कार्यालय प्रधान मुख्य वन संरक्षक (कक्ष–भू प्रबंध), वन भवन, मध्यप्रदेश, भोपाल

सी–ब्लॉक, द्वितीय तल, लिंक रोड नं.–2, तुलसी नगर, भोपाल–462003

क्रमांक / एफ–3 / 50 / 2019 / 10–11 / 6 / 2326   भोपाल, दिनांक 29/04/2024

प्रति,

वन महानिरीक्षक (एफ.सी.)
भारत सरकार, पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय,
इंदिरा पर्यावरण भवन, अलीगंज,
जोरबाग रोड़, नई दिल्ली–110003

विषयः–जिला दतिया एवं जिला ग्वालियर के अन्तर्गत मॉ रतनगढ़ बहुउद्देशीय परियोजना के निर्माण हेतु 1305.142 हेक्टेयर वनभूमि कार्यपालन यंत्री, हरसी उच्च स्तरीय नहर संभाग क्र–2 डबरा जिला ग्वालियर को उपयोग पर देने बाबत्। (FP/MP/IRRIG/40397/2019).

संदर्भः–भारत सरकार, पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय, इंदिरा पर्यावरण भवन, अलीगंज, जोरबाग रोड़, नई दिल्ली का पत्र क्र. 8-28/2021-FC दिनांक 22.02.2024
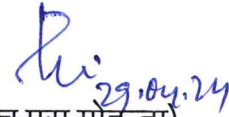
––00––

विषयांतर्गत संदर्भित पत्र से भारत सरकार द्वारा प्रकरण में Complete Layout Plan एवं पुनः उत्तर प्रदेश सरकार की टिप्पणियों को शामिल करते हुए Wildlife Management Plan की अनुमोदित प्रति प्रस्तुत करने के निर्देश दिए गए है।

आवेदक संस्थान द्वारा परियोजना संबंधी Layout Plan प्रस्तुत किया है एवं प्रस्ताव के भाग–1 में अतिरिक्त जानकारी की टेबल के बिन्दु क्रमांक–20 में अपलोड किया गया है। सुलभ संदर्भ हेतु प्रति संलग्न है।

प्रकरण में प्रधान मुख्य वन संरक्षक (वन्यजीव) उत्तर प्रदेश, लखनऊ द्वारा पत्र दिनांक 18.04.2024 से प्रकरण में अभिमत प्रदान किया गया है, सुलभ संदर्भ हेतु प्रति संलग्न है।

अतः उपरोक्तानुसार अनुरोध है, कि प्रकरण में भारत सरकार की सैद्धांतिक स्वीकृति प्राप्त कर अवगत कराने का कष्ट करें।
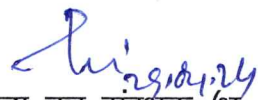
संलग्नः–उपरोक्तानुसार।

(एच.एस.मोहन्ता)
अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध)
मध्यप्रदेश, भोपाल

पृ. क्रमांक / एफ–3 / 50 / 2019 / 10–11 / 6 / 2327   भोपाल, दिनांक 29/04/2024

प्रतिलिपिः–

1. मुख्य वन संरक्षक, (क्षेत्रीय) ग्वालियर वृत्त ग्वालियर, मध्यप्रदेश।
2. वनमंडलाधिकारी, सामान्य वन मण्डल, दतिया / ग्वालियर / भिण्ड, मध्यप्रदेश।
3. कार्यपालन यंत्री, हरसी हाई लेवल नहर संभाग क्रं.–2 डबरा, जिला–ग्वालियर, मध्यप्रदेश।

की ओर सूचनार्थ अग्रेषित।

अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध)
मध्यप्रदेश, भोपाल

ई-मेल

कार्यालय प्रधान मुख्य वन संरक्षक, वन्य जीव, उत्तर प्रदेश, लखनऊ।

पत्रसंख्या– 415 /26–11

लखनऊः दिनांक 18 अप्रैल, 2024

सेवा में,

अपर मुख्य सचिव,
पर्यावरण, वन एवं जलवायु परिवर्तन, अनुभाग–4,
उत्तर प्रदेश शासन, लखनऊ।

विषयः– दतिया एवं ग्वालियर जिलों में मां0 रतनगढ़ बहुउद्देश्यीय सिंचाई परियोजना के निर्माण के लिए 1305.142 हेक्टेयर वनभूमि के प्रत्यावर्तन का प्रस्ताव।

सन्दर्भः– 1–प्रधान मुख्य वन संरक्षक (वन्यप्राणी), मध्यप्रदेश के कार्यालय का पत्रांक–व0प्रा0/माचि0/बांध/GEN-469/1331, दिनांक 13.02.2024
2–इस कार्यालय का पत्रांक–2309/26–11, दिनांक 18.03.2024
3–मुख्य वन संरक्षक, वन्यजीव, पश्चिमी क्षेत्र, उत्तर प्रदेश कानपुर के पत्रांक–2121/26–11 (चम्बल), दिनांक 16.04.2024

महोदय,

प्रधान मुख्य वन संरक्षक (वन्यप्राणी), मध्यप्रदेश के उपरोक्त सन्दर्भित पत्र दिनांक 13.02.2024 (संलग्नक–1) द्वारा विषयक प्रकरण के सम्बन्ध में भारत सरकार, नई दिल्ली कार्यालय में आयोजित वन सलाहकार समिति की बैठक दिनांक 20.10.2023 में प्राप्त कार्यवाही विवरण के बिन्दु क्रमांक–5(i) में लिए गए निर्णय, "The proposed area is about 45 kms away from the National Chambal Gharial Wildlife Sanctuary, therefore keeping in view the recommendations of Chief Wildlife Warden, the comment from the Government of Uttar Pradesh shall be obtained and incorporated in the Wildlife management plan" के क्रम में इस कार्यालय स्तर से अभिमत की अपेक्षा की गई।

उक्त के क्रम में इस कार्यालय के उपरोक्त सन्दर्भित पत्र दिनांक 18.03.2024 (संलग्नक–2) द्वारा भारत सरकार, नई दिल्ली कार्यालय में आयोजित वन सलाहकार समिति की बैठक दिनांक 20.10.2023 में प्राप्त कार्यवाही विवरण के बिन्दु क्रमांक–5(i) में लिए गए निर्णय के सम्बन्ध में अभिमत इस कार्यालय को उपलब्ध कराने हेतु मुख्य वन संरक्षक, वन्यजीव, पश्चिमी क्षेत्र, उत्तर प्रदेश कानपुर को निर्देशित किया गया।

तद्क्रम में मुख्य वन संरक्षक, वन्यजीव, पश्चिमी क्षेत्र, उत्तर प्रदेश कानपुर के उपरोक्त सन्दर्भित पत्र दिनांक 16.04.2024 (संलग्नक–3) द्वारा अवगत कराया गया कि राष्ट्रीय चम्बल सेंचुरी प्रोजेक्ट तीन राज्यों क्रमशः उत्तर प्रदेश, मध्य प्रदेश एवं राजस्थान द्वारा प्रबन्धित वन्यजीव अभ्यारण्य है, जोकि लुप्तप्रायः एवं घटनाग्रस्त प्राणी घड़ियाल के संरक्षण एवं सम्वर्द्धन की दृष्टि से भी महत्वपूर्ण है। इसके साथ ही यह सेंचुरी मगर एवं डॉल्फिन के संरक्षण और सम्वर्द्धन की दृष्टि से भी महत्वपूर्ण है। सिंध नदी चम्बल नदी की एक प्रमुख सहायक नदी है, जो चम्बल में नदी के प्रवाह एवं प्रवृत्ति और प्रतिवर्ष बालू एवं गाद के नवीनीकरण में प्रमुख भूमिका निभाती है। अतः चम्बल नदी तंत्र, जो कि एक विशिष्ट पारिस्थितिकी तंत्र है, में किसी भी प्रकार के कार्य या हस्तक्षेप से पूर्व यह सुझाव दिया गया है किः–

1. चम्बल नदी तंत्र में नदी के प्रवाह एवं प्रवृत्ति पर कोई प्रतिकूल प्रभाव नहीं पड़े।
2. प्रतिवर्ष बालू एवं गाद के नवीनीकरण में कोई बदलाव न हो।
3. इस कार्य से घड़ियाल तथा अन्य जलीय जीवों के पर्यावास, पारिस्थितिकी एवं प्रजनन पर कोई प्रतिकूल प्रभाव ना पड़े।

H:\Vijendra Sir\General Letter 2023\Letter.docx

मुख्य वन संरक्षक, वन्यजीव, पश्चिमी क्षेत्र, उत्तर प्रदेश कानपुर के उपरोक्त सन्दर्भित पत्र दिनांक 16.04.2024 द्वारा यह भी अवगत कराया गया कि चम्बल सेंचुरी में घड़ियालों का बड़ी संख्या में अवसान होने के पश्चात बड़ी मेहनत एवं कठिनाई से संरक्षण एवं सम्वर्द्धन द्वारा इनकी जनसंख्या का पुनः प्रवर्तन किया गया है। चम्बल सेंचुरी इस संकटग्रस्त प्राणी के उत्तरजीविता एवं अस्तित्व के लिए अंतिम शरण की तरह है। इस संदर्भ में मुख्य वन संरक्षक, वन्यजीव, पश्चिमी क्षेत्र, उत्तर प्रदेश कानपुर द्वारा उक्त कार्य एवं उसके दूरगामी प्रभाव के मद्देनजर ऐहतियाती सिद्धान्त का अनुसरण करते हुए, इसका अध्ययन जलीय पारिस्थितिकी तंत्र के क्षेत्र से जुड़े राष्ट्रीय स्तर के किसी प्रतिष्ठित शोध संस्थान से कराते हुए, इसके सुझावों पर तीनों हितधारक राज्यों की एक उच्चस्तरीय समिति के अभिमत के साथ कराए जाने हेतु सुझाव दिया गया है।

अतः उपरोक्त सन्दर्भित पत्रों को संलग्न कर इस अनुरोध के साथ प्रेषित किया जा रहा है कि विषयक प्रकरण के सम्बन्ध में शासन स्तर से आवश्यक कार्यवाही करने का कष्ट करें।

संलग्नकः– उपरोक्तानुसार।

भवदीय,

(संजय श्रीवास्तव)
प्रधान मुख्य वन संरक्षक, वन्यजीव/
मुख्य वन्यजीव प्रतिपालक,
उत्तर प्रदेश, लखनऊ।

पत्रांकः– 415 / उक्तदिनांकित।
प्रतिलिपिः प्रधान मुख्य वन संरक्षक (वन्यप्राणी), मध्य प्रदेश को सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

(संजय श्रीवास्तव)
प्रधान मुख्य वन संरक्षक, वन्यजीव/
मुख्य वन्यजीव प्रतिपालक,
उत्तर प्रदेश, लखनऊ।

SITE-SPECIFIC WILDLIFE CONSERVATION PLAN
OF
"MA RATANGARH MULTIPURPOSE PROJECT"
DISTRICT DATIA, MADHYA PRADESH

Submitted By

MAA RATANGARH PROJECT IMPEMETATION UNIT
MAU DISTT. - BHIND (M.P.)

WATER RESOURCES DEPARTMENT
MADHYA PRADESH

"Extolling the Earth as Mother, our scriptures say, 'The Earth is our Mother and we are her children'. The sentiment of universal brotherhood has constantly guided the nation and its people. With such a glorious culture and philosophy of lofty traditions of living in harmony with nature, it is only natural for India to remain at the forefront of global efforts for environment protection,"

Narendra Modi

PROJECT TEAM

Sl. No.	Name of Expert	Qualification	Area of Expert
1.	Dr. Pratibha Singh	Ph.D Environmental Science, GB Pant University of Agriculture &Technology, Pantnagar	Ecology, Biodiversity and Environmental Science
2.	Ms.Shyni Singh	M.Sc Botany (CCS University Meerut)	Ecology, Biodiversity and Environmental Science
3.	Mr. Raj Tewari	M.Sc Forestry, (Kumaon university Nainital) Diploma in Remote Sensing & GIS(B.H.U,Varanasi)	Forestry/wildlife/GIS
4.	Mr. Sunil Panthi	M.Sc Environmental Science University of Science & Technology, Meghalaya	Forestry/wildlife
5.	Mr. Deepak Pandey	M.Sc Environmental Science	Ecology, Biodiversity and Environmental Science

PREFACE

This Site Specific Wildlife Conservation Plan (WLCP) has been prepared for Maa Ratangarh Multipurpose Project over an area of 3337.5 Ha Project, located in distance of 65 Km from Datia and 10 Km from Seondha vide MoEF & CC letter no - No. by MoEF & CC vide letter No. J-12011/21/2016-IAI(R) Dated 15.05. 2017.

This document should be cited as: "Site Specific Wildlife Conservation Plan for Maa Ratangarh Multipurpose Project in Gwalior, Bhind, and Datia District, District, Madhya Pradesh".

A Site Specific Wildlife Conservation Plan is imperative for the conservation and protection of wildlife in any area where developmental project is happening. Hence, keeping in view of the above requirements, Water Resources Department, Madhya Pradesh, (A govt. undertaking) has agreed to comply with the conditions with all due care so that development and wildlife can go hand in hand. The mitigation strategies proposed in the present Wildlife Conservation Plan have been designed keeping in view of several dimensions such as environment and conservation of natural resources, habitat management, biodiversity conservation, ecotourism development, sustainable resource development and livelihood improvement.

ACKNOWLEDGEMENTS

EXECUTIVE SUMMARY

Site-Specific Wildlife Conservation Plan for Maa Ratangarh Multipurpose Project over an area of 3196.058 Ha aims to identify the anticipated impacts of the project activities on wildlife and their habitat, and also to advise mitigation measures in study area. Further, this plan is also intended to improve and minimize the adverse impact in the core as well as the buffer areas (10 km radius of the lease area). The recommendations are based on both the primary data collected through field studies in the affected villages and the secondary data procures from the forest department and the project proponent. Some of the Salient features of the project including its impact areas are as below in **Table E.1.**

Table E. 1. Salient Feature of the project

MAA RATANGARH MULTIPURPOSE PROJECT
SALIENT FEATURE OF UNIT 1 - DAM

1	Name of project	Maa Ratangarh Multipurpose Project		
2	**Location**			
a)	State	Madhya Pradesh		
b)	District	Datia		
c)	Tehsil/Block	Seondha/Seondha		
d)	Village	Dangdiroli		
e)	Longitude	$78^0$44'20"		
f)	Latitude	$26^0$08'29"		
g)	Topo Sheet No.	54J/12 scale 1:50000		
3	**Hydrology**			
a)	Catchment area	12739 Sq.km.		
b)	Average annual rainfall	875 mm (Datia)		
c)	Maximum Flood (PMF)	43127Cumec		
d)	**Annual yield**			
(i)	Total Yeild	4113.15 Mcum		
(ii)	Yield available at site	2812.76 Mcum (deducting U/S use)		
4	**Reservoir Data**			
(A)	**Capacity**	**Dam**		
a)	Gross Capacity (Mcum)	246.95		
b)	Dead Storage (Mcum)	9.08		
c)	Live Capacity (Mcum)	237.87		

B)	Principal Level	DAM			
a)	Nalla bed level (N.B.L.)	135.00 m			
b)	Lowest sill level (L.S.L.)	142.00 m			
c)	Max.Draw down level (MDDL)	142.00 m			
d)	Full tank level (F.T.L.)	161.00 m			
e)	Max. water level (M.W.L.)	162.80 m			
f)	Top bund level (T.B.L.)	166.00 m			
C)	Water spread area				
a)	Water spread area at L.S.L.	234.57 ha.			
b)	Water spread area at F.T.L.	3149.648 ha.			
c)	Villages coming under submergence	21 Nos.			
(i)	Fully submerged	5 Nos – Dheemarpura(Khamroli), Medhpura, Dhubyai(Budhera), Madikheda, Berchha			
(ii)	Partially submerged	16 Nos. DiroliDang, Shikarpur, Bisor, Basai Malik, Mersani Khurd, Mersani Buzurg, Dhorri, Dhorra, Rubaha, Pahadi, Dang Seondha, Dongarpur, Pali, Atrenta,Nanat, Jiganiya & Barkari (Devgarh)			
d)	Population Affected	3879 No.			
e)	Total Area Required for Project	3185.208 Ha			

S. No.	Particulars	Govt Land in Ha	Private Land in Ha	Forest Land in Ha	Total in Ha
1	Submergence Area	1127.218	752.848	1269.582	3149.648
2	For Dam	0	0	35.56	35.56
	TOTAL	**1127.218**	**752.848**	**1305.142**	**3185.208**

A total number of 21 villages are present in buffer areas. List of villages is provided in Table no. 9 of the report. The major forest types in the Core Area are southern moist and dry deciduous forest with Teak as the dominant species and mostly associated with the following species- *Terminalia tomentosa*, *Diospyros melanoxylon*, *Buchanania latifolia, Anogeissus latifolia*, *Adina cordifolia*, *Butea frondosa*, *Albizia sp, Ficus religiosa*, *Boswelia serrata*, *Aegle marmelos*, *Oogemia dalbergioides*, *Litsea glutinosa*, *Emblica officinalis*, *Terminalia chebula*, Schleichera trijuga. As per the documents of forest department and field discussions, the frequency of wildlife sightings or movement is minimal. For the past five years, there are sightings of predators such as tiger, leopard, etc. in the buffer area. The Core Area including the buffer areas (10 Km radius) doesn't form part of any Eco-sensitive zones (ESZs). The Study Area

doesn't come under any national park, wildlife sanctuary or biosphere reserve. There are no known or existing wildlife corridors in both the core as well as the buffer areas.

The recommendations made in the present Site Specific Wildlife Conservation Plan (WLCP) have to be discussed with the Chief Conservator of Forests, Forest Circle, Gwalior and Divisional Forest Officer, Forest Division, Datia for incorporating their comments/suggestions.

A total of Rs. 270.15 Lakh (Two crore seventy lakh fifteen thousand only /-) budget is proposed to carry-out the above-mentioned activities and projects. The budget along with the physical targets is detailed in this section. The budget for each proposed activity has been calculated taking into account for a period of 10 years. The cumulative total of the financial forecasts is calculated for a plan period of 10 years.

Breakup of the financial Budget

Part A TO BE IMPLEMENTED BY PROJECT PROPONENT

A total of Rs.108.4 Lakh (One crore eight lakh fourty thousand only/-) budget is proposed to carry-out the above-mentioned activities and projects.

Part B (FORESTRY WORKS) TO BE IMPLEMENTED BY FOREST DEPARTMENT

A total of Rs.137.19 Lakh (One crore thirty seven lakh nineteen thousand only) budget is proposed to carry-out the above-mentioned activities and projects.

Cost-escalation (@10% of the total budget- 24.56 lakhs (Twenty Four Lakh fifty six thusand only/-)

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CHAPTER 1

1 INTRODUCTION

1.1 BACKGROUND

There are six major river basins in the state and as the state geographically constitutes the central part of India, all the rivers flowing in the state have their genesis in the state itself and are interstate rivers. The rivers namely Chambal, Sindh, Betwa, Ken flow northward and confluence with the Yamuna whereas the river Son debouches into the Ganges, Narmada, Tapi and Mahi flow westward and outfall into the Arabian Sea. The Wainganga and Pench rivers meet Godavari in the south.

Maa Ratangarh Multipurpose Project lies in Sindh sub basin of Madhya Pradesh. The first and foremost requirement for any sizable water resources project to be implemented is the river basin Planning. River Basin plan of Sind is prepared by in house trained water resources professionals. On the basis of water availability, demand and other socio-economic factors, project is designed to sustain all the possible uses for next decades. The basin plan study reveals that the basin is unharnessed to 65% of its gross yield of 6.1 BCM. The spatial and temporal variation throughout the basin is closely analyzed on the corners of integrated water resources management principles in Plan. The basin is subdivided into 8 major sub basin namely Upper Sind, Parwati, Mahuar, Noon, Lower sindh, Pahuj, Baiseli and kunwari. Upper sind basin is almost harnessed by Atal sagar (Manikheda major project), Harsi major project lies in Parwati sub basin.The lower sind project recieves yield of upper sind, parwati,mahuar,non and lower sind sub basins comprising of 12739 sq km catchment at proposed site.

Keeping in view the irrigation potential of the state (10.22 Mha) vis-à-vis the created potential (up to 2013-14) 3.19 Mha which is hardly 31.21% of the irrigation potential and significantly below the national average of 38.75%, more and more identified irrigation projects need to be constructed.

1.2 IRRIGATION POTENTIAL IN MADHYA PRADESH

Before the first five-year Plan (1950-51), the State had 2 major projects, 18 medium projects and 618 minor irrigation schemes having irrigation potential of 4.69 lakh ha. At the eve of re-organization of the State in 1956, the State had 4.84 lakh ha irrigation potential with 3 major, 37 medium and 948 minor irrigation schemes. In the year 1984-85, the State had 17 major, 109 medium and 4991 minor irrigation schemes having irrigation potential of 24.52 lakh ha. The irrigation potential in the year 1997-98 has become 33.04 lakh ha through 22 major, 134 medium and 6910 minor irrigation schemes.

Up to Year 2009-10 irrigation potential created in the state was 26.72 lakh ha of which actual irrigation was 8.87 lakh ha only, but in successive years due to active participation of water user's association and constant monitoring by departmental officers, the actual irrigation as compared to potential created enhanced from 33.19 % to 74.63 %. The statistics of potential created vis-à-vis the actual irrigation achieved during 2009-10 to 2013-14 is shown in **Table 1.1**.

Table 1.1: Irrigation Potential of Madhya Pradesh

Year	Irrigation Potential created up to (In Lakh ha.)	Actual Irrigation Achieved (In Lakh ha.)	Percentage Utilisation
2009-10	26.72	8.87	33.19
2010-11	27.84	9.76	35.07
2011-12	29.30	16.35	55.80
2012-13	30.58	20.21	66.08
2013-14	31.89	23.80	74.63

Source: http://wrmin.nic.in/writereaddata/PIM05.pdf

1.3 OVERVIEW OF THE PROJECT

Maa Ratangarh Multipurpose Project has been conceived by Water Resource Department; Madhya Pradesh by planning a composite dam across river Sindh in Seondha Block of Datia District.The Site is located at a distance of 65 Km from Datia and 10 Km from Seondha. The project envisages construction of 31.0 mts high and 1162 mts long earthen dham & 578 m Concrete Dam including 464 m long spillway on river Sindh near village Dangdiroli of tehsil Seondha Distt. Datia, M.P. which is a tributary of Yamuna River to store 246.95 MCM live storage of water to provide irrigation to command area of 78484 ha. (CCA). 109015 (GCA) through a well planned pressurized irrigation on left flank of the river which lies in Gwalior, Bhind, and Datia District. Catchment area of Project is 12739 sq km. which entirely lies in M.P. Similarly, entire submergence at FRL is 3149.648 ha. The total land requirement for the project is 3185.208 Ha out of which 752.848 Ha is private land, 1127.218 Ha is government land and 1305.142 Ha is forest land. The Index map of project is shown in **Figure 1.1** and schematic diagram is shown in **Figure 1.2.**

By substituting open main canal /distributaries/minors/field channel by piped canal system the conveyance and field channel losses from bed and side of canal has been totally eliminated .By replacing free flooding system of irrigation application by sprinkler system the field application losses due to seepage and wastage have been drastically reduced .Thus in piped canal micro irrigation by sprinkler system the project efficiency can be achieved up to 84% against 45% for open unlined canal system .
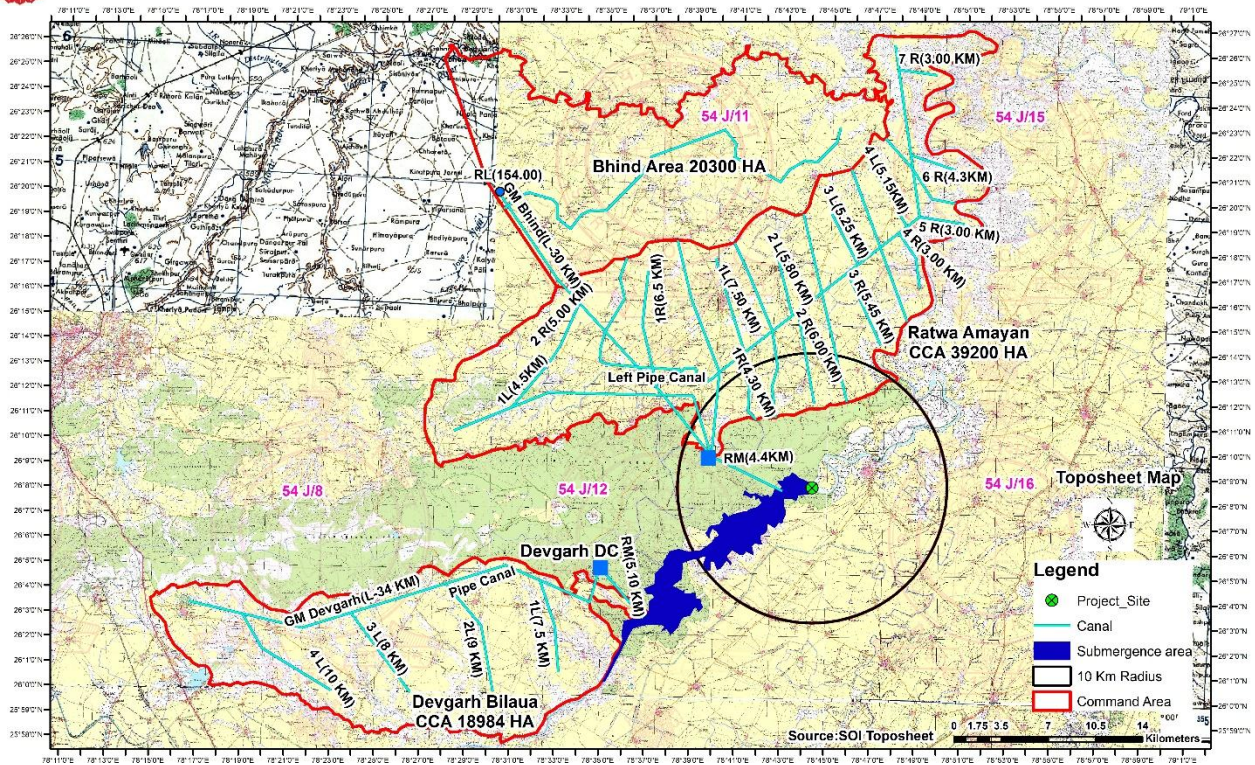
Figure 1.1: Index Map of Project
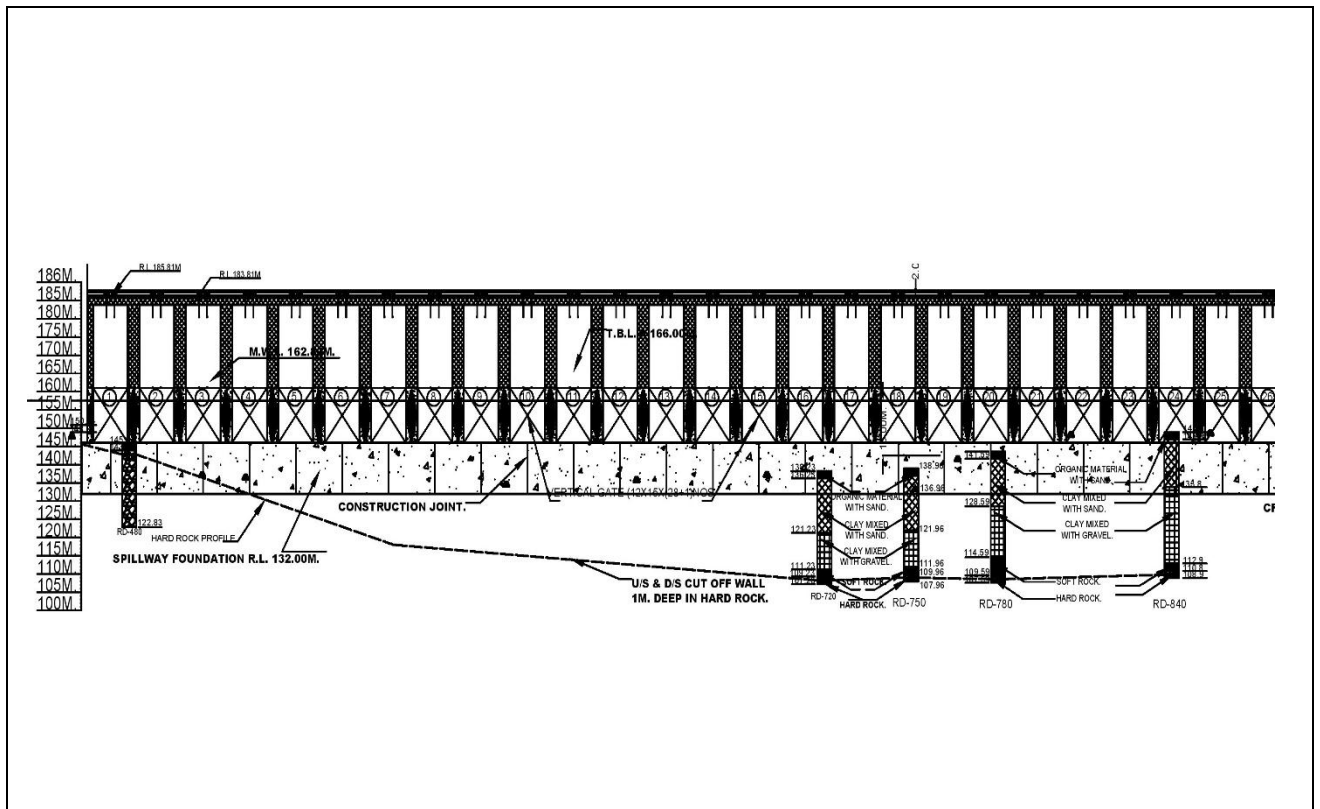
Figure 1.2: Schematic Diagram of Project

1.4 JUSTIFICATION OF THE PROJECT

As per assessment, the total irrigation potential of the state up to 2013-14 is 10.22 million ha against which 3.19 million ha has been created which is 31.21 % of the irrigation potential and is significantly below the national average of 38.75 %. Project is proposed in District Datia which is under administrative control of Gawalior Division. The agriculture in the district is totally dependent on the rainfall and thus subject to the vagaries of monsoon. Development of irrigation facilities will improve the economic condition of the agrarians and result in efficient utilization of soil and water resources of the region.

The rainfall affects agriculture of the study area, because major chunk of population of the area depends on agriculture, as a result agriculture of the area is directly affected by rainfall. Because of decrease in rainfall economic system of the farmers is disturbed. Region has been experiencing erratic rainfall, which has further worsened the situation. Fertile land is generally available in command area of the project where assured irrigation system can make a great deal of difference in yield of crops. Thus, this will result in development of agro-industries and overall development of the region, where during summer; the ground water table goes deeper thereby creating acute shortage of drinking water. Creation of water bodies and developing irrigation systems in the region will result in recharge of ground water and improvement in ecology and will have an overall great positive impact in sustainable manner.

The profession of the people of this area is based on agriculture; the area comes under draught prone area. The total percentage of irrigation of Datia district is very low. To fulfill the demand of local people and to improve the percentage of irrigation, Maa Ratangarh Irrigation project is proposed for development of the irrigation percentage of this area as well as the Ground Water recharge.

To improve the scenario and to have overall development of the area, the Govt. of Madhya Pradesh has planned the project to provide irrigation in part area of of Bhind (141 Villages), Gwalior (59 Villages) and Datia (15 Villages) District to harness the surplus water available in the Sindh river.

