores for this purpose shall be fully utilized and not to be diverted for any other purpose.

(xi) The proposed Conservation of Arli Reserve Forests & Tippeswar Wildlife Sanctuary should be implemented with State Forest Department. Allocated grant of Rs.15 lakhs for this purpose shall be fully utilized and not to be diverted for any other purpose.

(xii) The Tippeshwar Wildlife Sanctuary is 2 Km away from the intake canal and hence "No objection certificate" should be obtained from the PCCF, Government of Maharashtra along with clearance from the Standing Committee of NBWL.

(xiii) The proposed avenue plantation around various project appurtenances & along the road sides in consultation with State Forest Department shall be strictly adhered to. Allocated grant of Rs.88.25 lakhs shall be fully utilized and not to be diverted for any other purpose.

(xiv) Occurrence of stagnant pools/slow moving water channels during construction and operation of the project providing breeding source for vector mosquitoes and other parasites. The river should be properly channelized so that no smell pools and puddles are allowed to be formed. Even after taking precaution, due to unforeseen situations, breeding of mosquito and resultant malaria borne diseases can increase. If such a situation arises, it will be responsibility of the project authorities to take all steps i.e. residual insecticidal spray in all the project area and surrounding 3 km. Area keeping the flight range of mosquitoes in consideration.

(xv) Any other clearance from any other organization/department if required should be obtained.

Part-B: General Conditions

(i) Adequate arrangements for providing free fuel like kerosene/wood/LPG shall be made at the project cost for the labour engaged in the construction work so that indiscriminate felling of trees is prevented.

(ii) Medical facilities as well as recreational facilities shall also be provided to the labourers.

(iii) The labourers to be engaged for construction works shall be thoroughly examined by health personnel and adequately treated before issuing them work permit.

(iv) Water sprinkling arrangements shall be made to suppress the fugitive emissions.

(v) Potable drinking water and proper sanitary facilities shall be provided for the labour force.

(vi) Restoration of construction area including dumping sites of excavated materials shall be ensured by leveling, filing up of borrow pits, landscaping etc. The area should be properly treated with suitable plantation.

(vii) Environmental parameters shall be monitored and six monthly monitoring reports shall be submitted to the concerned Regional Office of the Ministry and to Ministry of Environment, Forest & Climate Change, New Delhi for their review.

6. The Project Proponent shall provide full cooperation and all required documents/ data to the Officials from concerned Regional Office of the Ministry who would be monitoring the implementation of environmental safeguards.

7. The responsibility of implementation of environmental safeguards rests fully with the I & CAD Department, Government of Telangana.

8. The livelihood plan to be prepared, if found necessary in consultation with concerned state government departments. The Government of Telangana should submit compliance on this component & also while submitting six monthly compliance report.

9. Besides the above stated conditions, the Project Proponent shall also implement all other environmental safeguards, as proposed in the EIA/EMP report and other reports from time to time. The Government of Telangana may also like to monitor implementation of EMP at regular intervals.

10. The Environmental Management Plan (EMP) shall be strictly adhered to and a sum of Rs. 15 Crores, the budgetary provisions for implementation of EMP shall be fully utilized and not to be diverted for any other purpose. In case of revision of the project cost due to price level change, the cost of EMP shall also be updated proportionately.

11. In case of change in the scope of the project, the same shall be intimated to the Ministry and fresh approval, if required, shall be taken from the Ministry.

12. The Ministry reserves the right to add additional safeguard measures subsequently, if found necessary and to take action including revoking of the clearance under the provisions of the Environment (Protection) Act, 1986, to ensure effective implementation of the suggested safeguard measures in a time-bound and satisfactory manner.

13. This clearance letter is valid for a period of 10 years from the date of issue of this letter for commissioning of the project.

14. A copy of the clearance letter shall be marked to concerned Panchayat/Zilla Parishad/Municipal Corporation, Urban local body and local NGO, if any, from whom any suggestion/representations were received while processing the proposal. The clearance letter shall also be put on website by the project proponent.

15. State Pollution Control Board / Committee shall display a copy of the clearance letter at the Regional Office, District Industries Centre and Collector's/Tehsildar's Office for 30 days.

16. The project proponent should advertise at least in two local newspapers widely circulated in the region around the project, one of which shall be in vernacular language of the locality concerned informing that the project has been accorded environmental clearance and copies of clearance letters are available with the State Pollution Control Board / Committee and may also be seen at Website of the Ministry of Environment, Forest & Climate Change at http://www.moef.nic.in.

17. After 5 years of the commissioning of the Project, a study shall be undertaken regarding impact of the project on the environment and downstream ecology. The study shall be undertaken by an independent agency, decided in consultation with the Ministry.

18. The project proponent shall also submit six monthly reports on the status of compliance of stipulated EC conditions including the results of monitored data (both in hard copies as well as by email) including the respective Regional Office of MOEF and Zonal Office of CPCB and SPCB.

19. Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days from the date of issue, as prescribed under Section-10 of the National Green Tribunal Act, 2010.

Yours faithfully,

28/5/2015

(S. K. Srivastava)
Scientist-E

Copy to:

1. The Secretary, Ministry of Water Resources, Shram Shakti, Bhawan, Rafi Marg, New Delhi-1.
2. The Principal Secretary (I & CAD), Government of Telangana, Telangana Secretariat, Hyderabad
3. The Secretary, Department of Environment, Government of Telangana, Telangana Secretariat, Hyderabad
4. The Engineer-in-Chief, (I& CAD), Government of Telangana, Errummanzil, Hyderabad.
5. The Chief Engineer, Project Appraisal Directorate, Central Water Commission, Sewa Bhawan, R.K. Puram, New Delhi-110066.
6. The CCF, Regional Office (SE Zone), Ministry of Environment, Forest & Climate Change, Cathdral Garden Road, Nugambakam, Chennai – 600 034.
7. Member Secretary, Telangana State Pollution Control Board, Paryavaran Bhawan, Industrial Estate, Hyderabad.
8. EI- Division, Ministry of Environment, Forest & Climate Change, New Delhi-110003.
9. NIC Cell – with a request to upload on MoEF website
10. PS to JS (BS)
11. Guard file/Notice Board.

28/5/2015

(S. K. Srivastava)
Scientist-E