1.5 POLICY, LEGAL, AND ADMINISTRATIVE STATUTORY

The emerging environmental scenario calls for requisite attention on conservation and proper use of natural resources and development without destruction. The environmental consideration in any development process has become a necessity for achieving sustainable development. To achieve these goals, the Ministry of Environment, Forests & Climate Change, Govt. of India, has enacted various acts, legislations, guidelines and standards from time to time. The principal environmental regulatory agency in India is the Ministry of Environment, Forests & Climate Change, New Delhi. Ministry of Environment and Forests formulates environmental policies and accords environmental clearances for different projects. The important environmental legislations in India are given in **Table 1.2.**

Table 1.2: Key Environmental Legislations

Name	Scope and Objective	Key Areas	Operational Agencies/Key player
Water (Prevention and Control of Pollution) Act, 1974, 1988	To provide for the prevention and control of water pollution and enhancing the quality of water	Control sewage and industrial effluent discharges	Central and State Pollution Control Boards

Name	Scope and Objective	Key Areas	Operational Agencies/Key player
Air (Prevention and Control of Pollution) Act, 1981, 1987	To provide for the prevention and control of air pollution	Controls emission of air pollutants	Central and State Pollution Control Board
Forest (Conservation) Act, 1980, 1988	To consolidate acquisition of common property such as forest, halt India's rapid deforestation and resulting environmental degradation	Regulates access to natural resources, state has a monopoly right over land, categories forests, restriction on de-reservation and using forest for non-forest purpose	State Government and Central Government
Wildlife (Protection) Act, 1972, 1993	To protect wildlife	Creates protected areas (national parks / sanctuaries) categories of wildlife which are protected	Wildlife Advisory Boards, Central Zoo Authorities
Environment (Protection) Act, 1986	To provide for the protection and improvement of environment	An umbrella legislation, supplements pollution laws	Central government nodal agency, MoEFCC can delegate to state departments of environment
EIA Notification 14th Sep 2006 and amendment thereof	Environment Impact Assessment	Environmental Protection	Project Development, State and Central Government
National Water Policy, 2012	Legislation needed in view of inequities in distribution and lack of unified perspective in planning, management and use of water resources with due consideration to environmental sustainability and holistic benefit to the people.	To recognize and consider while planning the environmental needs of aquatic eco-system, wetlands and embanked flood plains besides adaptation to strategies to provide a mechanism for dealing with increased variability due to climate change.	State and Central Government
Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013	To address concerns of farmers and those whose livelihoods is dependent on land being acquired and at the same time facilitating land acquisition in a timely and transparent manner and for ensuring comprehensive package for the land owners for	Social issues	Central and State Government

Name	Scope and Objective	Key Areas	Operational Agencies/Key player
	calculation of market value of the land besides comprehensive rehabilitation and resettlement package for land owners.		

1.6 SCOPING OF THE PROJECT

In consonance with the provision under section-6 of the MoEF & CC notification, dated 14th September 2006, the project proponent moved an application in the prescribed Form-I duly filled along with a copy of the PFR of the project to the MoEF & CC, New Delhi. In view of the project being classified as Category "A" project in terms of MoEF Notification September, 2006, The first step required in the environment clearance process is scoping by which the Expert Appraisal Committee determines detailed and comprehensive Terms of Reference (TOR) addressing all relevant environment concerns for the preparation of Environmental Impact Assessment (EIA) Report in respect of the project for which prior environment clearance is sought.

The Expert Appraisal Committee for River Valley and Hydro Electric Projects, after examining the project in great depth accorded scoping clearance/ToR. The MoEF & CC decided that the EIA should be prepared on the lines of ToR issued by MoEF & CC vide letter No. J-12011/21/2016-IAI(R) Dated 15.05. 2017. The PP informed that the scope of the project has been changed and submitted online application on 14.8.2018 and requested the Ministry for an amendment in TOR which was granted in 15.10.2018.

1.7 DETAILS OF THE PROJECT AND ITS IMPACT

Maa Ratangarh multipurpose project envisage the construction of 31.00 mts high and 1740 mts long including 1162 m earthen dam, 464 m long spillway and 114 m NOF portion on river Sindh, which is a tributary of Yamuna river near village Dangdiroli in Tehsil Seondha of Distt. Datia M.P. Catchment area at Sindh (Seondha) Dam is 12739 sqkm. Which entirely lies in Madhya Pradesh. The total land requirement for the project is 3185.208 Ha out of which 752.848 Ha is private land, 1127.218 Ha is government land and 1305.142 Ha is forest land. 75 % dependable yield after upstream use is 2812.76 Mcum. However, a gross storage capacity of 246.95 is created by fixing full reservoir level at 161.0 M after considering submergence constraints to irrigate total available command area i.e. 78484 ha. The total gross capacity of 246.95 Mcum will be available at the end of mansoon out of which total live capacity is 237.87 Mcum. Inflow in non mansoon months is also utilized. 78484 ha. (CCA) area through a well planned pressurized irrigation on left flank of the river which lies in Gwalior, Bhind and Datia District is proposed as under:-

1. Ratwa Amayan Area 39200 Ha.

2. Bilaua Devgrah Area 18984Ha.

3. Command area of Bhind Mau branch canal 20300 Ha.

At present 20300 ha area of Bhind- Mau branch canal is irrigated from Chambal canal System. A scheme of Micro irrigation of 20000 ha is being prepared in upper area of Morena and Sheopur district from Chambal canal system. There is severe problem in tail area of Bhind district due to erratic and insufficient supply of water from Rajasthan. To counter this problem 20300 Ha.

Command area of Bhind Mau branch canal is proposed to be irrigated from Maa Ratangarh multipurpose project. If required in future in second phase of this project pressurized irrigation of this command area will be planned. 9.00 Mw power generation is proposed from Main Dam and 30 Mcum water is provided for drinking water for surrounding area. Environment release of water is proposed from sluice in Power house.

Increasing in population growth has led to the need for increase in agriculture production for the survival of mankind. Therefore, agriculture has become an integral part of the development system and irrigation holds the key in increasing agricultural productivity. Since earlier times natural and manmade water bodies such as lakes, ponds, tanks and other similar structures were used for irrigation. A good water resource development which meets the need of the present generation without compromising the future needs and aspirations is considered as sustainable development. The concepts of constructing dams to harness water for irrigation are currently practiced. Irrigation projects are of prime importance for sustainable and improved crop production and ensuring food security in the country. Every development project changes the existing environment at micro and macro level, these changes is inevitable. The impact or the change in the existing environment can be beneficial or detrimental with respect to the duration of the project. Therefore the project should be planned, implemented and monitored is such a way that the demands of the growing population have to be met with minimum disturbance to the existing ecosystem. In view of the above since 1956, the Government of Madhya Pradesh is continuously putting their efforts to provide irrigation facilities in the State by constructing dams to serve the primary purpose of retaining excess water during monsoon season and make use of this water effectively for irrigation during non-monsoon season. The satellite view of dam site is shown in **Figure 1.3.**

Figure 1.3: Satellite Image of Project Site

1.8   PROJECT LOCATION

The Maa Ratangarh Multipurpose Project site is proposed near village Dangdiroli which comes in Teh. Seondha of District Datia (Madhya Pradesh). Latitude and Longitude at Dam site 26^0 8'-29" and 78^0-44'-20'' respectively which is covered by toposheet no. 54J/12.

1.9   ACCESSIBILITY

The site is approachable from Seondha by SH-19 up to 7 km. and then 5 km up to Dangdroli Dam site by fair weather road. The distance of project site from Datia is 65 km. The nearest railway station for the Dam site is Datia in New Delhi - Bhopal Section of Central Railway.

1.10   CATCHMENT AREA OF PROJECT

The Sindh basin, situated in the northern part of Madhya Pradesh is an important basin in the state. The river sindh has its origin at village Gopi Talai in Lateri, Tehsil of Vidisha district in Madhya Pradesh at an elevation of 533.40 m above M.S.L. Sindh a tributary of Yamuna flows mostly through M.P. in the district of Vidisha, Guna, Ashoknagar, Shivpuri, Gwalior, Datia and Bhind. It then joins river Yamuna near village Jagammanpur in Jalaun District of Uttar Pradesh. The total length of the river from its origin to its confluence with Yamuna is 500 km. The river flows through Malwa Plataue in Vidisha and Guna district. In Shivpuri it flows through a thick forest and hilly stretch and enters the plains after the town Narwar in Shivpuri district. The total drainage area up to the confluence with Yamuna River is 17413 sq.km. and catachment area upto Dam site is 12739 Sq Km.

1.11   COMMAND AREA OF PROJECT

The Gross command area of the project is 109015 Ha., out of which 78484 ha. is culturable command area. About 70% of the area of the culturable command is under cultivation at present. Food grains area grown on 95% of net cropped area at present. The project on completion will irrigate 78484 hectares of CCA in Bhind, Gwalior, Datia, District and the irrigation in these districts will be raised about 20 percent.
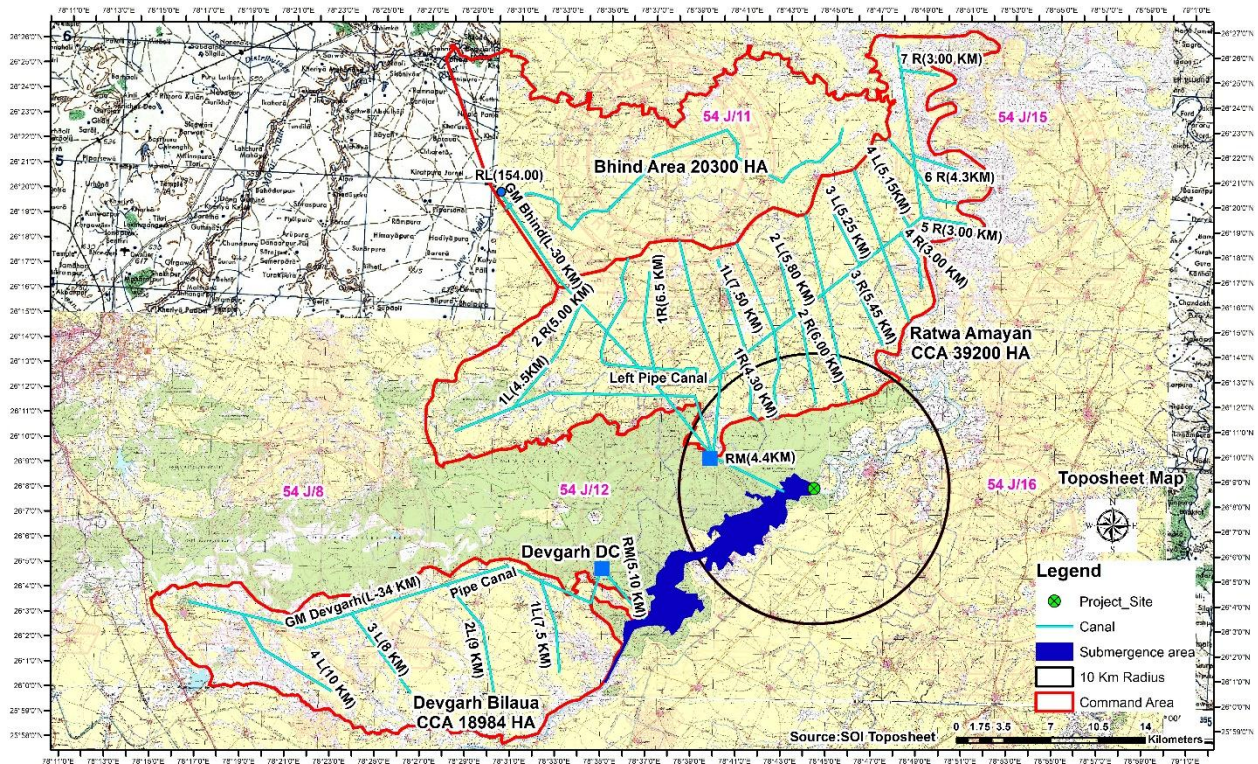
Figure 1.4: Command Area of the Project along with 10 Km study zone

1.12 SALIENT FEATURES

The salient features of the project are detailed in **Table 1.3.**

Table 1.3: Project Salient Features

SALIENT FEATURE

1	Name of project	Maa Ratangarh Multipurpose Project		
2	**Location**			
a)	State	Madhya Pradesh		
b)	District	Datia		
c)	Tehsil/Block	Seondha/Seondha		
d)	Village	Dangdiroli		
e)	Longitude	78^0 44'20"		
f)	Latitude	$26^0$08'29"		
g)	Topo Sheet No.	54J/12 scale 1:50000		
3	**Hydrology**			
a)	Catchment area	12739 Sq.km.		
b)	Average annual rainfall	875 mm (Datia)		
c)	Maximum Flood (PMF)	43127Cumec		
d)	**Annual yield**			
(i)	Total Yeild	4113.15 Mcum		
(ii)	Yield available at site	2812.76 Mcum (deducting U/S use)		
4	**Reservoir Data**			
(A)	**Capacity**	**Dam**		
a)	Gross Capacity (Mcum)	246.95		
b)	Dead Storage (Mcum)	9.08		
c)	Live Capacity (Mcum)	237.87		
B)	**Principal Level**	**DAM**		
a)	Nalla bed level (N.B.L.)	135.00 m		
b)	Lowest sill level (L.S.L.)	142.00 m		
c)	Max.Draw down level (MDDL)	142.00 m		
d)	Full tank level (F.T.L.)	161.00 m		
e)	Max. water level (M.W.L.)	162.80 m		
f)	Top bund level (T.B.L.)	166.00 m		
C)	**Water spread area**			
a)	Water spread area at L.S.L.	234.57 ha.		
b)	Water spread area at F.T.L.	3149.648 ha.		
c)	Villages coming under submergence	21 Nos.		
(i)	Fully submerged	5 Nos – Dheemarpura(Khamroli), Medhpura, Dhubyai(Budhera), Madikheda, Berchha		

(ii)	Partially submerged	16 Nos. DiroliDang, Shikarpur, Bisor, Basai Malik, Mersani Khurd, Mersani Buzurg, Dhorri, Dhorra, Rubaha, Pahadi, Dang Seondha, Dongarpur, Pali, Atrenta,Nanat, Jiganiya & Barkari (Devgarh)
d)	Population Affected	3879 No.
e)	Total Area Required for Project	3185.208 Ha

S. No.	Particulars	Govt Land in Ha	Private Land in Ha	Forest Land in Ha	Total in Ha
1	Submergence Area	1127.218	752.848	1269.582	3149.648
2	For Dam	0	0	35.56	35.56
	TOTAL	**1127.218**	**752.848**	**1305.142**	**3185.208**

1.13 BRIEF DESCRIPTION OF PROJECT COMPONENT

1.13.1 Water Storage Capacity

The project is envisaged to have a live storage capacity of 237.87 MCM.

1.13.2 Reservoir and Submergence Area

The reservoir shall submerge 3149.648 Ha at FTL in twenty-four villages. Out Of the total area required for project, the apportionment between forest, revenue and private land shall be 1269.582 ha, 1127.218 ha and 752.848 respectively.

Once the size of project components is finalized and the project completed, there shall be no change in elevation of MWL (162.8), FRL (161M), MDDL (142m) and LSL (142m), the live storage capacity of 237.87MCM shall be achived at 161m level.

1.13.3 Composite Dam

Maa Ratangarh multipurpose project envisage the construction of 31.00 mts high and 1740 mts long including 1162 m earthen dam & 578 M concreter dam having 464 m long spillway and 114 m NOF portion on river Sindh, which is a tributary of Yamuna river near village Dangdiroli in Tehsil Seondha of Distt. Datia M.P. The **figure 2.3** is showing the plan and elevation of dam section.
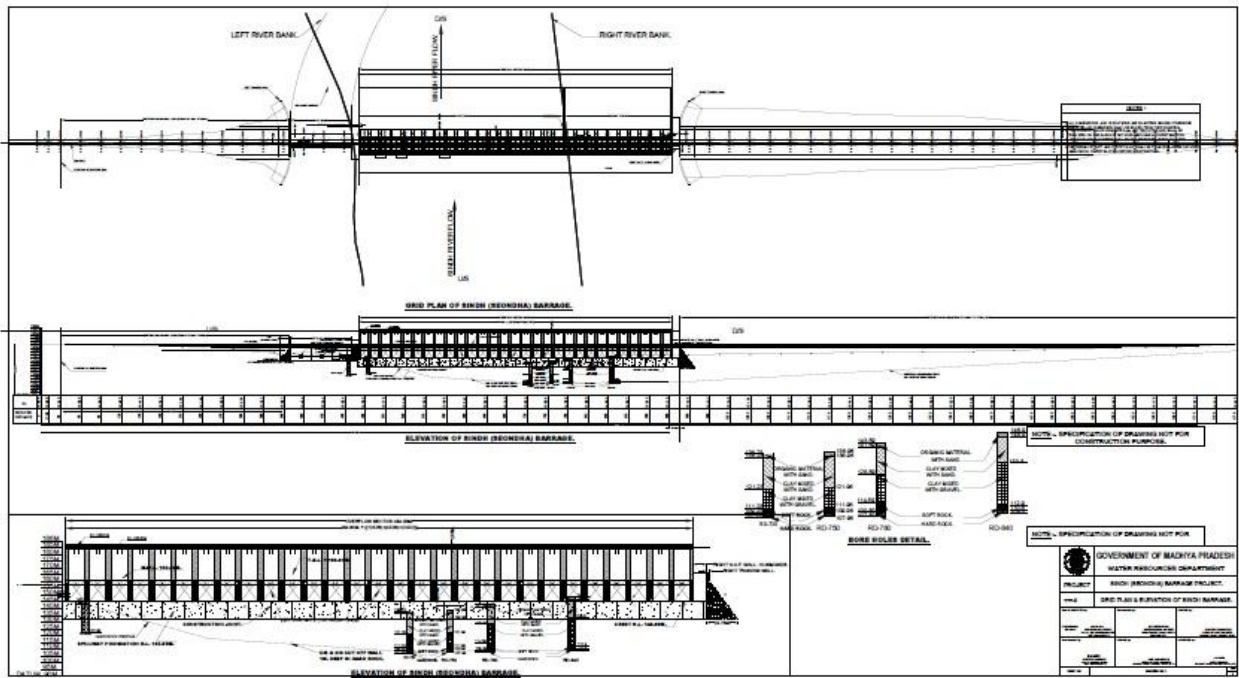
Figure 1.5: Showing the plan and elevation of Dam section

1.13.4 Spillway

An Ogee Type of length 464m with 29 no of gates of size 1200cmx 1500 Cm have been proposed. The **Figure 1.7** is showing the cross section of Concrete Dam.
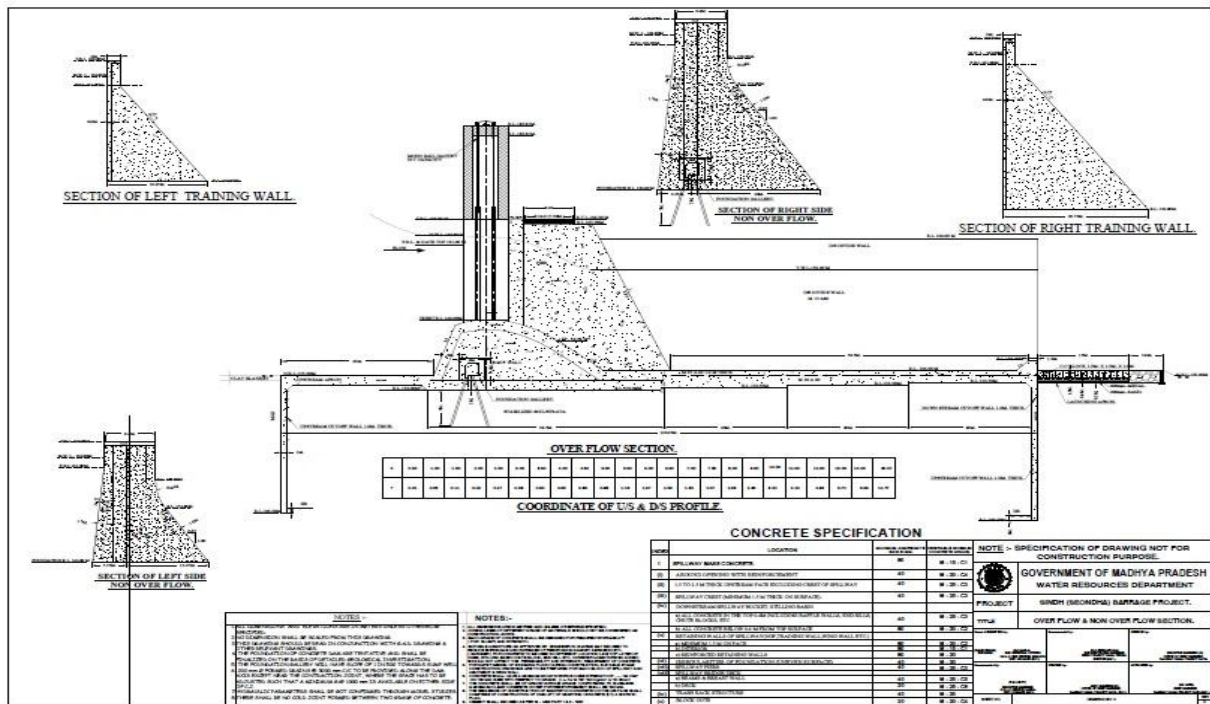
Figure 1.6: Showing Concrete Dam section

1.13.5 Non-Overflow Dam

Total length of non-overflow section is 114m. Length of Left non-overflow section is 90 m and Length of Right non-overflow section is 24 m. The non-overflow sections shall be properly keyed to the flanks.

1.13.6 Distribution Chamber

Water will be lifted from level of 142.00 m to the distribution chamber to maintain flow of required head.

1.13.7 Main Canal, Distributary and Minors

The irrigation facility shall be provided through two rising main of length 8.80 Km (Ratwa-Amayan) and 5.10 Km (Billawa-Devgarh) and with distribution network of 86.50 Km.

1.14 IRRIGATION PLANNING AND CROPPING PATTERN

The moot point for irrigation planning of a water resource project in an area where monsoon flow of a seasonal river has to be harnessed are the 75% dependable yield and the availability for irrigation purpose besides the existing cropping pattern and the proposed cropping pattern, the existing modes of irrigation. Based on the proposed cropping pattern the crop water requirement for area proposed for different crops is computed and month wise requirement are worked out.

1.14.1 Cropping Pattern and Horticulture Practices in the Study Area

Based on the DPR, the command area under 215 villages is proposed to be cultivated in Rabi crop season. The proposed canal shall run during Kharif and Rabi as the reservoir shall get discharge from Sindh during monsoon. Therefore, the project aims at providing irrigation support to area under crops and bringing larger area under wheat. At present some area in the command is being inadequately irrigated by farmers by harnessing ground water through private tube wells/wells. The proposed cropping pattern is shown in **Table 1.4.**

Table 1.4: Proposed Cropping Pattern in Command Area

S.N.	Crop	Proposed Area (ha)	Percentage of CCA
Rabi Season			
1	Wheat	25031	31.89
2	Wheat (Hyb)	29399	37.46
3	Gram	19007	24.22
4	Oilseeds	5047	6.43
	Total Rabi	**78484**	**100.00**

1.14.2 Collection of Primary Data on Agriculture Activities, Crops and Their Productivity and Irrigation Facilities Component

The proposed command area at present is not being facilitated by surface (gravity canal) or ground water source (tube wells) by state agency. The prevalent practice of irrigation in some chunks in the command is by harnessing underground water through private pump sets/wells. The climatic conditions of a region affect the agricultural cropping pattern and different areas, thus, produce different crops. Amongst a host of climatic factors, rainfall, temperature, humidity, wind velocity and duration of sunshine etc. affect the cropping pattern in a significant way. Annual rainfall and its distribution over the entire year, and the regimes of diurnal and annual temperatures are, by far, the prominent factors

affecting agriculture and the life style of the people. The cropping pattern of the study area is given in **Table 1.5.**

<div align="center">

Table 1.5: Cropping Pattern in Study Area

</div>

Crop	Name	Season
Rabi	Wheat, Barley, Gram, Oilseeds, Masoor, Green peas etc.	October-April
Kharif	Millet, Wheat, Maize, Urad, Moong, Soya bean, Sugarcane and Til etc.	April-October

1.14.3 Crop Water Requirement

The crop water requirement for the area proposed under different crops has been worked based on Modified Pen Man method during growing season. The net irrigation requirement at field and at canal head and gross irrigation requirement with recommended project efficiency by MPWRD BODHI/241/12/2002 has been worked. The value of delta has been shown in **Table 1.6**.

<div align="center">

Table 1.6: **Crop water requirement**

</div>

S.No.	Rabi Crop	Proposed Area(ha)	Delta (mm)
1	Wheat	34769	2798.36
2	Wheat (Hyb)	40836	3738.73
3	Gram	26400	2405.22
4	Oil seeds	7010	7495.09
Total		**109015**	

1.15 CONSTRUCTION MATERIAL REQUIREMENT AND SOURCE

The requirement of construction material for the composite dam has been worked out after incorporating the consumptive use of excavated material. Estimated requirement of various materials is under:

- Coarse aggregate: 6.10 lakh cum
- Fine aggregate (Sand): 4.68 lakh cum
- Stone/Metal: 3.76 lakh cum
- Earth for dam: 90.34 lakh cum
- C.O.T Soil: 7.12 lakh cum

Borrow areas and rock quarry have been identified in the submergence area near the project vicinity to provide construction materials.

1.16 LAND REQUIREMENT FOR THE PROPOSED PROJECT

The land requirement for various components of project like submergence area, seat of the dam has been assessed as 3185.208 ha. Out of this the forest, revenue and private land shall be 1305.142 ha, 1127.218 ha and 752.848 respectively. Besides this private and revenue land shall be temporarily acquired for constructing two underground piped main canals and distribution network.

<div align="center">

Table 1.7: Component wise Land Requirement for Project

</div>

S.N.	Project Component	Private (ha)	Revenue (ha)	Forest (ha)	Total (ha)
1	Submergence	752.848	1127.218	1269.582	3149.648
2	For Dam			35.56	35.56

Total	752.848	1127.218	1305.142	3185.208

1.17 JUSTIFICATION FOR LOCATION AND EXECUTION OF PROJECT

After studying the three alternate dam axis sites vis-à-vis the area under submergence and the assets to be affected, the final balance has been struck in the favour of the existing site based on which the project domain has been fixed and the land requirement has been worked out and the DPR formulated. Based on the available yield from the river, rate of sedimentation in the river, the governing elevation of the command and the permissible losses in the piped main canal, the dam height and various principal levels and the free board have been determined. The spillway crest level and clear width has been worked for passing the PMF.

1.18 MANPOWER REQUIREMENTS

About 1000 workers (labour and staff) would be engaged temporarily during peak construction period. It is expected that 75% of the total work force shall be locally available from adjacent areas. After completion of the project about 50 staff shall be permanently required for regulation of the head works of water conductor system, dam and canal and its distribution system.

1.19 WATER REQUIREMENT

The quantity of water required during construction is estimated as 500 KLD which shall be drawn from surface water resources i.e. Sindh River for works pertaining to water conductor system and for works of dam complex ground water resource shall be harnessed during non-monsoon months and during monsoon in the year.

1.20 POWER REQUIREMENT

The total requirement of construction power will be about 400 KW which shall be required at different consumption points. The power can be utilized from the existing sub-station in nearby village or a separate transformer shall be located for the construction power for the project work. In emergent situation resulting due to grid failure or load shedding diesel generator sets (2x200KVA) shall be deployed for captive power generation.

1.21 CONSTRUCTION SCHEDULE

The project has been planned to be completed in three years' time frame. The works shall be carried on contractual basis.

1.22 PROJECT COST

The total cost of the project for which administrative approval has been granted by the State Government is Rs.2244.97 crores.

1.23 STUDY AREA

For EIA study of the proposed project, following study areas have been considered:

- Catchment area up to the dam site.
- Submergence area.
- Project area or the direct impact area within 10 Km of the main project components (dam, canals etc.

Study area map comprising direct impact area which includes complete submergence area, area covered under 10 km radius from the dam axis, and the canal system with command area is shown in **Figure 1.8**
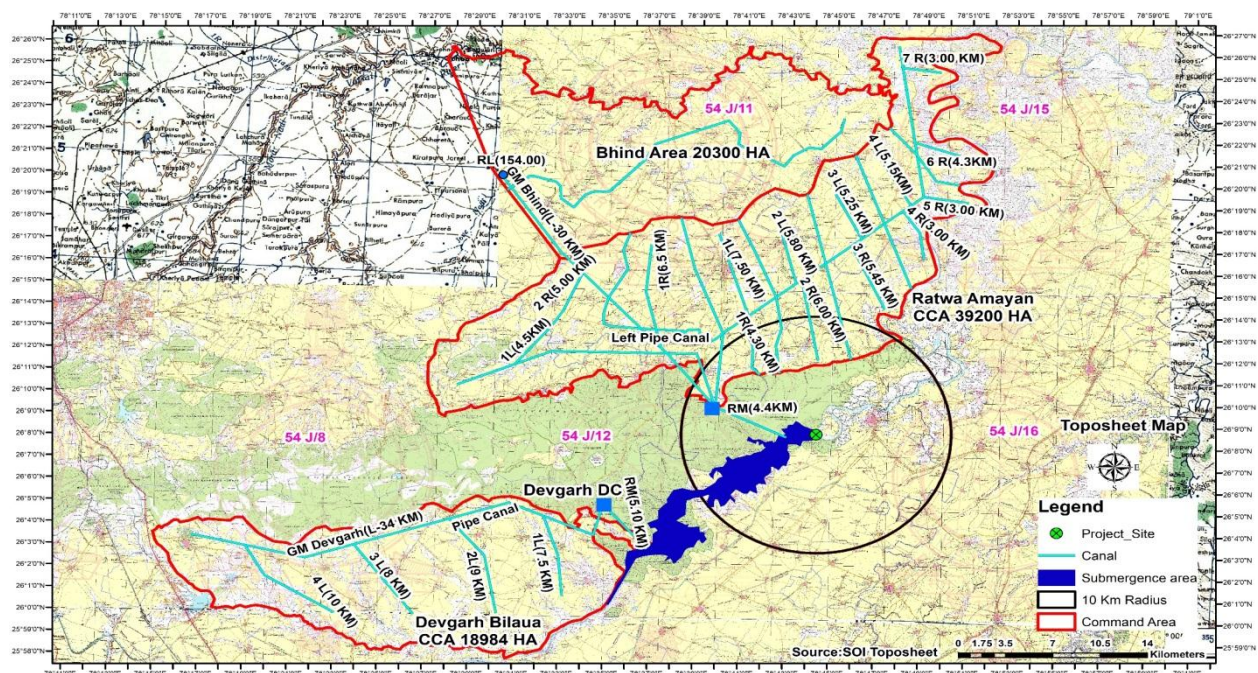
Figure 1.7: Study area map

Details of Forest land

i. The present project is spread over two Forest Divisions Datia (T) and Gwalior (T) and total of 51,121 no. of trees are marked for felling at FRL-4-meter Level.

ii. Legal status of land proposed for diversion: 635.152 ha is Protected Forest land, 669.99 ha is Reserved Forest land and 1840.11 ha non- forest land is also involved in the project. Density of the area proposed for diversion is reported to be 0.3, Eco-class-03.

iii. Proposal does not form part of any PA, Biosphere Reserve, Elephant corridor etc. No protected archaeological/ heritage site/defence establishment or any other important monuments is located in the area.

iv. Wildlife like Wolf, Wild bear and other wild animals such as Hyna, Chital, Nilgai, wild pig etc. are reported in the forest land proposed for diversion under Datia District and Blue Bull, Jackal, chinkarka, rabbit, crocodile etc. are reported under Gwalior district.

1.24 METHODOLOGY OF CONDUCTING BASELINE STUDY

The guiding factors for the present baseline study are the Ministry of Environment, Forests & Climate Change's (MoEF & CC) requirements for the Environmental Impact Assessment (EIA) notification and local regulations and directives. The impact zone is within a radius of 10 km from the center of the development site since most of the potential impacts are most likely to occur within this area.

Further, a buffer area extending up to 10 km radius from the site has also been studied, though with less detail. The baseline study and primary data collection has been carried out during Winter (2017), pre-monsoon (2018) and monsoon (2018). The studies were conducted by considering the following:

- The various environmental attributes were divided into primary and secondary studies. Primary attributes such as air environment, water, soil, noise, flora and fauna, and Socio- economic were assessed by conducting field studies, on-site monitoring and review of the past studies conducted.

- Baseline data on environmental attributes (Air, Noise, Water, Soil and) have been collected for 3 seasons (pre-monsoon, monsoon and winter) in the study area. The data has been collected by the EIA Consultant by engaging Noida Testing Laboratory, Noida (a NABL accredited laboratory).

- Secondary attributes such as land use studies, geology, physiological characteristics, and socio-economic environment have been assessed by literature review of previous studies conducted by various government publications.

- An interdisciplinary team through discussions, criteria questions and professional judgement formulated the scoping and the extent of data generation. The baseline studies started with site visits and reconnaissance survey in the study area for fixing the monitoring locations for the primary data. As a secondary data review, various Government agencies were approached for procuring information and relevant data of the area.

1.25 PHYSICO-CHEMICAL ENVIRONMENT

1.25.1 Topography

The Datia district comes under the Gangetic drainage system and is drained by the Sind, the Pahuj, the Mahuar and the Betwa. The former two, however form the drainage system of the main body of the district. The rivers are almost seasonal and have heavy run off only during the peak period of July and August in the rainy season. During the dry season most of the streams become dry and water is available only in some channels of the main stream.

1.25.2 Physiography

Situated in the northern part of the state and lies between the latitude $25^0 28'$ and $26^0 20'$ and longitude $78^0 10'$ and $78^0 45'$, Datia is the smallest district in terms of population as well as geographical area of 2691 sq.kms. Constituting only 0.9% of the total area of 3, 08,244 sq. kms of the state. The district is bounded by Bhind and Gwalior districts in the north and Jhansi district of Uttar Pradesh in the south; Gwalior and Shivpuri in the west and Bhind district in the east. The district can be divided into two broad physiographic division's *viz.*, the lower extension of Bundelkhand plateau and the Gangetic plain while the other division is an imperfect fringe of the Gangetic alluvial belt. The topography of the district is sloping towards north-east with mounds and hillocks seen intermittently on the plain. The southern part around Datia town lies in the granite area and forms a somewhat barren and rocky tract. The prominent hills lie to the south-east and west of Datia. Among these hills the highest point is the peak of Burdawan

(337 meters) in Basai revenue circle. To the north-west of Seondha and on the left bank of the river Sind, a low range of sandstone hills overlook it and extend upto its north-eastern part of the district. The plateau area is either bare or stony on steep slopes or is covered with reddish soil or black cotton soil. Most of the central and northern parts of the district lie in the Sind-Panjab Doab, which forms the southern margin of the Gangetic valley. The portion of the valley is flat with deposits of alluvial soil but occasional mounds of granite are also seen. The alluvial soil is loamy and fertile. However, in some patches where gravel layer comes up on the surface of the soil, vegetation becomes difficult. The disquieting feature of the alluvial tract is the formation of gullies along the major rivers and tributaries.

1.25.3 Local Geology

Granite of varying types from the lower pre-cambrian/Archean period are the pre-dominant geological material found across in the study area. Sedimentary strata such as sandstone and limestones are conspicuous in the northern parts of Datia district. Alluvial deposits of clay, silt and sand of subareal and fluviatile origin are most recent geologic deposits and are more pre-dominant near the Sindh and Pahuj River (CWGB, 2009). The valley is flat with deposits of alluvial soil but occaisional mounts of granite are also seen. Soil are mainly consisting of mixed red and black medium soil. The terrain is gently undulating, grading slowly in level plain in the northern part of the district. Rocky outcrops and boulder-strewn plains covers much of this area producing a more rugged looking landscape. **(Fig. 1.9)**
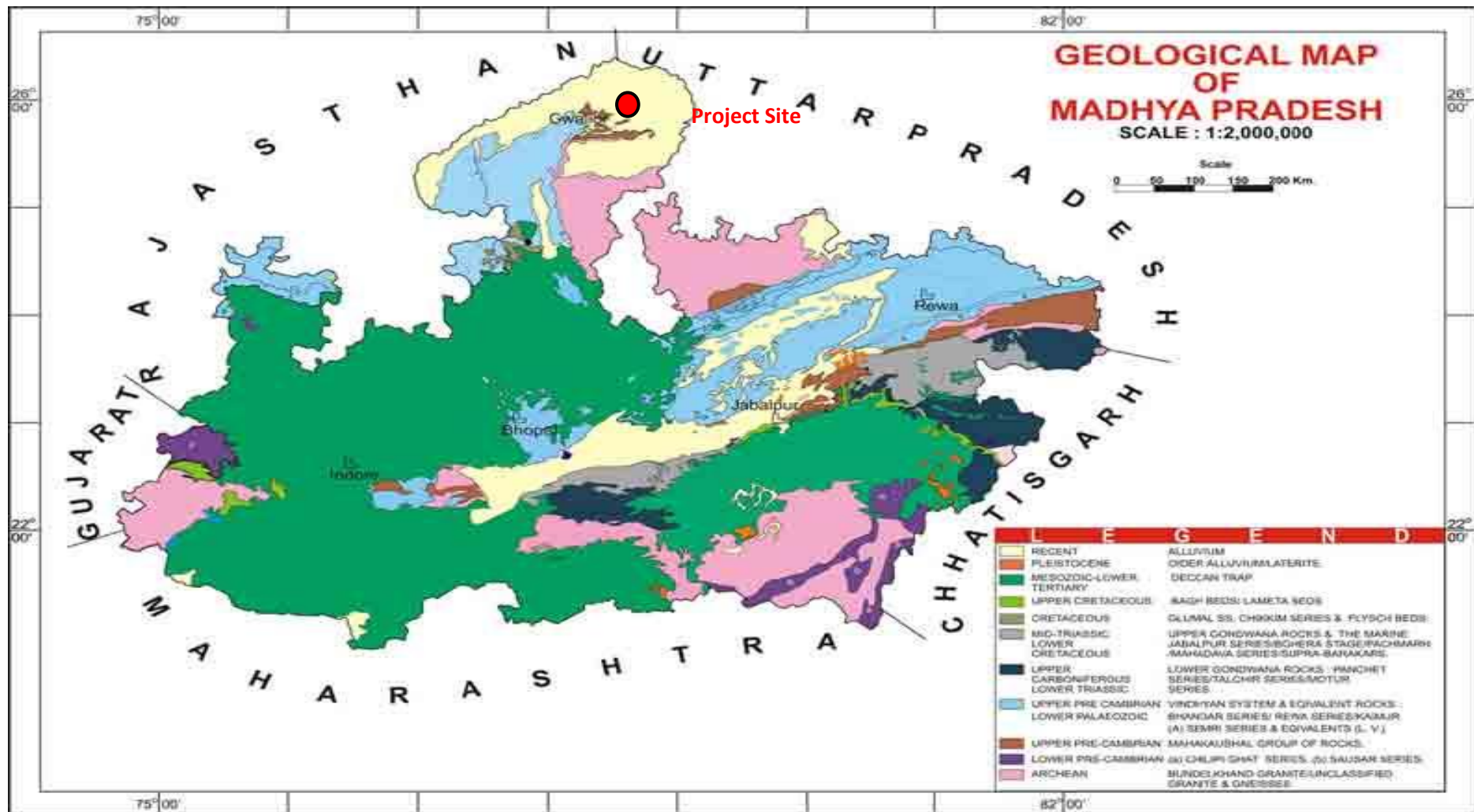
Figure 1.8: Geological Map of Datia District

1.25.4 Land Use and Land Cover of Study Area

Land use pattern has a considerable influence on the quality and quantity of runoff available for a project. It plays a key role in determining the various hydrological phenomena like Infiltration rate, overland flow, evaporation and interception. The modern technique of satellite remote sensing facilitates such type of studies. The inaccessibility to the region in diverse weather conditions, requirement of synoptic coverage at various locations, and the computer adaptability for land use classification makes the digital image processing and remote sensing an inevitable tool. The dominating classes are agriculture and dense forest followed by scrub. The land use pattern of study area is enumerated in **Table 1.8** and its disposition in **Figure 1.10.**

Table 1.8: Land Use Details of Study Area

Sl no.	Land use category	Area in Sq. Km	Area in %
1	Agriculture Land	1162.9	80.44
2	Dense Forest	71.97	4.97
3	Open scrub Forest	147.42	10.20
4	Dry river bed	5.64	0.40
5	Waterbody	6.81	0.47
6	Settlement	50.84	3.52
	Total	**1445.58**	
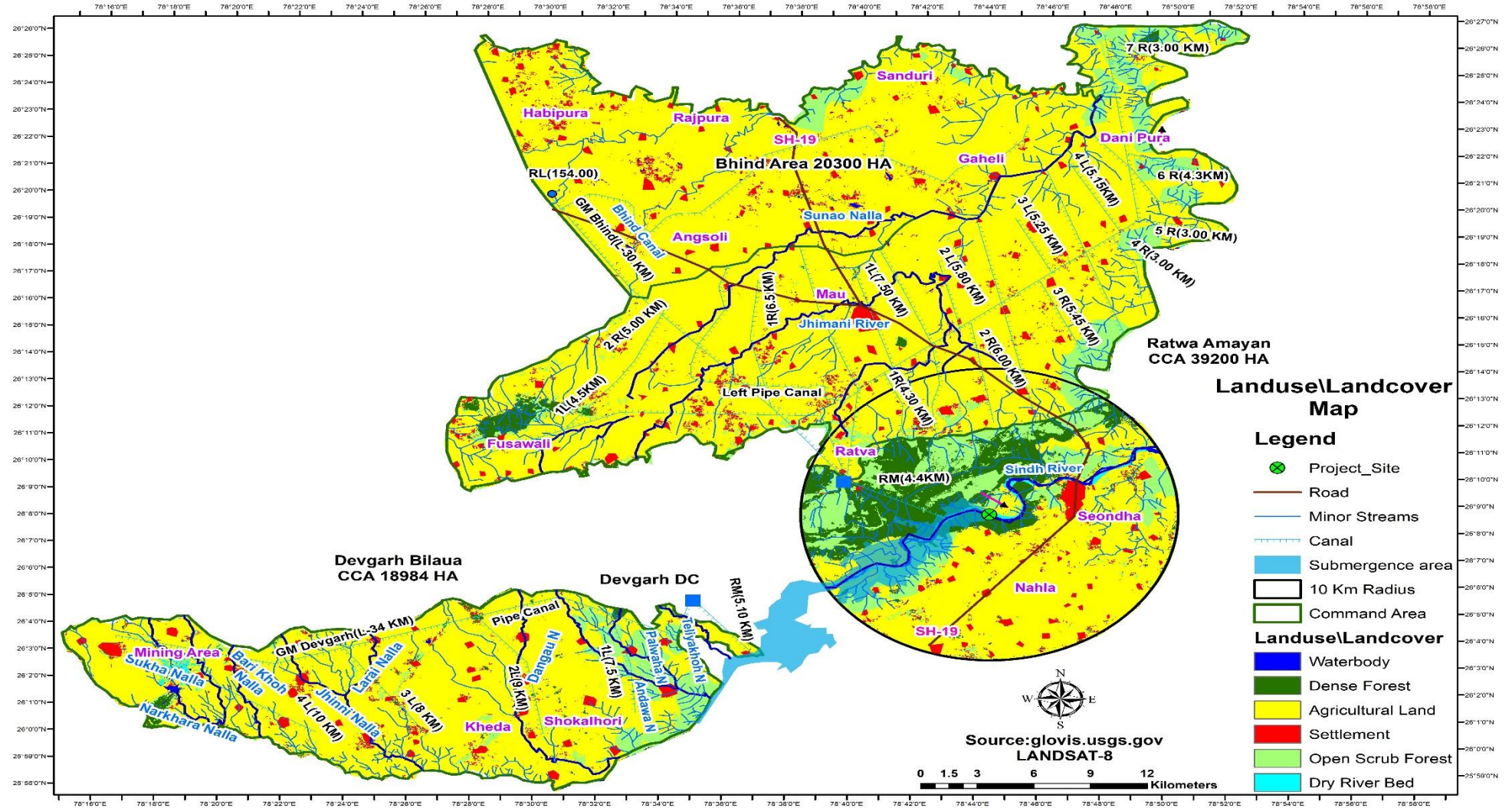
Figure 1.9: Land use Map of the Study Area

1.25.5 Slope of Study Area

The study area has hilly and plain topography. The general slope of the study area is from south to north and follows the general trend of drainage. The slope map of the study area is shown in **Figure 1.11** and the area under different slope classes is enumerated in **Table 1.9.** Almost 91% of the area is covers under very gentle to gentle slope.

Table 1.9: Slope details of Study Area

Sr. No	Description	Slope (degree)	Area (sq. km)	Area (%)
1	Very Gentle Slope	0-3	1093.37	75.63
2	Gentle Slope	3-8	225.78	15.62
3	Moderate Slope	08-15	74.01	5.12
4	Very Moderate slope	15-30	35.52	2.46
5	Steep slope	30-50	12.56	0.87
6	Very Steep slope	>50	4.34	0.30
Total			**1445.58**	**100**
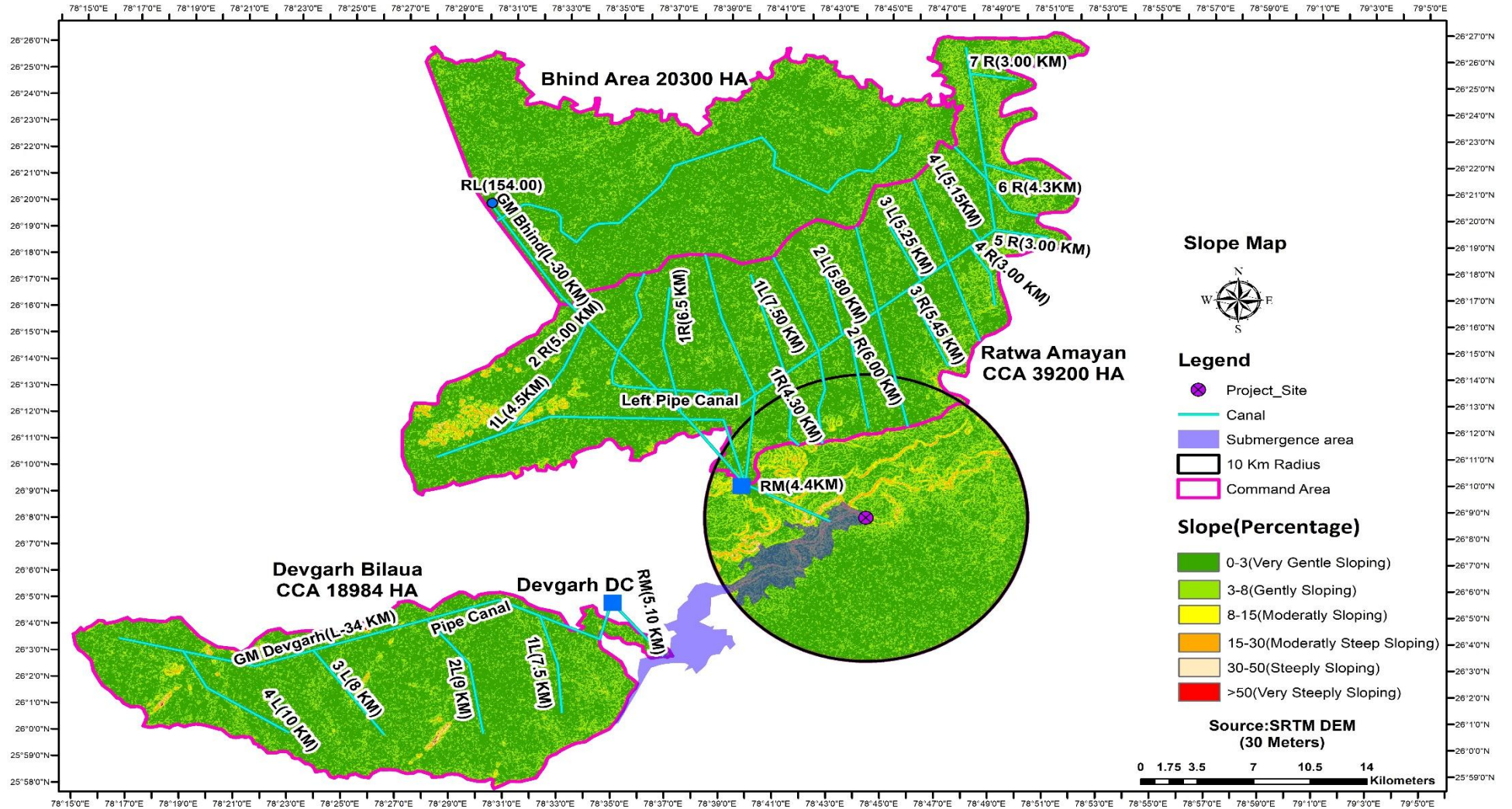
Figure 1.10:: Slope Map of the Study Area

1.25.6 Presence of important economic mineral deposit, if any

No major occurrence of economic deposit (major mineral) has been found in the reservoir area, except materials like boulder, shingle, pebbles and sand that are minor mineral and important as the construction material.

1.25.7 Land Slide Zonation

No dynamic land slide/slips have been observed within the reservoir area, near axis of dam and downstream of the dam and in other project areas.

1.25.8 Archaeological/Religious/Historical Monuments/Sensitive Areas

No archaeological monument of national importance lies either in the project area or in its submergence area. There is also neither any structure of national heritage nor any sensitive area around the project site.

1.26 METETROLOGY, AIR AND NOISE

Meteorological factors have a direct bearing on the dispersion and dilution of pollutants/contaminants, discharged into the atmosphere with consequent impact on air Environment. Micro-meteorological properties of the atmosphere govern the concentration of pollutants and its variations with time and location with respect to their sources. Meteorological information is required to understand the climatic profile of the area as well as for devising the baseline ambient air quality monitoring plans. The nearest authoritative IMD meteorological station in Gwalior, Madhya Pradesh is located at a distance of about 60 km from the site. The climatologically summary for station at Gwalior is given in **Table 1.10** and the interpretation of the data is given in sub sections.

Table 1.10: Climatological Summary for IMD Station in Gwalior (1981-2010)

Month	Mean max. temp (^{0}C)	Mean min. temp (^{0}C)	Monthly Rainfall (mm)	R.H.at 8:30 (%)	R.H.at 17:30 (%)
January	23	8.2	17.3	69	55
February	25.8	9.9	18.2	60	46
March	31.5	15	13.7	46	36
April	37.3	20.6	7	33	25
May	40.8	25	7.9	37	27
June	38.5	24.6	126.5	55	46
July	32.3	21.8	358.1	79	73
August	30.4	20.9	382.9	85	81
September	30.6	20.4	264.8	80	76
October	31	17.2	33.6	65	59
November	27.8	12.5	4.3	60	53
December	24.1	9.4	3.7	66	55
Average Total	**31.1**	**17.1**	**1238.1**	**61**	**52**

Source: Government of India, Indian Meteorological Department, Climatologically Tables (1981-2010)

1.26.1 Temperature

The mean daily maximum temperature of 32.8° C while mean daily minimum temperature of 18.7° C. The highest recorded temperature in the district is 48.3° C (30.05.1947) while lowest temperature observed to be -1.1° C (24.01.1954). Seasonal variation of daily maximum and minimum temperature is shown in **Figure 1.12**.
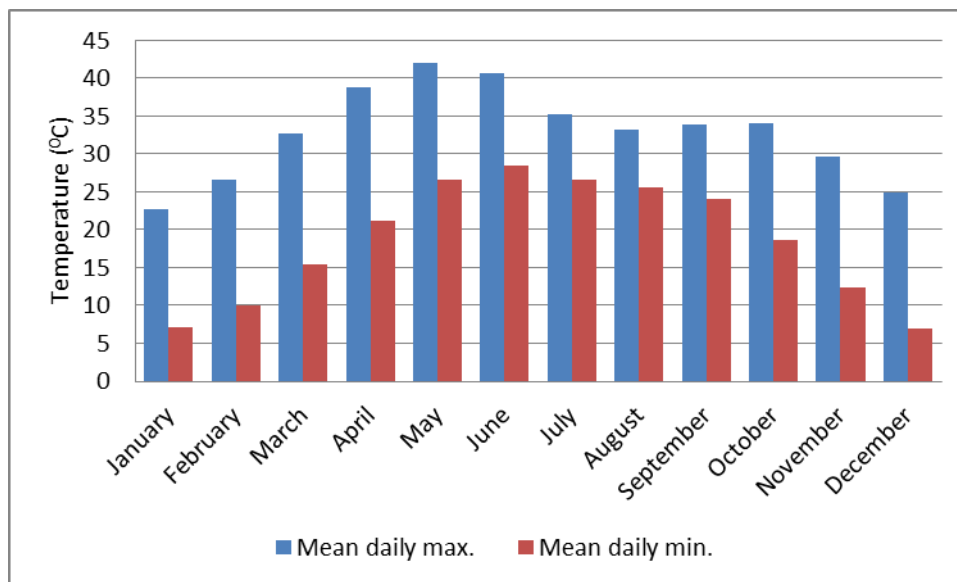
Source: IMD Climatological Table 1981-2010

Figure 1.11: Seasonal variation of daily maximum and minimum temperature

1.26.2 Rainfall

The south west monsoon during the month of June, July, August and September chiefly contributes the rainfall. The total annual rainfall is 780 mm (1981-2010). The maximum total monthly rainfall is 712 mm, which occurred in August, 1916. There are about 40.7 rainy days in a year and about 87% of total rainfall occurs during rainy season (June-September). The heaviest fall during 24 hours was 316 mm (07.09.1891). The rainfall pattern is given in **Figure 1.13**
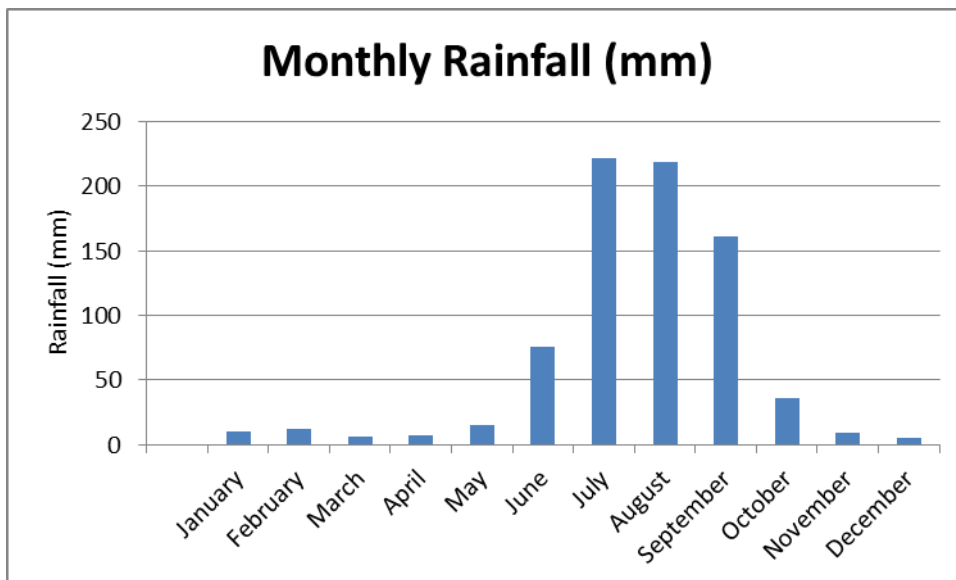
Source: IMD Climatological Table 1981-2010

Figure 1.12: Seasonal variation of Total Rainfall

1.26.3 Relative Humidity

During the monsoon season relative humidity generally varies between 49 % to 80 % in the morning and 37 % to 72 % in the afternoon. The air becomes dry after the withdrawal of the southwest monsoon. The driest part of the year is the summer season when in the afternoon's relative humidity becomes as low as 19%

1.26.4 Wind Pattern

Predominant wind direction is north-west, west and north-east. Winds are moderate to high particularly during the morning hours while during the afternoon hours the winds are stronger. During the monsoon season, winds blow from NE and E direction. The seasonal wind rose is shown in **Figure 1.14**.
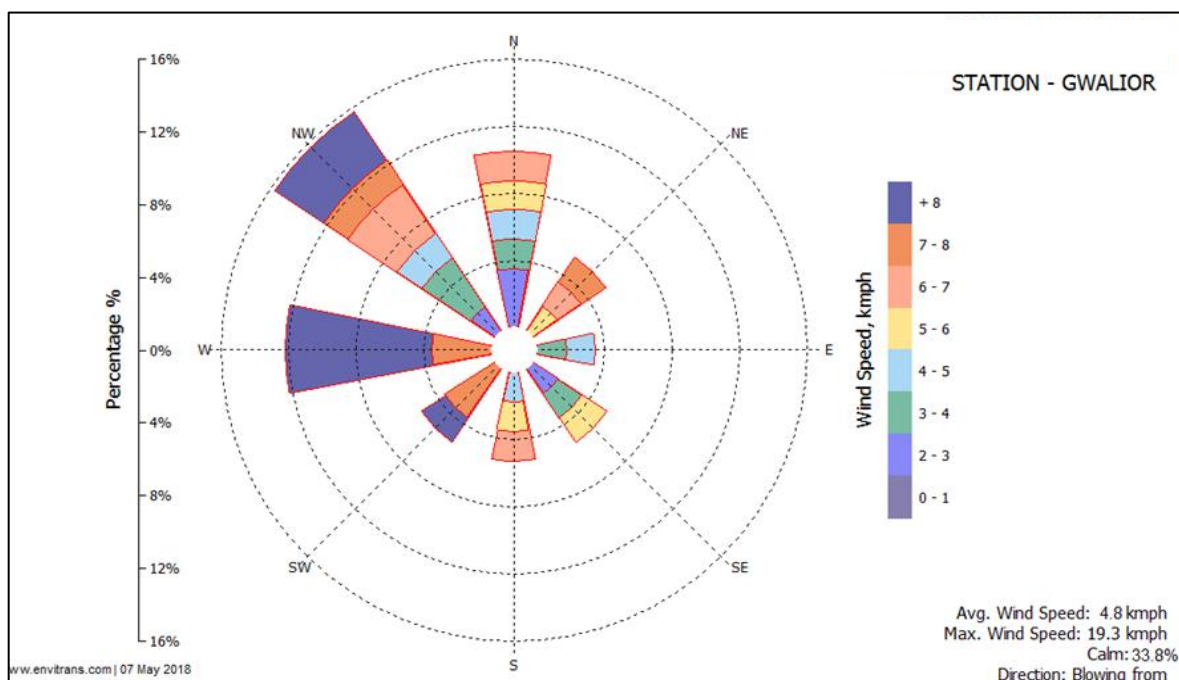
Pre-monsoon
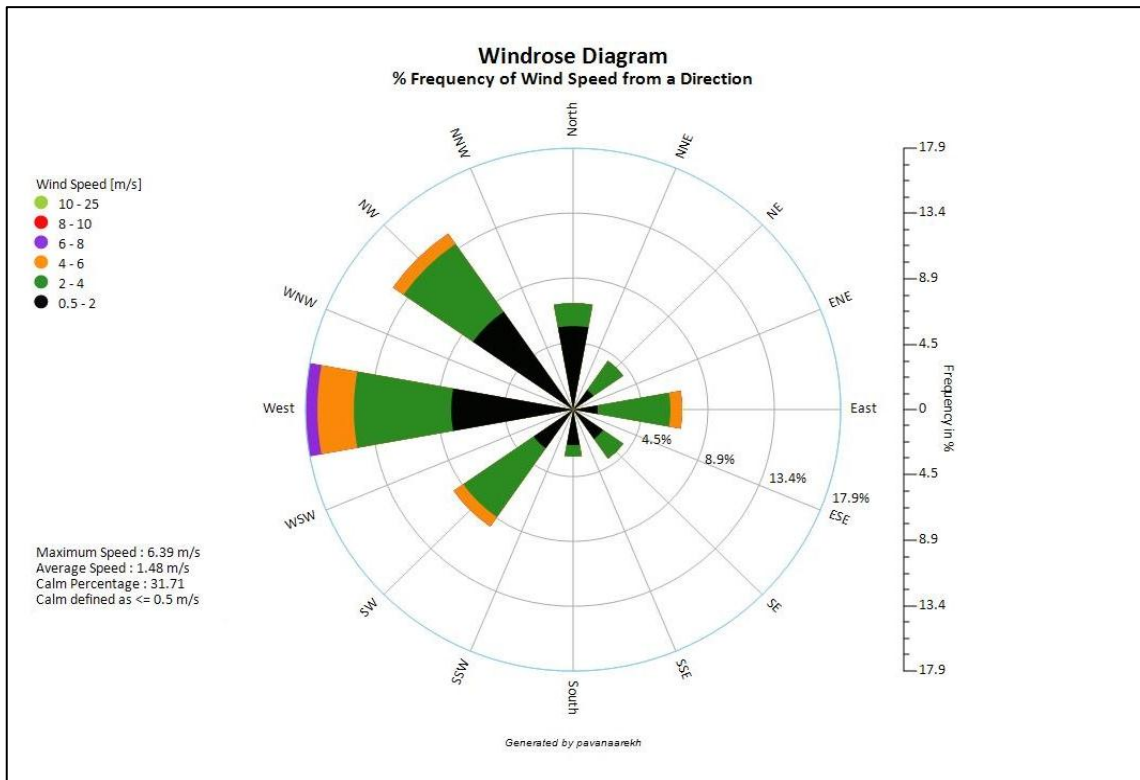
Monsoon
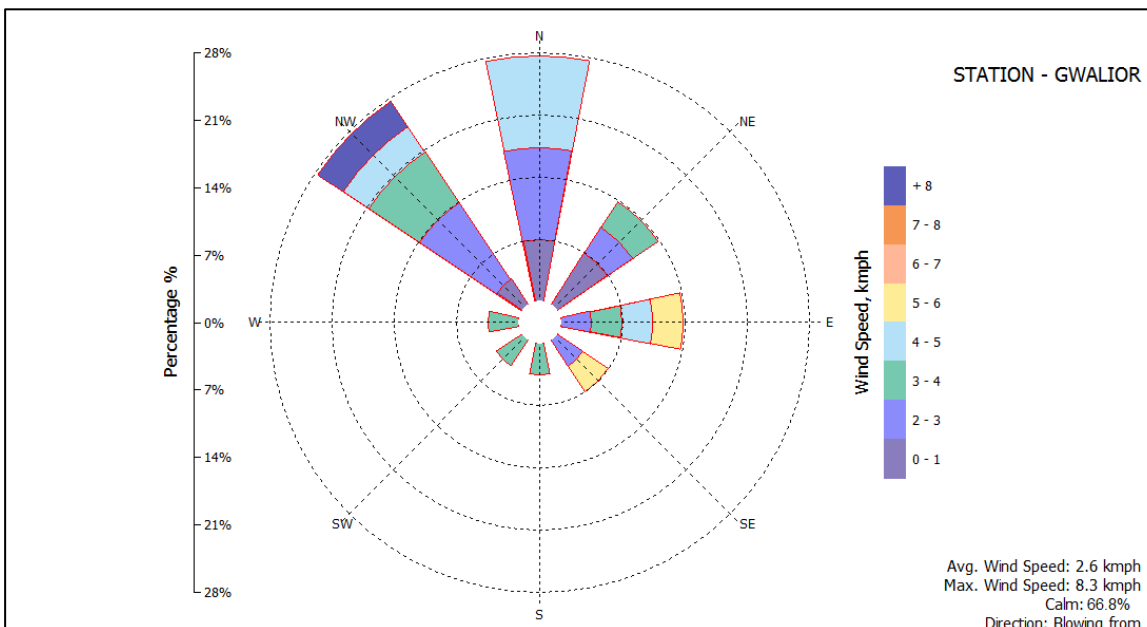
Winter

Figure 1.13: Wind rose diagrams

1.26.5 Cloud Cover

30 years' average data reveal that maximum cloud cover is observed around 6.0 oktas in the month of August. Generally, cloud cover is observed around 1.8 (in oktas) in the month of November, December, January, February and March.

1.26.6 Air Environment

Air pollution can cause significant effects on the environment and subsequently on human, animals, vegetation and materials. In most cases, air pollution aggravates pre-existing diseases or degrades health status, making people easily susceptible to other infections and development of chronic respiratory and cardiovascular diseases. Further, environmental impacts from air pollution can include acidic deposition and reduction in visibility. The proposed project is irrigation project where no air pollution is envisaged during operation phase. During construction phase, minor air pollution may occur due to quarrying, blasting, drilling, vehicle and D.G set operation.

A site–specific background of air quality monitoring program was conducted for the proposed project site during winter season. Background data was collected for PM_{10}, $PM_{2.5}$, SO_2, NO_x, since the proposed site has no pollution intensive activities in its vicinity, five sampling stations located within 5.0 km of the site was considered to provide the surrounding baseline air quality. For the selection of the monitoring locations, long-term meteorological trends were taken into consideration to obtain the predominant wind direction during the sampling period. The monitoring was carried out following CPCB standard protocol. The monitored concentration of PM_{10} and NO_X were within the NAAQs limits set forth by CPCB.

The ambient air quality monitoring locations are detailed in **Table 1.11** and shown in **Figure 1.15**. The ambient air quality monitoring during Winter (2017), pre-monsoon (2018) and monsoon (2018) was conducted by the EIA consultant through Noida Testing Laboratories (NABL accredited Laboratory). Monitoring was carried out for Particulate Matter (PM_{10} & $PM_{2.5}$), Sulphur dioxide (SO_2), and Oxides of Nitrogen (NO_x) as per TOR. Sampling was carried out on 24 hourly twice a week.

Table 1.11: Air Monitoring Locations

Station Code	Locations	Approximate Distance (km)/Direction From Dam
AAQ-1	Seondha	4.9/NE
AAQ-2	Dangdiroli (project Site)	1.2/SE
AAQ-3	Dhubyai	6.2/SW
AAQ-4	Mangroul	8.7/NE
AAQ-5	Kiti	15.49/NW
AAQ-6	Kitaura	22.4/SW
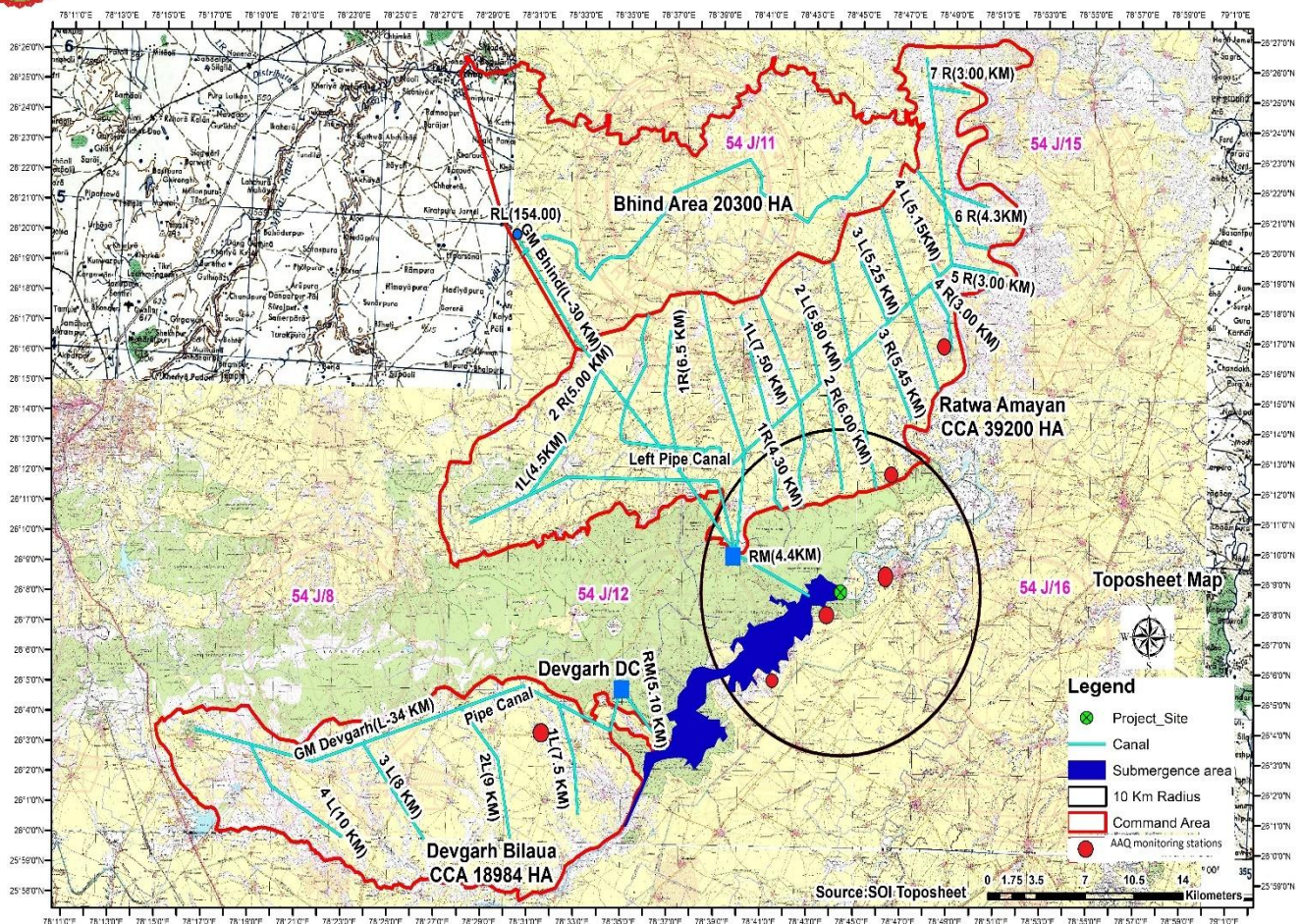
Figure 1.14: Air quality monitoring locations of study area

Ambient air quality levels were assessed with respect to National ambient air quality standards prescribed by Central Pollution Control board (CPCB) 2009. Summary results of ambient air quality monitoring data are shown in **Table 1.12, Table 1.13** and **Table 1.14**.

Table 1.12: Summary of Ambient Air Quality Data (µg/m^3) During Winter, 2017

St. Code	PM$_{10}$			PM$_{2.5}$			NOx			SO$_2$		
	MIN	MAX	98%	MIN	MAX	98%	MIN	MAX	98%	MIN	MAX	98%
AAQ-1	40.5	44.9	44.7	22.1	24.2	23.7	13.3	17.8	16.3	7.5	8.5	8.2
AAQ-2	39.4	46.0	45.1	21.2	24.7	25.6	12.2	17.5	17.2	7.1	7.9	7.6
AAQ-3	40.9	46.4	45.9	18.9	23.9	23.7	11.1	15.4	15.1	5.5	6.3	6.0
AAQ-4	42.1	45.5	45.4	20.9	23.8	23.5	11.7	15.0	14.9	6.9	7.6	7.4
AAQ-5	36.8	44.5	44.3	20.9	24.2	23.9	10.5	14.3	14.2	6.4	7.2	6.9
AAQ-6	39.4	46.5	46.4	16.8	21.2	21.1	11.9	13.5	13.1	7.1	6.1	7.7
24-Hours NAAQS	100			60			80			80		

Table 1.13: Summary of Ambient Air Quality Data (µg/m^3) During Pre-Monsoon, 2018

St. Code	PM$_{10}$			PM$_{2.5}$			NOx			SO$_2$		
	MIN	MAX	98%	MIN	MAX	98%	MIN	MAX	98%	MIN	MAX	98%
AAQ-1	41.8	50.4	49.9	20.1	24.3	23.1	13.3	18.8	18.5	6.3	8.1	8.2

St. Code	PM$_{10}$			PM$_{2.5}$			NOx			SO$_2$		
AAQ-2	40.5	46.5	46.2	16.5	18.7	18.5	10.2	14.4	14.1	BDL	BDL	BDL
AAQ-3	41.3	47.1	46.9	18.5	23.9	23.6	11.1	15.1	14.9	BDL	BDL	BDL
AAQ-4	43.2	48.7	48.3	19.6	23.8	23.5	11.7	16.6	16.3	5.3	6.9	6.7
AAQ-5	40.2	45.5	45.3	18.9	20.1	19.9	10.3	12.3	12.1	5.7	7.0	6.8
AAQ-6	39.8	46.7	46.4	16.1	19.2	19.0	11.9	13.8	13.6	5.5	6.7	6.5
24-Hours NAAQS	**100**			**60**			**80**			**80**		

Table 1.14: Summary of Ambient Air Quality Data (µg/m^3) During Monsoon, 2018

St. Code	PM$_{10}$			PM$_{2.5}$			NOx			SO$_2$		
	MIN	MAX	98%	MIN	MAX	98%	MIN	MAX	98%	MIN	MAX	98%
AAQ-1	38.7	45.6	45.1	18.6	21.3	20.5	12.5	17.7	17.5	6.7	8.2	7.9
AAQ-2	35.5	41.4	40.9	16.6	18.8	18.4	10.0	13.8	13.1	BDL	BDL	BDL
AAQ-3	34.3	39.1	38.8	17.6	22.5	22.1	10.6	14.7	14.1	BDL	BDL	BDL
AAQ-4	39.2	45.9	45.1	18.2	23.1	22.6	11.2	15.8	15.2	5.3	6.8	6.2
AAQ-5	36.0	42.0	41.6	17.3	20.0	19.8	11.3	12.8	12.2	5.5	7.0	6.6
AAQ-6	33.9	39.6	38.4	16.0	18.5	18.1	11.5	13.3	12.8	5.4	6.6	6.3
24-Hours NAAQS	**100**			**60**			**80**			**80**		

The monitoring results of ambient air quality were compared with the National Ambient Air Quality Standards (NAAQS) prescribed by MoEF, GoI Notification dated 16.11.2009. During study period, 2017-18, the maximum concentration of PM$_{10}$, PM$_{2.5}$ and NO$_X$ was 50.4 µg/m3, 25.6 µg/m3 and 18.8 µg/m3 respectively, while maximum concentration of SO$_2$ was 8.5 µg/m3). Thus, it was found that concentration of pollutants was within the limits of standards prescribed by CPCB.

1.26.7 Noise Environment

Noise can be defined as any sound that is undesirable because it interferes with speech and hearing, and is intense enough to damage hearing or is otherwise annoying. Noise impacts can be of concern during construction and operational phases of the project. Factors those are important in determining noise levels include distance from the noise source, natural or manmade barriers between the source and the receptors, whether conditions, etc. In assessing noise, an empirical measure called "dBA" indicates damage to hearing. The higher the dB (A) number, the greater is the risk of damage to hearing. Loud noise may adversely affect people in many ways. For example, noise may interface with sleep, speech, communication and can cause infuriation and other physiological problems. Occupational noise exposure is also the most common cause of Noise-Induced Hearing Loss (NIHL), threatening the hearing of individuals exposed to noise pollution for longer periods of time, at a less intense level. For example, repeated exposure to noise pollution at a construction site can cause NIHL to construction workers, an effect that cannot be reversed.

An assessment of baseline noise quality was undertaken to (a) establish the status of exposure of the major sensitive receptors, and (b) to identify the noise pollution levels in and around the site. The noise monitoring was done following CPCB protocol of Noise Monitoring. Noise monitoring was conducted at six locations within the study area wherever possible including the project site, approach roads and sensitive locations. The background monitoring program was carried out in accordance with the requirements of EIA study. Sound pressure level (SPL) measurements were automatically recorded to give the noise level for every hour continuously for 24 hours in a day. Accordingly, one full day (i.e. 24-hourly values) of data

was collected at each of the locations for each season. The monitoring locations are provided in **Table 1.15** and shown in **Figure 3.10**. The Noise monitoring results have been detailed in **Table 1.16** and **1.16**. Leq day time (6 am to 10 pm) and Leq night time (10 pm to 6 am) was calculated using the following equation:

$$L_{eq,T} = 10\log\left(1/n\sum_{i=1}^{n}10^{\frac{L_i}{10}}\right)$$

Where, Li = levels observed at n equally spaced times during interval T. Leq day and night (Ldn) was also worked out by using the following equation: dB (A) Ldn =10 Log$_{10}$[0.666X10 $^{Ld/10}$+0.333 X10 $^{(Ln+10)/10}$

Table 1.15: Noise monitoring locations

S. No	Location	Code	Direction	Distance	Zone
1	Seondha	N1	NE	4.9	Commercial/ Residential
2	Dangdiroli (project Site)	N2	SE	1.2	Rural/Residential
3	Dhubyai	N3	SW	6.2	Rural/Residential
4	Mangroul	N4	NE	8.7	Commercial/ Residential
5	Kiti	N5	NW	15.49	Rural/Residential
6	Kitaura	N6	SW	22.46	Rural/Residential
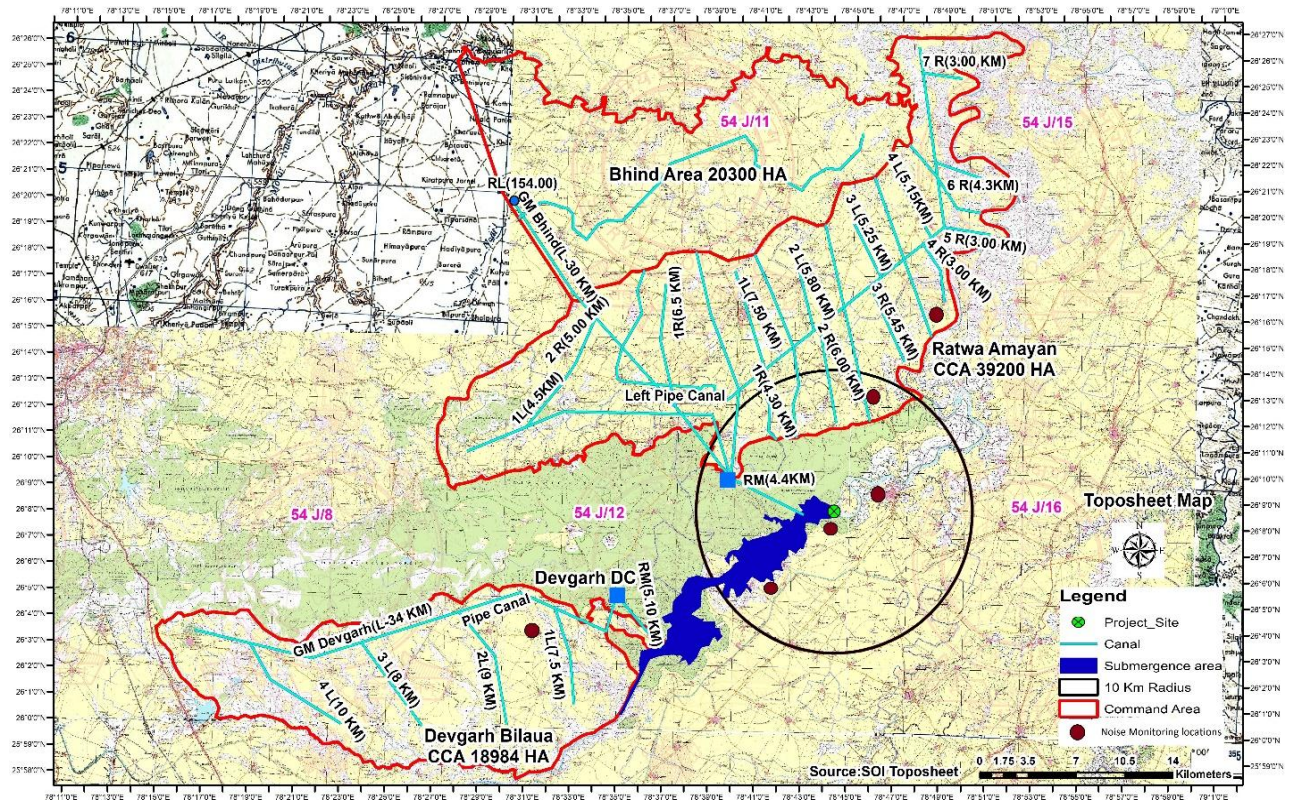
Figure 1.15: Noise monitoring locations of study area

Table 1.16: Leq day time and night time noise levels and Leq day and night time noise levels

S.No	Station Code	Pre-Monsoon Season (2018)		Monsoon (2018)	CPCB Limits Leq. dB(A)

		Leq Day dB(A)	Leq Night dB(A)	Leq Day and Night dB(A)	Leq Day dB(A)	Leq Night dB(A)	Leq Day and Night dB(A)	Day*	Night*
1	N1	61.2	43.8	59.4	55.4	40.6	54.2	65	55
2	N2	44.2	30.3	43.1	44.5	32.3	43.9	55	45
3	N3	46.2	35.5	46.0	44.3	32.7	44.0	55	45
4	N4	61.2	44.8	59.7	57.2	38.5	56.9	65	55
5	N5	49.5	35.8	48.4	45.8	33.6	45.2	55	45
6	N6	55.0	45.7	55.3	46.7	31.5	46.2	55	45

Table 1.17: Leq day time and night time noise levels and Leq day and night time noise levels

S.No	Station Code	Winter season (2017)			CPCB Limits Leq. dB(A)	
		Leq Day dB(A)	Leq Night dB(A)	Leq Day and Night dB(A)	Day*	Night*
1	N1	61.8	42.1	60.1	65	55
2	N2	45.2	30.4	43.5	55	45
3	N3	47.6	34.9	46.0	55	45
4	N4	55.3	44.3	53.7	65	55
5	N5	50.2	39.4	48.6	55	45
6	N6	54.2	41.5	54.3	55	45

The noise monitoring shows the day and night time noise level at Seondha recorded are 61.8 dB (A) Leq during day time and 43.8 dB (A) Leq during night time and were within the prescribed limit. The noise levels for the rest of 5 stations are within the prescribed limits. The major source of the noise in the study area is vehicular movement as well as rural activity. The ambient air quality standards in respect of noise are 75, 65, 55 and 50 dB (A) Leq in daytime and 70, 55, 45 and 40 dB (A) Leq during nighttime for industrial, commercial, residential and silence zone respectively. The daytime noise level measured during 6:00 a.m. to 10:00 p.m. and nighttime measured from 10:00 p.m. to 6:00 a.m.

1.27 SOIL

1.27.1 Soil Types

The soil resource map of Madhya Pradesh (NBSS Publication No 59) has been used in the present study. The soil is predominantly sandy clay loam to sandy clay loam soil. The soil of the study area area is cover under various soil units described here under;

- **Soil map unit 425**
  The soil type belongs to very shallow, excessively drained, loamy soils on moderately steep sloping hill with escarpments with severe erosion and strongly stony associated with: Very shallow, excessively drained, loamy skeletal soils on moderately sloping with severe erosion and strongly stony.

- **Soil map unit 432**
  The soil type belongs to very shallow, somewhat excessively drained, loamy soils on moderately hill with pediments with sever erosion and slight stony, associated with: Deep well moderately drained, calcareous, coarse-loamy soils on gently sloping with moderate erosion.

- **Soil map unit 447**

  The soil type belongs to Very shallow, somewhat excessively drained, loamy-skeletal soils on gently sloping undulating plateau with severe erosion and moderately stony, associated with: Very shallow, well drained loamy soils on very gently sloping with moderate erosion and moderately stony.

- **Soil map unit 454**

  The soil type belongs to Deep, well drained, loamy soils on moderately sloping undulating plateau with (slight dissected) moderate erosion, associated with: Very shallow, well drained loamy soils very gently sloping with moderate erosion.

- **Soil map unit 533**

  The soil type belongs to Deep, well drained, loamy soils on gently sloping plateau with moderate erosion, associated with: Slightly deep, well drained, loamy soil on very gently sloping with moderate erosion and slightly stony.

- **Soil map unit 535**

  The soil type belongs to Shallow, somewhat excessively drained, loamy soils on moderately sloping plateau with severer erosion, associated with: Very shallow, somewhat excessively drained, loamy soils on moderately sloping with severe erosion.

- **Soil map unit 548**

  The soil type belongs to moderately deep, moderately well drained calcareous, loamy soils on very gently sloping undulating plain with mounds with moderate erosion, associated with: Moderately well drained loamy soils on very gently sloping with moderate erosion.

- **Soil map unit 555**

  The soil type belongs to Deep Moderately well drained calcareous clayey soils on gently sloping plain with hummocks (slightly dissected) with moderate erosion, associated with: Moderately deep moderately well drained calcareous clayey soils on gently sloping plain with slight erosion.

- **Soil map unit 558**

  The soil type belongs to Deep, well drained, loamy soils on gently sloping plain land with valleys with slight erosion, associated with: Moderately well drained, calcareous, loamy soils on very gently sloping with moderate erosion.

- **Soil map unit 562**

  The soil type belongs to Moderately deep, well drained, loamy soils on very gently sloping flood plain (mode-rately dissected) with moderate erosion, associated with; Deep, well drained, calcareous clayey soils on gently sloping with moderate erosion.

- **Soil map unit 567**

  The soil type belongs to Deep, moderately well drained calcareous clayey soils on Moderately sloping ravinous land (slightly dissected) with very severe erosion, associated with; Deep, well drained, calcareous, loamy soils on moderately sloping with slight erosion.

- **Soil map unit 572**

  The soil type belongs to Deep, somewhat excessively drained, calcareous, loamy soils on moderately sloping ravinous land (highly dissected) with very severe erosion, associated with; Deep, well excessively drained calcareous, loamy soils on moderately steep sloping with severe erosion.

- **Soil map unit 572**
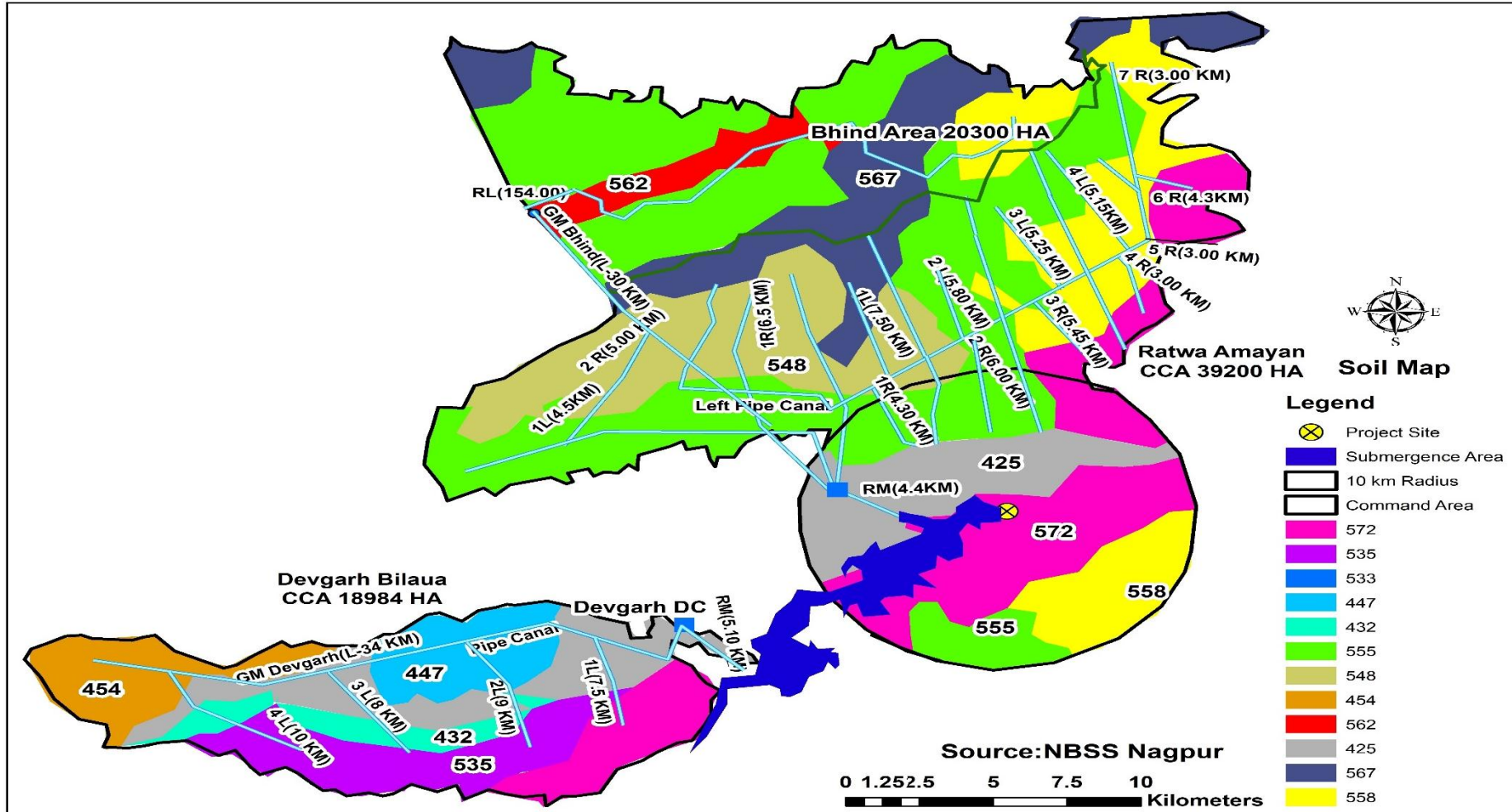
Figure 1.16: Soil map of Study Area

1.27.2 Soil Monitoring

For studying soil quality of the study area and with a view to ascertain the impacts due to construction activities on the nearby agriculture land and due to application of water on the soil of command area, six sampling locations, representing various land use conditions, were selected to assess the existing soil conditions in and around the project area of impact area. The samples have been collected from the depth of 5cm to 15cm and representative samples prepared by thoroughly mixing. The homogenized samples were analyzed for physico chemical characteristics.

The detail of sampling locations is given in **Table 1.18** and shown in **Figure 1.18**.

Table 1.18: Soil Sampling Location

S. No.	Location	Station code	Environmental Setting
1.	Seondha	S-1	Agriculture
2.	Dangdiroli (project Site)	S-2	Forest
3.	Dhubyai	S-3	Agriculture
4.	Kheriachandan	S-4	Agriculture
5.	Bhaggeh	S-5	Agriculture
6.	Dandrua	S-6	Agriculture
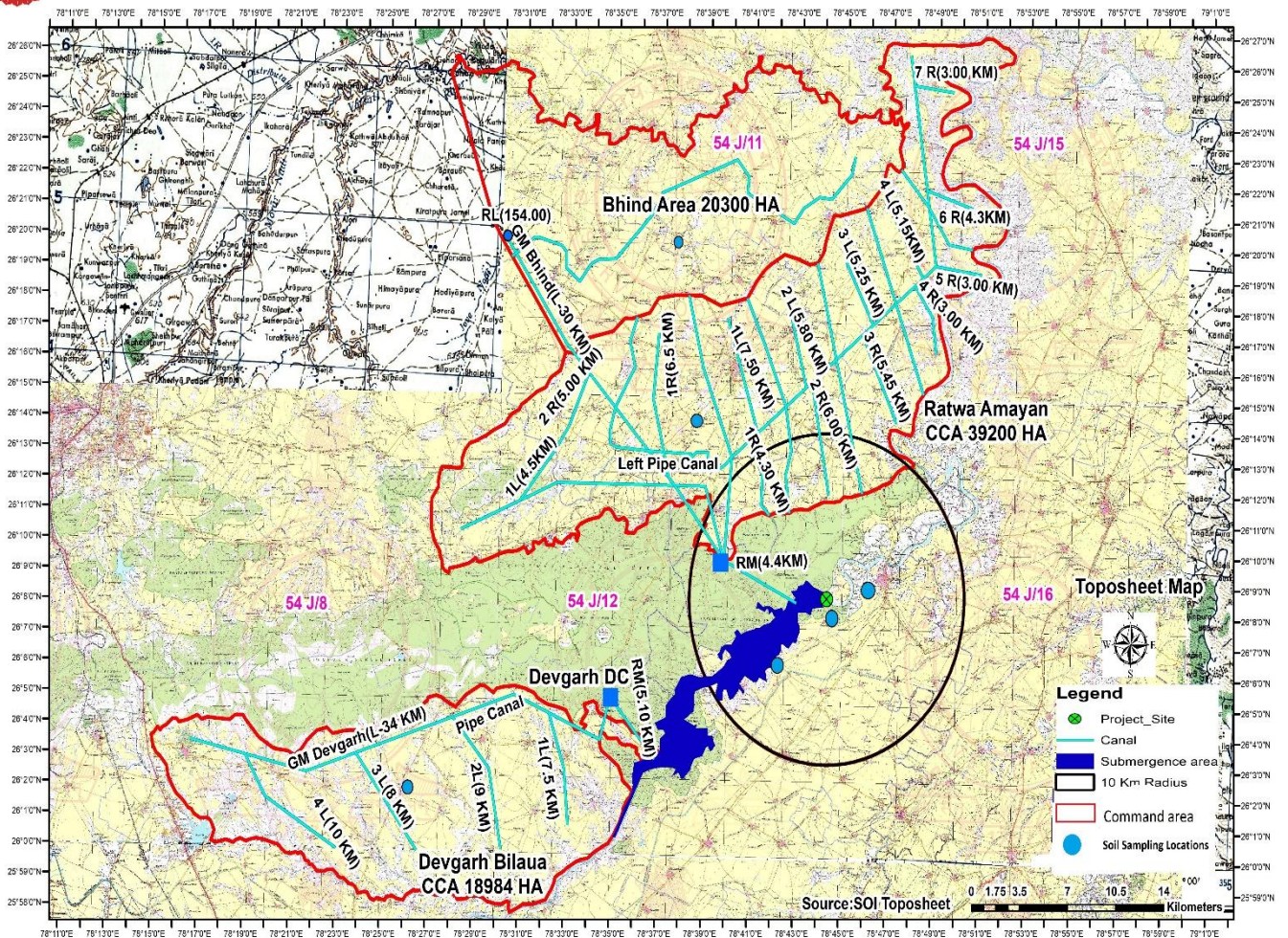
Figure 1.17: Soil sampling locations of Study Area

1.27.3 Interpretation of Soil Characteristics

Interpretation of Soil Characteristic has been dwelled in following sub-sections:

Soil Texture: The soil textures refer to proportion of mineral composition of soil i.e., sand, clay and silt present in the soil sample. The most commonly observed soil textures are clay loam and sandy clay loam.

Soil pH: Soil pH is an important soil property, which affects the availability of several plant nutrients. It is a measure of acidity and alkalinity and reflects the status of base saturation. It measures the -ve logarithm of hydrogen ions activity of soil solution and defines the soil acidity and alkanity. The soil pH ranges from 6.8 to 7.7, thereby indicating the soils are neutral to slightly alkaline in nature.

Organic Matter: The effect of soil organic matter on soil properties is well recognized. Soil organic matter plays a vital role in supplying plant nutrients, cation exchange capacity, improving soil aggregation and hence water retention and soil biological activity. The organic matter content of soil varied from 0.77 to 0.97% (0.44 to 0.56% as organic carbon), thereby implying that soils are low to medium in organic content.

Macronutrients: Nutrients like nitrogen (N), phosphorus (P) and potassium (K) are considered as primary nutrients and Sulphur (S) as secondary nutrient. These nutrients help in proper growth, development and yield differentiation of plants and are generally required by plants in large quantity.

Available Nitrogen: Nitrogen is an integral component of many compounds including chlorophyll and enzyme essential for plant growth. It is an essential constituent for amino acids which is building blocks for plant tissue, cell nuclei and protoplasm. It encourages the aboveground vegetative growth and deep green color to leaves. Deficiency of Nitrogen decreasing rate and extent of protein-synthesis and result into stunted growth and develop chlorosis. Available nitrogen content in the surface soils ranges between 10.23 to 15.23 mg /kg thereby is indicating that soils are low in available nitrogen content.

Available Phosphorus: Phosphorus is important component of adenosine di-phosphate (ADP) and adenosine tri-phosphate (ATP), which involves in energy transformation in plant. It is essential component of deoxyribonucleic acid (DNA), the seat of genetic inheritance in plant and animal. Phosphorous take part in essential functions like photosynthesis, nitrogen fixation, crop maturation, root development, strengthening straw in cereal crops etc. The availability of phosphorous is restricted under acidic and alkaline soil reaction mainly due to P-fixation. In acidic condition, it gets fixed with aluminum and iron and in alkaline condition with calcium. Available phosphorus content ranges between 1.58 to 2.5 mg/kg thereby indicating that soils are low in available phosphorus.

Available Potassium: Potassium is an activator of various enzymes responsible for plant processes like energy metabolism, starch synthesis, nitrate reduction and sugar degradation. It is extremely mobile in plant and help to regulate opening and closing of stomata in the leaves and uptake of water by root cells. It is important in grain formation and tuber development and encourages crop resistance for certain fungal and bac*ter*ial diseases. Available potassium content in these soils ranges between 41.02 to 57.55 mg/kg, thereby indicating high in potassium content in the area.

Micronutrients: Proper understanding of micronutrients availability in soils and extent of their deficiencies is the pre-requisite for efficient management of micronutrient fertilizer to sustain crop productivity. Therefore, it is essential to know the micronutrients status of soil before introducing any type of land use.

Available Manganese: Manganese is essential in photosynthesis and nitrogen transformations in plants. It activates decarboxylase, dehydrogenize, and oxides enzymes. The available manganese content in surface soils ranged from 8.10 to 11.0 mg/kg i.e. above the critical llimit of available manganese (2.0 mg/kg)

Available Zinc: Zinc plays role in protein synthesis, reproductive process of certain plants and in the formation of starch and some growth hormones. It promotes seed maturation and production. As zinc content in soil of study area are between 2.5-6.3mg/kg which is more than the critical limit (0.5mg/kg), most of the study area soils are more than sufficient in available zinc.

Available Copper: It is important for reproduction growth. It aids in root metabolism and helps in utilization of protein. The available copper in surface soils of the study area ranges from 5.00 to 6.27 mg/kg. As per the critical limit of available copper (0.2mg/kg), most of the study area soils are more than sufficient in available copper near the project.

Available Iron: Iron in soil is important for formation of chlorophyll. As per the critical limit of available zinc (0.5mg/kg), most of the study area soils are more than sufficient in available iron near the project.

1.28 WATER QUALITY

Selected water quality parameters of ground water and surface water resources within 10 km radius of the study area has been studied for assessing the water environment and evaluate anticipated impact of the mining activity. Understanding the water quality is essential in preparation of Environmental Impact Assessment and to identify critical issues with a view to suggest appropriate mitigation measures for implementation. The purpose of this study is to:

- Assess the water quality characteristics for critical parameters; and
- Predict the impact of water quality by these mining and related activities.

1.28.1 Sampling Location

The information required has been collected through primary surveys and secondary sources. 29 groundwater sources and 6 surface water sources covering 10 km radial distance and command area were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of existing status and other activities on water. The samples were collected and analyzed for Winter (2017), Pre-monsoon (2018) and Monsoon (2018). Water sampling and analysis has been carried out to determine the existing baseline water quality of the river water to be applied for irrigation and also the baseline data of ground water quality in the command area villages. Sampling and analysis have been carried out with following standard guidelines for physical, chemical and bacteriological parameters. The surface and ground water sampling locations are presented in **Table 1.19** and shown in **Figure 1.19.** Twenty-nine ground water and six surface water sampling locations from the study area have been selected for sampling.

Table 1.19: Water Quality Monitoring Locations

S. No.	Station Code	Site/village	Source
GROUND WATER			
1.	GW1.	Village Dangdiroli	HP
2.	GW2.	Village Bercha	HP
3.	GW3.	Village Seondha	HP
4.	GW4.	Village Basturi	HP
5.	GW5.	Village Daryapur	HP
6.	GW6.	Village Hathnaura	HP
7.	GW7.	Village Lalpura	HP
8.	GW8.	Village Nahla	HP
9.	GW9.	Village Kuwarpura	HP
10.	GW10.	Village Dhubyai	HP
11.	GW11.	Village Dhubyai 2	DW
12.	GW12.	Village Bilaua	HP
13.	GW13.	Village Kiti	HP
14.	GW14.	Village Kiti 2	DW
15.	GW15.	Village Shikarpurwa	HP
16.	GW16.	Village Madhukheda	HP
17.	GW17.	Village Mangraul	HP
18.	GW18.	Village Bhagwanpura	HP
19.	GW19.	Village Bhadurpur	HP
20.	GW20.	Village Kitaura	HP

21.	GW21.	Village Bhaggeh	HP
22.	GW22.	Village Dhamanka	HP
23.	GW23.	Village Ladera	HP
24.	GW24.	Village Ekahra	HP
25.	GW25.	Village Bharoli kalan	HP
26.	GW26.	Village Dandrua	HP
27.	GW27.	Village Habibpur	HP
28.	GW28.	Village Chitora	HP
29.	GW29.	Village Karwas	HP
		SURFACE WATER	
30.	SW1.	Sindh river near Dangdiroli	(River)
31.	SW2.	Sindh river near Seondha	(River)
32.	SW3.	Bhander canal near Bercha	(Canal)
33.	SW4.	Larai Nala near Dhamanka	(Nala)
34.	SW5.	Mau branch Bhind canal near kanathar	(Canal)
35.	SW6.	Local Nala at Mehgaon	(Nala)
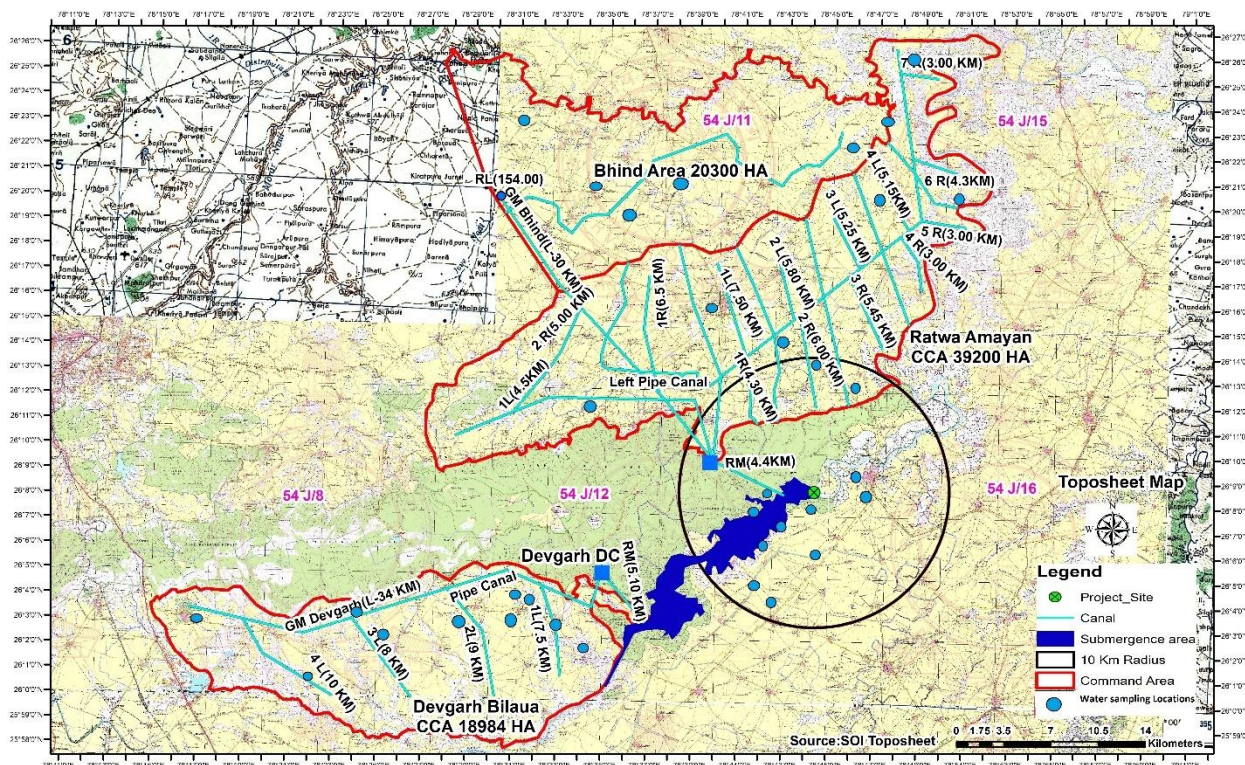
Figure 1.18: Ground and Surface Water Sampling Locations

1.28.2 Interpretation of Ground Water Quality

The analysis results indicate that the pH ranged between 6.70 to 8.0, which is well within the specified standard of 6.5 to 8.5 limit. Total hardness was recorded to range from 150.40 to 285.20 mg/l, which is within the permissible limit 600 mg/l at all locations. The Total Dissolved Solids (TDS) concentration recorded ranged between 322.80 to 462.40mg/l and was within the permissible limits (2000mg/l).

Chlorides at all the locations were within the desirable limits (200 mg/l) as it ranged between 19.30 to 45.0. Sulphates at all the locations were within the permissible limits (400 mg/l) as it ranged between19.3–34.80 mg/l. Fluorides recorded ranged between 0.23 to 0.82 mg/l and were within the desirable limit (1.0

mg/l). Nitrates were recorded to be ranging in between 23.8 to 42.2 mg/l and are found to be within the desirable limit (45mg/l). Bacteriological studies reveal that no coliform bacterial are present in the samples. The heavy metal contents were observed to be in below detectable limits. All physical and general parameters were observed within the desirable/permissible limit at all the sampling locations as per IS 10500:2012. Maximum dissolved solid concentration was observed in the ground water sample collected from Kitaura village and maximum hardness was observed in Dhamanka village but were within the permissible limit.

Thus, it is recommended that water be filtered and disinfected prior to be given to villages for meeting their drinking water requirements. The oil & grease level was below detectable limits in all the samples, which is expected in the project area, as there are no sources of pollution which can lead to increase oil & grease content in surface water. Apart from domestic sources, there are no sources of pollution in the project area. The project has no industries. Likewise, the fertilizer consumption is also low.

All physical and general parameters like pH, TDS, Hardness, Chloride, Sulphate, Fluoride Nitrites etc., were observed within the desirable limit at all monitoring locations as per IS 10500:2012.

The pH values of all analyzed samples ranged between 7.6-8.1 and was within the permissible limit (6.5-8.5). The TDS levels ranged from 244.75 to 382.12 mg/l and were well below the permissible limit of 1500 mg/l. The chlorides level in surface water samples ranged from 20.10 to 32.30 mg/l and were below the permissible limit of 600 mg/l. The sulphates level ranged from 45.5 to 53.6 mg/l and were below the permissible limit of 400 mg/l. The fluorides level was marginally lower than the permissible limit of 0.30 to 0.58 mg/l. The BOD values exceeded the permissible limits, indicating the presence of organic pollution loading. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The concentration of cyanides and phenolic compounds were also below the detectable limits. The Total Coliform level was within the limits specified for Class C water i.e. the water is suitable for meeting drinking water requirements after conventional treatment and disinfection.

All the analyzed parameters were within the limits specified for Class C water i.e. the water is suitable for meeting drinking water requirements after conventional treatment and disinfection. The river water is suitable for irrigation as the important parameters relevant to irrigation such as TDS, electrical conductivity and SAR etc., are within the limits specified for Class E water.

1.29 WATER ENVIRONMENT AND HYDROLOGY

1.29.1 Basin Characteristic

The Sindh originates on the Malwa Plateau in Vidisha district, and flows north-northeast through the districts of Guna, Ashoknagar, Shivpuri, Datia, Gwalior and Bhind in Madhya Pradesh to join the Yamuna River in jalaun district, Uttar Pradesh, just after the confluence of the Chambal River with the Yamuna River. It has a total length of 470 kilometres (290 mi), out of which 461 kilometres (286 mi) are in Madhya Pradesh and 9 kilometres (5.6 mi) are in Uttar Pradesh.

The river basin lies between 23°12'–25°54' N latitudes and   78° 30' – 80° 36' E longitudes. The total catchment area of the river is 28058 sq. km, out of which 24472 sq. km lies in Madhya Pradesh and the remaining 3586 sq. km in Uttar Pradesh.

As per nomenclature contained in Water Atlas of India, Edition 1993, the free draining catchment under the study area lies in Water Resource Region-2 (Ganga); basin 2C (Yamuna), Catchment 2C4 (Sindh to Chambal confluence. Kunwari), sub-catchment 2C4B6 (Sindh).

1.29.2 Drainage pattern

The dominant drainage pattern is dendritic and radial in the hilly and plateau regions, while in the plains it is parallel to sub-parallel. The drainage pattern of the study area is shown in **Figure 1.20.** Most of the area possesses a dendritic to sub-dendritic drainage containing irregular branching of the smaller tributaries. The closeness of these small branches is depending on the permeability of the underlying rocks and the amount and nature of precipitation. It is the most common drainage pattern of hillside slopes of the study area.
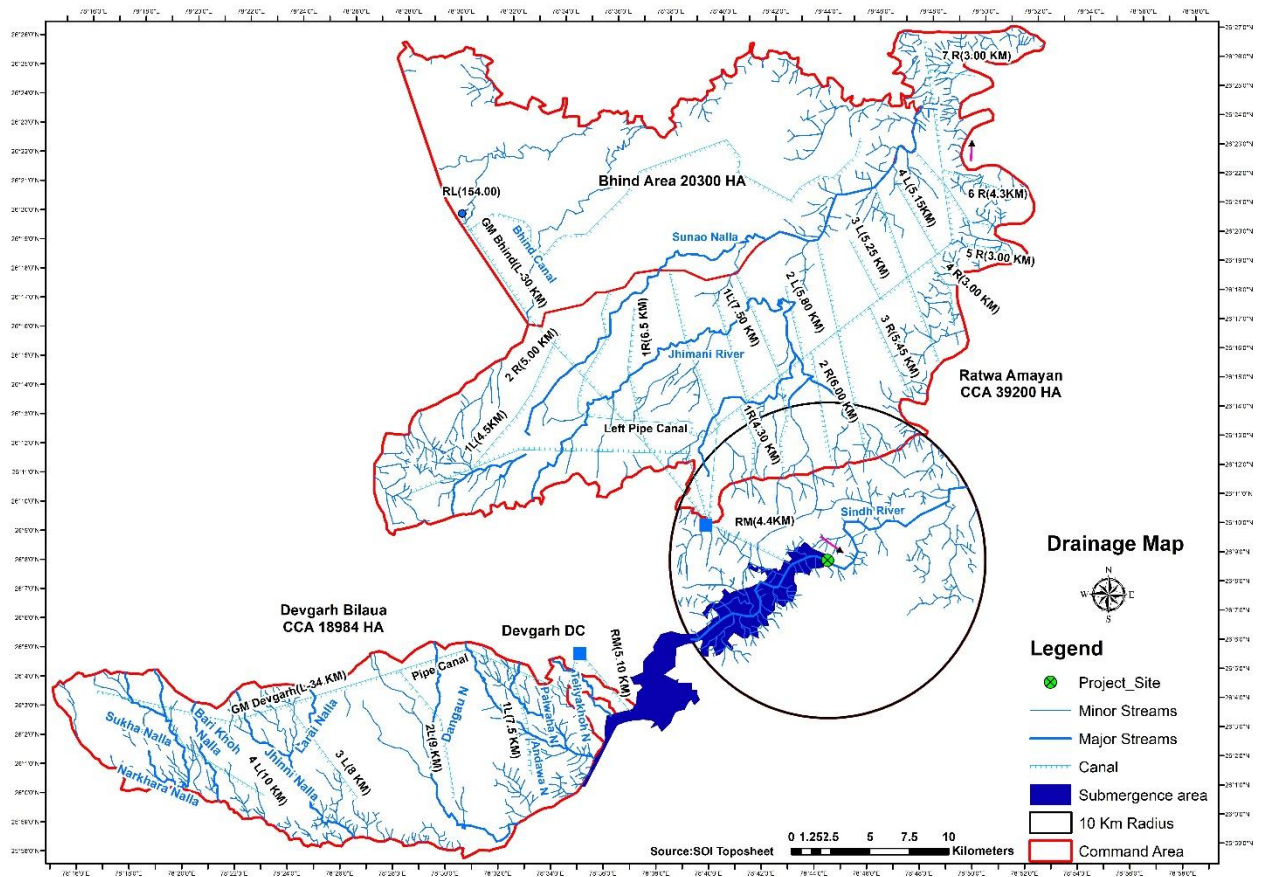
Figure 1.19: Drainage Map of Study Area

1.29.3 Hydro-meteorological Data

Maa Ratangarh Multipurpose project lies in sindh sub basin of Madhya Pradesh. The first and foremost requirement for any sizable water resources project to be implemented is the river basin Planning. River Basin plan of Sindh is prepared by in house trained water resources professionals with the support of eminent water management institute, Unesco-IHE, Delft, the Netherlands. The basin plan study reveals that the basin is unharnessed to 65% of its gross yield of 6.1 BCM. The spatial and temporal variation throughout the basin is closely analyzed on the corners of integrated water resources management principles in Plan. The basin is subdivided into 8 major sub basins namely Upper Sindh, Parwati, Mahuar, Non, Lower sindh, Pahuj, Baiseli and kunwari. Upper sind basin is almost harnessed by Atal sagar (manikheda major project), Harsi major project lies in Parwati sub basin.The lower sind project receives yield of upper sindh, parwati,mahuar,non and lower sind sub basins comprising of 12739 sq km catchment at proposed site. The rain fall data (from year 1982 to 2014) of 16 rain gauge stations affecting the   catchment are used to compute the 75 % dependable rainfall data of proposed dam. The rain fall data has been taken from WRD website.

The names of influencing stations are given below along with their Thiessen weights: -

Table 1.20: Rain gauge stations along with their Thiessen weights

S.No.	R. G. STATION	INFLUENCE AREA IN SQ M	IF
1	Aron	918881798	0.07213
2	Ashooknagar	546959544	0.04294
3	Dabra	1570324759	0.12327
4	Datia	255253355	0.02004
5	Guna	579512902	0.04549
6	Gwalior	261517306	0.02053
7	Harsi	1754886487	0.13776
8	Isagarh	816919141	0.06413
9	Kanyadhana	463813592	0.03641
10	Karera	1499297747	0.11769
11	Kolaras	1129367537	0.08865
12	Lateri	280844218	0.02205
13	Narwar	906758992	0.07118
14	Pohari	610248215	0.04790
15	Shivpuri	1007941282	0.07912
16	sironj	136473125	0.01071
	Total	12739000000.0000	1.00000

Using above weights weighted rainfall have been computed for the period 1982 to 2014 for gross catchment of 12739sqkm. Mohini pick up and Mohini sagar dam on Sindh River is in u/s of proposed dam site. Water awalibility of Mohini sagar dam site has been approved by CWC in 1991 vide no. CWC hydrology north no 7/67/77 dtd 9.5.1991using discharge data for the period 1961-61 to 1989-90 at seondha GD site maintained by CWC in d/s of Mohinisagar and proposed dam site. Regression equation derived for this study for monsoon months have been considered appropriate to compute water availability for weighted rainfall of Maa Ratangarh Multipurpose project

1.30 SOCIO-ECONOMIC ENVIRONMENT

The development projects are invariably planned based on the availability of exploitable natural resources. These projects attract flow of finances, investments, jobs and other livelihood opportunities, which brings in people from diverse cultural and social background. Such planned activities not only provide impetus to the local economy but also bring about a multi-dimensional economic, social and cultural change. Most often it has been observed that such development projects are commissioned in economically and socially backward areas, which are inhabited by some of the indigenous populations. The development of hydro-power unfortunately herald's displacement of the local people due to formation of reservoir and land required for the project components. This unpleasant situation is mainly caused due to the agricultural land and settlements being situated near the river banks and due to location of the proposed diversion structures across the river bed and the formation of reservoir at higher

levels generally cause submergence of private land and assets besides forests and revenue land. This un-toward situation brings heavy stress into the life of the indigenous people residing in the project area from centuries. The hapless persons are often socio-economically wracked if they are not rehabilitated and resettled and are allowed to continue their traditional activities even after resettlement. The plight of such persons who do not have rights over the land on which they are critically dependent for their bare subsistence becomes gory. The obtaining situation calls for proper assessment of the adverse impact such as economic and socio-cultural on project affected families.

The present socio-economic assessment involves primary field survey of socio-economic status of the people of the study area in general and the project affected villages and the PAF in general. Review of secondary data, such as District Census Statistical Handbooks-2011 and the records of National Informatics Center data, for the parameters of demography, occupational structure of people within the study area which mainly comprises of the villages, where the project area is located as per revenue records. The information in this context was gathered on the following socio-economic parameters viz.

- Demographic profile
- Educational levels
- Occupational Profile
- Cropping pattern
- Other socio-economic parameters

1.30.1 Datia District

The district is named after the district headquarters town of Datia. The term Datia is derived from Dant. As per the legend Danta Vakra, the danava (demon) king of Karush opposed Lord Krishna and was killed. Thus the place was known as Dant Nagar in those times. The Chandellas, a Rajput clan ruled over the territory around Khujuraho in the earlier part of the 9th century A.D. The king Harshadeva was important king who ruled over the region from 900 to 925 A.D. After the downfall of Chandella dynasty, Sultanate (mugal emperor) period started from Qutbuddin Aibak in 1207 A.D. Datia territory was a part of Mohammad –Bin Tughluqs regime till 1351 A.D. The Sultanate period lasted in the year 1389-90. After the invasion of Timur in 1398 the Tomar Rajputs rose to power at Gwalior and included part of Datia district till the final victory of Ibrahim Lodi in 1518. After the downfall of Tomars and Khangars, Bundelas became powerful in the land of this region who fought with Mughals. In the year 1736 Indrajit, the grandson of Ram Chandra succeeded the throne without any interest. He died at Datia in 1762, succeeded by his son Shatrujat who ruled Datia till 1801. After his death Datia came under the British protection although the king was free in the internal administration of the state. The king Parichhat (died in 1839) was succeede d by adopted son Vijai Bahadur who kept himself aloof from the politics. Practically whole of the former princely state of Datia became a part of the former province of Vindhya Pradesh in 1948. With the merger of Vindhya Pradesh and other areas, the new state of Madhya Pradesh came into being on 1st November 1956 as a consequence of reorganization of states on linguistic basis and Datia continued to remain as a separate district of the new state. In the year 1998, Bhander tahsil of district Gwalior and Udgavan revenue circle of the Shivpuri district were merged in the district.

Situated in the northern part of the state and lies between the latitude $25^0 28'$ and $26^0 20'$ and longitude $78^0 10'$ and $78^0 45'$, Datia is the smallest district in terms of population as well as geographical area of 2691 sq.kms. Constituting only 0.9% of the total area of 3, 08,244 sq. kms of the state. The district is bounded by Bhind and Gwalior districts in the north and Jhansi district of Madhya Pradesh in the south; again Gwalior and Shivpuri in the west and Bhind district in the east. The district comes under the Gangetic drainage system and is drained by the Sind, the Pahuj, the Mahuar and the Betwa rivers. The former two, however, form the drainage system of the main body of the district. The Sind flows along the western boundary for a considerable distance, whereas the Pahuj touches the eastern boundary only for about a kilometre and a half. The river Sind rises near Narpur in Sironj sub division of Vidisha district and touches Datia at a point 25^0 28' N and 78^0 10' E. It flows towards north-east and crosses the boundary beyond Seondha. During the rainy season the stream is of great volume and can be crossed only by boats. The river Pahuj rises at 25^0 19' N and 78^0 18' E near the Jhansi-Shivpuri boundary and flows towards the north-east. It enters the district near Unnao and flows to the north-east where it joins the Sind.

1.30.2 Population

The description of the demography of Datia district is presented in **Table 1.21.** It could be well inferred from the data above that the population of Datia is 7, 86,754 and Tehsil Seondha having population of 1, 16,232.

Table 1.21: Demographic Details of Project District and Tehsils

Sl. No.	District/ Tehsil	Households	Population					
			Total	Male	%	Female	%	Sex Ratio
1	Datia	160215	786754	420157	53.4	366597	46.6	872
2	Seondha	22505	116232	63017	54.2	53215	45.8	844

Source: Census of India, 2011

Out of the total population of Datia, the male population is 4, 20,157 and female population is 3, 66,597, which are nearly 53.4 percent and 46.6 percent of the total population respectively. Sex ratio of Datia is 872 whereas Seondha tehsil has sex ration of 844.Caste wise Distribution of Population

The **Table 1.22**provides detailed information about the SC, ST population in Datia district as well as on the Tehsil level of Seondha. The total SC population in Datia district is 2, 00,270 which is 25.45 per cent of the total population, while ST population is 15,061, which is 1.91 per cent of the total population. Similarly, at the Tehsil level the SC & ST population of Seondha is, 23,959(20.61 per cent) and 682 (0.59 per cent) of the total populations respectively.

Table 1.22: Caste wise distribution of population

Sl. No.	District/Tehsil	Schedule Caste (SC)		Schedule Tribes (ST)	
		Total	% of SC	Total	% of ST
1	Datia	200270	25.45	15061	1.91
2	Seondha	23959	20.61	682	0.59

Source: Census of India, 2011

1.30.3 Literacy Rate

District Datia: The literate population in Datia district is, of which male & female are 3, 03,815 and 1, 87,630 respectively, which implies that literacy rate for district is 62.46 per cent of the total population. The male literates represent 38.62 percent of the total male population while female represent 23.84 percent of the female population. The gender gap for literacy at district level for Datia is 14.77 percent.

Tehsil level: At Tehsil level, the literate population is 59.22 percent out of which 37.60 percent are male and 21.62 percent are female showing a gender gap of 15.98.

The details of literacy rate and literate people in Datia district and its Tehsils are provided in **Table 1.23.**

Table 1.23: Literacy Rateof Project District and Tehsils

S. No	District/Tehsil	Number of Literate			Literacy Rate			Gender Gap
		Total	Male	Female	Total %	Male	Female	
1	Datia	491445	303815	187630	62.46	38.62	23.84	14.77
2	Seondha	68837	43704	25133	59.22	37.60	21.62	15.98

1.30.4 Ethnographic Profile

In ancient times Datia was included in the Chedi kingdom and from all sources it can be surmised that the district shared the brilliance of the golden age and came under Gupta sway in the middle of the fourth century till the early years of the eighth century A.D. after Nanda, Maurya, Sunga and Naga dynasty. Padmavati was the capital of royal house of the Nagas during the first century A.D.

In the year 515 A.D, the Huna chief Mihirakula acquired large part of Gwalior including Datia and remained till 533 A.D. when Mihirakula was defeated and killed by Yasodharman of Mandsaur. Then the district came under the sway of the Pratihara dynasty in the second half of the 8th century till the third quarter of the 10th century A.D. Nagabhato II was a great conqueror who formed Datia as part of his empire. The Chandellas, a Rajput clan ruled over the territory around Khujuraho in the earlier part of the 9th century A.D. The king Harshadeva was important king who ruled over the region from 900 to 925 A.D. and enhanced the army and became the most powerful monarch. Dhanga was the greatest king of Chandella dynasty and was a military genius who ruled over the kingdom till 1008 A.D. The next king Vidyadhara achieved the distinction of being the only Indian ruler of those times who effectively checked Mahmood's triumphant march in India and saved his kingdom from needless destruction by the ruthless invader. From Vidyadhara onwards the Chandella rulers were entangled in protracted clashes with the Chedi and Paramar rulers which kept their kingdom in constant turmoil. The last known rulers of this dynasty were Hammitavarman and Viravarman II after whom nothing is heard of this royal house.

After the downfall of Chandella dynasty, Sultanate (mugal emperor) period started from Qutbuddin Aibak in 1207 A.D. Datia territory was a part of Mohammad –Bin Tughluqs regime till 1351 A.D. The Sultanate period lasted in the year 1389-90. After the invasion of Timur in 1398 the Tomar Rajputs rose to power at Gwalior and included part of Datia district till the final victory of Ibrahim Lodi in 1518. Dungar Singh with his extra ordinary abilities attained a new

eminence in the political spirit of northern India. After the downfall of Tomars and Khangars, Bundelas became powerful in the land of this region who fought with Mughals. In the year 1736 Indrajit, the grandson of Ram Chandra succeeded the throne without any interest. He died at Datia in 1762, succeeded by his son Shatrujat who ruled Datia till 1801. After his death Datia came under the British protection although the king was free in the internal administration of the state. The king Parichhat (died in 1839) was succeeded by adopted son Vijai Bahadur who kept himself aloof from the politics. Practically whole of the former princely state of Datia became a part of the former province of Vindhya Pradesh in 1948. With the merger of Vindhya Pradesh and other areas, the new state of Madhya Pradesh came into being on 1st November 1956 as a consequence of reorganization of states on linguistic basis and Datia continued to remain as a separate district of the new state. In the year 1998, Bhander tahsil of district Gwalior and Udgavan revenue circle of the Shivpuri district were merged in the district.

Major schedule castes of the districts are Audhelia, Bagri, Bagdi (excluding Rajput, Thakur sub-castes among Bagri, Bagdi), Bahna, Bahana, Balahi, Balai, Banchada, Barahar, Basod, Bargunda, Basor, Burud, Bansor, Bansodi, Bansphor, Basar, Bedia, Beldar, Sunkar, Bhangi, Mehtar, Balmik, Lalbegi, Dharkar ,Bhanumati, Chadar, Chamar, Chamari, Bairwa, Bhambi, Jatav, Mochi, Regar, Nona, Rohidas, Ramnami, Satnami, Surjyabanshi, Surjyaramnami, Ahirwar, Chamar Mangan, Chidar, Chikwa, Chikvi, Chitar Raidas Dahait, Dahayat, Dahat, Dewar,Dhanuk, Dhed, Dher, Dhobi (in Bhopal, Raisen and Sehore districts), Dohor, Dom, Dumar, Dome, Domar, Doris, Ganda, Gandi,Ghasi, Ghasia, Holiya, Kanjar, Katia, Patharia, Khatik, Koli, Kori, Kotwal, Khangar, Kanera, Mirdha, Mang, Mang Garodi, Mang Garudi, Dankhni Mang, Mang Mahasi, Madari, Garudi, Radhe Mang etc and schedule tribes includes Agariya,Andh,Baiga ,Bhaina,Bharia Bhumia, Bhuinhar Bhumia, Bhumiya, Bharia, Paliha, Pando,Bhattra, Bhil, Bhilala, Barela, Patelia, Bhil Mina, Bhunjia, Biar, Biyar, Binjhwar, Birhul, Birhor, Damor, Damaria, Dhanwar, Gadaba, Gadba, Gond, Arakh, Arrakh, Agaria, Asur, Badi Maria, Bada Maria, Bhatola, Bhimma, Bhuta, Koilabhuta, Koliabhuti, Bhar, Bisonhorn Maria, Chota Maria, Dandami Maria, Dhuru, Dhurwa, Dhoba, Dhulia, Dorla, Gaiki, Gatta, Gatti, Gaita, Gond Gowari, Hill Maria, Kandra, Kalanga, Khatola, Koitar, Koya, Khirwar, Khirwara, Kucha Maria, Kuchaki Maria, Madia, Maria, Mana, Mannewar, Moghya, Mogia, Monghya, Mudia, Muria, Nagarchi, Nagwanshi, Ojha, Raj, Sonjhari, Jhareka, Thatia, Thotya, Wade Maria, Vade Maria, Daroi, Kawar, Kanwar, Kaur, Cherwa, Rathia, Tanwar, Chattri, Kondar, Kol, Majhi, Oraon, Dhangad, Bahelia, Sahariya etc.

1.30.5 Religion and Culture

The **Table 1.24** gives a description of religion wise distribution in district. It can be concluded that Hindus are in majority having a total population of 95.0%, second are Muslim in population, contributing 3.6% of the total population. The Buddhist contributes 1% population and Christians, Sikh and other religions have approximately 1 percent of contribution in the entire populations.

Table 1.24: Religion wise distribution of Population

Religion	Total	%total	Rural	%total	Urban	%total
Hindu	747693	95.0	588558	97.3	159135	87.4

Muslim	28483	3.6	7446	1.2	21037	11.5
Christian	683	0.9	192	0.03	491	0.27
Sikh	490	0.7	253	0.04	237	0.13
Buddhist	7923	1.08	7099	1.17	824	0.45
Jain	453	0.06	342	0.06	111	0.06
Other religions and persuasions	10	0.001	8	0.001	2	0.001
Religion not stated	1019	0.13	874	0.14	145	0.079
Total	**786754**		**604772**		**181982**	

Source: Census of India, 2011

Religious practices are as much an integral part of everyday life and a very public affair as they are in the rest of India. Therefore, not surprisingly, many festivals are religious in origin although several of them are celebrated irrespective of caste and creed. Among the most important Hindu festivals are Diwali, Holi and Vijayadashami, Mahashivaratri, Ram Navmi, Basant Panchami, Sri Krishna Janamastmi and Raksha Bandhan, which are also observed by Jains and Sikhs. Eid ul Milad, Eid ul-Fitr, Bakr-Id, Muharram are Muslim religious festivals. Mahavir Jayanti is celebrated by Jains, Buddha Jayanti by Buddhists, Guru Nanak Jayanti by Sikhs and Good Friday, Christmas by the Christians

1.30.6 Economic Structure

The majority of people in rural sector are cultivators & agricultural labours which indicates dominant agricultural economy. A small section of people is engaged as workers in household industries. But in urban sector the existing scenario is completely reversed as most of the people there are engaged in non-agricultural activity especially in local hotels/restaurants and as drivers some people also operates their vans/jeeps/cars as tourist vehicle. Annual income helps in identifying families below poverty line. During the survey income of a household through all possible sources was recorded. Agriculture and allied activities were reported to be the major source of income followed by non-farm wage labour, business, government service and private service.

The **Table 1.25** given below describes two sections of workers main and marginal with a third category which is non-worker; the total number of workers at district level is 3, 21,160 which is 40.82 percent out of which main workers represent 31.42 percent of the total workers, marginalized workers have a share of 9.40 percent in total workers while rest nearly 59.18 percent workers are non-workers

Table 1.25: Main workers, marginal workers and Non-workers of Project District and Tehsils

Sl. No.	District/Tehsil	Total workers	%	Main workers	%	Marginalized workers	%	Non-workers	%
1	Datia	321160	40.82	247229	31.42	73931	9.40	465594	59.18
2	Seondha	43958	37.82	35782	30.78	8176	7.03	72274	62.18

At Tehsil level the total number of workers is 43,958 of the total work population out of which main workers are 30.78 percent, marginalized workers are 7.03 percent and rest are non-workers which is 62.18 percent of the total.

The distribution of workers by four categories of economic activity at Datia district shown in **Table 1.26** indicates the total number of workers comprising of both main and marginal workers are 321,160. The proportion of cultivators is 47.61 per cent, Agriculture sector comprises 29.19 per cent, which is highest and percentage of household is lowest, 2.13 per cent.

The number of workers (main+marginal) is present in Seondha tehsil is 43,958, out of total population. Among these workers, cultivators constitute 49.19 per cent, 31.20 per cent agricultural labourers, 1.69 per cent household industry workers and 17.92 per cent other workers.

Table 1.26: Distribution of workers in four categories of economic activities at Tehsil level, 2011

SI No.	District /Tehsil	Total workers (main + marginal)	Cultivators	%	Agricultural	%	Household industry	%	Others	Others %
1	Datia	321,160	152,903	47.61	93,744	29.19	6,839	2.13	67,674	21.07
2	Seondha	43,958	21,625	49.19	13,714	31.20	741	1.69	7,878	17.92

1.30.7 Socio-economic profile of Project Affected Villages

Due to the construction of Maa Ratangarh Mutilpurpose project, a total of 24 vilaages will affected, 16 revenue villages shall be partially affected and 8 shall be fully submerged due to acquisition of land in flood plain under submergence and also land required for marginal and afflux bunds. Out of these 24 villages, 3 of them are uninhabited viz., Dangseondha, Nanat & Shikarpurwa. The demographic profile of the affected area villages is presented in **Table 1.27.** In the affected villages, the total house hold is 3621. The total population of villages is 17412 which comprises of male and female population of 9,486 and 7,926 respectively. It implies that the sex ratio is 835.5 females per thousand males. Dhubyai has maximum population (2091) whereas Pali has the minimum (12).

Table 1.27: Demographic Profile of the Project Affected Villages

S.No.	Village	Households	Population				
			Total	Male	Female	Population below 6 yrs.	Sex Ratio
1.	Atreta	315	1502	806	696	215	863.5
2.	Badokhari	314	1659	891	768	223	861.9
3.	Basaimalak	63	294	161	133	46	826.9
4.	Berchha	475	1876	1003	873	266	870.4
5.	Bisor	111	674	381	293	101	769.0
6.	Chitai	15	79	46	33	7	717.4
7.	Dangdiroli	74	483	256	227	79	886.7
8.	Dharampura	92	460	246	214	57	869.9
9.	Dhorra	122	804	439	365	137	831.4
10.	Dhorri	77	384	205	179	56	873.2
11.	Dhubyai	495	2091	1121	970	304	865.3
12.	Dongarpur	39	252	142	110	50	774.6

13.	Jiginiya	237	972	539	433	142	803.3
14.	Khamroli	247	1219	673	546	174	811.3
15.	Madikhera	5	15	11	4	2	363.6
16.	Marsenibuzurg	406	1892	1072	820	267	764.9
17.	Marsenikhurd	178	975	526	449	136	853.6
18.	Medpura	2	14	10	4	0	400
19.	Pahadi	193	1071	584	487	187	833.9
20.	Pali	3	12	6	6	3	1000
21.	Rubaha	158	684	368	316	86	858.7
	Total	**3621**	**17412**	**9486**	**7926**	**2538**	**835.5**

Source: Census of India, 2011

The caste wise distribution in the project affected villages is depicted in **Table 1.28.** It is inferred from the table that; the total population of the scheduled caste and scheduled tribes is 3103(17.8%) and 71 (0.41%) respectively. The maximum schedule cast population (80.9%) lives in village Dharampura.

Table 1.28: Details of SC and ST population of Project Affected Villages

S. No.	Villages	Schedule Caste (SC)				Schedule Tribes (ST)			
		Total	Male	Female	% of SC	Total	Male	Female	% of ST
1.	Atreta	266	146	120	17.7	0	0	0	0
2.	Badokhari	398	223	175	24.0	0	0	0	0
3.	Basaimalak	43	25	18	14.6	0	0	0	0
4.	Berchha	163	86	77	8.7	4	2	2	0.2
5.	Bisor	74	44	30	11.0	0	0	0	0
6.	Chitai	0	0	0	0	0	0	0	0
7.	Dangdiroli	0	0	0	0	0	0	0	0
8.	Dharampura	372	198	174	80.9	0	0	0	0
9.	Dhorra	84	47	37	10.4	0	0	0	0
10.	Dhorri	11	6	5	2.9	0	0	0	0
11.	Dhubyai	385	202	183	18.4	0	0	0	0
12.	Dongarpur	0	0	0	0	0	0	0	0
13.	Jiginiya	355	199	156	36.5	3	3	0	0.31
14.	Khamroli	79	43	36	6.5	4	1	3	0.3
15.	Madikhera	0	0	0	0	0	0	0	0
16.	Marsenibuzurg	429	235	194	22.7	60	28	32	3.2
17.	Marsenikhurd	193	103	90	19.8	0	0	0	0
18.	Medpura	0	0	0	0	0	0	0	0
19.	Pahadi	191	105	86	17.8	0	0	0	0
20.	Pali	0	0	0	0	0	0	0	0
21.	Rubaha	60	30	30	8.8	0	0	0	0
	Total	**3103**	**1692**	**1411**	**17.8**	**71**	**34**	**37**	**0.41**

Source: Census of India, 2011

The literacy profile of the villages is presented in **Table 1.29**. It is manifested from the Table that the total male and female literate population is 6406 and 3540 respectively, which implies

that the total literacy rate of the project affected village is 57.1 % of which the literacy rate of male and female is 36.8 % and 20.3% respectively.

From the data above, it could be inferred that Chitai has the highest literacy rate (75.9 %) while Madhikheda has the least literacy rate of 6.7 percent. The data states that Chitai has the highest female literacy rate (27.8%). Madhikheda has the lowest female literacy rate of 0%. The highest gender gap is for Marsenibuzurg (19.8%) while the least for Madhikheda (6.7%).

Table 1.29: Literacy and Gender gap of the Project Affected Villages

S. No	Village	Number of Literate			Literacy Rate (%)			Gender Gap
		Total	Male	Female	Total	Male	Female	
1.	Atreta	732	474	258	48.7	31.5	17.2	14.4
2.	Badokhari	1126	692	434	67.9	41.7	26.2	15.5
3.	Basaimalak	167	111	56	56.8	37.7	19.0	18.7
4.	Berchha	998	628	370	53.2	33.5	19.7	13.7
5.	Bisor	407	261	146	60.4	38.7	21.7	17.1
6.	Chitai	60	38	22	75.9	48.1	27.8	20.2
7.	Debhai	1328	847	481	63.5	40.5	23.0	17.5
8.	Dharampura	316	193	123	68.7	41.9	26.7	15.2
9.	Dhorra	405	246	159	50.4	30.6	19.7	10.8
10.	Dhorri	250	152	98	65.1	39.6	25.5	14.1
11.	Dirolidang	214	152	62	44.3	31.5	12.8	18.6
12.	Dongarpur	108	75	33	42.8	29.8	13.1	16.7
13.	Jiginiya	528	349	179	54.3	35.9	18.4	17.5
14.	Khamroli	600	409	191	49.2	33.5	15.7	17.9
15.	Madikhera	1	1	0	6.7	6.7	0	6.7
16.	Marsenibuzurg	1142	758	384	60.3	40.1	20.3	19.8
17.	Marsenikhurd	558	360	198	57.2	36.9	20.3	16.6
18.	Medpura	6	5	1	42.8	35.7	7.1	28.6
19.	Pahadi	538	362	176	50.2	33.8	16.4	17.4
20.	Pali	4	3	1	33.3	25	8.3	16.7
21.	Rubaha	458	290	168	66.9	42.4	24.5	17.8
	Total	**9946**	**6406**	**3540**	**57.1**	**36.8**	**20.3**	**16.4**

Source: Census of India, 2011

The worker participation in the project affected villages is elucidated in **Table 1.30**. The data above shows that Dhubyai (926) has the highest number of workers followed by Atreta (701). The work participation rate is highest in Rubaha (71.64%) and lowest in Khamroli (26.33%). There is no village where there are more females employed as labour as males.

Table 1.30: Work Participation Rate of the Project Affected Villages

S. No.	Town	Total Worker			Work Participation Rate (WPR)			Gender Gap in WPR
		Total	Male	Female	Total	Male	Female	
1.	Atreta	701	452	249	46.67	30.09	16.58	13.52
2.	Badokhari	692	494	198	41.71	29.78	11.93	17.84
3.	Basaimalak	133	97	36	45.24	32.99	12.24	20.75
4.	Berchha	691	550	141	36.83	29.32	7.52	21.80
5.	Bisor	235	198	37	34.87	29.38	5.49	23.89
6.	Chitai	32	30	2	40.51	37.97	2.53	35.44
7.	Dangdiroli	154	123	31	31.88	25.47	6.42	19.05
8.	Dharampura	190	126	64	41.30	27.39	13.91	13.48

9.	Dhorra	474	260	214	58.96	32.34	26.62	5.72
10.	Dhorri	130	120	10	33.85	31.25	2.60	28.65
11.	Dhubyai	926	610	316	44.29	29.17	15.11	14.06
12.	Dongarpur	59	58	1	23.41	23.02	0.40	22.62
13.	Jiginiya	406	286	120	41.77	29.42	12.35	17.08
14.	Khamroli	321	307	14	26.33	25.18	1.15	24.04
15.	Madikhera	8	4	4	53.33	26.67	26.67	0.00
16.	Marsenibuzurg	677	557	120	35.78	29.44	6.34	23.10
17.	Marsenikhurd	313	297	16	32.10	30.46	1.64	28.82
18.	Medpura	8	7	1	57.14	50.00	7.14	42.86
19.	Pahadi	343	310	33	32.03	28.94	3.08	25.86
20.	Pali	7	5	2	58.33	41.67	16.67	25.00
21.	Rubaha	490	248	242	71.64	36.26	35.38	0.88
	Total	**6990**	**5139**	**1851**	**40.14**	**29.51**	**10.63**	**18.88**

Source: Census of India, 2011

The village wise statistics of main and marginal workers has been abstracted and presented in **Table 1.31**. The data above states that Dhorra has highest percent of main workers (44.53%) as there is 14.43 % marginal workers in the villages. The presence of marginal worker is highest in Atreta having 33.16 per cent.

Table 1.31: Main Worker and Marginal Worker

S. No.	Town	Main Worker				Marginal Worker			
		Total	Male	Female	%	Total	Male	Female	%
1.	Atreta	203	177	26	13.52	498	275	223	33.16
2.	Badokhari	579	425	154	34.90	113	69	44	6.81
3.	Basaimalak	91	84	7	30.95	42	13	29	14.29
4.	Berchha	636	526	110	33.90	55	24	31	2.93
5.	Bisor	185	178	7	27.45	50	20	30	7.42
6.	Chitai	32	30	2	40.51	0	0	0	0
7.	Dangdiroli	144	119	25	29.81	10	4	6	2.07
8.	Debhai	458	407	51	21.90	468	203	265	22.38
9.	Dharampura	53	46	7	11.52	137	80	57	29.78
10.	Dhorra	358	225	133	44.53	116	35	81	14.43
11.	Dhorri	126	117	9	32.81	4	3	1	1.04
12.	Dongarpur	37	36	1	14.68	22	22	0	8.73
13.	Jiginiya	293	274	19	30.14	113	12	101	11.63
14.	Khamroli	286	275	11	23.46	35	32	3	2.87
15.	Madikhera	0	0	0	0.00	8	4	4	53.33
16.	Marsenibuzurg	538	519	19	28.44	139	38	101	7.35
17.	Marsenikhurd	311	296	15	31.90	2	1	1	0.21
18.	Medpura	6	6	0	42.86	2	1	1	14.29
19.	Pahadi	330	304	26	30.81	13	6	7	1.21
20.	Pali	5	5	0	41.67	2	0	2	16.67
21.	Rubaha	281	191	90	41.08	209	57	152	30.56
	Total	**4952**	**4240**	**712**	**28.44**	**2038**	**899**	**1139**	**11.70**

Source: Census of India, 2011

1.30.8 Project affected villages and families

The project affected villages are those villages within the bounds of which the surface project and ancillary works are located and which are impacted during construction and thereafter

either due to project activities or acquisition of private land and other assets, including the forest/government land and village Panchayat land which are proposed to be utilized for the project purpose in public interest. There are 16 project affected villages which are being impacted due to acquisition of private land and other assets. The total private land requirement for the project is 752.848 ha. The village-wise details of PAF are given in **Table 1.32.**

Table 1.32:Village-wise details of Land acquisition

S.No.	Village	Private Land (ha)		
		Irrigated	**Un-irrigated**	**Total**
1.	Atreta	21.86	40.3	62.16
2.	Basaimalak	73.21	3.69	76.9
3.	Berchha	6.99	3.6	10.59
4.	Bisor	1.39	9.78	11.17
5.	Dangdiroli	0.66	11.13	11.79
6.	Budhera	37.93	59.55	97.48
7.	Dongarpur	6.66	1.55	8.21
8.	Devgarh	7.441	42.211	49.652
9.	Khamroli	63.58	174.672	238.252
10.	Madikheda	11.86	32.65	44.51
11.	Marsenibuzurg	11.14	29.45	40.59
12.	Marsenikhurd	2.57	1.66	4.23
13.	Medpura	8.87	17.864	26.734
14.	Dhorri	6.24	1.31	7.55
15.	Naanat	9.65	45.7	55.35
16.	Shikarpura	4.76	2.92	7.68
	Total	274.811	478.037	752.848

1.31 BIOLOGICAL ENVIRONMENT

Madhya Pradesh is endowed with rich and diverse forest resources. Madhya Pradesh is the second largest state covering an area of 3, 08,252 sq km which is 9.38 % of the geographical area of the country. Physiographically, the state can be divided into four regions, *viz*., the low-lying areas in northern and north-west Gwalior, Malwa Plateau, Satpura and Vindhyan ranges. Total forest cover in the state is 77,414 sq. km. which is 25.11 per cent of the total geographical area. In terms of forest canopy density classes, the state has 6,563 sq km under very dense forest, 34,571 sq km under moderately dense forest and 36, 280 sq km under open forest category. Total carbon stock of the forests in the state is 695.664 million tonnes of CO2 equivalent which is 9.82 per cent of total forest carbon of the country.

The district Datia has a total geographical area of 2,902 sq km, Forest cover in the district is merely 199 sq km which further comprises of Moderately Dense forest and Open Forest having area 92 and 107 sq km, respectively. The total forest cover in the district is 6.86 per cent of total forest of the State. (**FSI, 2017**).

1.31.1 METHODOLOGY FOR THE STUDY

Following the TOR for the project "Maa Ratangarh Medium Irrigation project" of Datia district, Madhya Pradesh, by Water Resources Department, Govt. of M.P. the studies on ecology and biological environment assessment were undertaken during Winter (2017), Pre-monsoon (2018) and Monsoon (2018). A phased and consultative approach was followed to carry out the ecological assessment. The successive phases include: (i) Reconnaissance survey, (ii) on-site primary data collection for flora and fauna, and (iii) secondary data collection through review of available literature and Government documents. Wherever necessary, the required information was also collected through formal and informal discussions with the project staff, personnel of Water Resource Department and local inhabitants and natural resource users. Both the terrestrial and aquatic ecosystems were studied. The primary data were collected through extensive field visits and using ecological methods as per requirements as described in Mishra (1968).

In order to understand the composition of the vegetation, most of the plant species could be identified in the field itself whereas in case of the species that could not be identified, a herbarium specimen of the same were collected without uprooting the plant and in addition their photographs were also taken wherever necessary for identification later with the help of available published literature and flora of the region.

The vegetation of forest and grassland was described following Champion and Seth (1968) and Dabadghao and Shankarnarayan (1973), respectively. The flora and fauna of the project site were classified and identified following published Floral and Faunal literature as cited in the section "References". The conservation status of the species has been recorded following the Red Data Book of BSI, The WildLife (Protection) Act, 1972 and IUCN Red list of threatened species.

Analysis of existing flora and fauna (as described hereunder) indicates almost complete absence of endemic and threatened and endangered species of plants and animals, hence, quantitative analysis has been presented briefly. Local availability (based on field visits and interactions with the inhabitants) for each species of plants and animals has been indicated in each checklist which is an indicative of abundance and dominance of the existing species.

1.31.2 FOREST AND GRASSLAND TYPES

The vast diversity of habitats has led to occurrence of a wide variety of species in the project site. The project area belongs to the Deccan Peninsula Biogeographic Zone and 6A Deccan Peninsular-Central Highlands Biogeographic province as classified by the Ministry of Environment and Forests (2009). Following the classification of forest types given by Champion and Seth (1968), the project site included following groups of forests:

Major group II Dry Tropical, Tropical Thorn Forest

Sub-group 6B Northern Tropical Thorn forest

   C2-Ravine thorn forest- *Acacia leucophloea*

   DS 1- *Zizyphus* scrub- *Acacia leucophloea*
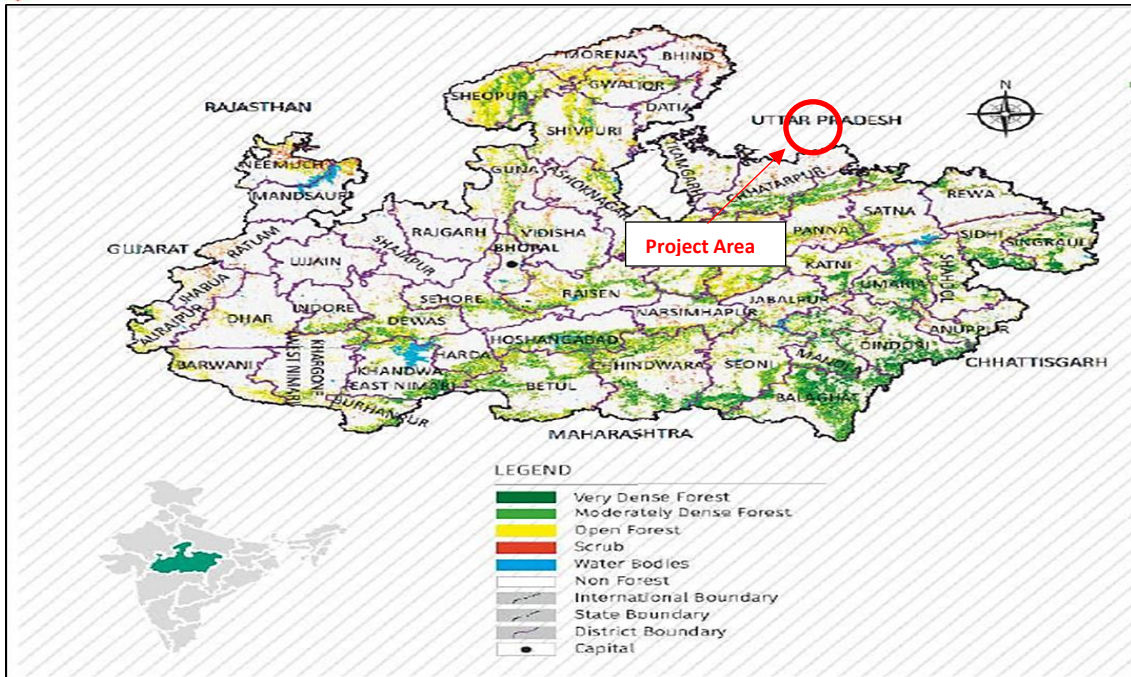
Source: India State of Forest Report, FSI 2017

Figure 1.20: Forest cover map of Madhya Pradesh showing project area

(a) Riverian site

(b) Shrubby growth in depression in low ravinous area

(c) Profound growth *Acacia leucophloea*

(d) Prostate growth of a herbaceous species **flat sandy area**

(e) Growth of moss species (*Funaria* species) on the calcareous site

(f) A climber species over *Capparis spp.* bush

Figure 1.21: An illustration of vegetation in the study area of project

1.31.3 TAXONOMIC DIVERSITY: FLORISTICS OF TERRESTRIAL ECOSYSTEM

Floral diversity refers to the diversity of plant species occurring in a specific region during particular time. It generally refers to the diversity of naturally occurring indigenous or native plants. The study area was recorded with a total of 130 plant species during the study period 2017-18. The terrestrial flora was recorded to be 100 whereas aquatic flora was 30 in number **(Fig. 1.23)**.
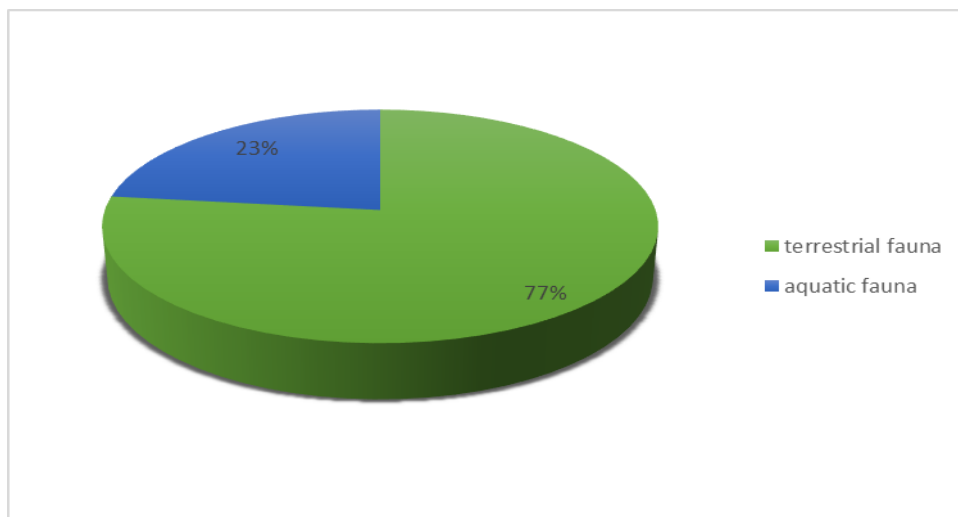
Figure 1.22: Taxonomic diversity of total flora in the project area during study period, 2017-18

1.31.3.1 Pre-Monsoon Season

While the flora of an area is represented by all the species of plants occurring in that area, the vegetation results from the dominance, diversity and evenness of the structural species. A total of 80 species were recorded inhabiting land during pre-monsoon period, 2018 (**Fig. 1.24).**

The floral angiospermic diversity (80 species) was dominated by tree species (37); the other species recorded are shrub (09), climber (04), herb (16), parasitic angiosperm (01) and grass (13) species.

Figure 1.23: Taxonomic diversity of terrestrial flora in the project area during pre-monsoon season,   2018

Table 1.33: Tree species (angiospermic) recorded in the study area during pre-monsoon period, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN CATEGORY
1.	*Acacia catechu*	Khair	Mimosaceae	Common	NA
2.	*Acacia leucophloea*	Reonjha	Mimosaceae	Abundant	NA

3.	*Acacia nilotica*	Babul	Mimosaceae	Abundant	NA
4.	*Adina cordifolia*	Haldu	Rubiaceae	Common	NA
5.	*Aegle marmelos*	Bel	Rutaceae	Very common	NA
6.	*Ailanthus excelsa*	Maharukh	Simarubiaceae	Abundant	NA
7.	*Albizzia lebbek*	Kala siris	Mimosaceae	Common	NA
8.	*Anogeissus pendula*	Kardhai	Combretaceae	Abundant	NA
9.	*Azadirachta indica*	Neem	Meliaceae	Very common	NA
10.	*Bauhinia racemosa*	Asto	Caesalpiniaceae	Common	NA
11.	*Butea monosperma*	Dhak; Palas	Papilionaceae	Very common	NA
12.	*Cordia myxa*	Dhahman	Boraginaceae	Common	NA
13.	*Dalbergia sissoo*	Shisham	Papilionaceae	Very common	NA
14.	*Diospyros melanoxylon*	Tendu	Ebenaceae	Very common	NA
15.	*Emblica officinalis*	Amla	Euphorbiaceae	Abundant	NA
16.	*Erythrina suberosa*	pangra	Papilionaceae	Very common	NA
17.	*Ficus bengalensis*	Bar	Moraceae	Rare	NA
18.	*Ficus glomerata*	Gular	Moraceae	Common	NA
19.	*Ficus hispida*	Kathgular	Moraceae	Rare	NA
20.	*Ficus religiosa*	Pipal	Moraceae	Common	NA
21.	*Ficus tomentosa*	Son pakar	Moraceae	Common	NA
22.	*Garuga pinnata*	Kekar	Burseraceae	Rare	NA
23.	*Kydia calycina*	Pula	Malvaceae	Common	NA
24.	*Lagerstroemia parviflora*	Ledi	Lytharaceae	Abundant	NA
25.	*Litsea glutinosa*	Maidalkari	Lauraceae	Common	NA
26.	*Madhuca indica*	Mahua	Sapotaceae	Very common	NA
27.	*Pithocelobium dulce*	Jungle jalebi	Mimosaceae	Abundant	NA
28.	*Pongamia pinnata*	Sonpakar	Moraceae	Common	NA
29.	*Schleichera trijuga*	Kusum	Sapindaceae	Very common	NA
30.	*Soymida febrifuga*	Rohan	Meliaceae	Common	NA
31.	*Sterculia urens*	Salai	Sterculiaceae	Common	NA
32.	*Syzygium cumini*	Jamun	Myrtaceae	Very common	NA
33.	*Terminalia arjuna*	Koha	Combetaceae	Very common	NA
34.	*Terminalia belerica*	Bahera	Combretaceae	Common	NA
35.	*Terminalia tomentosa*	Saja	Combretaceae	Common	NA
36.	*Zizyphus jujuba*	Ber	Rhamnaceae	Common	NA
37.	*Zizyphus xylopara*	Ghot	Rhamnaceae	Common	NA

Source: field survey

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.34: Shrub species (angiosperms) recorded in the study area during pre-monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Adhatoda vasica*	Adusa	Acanthaceae	Abundant	NA
2.	*Calotropis procera*	Madar	Apocynaceae	Very common	NA
3.	*Capparis aphylla*	Kareel	Capparidanceae	Abundant	NA

4.	Cassia tora	Banar	Caesalpiniaceae	Abundant	NA
5.	Colebrookea oppositifolia	Ameda	Apocynaceae	Very common	NA
6.	Lantana camara	Kur	Verbenaceae	Abundant	NA
7.	Nyctanthes arbor-tristis	Parijat	Nyctaginaceae	Very common	NA
8.	Vitex negundo	Nirgudi	Verbenaceae	Common	NA
9.	Woodfordia fruticosa	Meghapati	Lythaceae	Common	NA

*Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.35: Herb species (angiosperms) recorded in the study area during pre-monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	Achyranthus aspera	Latjeera	Amaranthaceae	Abundant	NA
2.	Ageratum conyzoides	White weed	Asteraceae	Very common	NA
3.	Ageratum houstonianum	Flossflower	Asteraceae	Abundant	NA
4.	Datura stramonium	Datura	Solanaceae	Rare	NA
5.	Desmodium pulchellum	Chipati	Papilionaceae	Abundant	NA
6.	Desmodium spp.	?	Papilionaceae	Common	-
7.	Dicliptera bupleuroides	?	Acanthaceae	Very common	NA
8.	Drymeria cordata	Pithpara	Caryophyllaceae	Common	NA
9.	Eclipta procera	Dhamira	Asteraceae	Common	NA
10.	Eregiron sp.	?	Asteraceae	Rare	-
11.	Oxalis corniculata	Amrit Sak	Oxalidaceae	Very common	NA
12.	Parthenium hysterophorus	Gajar ghas	Asteraceae	Abundant	NA
13.	Sonchus asper	Southistle	Asteraceae	Very common	NA
14.	Triumfetta rhomboidea	Burweed	Tiliaceae	Rare	NA
15.	Xanthium strumarium	Godhru	Asteraceae	Abundant	NA
16.	Zornia diphylla	Jimgari	Papilionaceae	Common	NA

*Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.
NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.36: Climber species (angiosperms) recorded in the study area during pre-monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	Abrus precatorius	Ratti	Papilionaceae	Common	NA NF
2.	Cryptolepis buchnania	Nagbel	Combretaceae	Rare	NA NF
3.	Tinospora cordifolia	Giloi	Menispermaceae	Common	NA
4.	Ventilago aciculata	Qyuti	Rhamnaceae	Rare	NA NF

Source: *field survey*

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list but is in the Catalogue of Life; NF= not available in Catalogue of Life,

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.37: Grass species (angiosperm) recorded in the study area during pre-monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Agrostis spp.*	?	Poaceae	Very common	-
2.	*Apluda mutica*	Phuli	Poaceae	Common	NA
3.	*Aristida sp.*	Thani	Poaceae	Rare	NA
4.	*Cenchrus ciliaris*	Sen	Poaceae	Common	NA
5.	*Chrysopogon fulvus*	Ghoriya	Poaceae	Common	NA
6.	*Cymbopogon sp.*	Rusa	Poaceae	Rare	NA
7.	*Cynodon dactylon*	Dub	Poaceae	Abundant	NA
8.	*Heteropogon contortus*	Kumariya	Poaceae	Abundant	NA
9.	*Imperata cylindrica*	Chhir	Poaceae	Very common	NA
10.	*Saccharum munja*	Muj	Poaceae	Common	NA
11.	*Saccharum spontaneum*	Kans	Poaceae	Common	NA
12.	*Themeda quadrivalvis*	Guner	Poaceae	Common	NA
13.	*Thysanolaena maxima*	Phulbahari	Poaceae	Rare	NA

Source: *field survey*

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.38: Parasitic angiosperms recorded in the study area during pre-monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Cuscuta reflexa*	Amarbel	Convolvulaceae	Common	NA

Source: *field survey*

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

1.31.3.2 Monsoon Season

The life form category wise floral diversity during monsoon in given **Figer 1.25** during monsoon season, a total of 99 species were recorded inhabiting land. Of these, 08 species belong to non-flowering plant category and 91 to flowering plant category. The details of non-flowering plant species are given in **Table 1.39.** No gymnospermic species was recorded in the project site.

Table 1.39: Non-flowering plant species in the study area during monsoon season, 2018

S. NO.	SCIENTIFIC NAME	LOCAL/ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN CATEGORY
(A) BRYOPHYTES					
1	*Anthocros sp.*		Anthoceroceae	Rare	-
2	*Funaria spp.*		Funariaceae	Common	-
3	*Marchantia spp.*		Marchantiaceae	Rare	-

4	*Plagiochasma spp.*		Plagiochasmaceae	Common	-
5	*Riccia spp.*		Ricciaceae	Common	-
	(B) PTERIDOPHYTES				
1	*Adiantum sp.*		Adiantaceae	Common	-
2	*Pleopeltis sp.*		Pleopeltae	Common	-
3	*Pteris sp.*		Pteridae	Common	-
	(C) GYMNOSPERMS				
	Not recorded				

Source: *field survey*

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.

Among flowering plant category, Asteraceae, Fabaceae and Poaceae were recorded as dominant family. The floral angiospermic diversity (91 species) was dominated by tree species (37); the other species recorded are shrub (09), climber (05), herb (18), parasitic angiosperm (01) and grass (21) species.
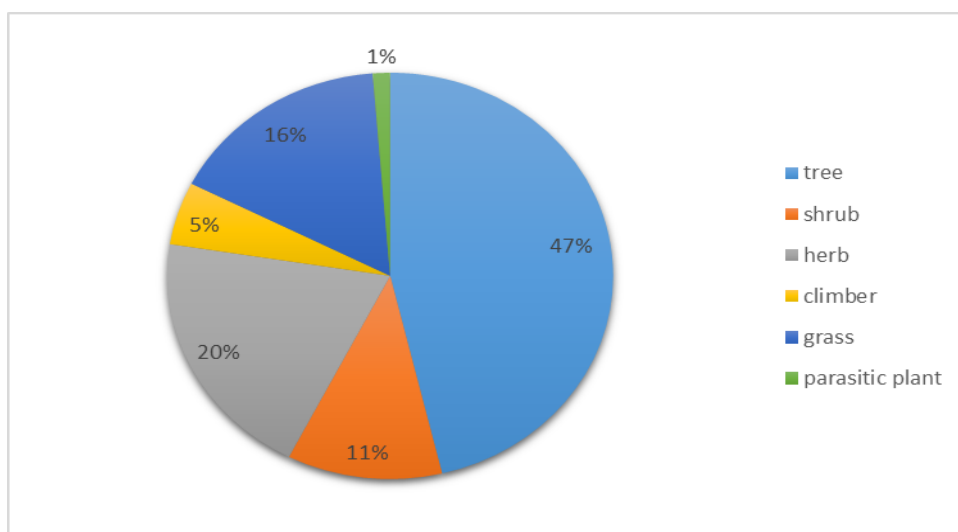

Figure 1.24: Taxonomic diversity of terrestrial flora in the project area during monsoon season, 2018

Table 1.40: Tree species (angiospermic) recorded in the study area during monsoon period, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN CATEGORY
1.	*Acacia catechu*	Khair	Mimosaceae	Common	NA
2.	*Acacia leucophloea*	Reonjha	Mimosaceae	Abundant	NA
3.	*Acacia nilotica*	Babul	Mimosaceae	Abundant	NA
4.	*Adina cordifolia*	Haldu	Rubiaceae	Common	NA
5.	*Aegle marmelos*	Bel	Rutaceae	Very common	NA
6.	*Ailanthus excelsa*	Maharukh	Simarubiaceae	Abundant	NA
7.	*Albizzia lebbek*	Kala siris	Mimosaceae	Common	NA
8.	*Anogeissus pendula*	Kardhai	Combretaceae	Abundant	NA
9.	*Azadirachta indica*	Neem	Meliaceae	Very common	NA

10.	*Bauhinia racemosa*	Asto	Caesalpiniaceae	Common	NA
11.	*Butea monosperma*	Palas	Papilionaceae	Very common	NA
12.	*Cordia myxa*	Dhahman	Boraginaceae	Common	NA
13.	*Dalbergia sissoo*	Shisham	Papilionaceae	Very common	NA
14.	*Diospyros melanoxylon*	Tendu	Ebenaceae	Very common	NA
15.	*Emblica officinalis*	Amla	Euphorbiaceae	Abundant	NA
16.	*Erythrina suberosa*	pangra	Papilionaceae	Very common	NA
17.	*Ficus bengalensis*	Bar	Moraceae	Rare	NA
18.	*Ficus glomerata*	Gular	Moraceae	Common	NA
19.	*Ficus hispida*	Kathgular	Moraceae	Rare	NA
20.	*Ficus religiosa*	Pipal	Moraceae	Common	NA
21.	*Ficus tomentosa*	Son pakar	Moraceae	Common	NA
22.	*Garuga pinnata*	Kekar	Burseraceae	Rare	NA
23.	*Kydia calycina*	Pula	Malvaceae	Common	NA
24.	*Lagerstroemia parviflora*	Ledi	Lytharaceae	Abundant	NA
25.	*Litsea glutinosa*	Bollygum	Lauraceae	Common	NA
26.	*Madhuca indica*	Mahua	Sapotaceae	Very common	NA
27.	*Pithocelobium dulce*	Jungle jalebi	Mimosaceae	Abundant	NA
28.	*Pongamia pinnata*	Sonpakar	Moraceae	Common	NA
29.	*Schleichera trijuga*	Kusum	Sapindaceae	Very common	NA
30.	*Soymida febrifuga*	Rohan	Meliaceae	Common	NA
31.	*Sterculia urens*	Salai	Sterculiaceae	Common	NA
32.	*Syzygium cumini*	Jamun	Myrtaceae	Very common	NA
33.	*Terminalia arjuna*	Koha	Combetaceae	Very common	NA
34.	*Terminalia belerica*	Bahera	Combretaceae	Common	NA
35.	*Terminalia tomentosa*	Saja	Combretaceae	Common	NA
36.	*Zizyphus jujuba*	Ber	Rhamnaceae	Common	NA
37.	*Zizyphus xylopara*	Ghot	Rhamnaceae	Common	NA

Source: field survey

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list;

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.41: Shrub species (angiosperms) recorded in the study area during monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Adhatoda vasica*	Adusa	Acanthaceae	Abundant	NA
2.	*Calotropis procera*	Madar	Apocynaceae	Very common	NA
3.	*Capparis aphylla*	Kareel	Capparidanceae	Abundant	NA
4.	*Cassia tora*	Banar	Caesalpiniaceae	Abundant	NA
5.	*Colebrookea oppositifolia*	Ameda	Apocynaceae	Very common	NA
6.	*Lantana camara*	Kur	Verbenaceae	Abundant	NA
7.	*Nyctanthes arbor-*	Parijat	Nyctaginaceae	Very	NA

				common	
8.	*Vitex negundo*	Nirgudi	Verbenaceae	Common	NA
9.	*Woodfordia fruticosa*	Meghapati	Lythaceae	Common	NA

***Source:** field survey*
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population. NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.42: Herb species (angiosperms) recorded in the study area during monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Achyranthus aspera*	Latjeera	Amaranthaceae	Abundant	NA
2.	*Ageratum conyzoides*	Whiteweed	Asteraceae	Very common	NA
3.	*Ageratum houstonianum*	Flossflower	Asteraceae	Abundant	
4.	*Asparagus filicinis*	Satavar	Liliaceae	Rare	NA
5.	*Astragalus sp.*	?	Caesalpiniaceae	Common	-
6.	*Cyprus rotundus*	Motha	Cyperaceae	Very common	NA
7.	*Datura stramonium*	Datura	Solanaceae	Rare	NA
8.	*Desmodium pulchellum*	Chipati	Papilionaceae	Abundant	NA
9.	*Desmodium spp.*	?	Papilionaceae	Common	-
10.	*Dicliptera bupleuroides*	?	Acanthaceae	Very common	NA
11.	*Eclipta procera*	Dhamira	Asteraceae	Common	NA
12.	*Ocimum sanctum*	Bantulsi	Lamiaceae	Common	NA
13.	*Oxalis corniculata*	?	Oxalidaceae	Very common	NA
14.	*Parthenium hysterophorus*	Gajar ghas	Asteraceae	Abundant	NA
15.	*Picrius spp.*	?	Cyperaceae	Common	-
16.	*Solanum nigrum*	Bhatkatya	Solanaceae	Very common	NA
17.	*Sonchus asper*	?	Asteraceae	Very common	NA
18.	*Xanthium strumarium*	Godhru	Asteraceae	Abundant	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.43: Climber species (angiosperms) recorded in the study area during monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Abrus precatorius*	Ratti	Papilionaceae	Common	NA NF
2.	*Cryptolepis buchnania*	Nagbel	Combretaceae	Rare	NA NF
3.	*Smilax zeylanica*	Ramdaton	Vitaceae	Common	NA NF
4.	*Tinospora cordifolia*	Giloi	Menispermaceae	Common	NA
5.	*Ventilago aciculata*	Qyuti	Rhamnaceae	Rare	NA NF

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.44: Grass species (angiosperms) recorded in the study area during monsoon season,2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Agrostis spp.*	?	Poaceae	Very common	-
2.	*Apluda mutica*	Phuli	Poaceae	Common	NA
3.	*Aristida setacea*	Thani	Poaceae	Rare	NA
4.	*Bothriochloa intermedia*	?	Poaceae	Abundant	NA
5.	*Bothriochloa pertusa*	?	Poaceae	Common	NA
6.	*Cenchrus ciliaris*	?	Poaceae	Common	NA
7.	*Chrysopogon fulvus*	Ghoriya	Poaceae	Common	NA
8.	*Cynodon dactylon*	Dub	Poaceae	Abundant	NA
9.	*Dactyloctenium aegyptium*	?	Poaceae	Very common	NA
10.	*Dichanthium annulatum*	Kel	Poaceae	Very common	NA
11.	*Digitaria spp.*	?	Poaceae	Very common	-
12.	*Elusine indica*	?	Poaceae	Common	NA
13.	*Eregrostis tenella*	Bhurbhuli	Poaceae	Very common	NA
14.	*Heteropogon contortus*	Kumariya	Poaceae	Abundant	NA
15.	*Imperata cylindrica*	Chhir	Poaceae	Very common	NA
16.	*Panicum spp.*	?	Poaceae	Common	-
17.	*Saccharum munja*	Munj	Poaceae	Common	NA
18.	*Saccharum spontaneum*	Kans	Poaceae	Common	NA
19.	*Setaria glauca*	?	Poaceae	Common	NA
20.	*Themeda quadrivalvis*	?	Poaceae	Common	NA
21.	*Thysanolaena maxima*	Phulbahari	Poaceae	Rare	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.45: Parasitic angiosperm recorded in the study area during monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL/ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Cuscuta reflexa*	Amarbel	Convolvulaceae	Common	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population
NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

1.31.3.3 Winter season

During winter season, a total of 83 species were recorded inhabiting land. The life-form category-wise floral diversity is given in **Fig. 1.26.** The floral angiospermic diversity (83 species) was dominated by tree species (37); the other species recorded are shrub (09), climber (04), herb (20), parasitic angiosperm (01) and grass (12) species.
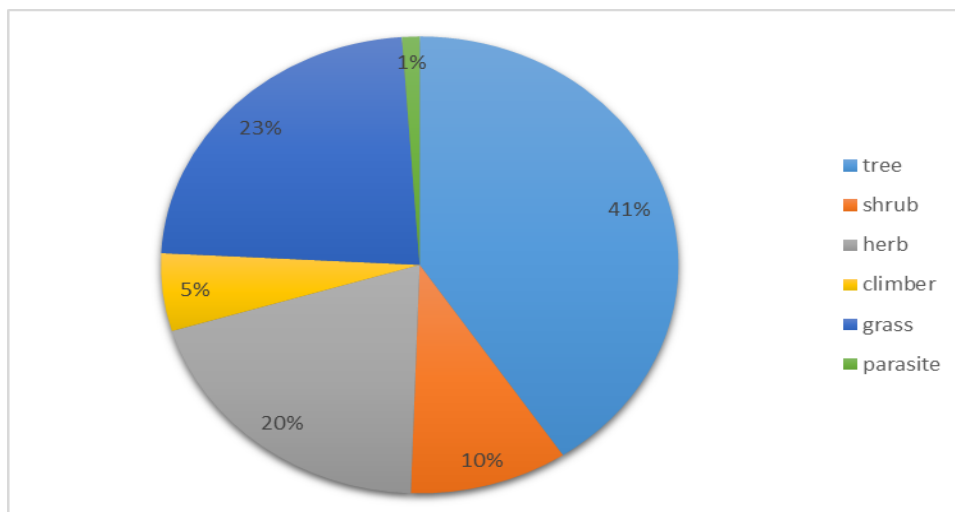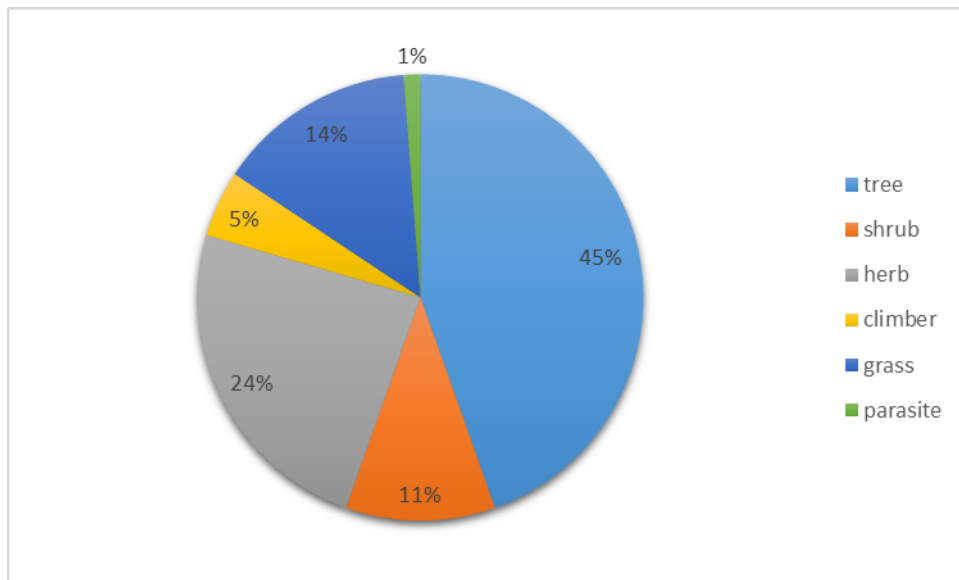
Figure 1.25: Taxonomic diversity of terrestrial flora in the project area during winter season, 2017

Table 1.46: Tree species (angiospermic) recorded in the study area during winter season period, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL/ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN CATEGORY
1.	*Acacia catechu*	Khair	Mimosaceae	Common	NA
2.	*Acacia leucophloea*	Reonjha	Mimosaceae	Abundant	NA
3.	*Acacia nilotica*	Babul	Mimosaceae	Abundant	NA
4.	*Adina cordifolia*	Haldu	Rubiaceae	Common	NA
5.	*Aegle marmelos*	Bel	Rutaceae	Very common	NA
6.	*Ailanthus excelsa*	Maharukh	Simarubiaceae	Abundant	NA
7.	*Albizzia lebbek*	Kala siris	Mimosaceae	Common	NA
8.	*Anogeissus pendula*	Kardhai	Combretaceae	Abundant	NA
9.	*Azadirachta indica*	Neem	Meliaceae	Very common	NA
10.	*Bauhinia racemosa*	Asto	Caesalpiniaceae	Common	NA
11.	*Butea monosperma*	Dhak;Palas	Papilionaceae	Very common	NA
12.	*Cordia myxa*	Dhahman	Boraginaceae	Common	NA
13.	*Dalbergia sissoo*	Shisham	Papilionaceae	Very common	NA
14.	*Diospyros melanoxylon*	Tendu	Ebenaceae	Very common	NA
15.	*Emblica officinalis*	Amla	Euphorbiaceae	Abundant	NA
16.	*Erythrina suberosa*	pangra	Papilionaceae	Very common	NA
17.	*Ficus bengalensis*	Bar	Moraceae	Rare	NA
18.	*Ficus glomerata*	Gular	Moraceae	Common	NA
19.	*Ficus hispida*	Kathgular	Moraceae	Rare	NA
20.	*Ficus religiosa*	Pipal	Moraceae	Common	NA
21.	*Ficus tomentosa*	Son pakar	Moraceae	Common	NA
22.	*Garuga pinnata*	Kekar	Burseraceae	Rare	NA
23.	*Kydia calycina*	Pula	Malvaceae	Common	NA
24.	*Lagerstroemia parviflora*	Ledi	Lytharaceae	Abundant	NA

25.	*Litsea glutinosa*	?	Lauraceae	Common	NA
26.	*Madhuca indica*	Mahua	Sapotaceae	Very common	NA
27.	*Pithocelobium dulce*	Jungle jalebi	Mimosaceae	Abundant	NA
28.	*Pongamia pinnata*	Sonpakar	Moraceae	Common	NA
29.	*Schleichera trijuga*	Kusum	Sapindaceae	Very common	NA
30.	*Soymida febrifuga*	Rohan	Meliaceae	Common	NA
31.	*Sterculia urens*	Salai	Sterculiaceae	Common	NA
32.	*Syzygium cumini*	Jamun	Myrtaceae	Very common	NA
33.	*Terminalia arjuna*	Koha	Combetaceae	Very common	NA
34.	*Terminalia belerica*	Bahera	Combretaceae	Common	NA
35.	*Terminalia tomentosa*	Saja	Combretaceae	Common	NA
36.	*Zizyphus jujuba*	Ber	Rhamnaceae	Common	NA
37.	*Zizyphus xylopara*	Ghot	Rhamnaceae	Common	NA

Source: field survey

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.47: Shrub species (angiosperms) recorded in the study area during winter season, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Adhatoda vasica*	Adusa	Acanthaceae	Abundant	NA
2.	*Calotropis procera*	Madar	Apocynaceae	Very common	NA
3.	*Capparis aphylla*	Kareel	Capparidanceae	Abundant	NA
4.	*Cassia tora*	Banar	Caesalpiniaceae	Abundant	NA
5.	*Colebrookea oppositifolia*	Ameda	Apocynaceae	Very common	NA
6.	*Lantana camara*	Kur	Verbenaceae	Abundant	NA
7.	*Nyctanthes arbor-tristis*	Parijat	Nyctaginaceae	Very common	NA
8.	*Vitex negundo*	Nirgudi	Verbenaceae	Common	NA
9.	*Woodfordia fruticosa*	Meghapati	Lythaceae	Common	NA

*Source: field survey

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972

Table 1.48: Herb species (angiosperms) recorded in the study area during winter season, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Achyranthus aspera*	Latjeera	Amaranthaceae	Abundant	NA
2.	*Ageratum conyzoides*	?	Asteraceae	Very common	NA
3.	*Ageratum houstonianum*	?	Asteraceae	Abundant	
4.	*Campanula colorata*	?	Campanulaceae	Rare	NA
5.	*Dicliptera bupleuroides*	?	Acanthaceae	Very common	NA
6.	*Drymeria cordata*	?	Caryophyllaceae	Common	NA
7.	*Eclipta procera*	Dhamira	Asteraceae	Common	NA
8.	*Eregiron sp.*	?	Asteraceae	Rare	-
9.	*Juncus bufonis*	?	Juncaceae	Rare	NA

10.	*Malva reticullata*	?	Malvaceae	Common	NA
11.	*Oxalis corniculata*	?	Oxalidaceae	Very common	NA
12.	*Oxalis latifolia*	?	Oxalidaceae	Common	NA
13.	*Parthenium hysterophorus*	Gajar ghas	Asteraceae	Abundant	NA
14.	*Polygala sp.*	?	Polygalaceae	Rare	-
15.	*Sonchus oleraceus*	?	Asteraceae	Rare	NA
16.	*Tridax procumbans*	?	Asteraceae	Common	NA
17.	*Triumfetta rhomboidea*	?	Tiliaceae	Rare	NA
18.	*Vaccaria pyramidica*	?	Caryophyllaceae	Common	NA
19.	*Viola vestita*	?	Asteraceae	Rare	NA
20.	*Xanthium strumarium*	Godhru	Asteraceae	Abundant	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, very abundant= >70% of the total population; NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972

Table 1.49: Climber species (angiosperms) recorded in the study area during winter season, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Abrus precatorius*	Ratti	Papilionaceae	Common	NA NF
2.	*Cryptolepis buchnania*	Nagbel	Combretaceae	Rare	NA NF
3.	*Tinospora cordifolia*	Giloi	Menispermaceae	Common	NA
4.	*Ventilago aciculata*	Qyuti	Rhamnaceae	Rare	NA NF

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.50: Grass species (angiosperms) recorded in the study area during winter season, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Apluda mutica*	Phuli	Poaceae	Common	NA
2.	*Aristida setacea*	Thani	Poaceae	Rare	NA
3.	*Cenchrus ciliaris*	?	Poaceae	Common	NA
4.	*Cynodon dactylon*	Dub	Poaceae	Abundant	NA
5.	*Eragrostis ciliaris*	?	Poaceae	Common	NA
6.	*Eregrostiella bifaria*	?	Poaceae	Common	NA
7.	*Imperata cylindrica*	Chhir	Poaceae	Very common	NA
8.	*Perotis indica*	?	Poaceae	Rare	NA
9.	*Saccharum munja*	Munj	Poaceae	Common	NA
10.	*Saccharum spontaneum*	Kans	Poaceae	Common	NA
11.	*Themeda quadrivalvis*	?	Poaceae	Common	NA
12.	*Thysanolaena maxima*	Phulbahari	Poaceae	Rare	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.51: Parasitic angiosperm recorded in the study area during winter season, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL/ ENGLISH NAME	FAMILY	LOCAL AVAILABILITY	IUCN STATUS
1.	*Cuscuta reflexa*	Amarbel	Convolvulaceae	Common	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN
<u>*Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.*</u>

1.31.4 ECONOMICALLY-IMPORTANT TREE SPECIES

Forests of Madhya Pradesh are rich and valuable sources of commercial timber and non-timber or non-Wood forest products (NTFPs or NWFPs). Forest products play an important role in the socio-economic development of the State and Country. In addition to meeting the bonafide needs of the villagers residing in and around forest areas, sale of forest products contributes substantially to the State exchequer. During the field survey, numbers of plant species which are of economic importance in the area were recorded. These plants are used by local people for various purposes in their day to day life. These species include timber, firewood, fruits-yielding, fodder, oil-yielding, medicinal and multi-purpose species.

A total of 20 species of economically important plants were recorded in the project area. These include 16 tree species, 02 shrub species and 01 species each of climber and herb (**Table 1.52**). Majority of species are utilized as a source of fodder, followed by species of medicinal utility.

Table 1.52: Economically-important plant species recorded in the project area

Sl. No.	SCIENTIFIC NAME	LOCAL/ENGLISH NAME	FAMILY	ECONOMIC USE**
	(A) TREE SPECIES			
1.	*Acacia catechu*	Khair	Papilionaceae	FW
2.	*A. leucophloea*	Ronjh	Fabaceae	FW
3.	*A. nilotica*	Babul	Fabaceae	T,FW
4.	*Ailanthes excelsa*	Maharukh	Simaroubaceae	FO
5.	*Angle marmelos*	Bel	Rutaceae	R, Me, FrE
6.	*Anogeissus pendula*	Kardhai	Combretaceae	FW
7.	*Azadhirachta indica*	Neem	Meliaceae	MP
8.	*Bauhinia purpurea*	Kevlor	Caesalpiniaceae	FO
9.	*Butea monosperma*	Dhak	Fabaceae	FW,LP
10.	*Dalbergia sissoo*	Shisham	Fabeaceae	T
11.	*Emblica officinale*	Amla	Euphorbiaceae	FrE, Me
12.	*Madhuca indica*	Mahua	Sapotaceae	MP
13.	*Pongamia pinnata*	Karam	Papilionaceae	O
14.	*Syzygium cumini*	Jamun	Myrtaceae	FrE,T
15.	*Tectona grandis*	Sagwan	Verbenacae	T
16.	*Terminalia belerica*	Imli	Caesalpiniaceae	MP
	(B) SHRUB SPECIES			
1.	*Adhatoda vasica*	Adhusa	Acanthaceae	Me
2.	*Calotropis procera*	Aak	Apocynaceae	R
	(C) CLIMBER			
1.	*Tinospora cordifolia*	Gurj	Menispermaceae	Me
	(D) HERBACEOUS SPECIES			
1.	*Asparagus filicinis*	Satavari	Liliaceae	Me

Source: field survey
**Economic Use: FW= Firewood, T=Timber, FO=Fodder, R= Religious,
Me=Medicinal, FrE= Fruit edible, MP=Multi-purpose, O=Oil-Yeilding

1.31.5 COMMUNITY STRUCTURE (QUANTITATIVE)

1.31.5.1 METHODOLOGY

To understand the community composition and profile of vegetation of the study area, quadrat-based sampling has been carried out. The size and number of quadrats needed were determined using the species-area curve method (Misra, 1968). A total of three season surveys (winter (2017), Pre-monsoon (2018) and Monsoon (2018)) have been carried out to enumerate the seasonal variation in species composition, especially in shrub and herb flora, and to evaluate maximum species. The entire study area was divided in grids of 5 km X 5 km and thereafter 25 % of the grids were randomly selected for phyto-sociological study. The sampling consisted with randomly placed quadrat of 10 x 10 m for tree, 5 x 5 m for shrub and 1 x 1 m for herb species around the same sampling locations. All the quadrats were spatially distributed so as to minimize the autocorrelation among the vegetation. In this study a total of 20 quadrats were laid down for tree (05 in each location) and 40 for shrub (10 at each location) and 100 for herb (25 in each location) at three sampling locations. The data on vegetation were quantitatively analyzed for density, frequency and abundance as per Curtis and McIntosh (1950). The Importance Value Index (IVI) for trees was determined as the sum of relative density, relative frequency and relative dominance (Curtis 1959).

The data thus collected, were analyzed for frequency, density, total basal cover and Importance Value Index (IVI) following standard ecological formula.

1.31.5.2 SAMPLING LOCATIONS

Owing to large variation in topography, soils, disturbances of different frequency and magnitude, climate and biotic pressure, the vegetation showed patchiness with contagious type of distribution. It can be described as a rough grain mixture and, hence, restricted random sampling procedure was used for collection of quantitative data. However, for the collection of data on floristic composition, the entire area was extensively surveyed by trekking haphazardly in the forest and non-forest areas with a view to collect as many species as possible.

From the **Tables 1.53** to **1.63,** it is evident that among the tree species based on IVI, *Dalbergia sissoo* dominated the top layer, followed by *Lagerstromia parviflora.* Among shrubs, *Colebrookea oppositifolia* dominated the under storey shrub layer. Among herbs, during monsoon, *Ageratum conyzoides* and Chrysopogon fulvus dominated the herb layer.

Table 1.53: Community structure (quantitative) in the study area during pre-monsoon season, 2018

PLANT SPECIES	FREQUENCY (%)	DENSITY (Individual/ha)	ABUNDANCE	TOTAL BASAL COVER (m²/ha)	IVI
TREE SPECIES					
Acacia leucophloea	60.00	17.10	1.0	0.76	12
Albizzia lebbek	30.00	15.00	1.0	2.00	20
Anogeissus pendula	52.20	10.75	1.5	2.46	20
Azadirachta indica	48.00	18.00	1.0	2.40	25

Butea monosperma	46.00	16.50	2.5	1.50	12
Dalbergia sissoo	56.00	18.00	2.0	0.80	52
Diospyros melanoxylon	45.00	16.40	1.5	0.70	13
Erythrina suberosa	34.00	12.00	1.5	1.30	25
Lagerstroemia parviflora	56.00	14.00	1.5	0.75	28
Pithocellobium dulce	54.00	10.00	1.5	0.72	20
Pongamia pinnata	30.00	14.00	1.5	0.45	20
Terminalia tomentosa	32.00	12.00	1.5	1.20	25
Zizyphus jujuba	40.00	10.00	1.5	1.20	9
Zizyphus xylopyru	30.00	9.00	1.7	1.10	9
SHRUB SPECIES					
Adhatoda vasica	34	120	3.2	3.2	38
Calotropis procera	32	140	3.0	3.0	32
Capparis aphylla	30	140	2.5	2.5	42
Cassia tora	40	305	2.5	2.5	38
Colebrookia oppositifolia	34	142	3.0	3.0	68
Lantana camara	42	146	2.8	2.8	42
Woodfordia fruticosa	25	135	2.0	2.0	20
HERB SPECIES					
Achyranthus aspera	25	175	1.5	0.15	58
Ageratum conyzoides	35	9500	2.5	0.10	54
Eregiron species	10	150	2.0	0.30	55
Parthenium hysterophorus	20	710	2.0	0.15	80
Sonchus asper	06	250	1.5	0.20	34
Xanthium strumarium	10	915	2.0	0.98	45

Table 1.54: Community structure (quantitative) in the study area during monsoon 2018

PLANT SPECIES	FREQUENCY (%)	DENSITY (Individual/ha)	ABUNDANCE	TOTAL BASAL COVER (m²/ha)	IVI
TREE SPECIES					
Acacia leucophloea	60.00	17.10	1.0	0.76	12
Albizzia lebbek	30.00	15.00	1.0	2.00	20
Anogeissus pendula	52.20	10.75	1.5	2.46	20
Azadirachta indica	48.00	18.00	1.0	2.40	25
Butea monosperma	46.00	16.50	2.5	1.50	12
Dalbergia sissoo	56.00	18.00	2.0	0.80	52
Diospyros melanoxylon	45.00	16.40	1.5	0.70	13
Erythrina suberosa	34.00	12.00	1.5	1.30	25
Lagerstroemia parviflora	56.00	14.00	1.5	0.75	28
Pithocellobium dulce	54.00	10.00	1.5	0.72	20
Pongamia Pinnata	30.00	14.00	1.5	0.45	20
Terminalia tomentosa	32.00	12.00	1.5	1.20	25
Zizyphus jujuba	40.00	10.00	1.5	1.20	20
Zizyphus xylopyru	32.00	9.00	1.7	1.10	10

SHRUB SPECIES					
Adhatoda vasica	34	120	3.2	3.2	38
Calotropis procera	32	140	3.0	3.0	32
Capparis aphylla	30	140	2.5	2.5	42
Cassia tora	40	305	2.5	2.5	35
Colebrookia oppositifolia	34	142	3.0	3.0	68
Lantana camara	42	146	2.8	2.8	95
Woodfordia fruticosa	25	135	2.0	2.0	20
HERB SPECIES					
Ageratum conyzoides	30	8500	2.8	0.16	42
Chrysopogon fulvus	44	10530	2.6	0.15	42
Cynodont dactylon	40	12150	2.3	0.14	37
Desmodium pulchellum	20	1800	2.5	1.38	28
Dichanthium annulatum	16	1200	2.0	1.24	36
Heteropogon contortus	44	12250	2.6	0.18	38
Setaria glauca	30	2200	3.2	1.41	30
Sonchus asper	10	750	1.8	0.94	19
Xanthium strumarium	18	1350	2.2	1.40	26

Table 1.55: Community structure (quantitative) in the study area during winter 2017

PLANT SPECIES	FREQUENCY (%)	DENSITY (Individual/ha)	ABUNDANCE	TOTAL BASAL COVER (m²/ha)	IVI
TREE SPECIES					
Acacia leucophloea	60.00	17.10	1.0	0.76	12
Albizzia lebbek	30.00	15.00	1.0	2.00	20
Anogeissus pendula	52.20	10.75	1.5	2.46	20
Azadirachta indica	48.00	18.00	1.0	2.40	25
Butea monosperma	46.00	16.50	2.5	1.50	12
Dalbergia sissoo	56.00	18.00	2.0	0.80	52
Diospyros melanoxylon	45.00	16.40	1.5	0.70	13
Erythrina suberosa	34.00	12.00	1.5	1.30	25
Lagerstroemia parviflora	56.00	14.00	1.5	0.75	28
Pithocellobium dulce	54.00	10.00	1.5	0.72	20
Pongamia Pinnata	30.00	14.00	1.5	0.45	20
Terminalia tomentosa	32.00	12.00	1.5	1.20	25
Zizyphus jujuba	40.00	10.00	1.5	1.20	20
Zizyphus xylopyru	32.00	9.00	1.7	1.10	10
SHRUB SPECIES					
Adhatoda vasica	34	120	3.8	3.2	38
Calotropis procera	36	190	3.0	0.78	24
Capparis aphylla	30	140	2.5	2.5	42
Lantana camara	42	146	2.8	2.8	95
Woodfordia fruticosa	25	135	2.0	2.0	20
HERB SPECIES					
Ageratum conyzoides	35	9500	2.5	0.10	90

Parthenium hysterophorus	10	8	2.0	0.10	70
Sida acuta	06	250	1.5	0.20	38
Sonchus asper	12	750	2.0	0.94	85
Xanthium strumarium	10	925	2.0	0.98	87

1.31.5.3 Diversity and Dominance

Season plays an important role in establishment and development of floral elements.

Higher number of species has been recorded during monsoon season in both shrub and herb layers at all sampling locations. Shannon Diversity Index values were higher during monsoon seasons in both herb and shrub layers in all sampled location **Table 1.56**. A considerable gain in Shannon diversity has been recorded in both herb and shrub layers at all sampling locations during monsoon season. Concentration of Dominance (CD) was higher during monsoon seasons in shrub layers at all the sampling locations.

Table 1.56: Shannon Diversity Index and Concenteration of dominance in the floristics in the project area

Life form	Pre-monsoon		Monsoon		Winter	
	Shannon Index	*Concentration of dominance*	*Shannon Index*	*Concentration of dominance*	*Shannon Index*	*Concentration of dominance*
Tree	*1.5*	*0.05*	*1.5*	*0.05*	*1.5*	*0.05*
Shrub	*1.3*	*0.09*	*1.9*	*0.10*	*1.4*	*0.09*
Herb	*1.2*	*0.06*	*2.1*	*0.18*	*1.7*	*0.13*

1.31.6 TAXONOMIC DIVERSITY: FAUNISTICS IN TERRESTRIAL ECOSYSTEMS

The list of fauna reported are based on primary survey (observations) and multiple sources of information including the working plans of the concerned forest divisions, published articles in scientific journals, publications of multiple sources of information such as the ZSI, printed books on fauna, and wildlife of the region. A total of 127 faunal species were recorded in the project site. These include 88 non-aquatic (terrestrial) species, 02 amphibians and 37 aquatic species. (**Fig. 1.27**)

Figure 1.26: Taxonomic diversity of total fauna in the project area during study period, 2017-18

1.31.7 Pre-Monsoon Season

The faunal species recorded in the project area include: butterfly 09 species, insect 11 species, amphibian 02 species, reptile 13 species, avifauna 27 species and mammal (primate) 16 species **(Fig. 1.28).** The percentage contribution of different species is dominated by birds and mammals, followed by insects and butterflies.

Figure 1.27: Taxonomic diversity of terrestrial fauna in the project area during pre-monsoon season, 2018

Table 1.57: Butterfly species recorded in the project area during pre-monsoon season, 2018

S. No.	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	*Atrophaneura aristolochiae*	Common	NA
2.	*Byblia ilithyia*	Abundant	NA
3.	*Curetis theitis*	Common	NF
4.	*Delias eucharis*	Common	NA
5.	*Graohium nomius*	Abundant	NF
6.	*Graphium agememnon*	Abundant	NF
7.	*Jamides bochus*	Abundant	NA
8.	*Papilio demoleus*	Abundant	NF
9.	*Prosotas dubiosa indica*	Common	NF

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.58: Insect fauna recorded in the project area during pre-monsoon season, 2018

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	Grasshopper	*Acrida sp.*	Common	NA
2.	Trumpet tail	*Aisoma panorpoids*	Common	NA
3.	Giant honeybee	*Apis dorseta*	Common	NA
4.	Honey bee	*Apis indica*	Common	NA
5.	Ant	*Camponotus sp.*	Abundant	NA

6.	Mosquito	*Cuileceta longiareolata*	Common	NA
7.	Locust	*Gastrimargles marmoratus*	Common	NA
8.	Cricket	*Gryllus domesticus*	Rare	NA
9.	House fly	*Musca domestica*	Abundant	NA
10.	Green marsh hawk	*Orthetrum sabina*	Rare	NA
11.	Scorpion	*Typhlochactus mitchelli*	Rare	NA

Source: field survey

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; *NA= not assessed yet for IUCN red list*

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.59: Avifauna (bird species) recorded in the project area during pre-monsoon season, 2018

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILIBILITY	WLA SCHEDULE*	IUCN STATUS
1.	Shikra	*Accipiter badius*	Common	IV	LC
2.	Bank Myna	*Acridotheres ginginianus*	Common	IV	LC
3.	Myna	*Acridotheres tristis*	Common	IV	LC
4.	Small blue kingfisher	*Alcedo atthis*	Rare	IV	LC
5.	Asian openbill stork	*Anastomus oscitans*	Rare	IV	LC
6.	Bada Bagula	*Ardea alba*	Common	IV	LC
7.	Anjan	*Ardea cinerea*	Common	IV	LC
8.	Slender-billed gull	*Chroicocephalus genei*	Rare	IV	LC
9.	Rock pigeon	*Columba livia*	Rare	IV	LC
10.	Neelkanth	*Coracias benghalensis*	Common	IV	LC
11.	Crow	*Corvus splendens*	Common	V	LC
12.	Black drongo	*Dicrurus macrocercus*	Common	IV	LC
13.	Kathphora	*Dinopium bengalense*	Rare	IV	LC
14.	Little egret	*Egretta garzetta*	Rare	IV	LC
15.	Blackwinged kite	*Elanus caeruleus*	Rare	IV	LC
16.	Koyal	*Eudynamys scolopacea*	Rare	IV	LC
17.	Jungle owlet	*Glaucidium radiatum*	Rare	IV	LC
18.	Common Hawk-Cuckoo	*Hieracaccyx varius*	Rare	IV	LC
19.	Green bee eater	*Merops orientalis*	Common	IV	LC
20.	Cheel	*Milvus migrans*	Rare	I	LC
21.	White vulture	*Neophron percnopterus*	Rare	IV	EN
22.	Sparrow	*Passer domesticus*	Common	IV	LC
23.	Peacock	*Pavo cristatus*	Abundant	I	LC
24.	Pankaua	*Phlacrocorax niger*	Common	IV	LC
25.	Parrot	*Psittacula krameri manillensis*	Common	IV	LC
26.	Black headed myna	*Sturnus Pagodarum*	Common	IV	LC
27.	Red-wattled lapwing	*Vanellus indicus*	Common	IV	LC

***Source:** field survey*

LC= Least Concern in the IUCN catalogue; EN=Endangered

Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.

1.31.7.1 Monsoon Season

During monsoon season, a total of 125 faunal species were recorded in the project site. These include 86 non-aquatic species, 02 amphibians and 37 aquatic species. The faunal species recorded i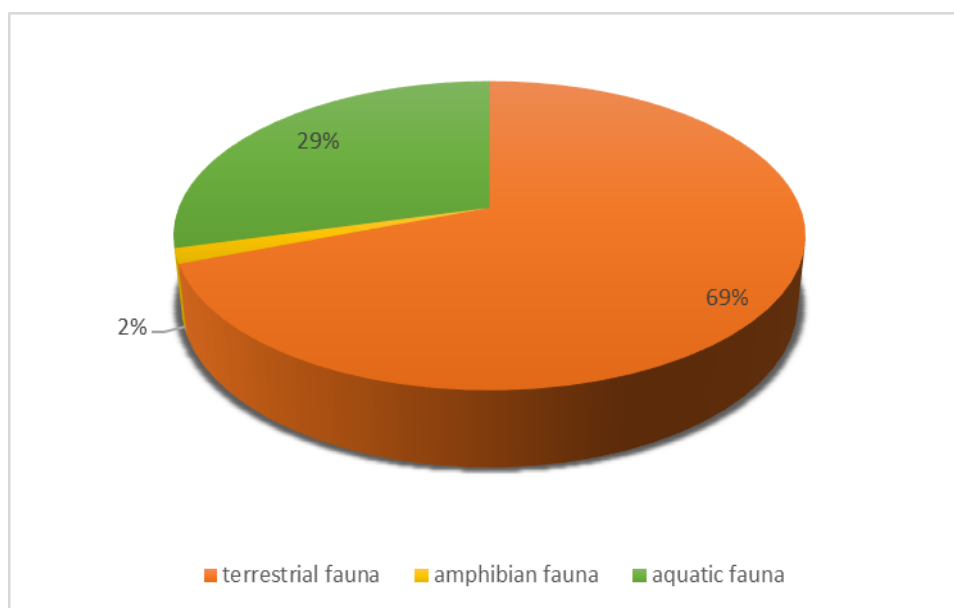n the project area includes: butterfly 14 species, insect 16 species, amphibian 02 species, reptile 13 species, avifauna 27 species and mammal (primate) 16 species **(Fig. 1.29)**. The percentage contribution of different species is dominated by birds, followed by mammals and insects and butterflies**.**
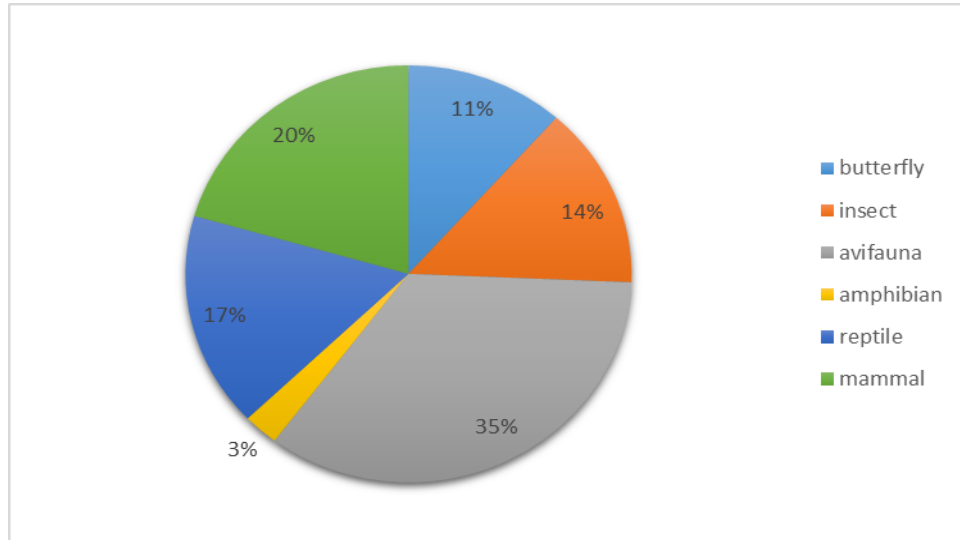

Figure 1.28: Taxonomic diversity of terrestrial fauna in the project area during monsoon season, 2018

Table 1.60: Butterfly species recorded in the project area during monsoon season, 2018

Sl. No.	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	*Atrophaneura aristolochiae*	Common	NA
2.	*Belenois aurota*	Common	NA
3.	*Byblia ilithyia*	Abundant	NA
4.	*Cepora nerissa phryne*	Common	NF
5.	*Curetis theitis*	Common	NF
6.	*Delias eucharis*	Common	NA
7.	*Eurema brigitta*	Common	LC
8.	*Graohium nomius*	Abundant	NF
9.	*Graphium agememnon*	Abundant	NF
10.	*Ixias pyrene*	Rare	NA
11.	*Jamides bochus*	Abundant	NA
12.	*Papilio demoleus*	Abundant	NF
13.	*Papilio polytes*	Common	NA
14.	*Prosotas dubiosa indica*	Common	NF

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population
NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN; LC=Least concern

Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.61: Insect fauna recorded in the project area during monsoon season, 2018

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	Grasshopper	*Acrida sp.*	Common	*NA*
2.	Trumpet tail	*Aisoma panorpoids*	Common	*NA*
3.	Giant honeybee	*Apis dorseta*	Common	*NA*
4.	Honey bee	*Apis indica*	Common	*NA*
5.	Ant	*Camponotus sp.*	Abundant	*NA*
6.	Mosquito	*Cuileceta longiareolata*	Common	*NA*
7.	Ground skimmer	*Diplocodes trivialis*	Rare	*NA*
8.	Locust	*Gastrimargles marmoratus*	Common	*NA*
9.	Cricket	*Gryllus domesticus*	Rare	*NA*
10.	House fly	*Musca domestica*	Abundant	*NA*
11.	Blister beetle	*Mylabris pustulata*	Common	*NA*
12.	Green marsh hawk	*Orthetrum sabina*	Rare	*NA*
13.	Spider	*Pholcus phalangiodes*	Common	*NA*
14.	Moth	*Spoledea recurralis*	Common	*NA*
15.	Red marsh trotter	*Tramea basilaris*	Rare	*NA*
16.	Scorpion	*Typhlochactus mitchelli*	Rare	*NA*

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population
NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.62: Avifauna (bird species) recorded in the project area during monsoon season, 2018

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILIBILITY	WLA SCHEDULE*	IUCN STATUS
1.	Shikra	*Accipiter badius*	Common	IV	LC
2.	Bank Myna	*Acridotheres ginginianus*	Common	IV	LC
3.	Myna	*Acridotheres tristis*	Common	IV	LC
4.	Small blue kingfisher	*Alcedo atthis*	Rare	IV	LC
5.	Asian openbill stork	*Anastomus oscitans*	Rare	IV	LC
6.	Bada Bagula	*Ardea alba*	Common	IV	LC
7.	Anjan	*Ardea cinerea*	Common	IV	LC
8.	Slender-billed gull	*Chroicocephalus genei*	Rare	IV	LC
9.	Rock pigeon	*Columba livia*	Rare	IV	LC
10.	Neelkanth	*Coracias benghalensis*	Common	IV	LC
11.	Crow	*Corvus splendens*	Common	V	LC
12.	Black drongo	*Dicrurus macrocercus*	Common	IV	LC
13.	Kathphora	*Dinopium bengalense*	Rare	IV	LC
14.	Little egret	*Egretta garzetta*	Rare	IV	LC
15.	Blackwinged kite	*Elanus caeruleus*	Rare	IV	LC
16.	Koyal	*Eudynamys scolopacea*	Rare	IV	LC
17.	Jungle owlet	*Glaucidium radiatum*	Rare	IV	LC

18.	Common Hawk-Cuckoo	*Hieracaccyx varius*	Rare	IV	LC
19.	Green bee eater	*Merops orientalis*	Common	IV	LC
20.	Cheel	*Milvus migrans*	Rare	I	LC
21.	White vulture	*Neophron percnopterus*	Rare	IV	EN
22.	Sparrow	*Passer domesticus*	Common	IV	LC
23.	Peacock	*Pavo cristatus*	Common	I	LC
24.	Pankaua	*Phlacrocorax niger*	Common	IV	LC
25.	Parrot	*Psittacula krameri manillensis*	Common	IV	NA
26.	Black headed myna	*Sturnus Pagodarum*	Common	IV	LC
27.	Red-wattled lapwing	*Vanellus indicus*	Common	IV	LC

*Source: field survey
NA=Not Assessed; NF=Not Found in the IUCN catalogue; LC= Least Concern; EN=Endangered
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.*

3.10.7.2 Winter Season

During winter season, a total of 105 faunal species were recorded in the project site. These include 71 non-aquatic species, 02 amphibians and 32 aquatic species. The faunal species recorded in the project area includes: butterfly 06 species, insect 07 species, amphibian 02 species, reptile 13 species, avifauna 29 species and mammal (primate) 16 species (**Fig. 1.30**). The percentage contribution of different species is dominated by mammals and birds, followed by insects and butterflies.
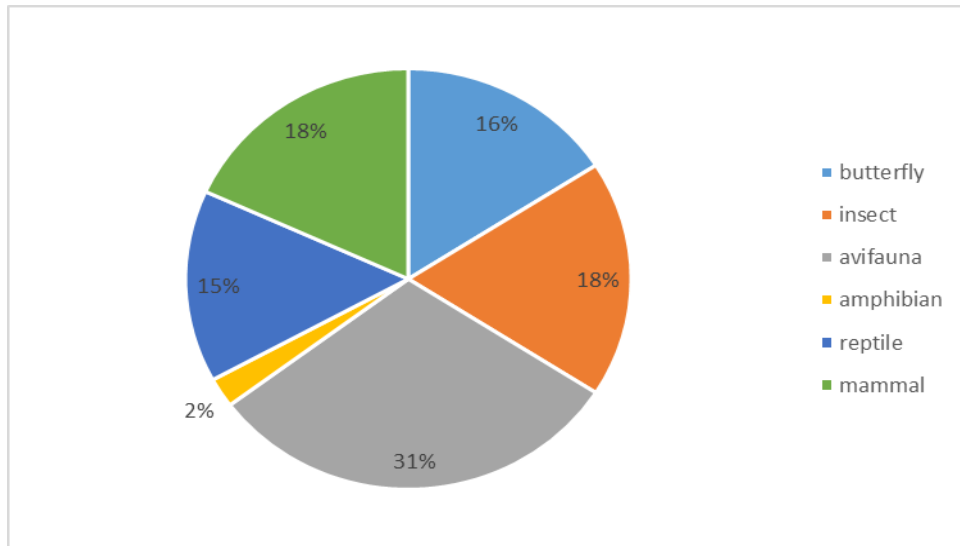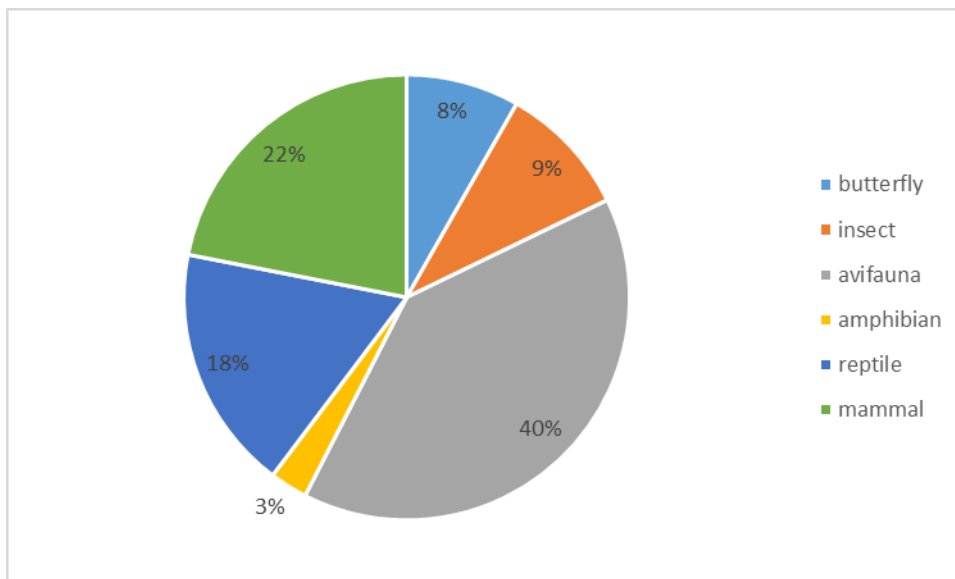

Figure 1.29: Taxonomic diversity of terrestrial fauna in the project area during winter season, 2017

Table 1.63: Butterfly species recorded in the project area during winter, 2017

Sl. No.	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	*Atrophaneura aristolochiae*	Common	NA
2.	*Belenois aurota*	Common	NA

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3.	*Graohium nomius*	Abundant	NF
4.	*Graphium agememnon*	Abundant	NF
5.	*Jamides bochus*	Abundant	NA
6.	*Prosotas dubiosa indica*	Common	NF

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population
NA= not assessed yet for IUCN red list; NF= not found in the catalogue of IUCN
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

Table 1.64: Insect fauna recorded in the project area during winter season, 2017

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	Trumpet tail	*Aisoma panorpoids*	Common	NA
2.	Giant honeybee	*Apis dorseta*	Common	NA
3.	Honey bee	*Apis indica*	Common	NA
4.	Ant	*Camponotus sp.*	Abundant	NA
5.	Cricket	*Gryllus domesticus*	Rare	NA
6.	Green marsh hawk	*Orthetrum sabina*	Rare	NA
7.	Scorpion	*Typhlochactus mitchelli*	Rare	NA

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population; NA= not assessed yet for IUCN red list
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972

Table 1.65: Avifauna (bird species) recorded in the project area during winter season, 2017

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILIBILITY	WLA SCHEDULE*	IUCN STATUS
1.	Shikra	*Accipiter badius*	Common	IV	LC
2.	Bank myna	*Acridotheres ginginianus*	Common	IV	LC
3.	Common myna	*Acridotheres tristis*	Common	IV	LC
4.	Small blue kingfisher	*Alcedo atthis*	Rare	IV	LC
5.	Asian openbill stork	*Anastomus oscitans*	Rare	IV	LC
6.	Bada Bagula	*Ardea alba*	Common	IV	LC
7.	Anjan	*Ardea cinerea*	Common	IV	LC
8.	Temminck's stint	*Calidris temminckii*	Rare	IV	LC
9.	Slender-billed gull	*Chroicocephalus genei*	Rare	IV	LC
10.	Rock pigeon	*Columba livia*	Rare	IV	LC
11.	Neelkanth	*Coracias benghalensis*	Common	IV	LC
12.	Crow	*Corvus splendens*	Common	V	LC
13.	Black drongo	*Dicrurus macrocercus*	Common	IV	LC
14.	Kathphora	*Dinopium bengalense*	Rare	IV	LC
15.	Little egret	*Egretta garzetta*	Rare	IV	LC
16.	Blackwinged kite	*Elanus caeruleus*	Rare	IV	LC
17.	Koyal	*Eudynamys scolopacea*	Rare	IV	LC
18.	Jungle owlet	*Glaucidium radiatum*	Rare	IV	LC

19.	Common crane	*Grus grus*	Rare	IV	LC
20.	Common Hawk-Cuckoo	*Hieracaccyx varius*	Rare	IV	LC
21.	Green bee eater	*Merops orientalis*	Common	IV	LC
22.	Cheel	*Milvus migrans*	Rare	I	LC
23.	White vulture	*Neophron percnopterus*	Rare	IV	EN
24.	Sparrow	*Passer domesticus*	Common	IV	LC
25.	Peacock	*Pavo cristatus*	Abundant	I	LC
26.	Pankaua	*Phlacrocorax niger*	Common	IV	LC
27.	Parrot	*Psittacula krameri manillensis*	Common	IV	LC
28.	Black headed myna	*Sturnus Pagodarum*	Common	IV	LC
29.	Red-wattled lapwing	*Vanellus indicus*	Common	IV	LC

*Source: field survey
LC= Least Concern in IUCN catalouge; EN=Endangered
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.

3.10.7.3 Amphibians and Reptiles

The list of amphibians and reptiles recorded in the project is given in Table 1.66. Both Marsh crocodile (*Crocodilus palustris*) and Gharial (*Gavialus gangeticus*) co-exist in the Sindh River but their occurrence is rare. This is the very uncommon occurrence as they are generally found separately. No complete study of reptile has been done for the area and such studies are essential for long-term conservation and protection of these species. Both Ghariyal and Marsh Crorodile are protected in Schedule I of Indian Wildlife (Protection Act), 1972 and listed as Critically Endangered and Vulnerable in IUCN Red List repectively.

Table 1.66: Amphibians and reptiles recorded in the project area during entire study period

Sl. No.	LOCAL/ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILABILITY	WLA SCHEDULE	IUCN STATUS
(A) AMPHIBIANS					
1.	Toad	*Bufo melanostictus*	Abundant	IV	LC
2.	Frog	*Rana caterbeiana*	Common	IV	LC
(B) REPTILES					
•	Krait	*Bangarus caeruleus*	Common	IV	NA
•	Girgit	*Calotes versicolor*	Common	IV	NA
•	Crocodile	*Crocodylus palustris*	Rare	I	VU
•	Gharial	*Gavialis gangeticus*	Rare	I	CR
•	Chipkali	*Hemidactylus flaviviridis*	Common	-	NA
•	Snake skink	*Lygosoma punctata*	Rare	-	NA
•	Bahmani	*Mabuya carinata*	Common	-	LC
•	Cobra	*Naja naja*	Common	II	VU
•	Lizard	*Podaris muralis*	Abundant	IV	NA
•	Dhaman	*Ptyas mucosus*	Abundant	IV	NA
•	Ajgar	*Python molurus*	Rare	I	NT
•	Pit viper	*Trimeresurus gramineus*	Rare	IV	LC
•	Goh	*Varanus bengalensis*	Common	II	LC

Source: field survey
NA=Not Assessed; NF=Not Found in the IUCN catalogue; LC= Least Concern; VU=Vulnerbale; EN=Endangered
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.

3.10.7.4 Mammals

A list of Mammals either seen or known to occur in the project area is presented in **Table 1.67**. A large number of herbivores such as Nilghai and wild boar were seen in small groups in the agricultural fields and open thorn forests. Langur and Rhesus monkey were also observed during site visit around human habitations and waterbodies.

Table 1.67: Mammal species recorded in the project area during entire study period

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILIBILITY	WLA Schedule*	IUCN STATUS
1.	Bat	*Scotophilus heathi*	Common	-	LC
2.	Bherki	*Muntiacus muntjack*	Rare	III	LC
3.	Chhuchhunder	*Suncus murinus*	Common	-	LC
4.	Fox	*Vulpes bengalensis*	Common	II	LC
5.	Gilahri	*Funambulus palmarum*	Abundant	IV	LC
6.	Hyena	*Hyaena hyaena*	Rare	III	NT
7.	Jackal	*Canis aureus*	Rare	II	LC
8.	Langur	*Semnopithecus entellus*	Rare	II	LC
9.	Monkey	*macaca mulatta*	Common	II	LC
10.	Neelgai	*Boselaphus tragocamelus*	Common	III	LC
11.	Nevla	*Herpestes edwardsii*	Common	II	LC
12.	Rabbit	*Lepus nigricollus*	Common	-	LC
13.	Rat	*Rattus rattus*	Common	V	LC
14.	Sambhar	*Cervus unicolor*	Rare	III	VU
15.	Sehi	*Hystrix indica*	Common	IV	LC
16.	Wild boar	*Sus scropha*	Common	III	LC

Source: field survey
 LC= Least Concern in the IUCN catalogue; NT=near threatened; VU=Vulnerbale; EN=Endangered
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population.

1.31.8 AQUATIC BIODIVERSITY

Aquatic biodiversity can be defined as the variety of life and the ecosystems that make up the freshwater, tidal, and marine regions of the world and their interactions. Aquatic biodiversity encompasses freshwater ecosystems, including lakes, ponds, reservoirs, rivers, streams, groundwater, and wetlands. Aquatic species studied during the three seasons were classified as Phytoplanktons, Aquatic macrophytic species and aquatic fauna (zooplanktons, annelids and molluscs)

1.31.8.1 Pre-Monsoon Season

A total of 22 plant species were recorded inhabiting aquatic sites. These include 13 species of phytoplankton and 09 species of angiosperm (**Table 1.68**).

Table 1.68: Phytoplankton and aquatic angiospermic diversity in the study area during pre-monsoon season, 2018

Sl. No.	PHYTOPLANKTON SPECIES
1.	*Anabaena spp.*
2.	*Amphora spp.*
3.	*Anacyustis spp.*
4.	*Arthrspiora spp.*
5.	*Chlorella spp.*
6.	*Chlorococcum spp.*
7.	*Diatoma spp.*
8.	*Lelothrix spp.*
9.	*Nostoc spp.*
10.	*Oscillatoria spp.*
11.	*Synedra spp.*
12.	*Tetradon spp.*
13.	*Zygnaema spp.*

Sl. No.	ANGIOSPERM SPECIES	LOCAL AVAILABILITY
1.	*Acorus calamus*	Common
2.	*Ceratophyllum sp.*	Very Common
3.	*Hydrilla sp.*	Abundant
4.	*Ipomoea aquatica*	Rare
5.	*Ipomoea sp.*	Rare
6.	*Jussiaca sp.*	Rare
7.	*Potamogeton pectinatus*	Abundant
8.	*Sesbania sp.*	Rare
9.	*Typha angustifolia*	Common

Source: *field survey*

The taxonomic diversity in this ecosystem includes zooplanktons 09 species, annelid 01 species, mollusc 01 species (**Table 1.69**).

Table 1.69: Aquatic fauna recorded in the project area during pre-monsoon season, 2018

S. no.	GROUP	SPECIES
1	Zooplankton	*Bosmina spp.*
		Cyclops spp.
		Euglaena spp.
		Filinia spp.
		Horerlla spp.
		Merocyclops spp.
		Nauplius spp.
		Bosmina spp.
		Cyclops spp.
2	Annelida	*Pheritima posthuma*
3	Mollusca	*Pila sp.*

Source: *field survey*

1.31.8.2 Monsoon Season

A total of 30 plant species were recorded inhabiting aquatic sites during monsoon season, 2018. These include 18 species of phytoplankton and 12 species of angiosperm.The aquatic fauna include 14 zooplankton, 01 annelid and 01 mollusc species **(Table 1.70).**

Table 1.70: Aquatic phytoplankton and angiospermic diversity in the study area during monsoon season, 2018

Sl. No.	PHYTOPLANKTON SPECIES
1.	*Anabaena Spp.*
2.	*Anacyustis spp.*
3.	*Arthrspiora spp.*
1.	*Chara spp.*
2.	*Chlorella spp.*
3.	*Chlorococcum spp.*
4.	*Cladophora spp.*
5.	*Cymbella spp.*
6.	*Diatoma spp.*
7.	*Euglena spp.*
8.	*Fragilaria spp.*
9.	*Lelothrix spp.*
10.	*Nostoc spp.*
11.	*Oscillatoria spp.*
12.	*Spirogyra spp.*
13.	*Spirulina spp.*
14.	*Synedra spp.*
15.	*Tetradon spp.*
16.	*Ulothrix spp.*
17.	*Volvox spp.*
18.	*Zygnaema spp.*

Sl. No.	ANGIOSPERM SPECIES	LOCAL AVAILABILITY
1.	*Acorus calamus*	Common
2.	*Ceratophyllum sp.*	Very Common
3.	*Cyperus spp.*	Very Common
4.	*Hydrilla sp.*	Abundant
5.	*Ipomoea aquatica*	Rare
6.	*Ipomoea sp.*	Rare
7.	*Jussiaca sp.*	Rare
8.	*Marsilea sp.*	Rare
9.	*Nymphaca sp.*	Rare
10.	*Potamogeton pectinatus*	Abundant
11.	*Sesbania sp.*	Rare
12.	*Typha angustifolia*	Common

Source: field survey

Table 1.71: Aquatic fauna recorded in the project area during monsoon season

S. no.	GROUP	SPECIES
1	Zooplankton	*Bosmina spp.*
		Cyclops spp.
		Cypris spp.
		Daphnia spp.
		Euglaena spp.
		Filinia spp.
		Horerlla spp.
		Macrothrix spp.
		Merocyclops spp.
		Nauplius spp.
		Paramecium Caudatum
		Vorticella sp.
		Bosmina spp.
		Cyclops spp.
2	Annelida	*Pheritima posthuma*
3	Mollusca	*Pila sp.*

1.31.8.3 Winter Season

During winter season, total of 19 plant species were recorded inhabiting aquatic sites. These include 12 species of phytoplankton and 07 species of angiosperm (**Table 1.72**).

Table 1.72: Phytoplankto and aquatic angiospermic diversity in the study area during winter season, 2017

Sl. No.	PHYTOPLANKTON SPECIES
1.	*Anabaena Spp.*
2.	*Anacyustis spp.*
3.	*Arthrspiora spp.*
4.	*Chlorella spp.*
5.	*Chlorococcum spp.*
6.	*Diatoma spp.*
7.	*Lelothrix spp.*
8.	*Nostoc spp.*
9.	*Oscillatoria spp.*
10.	*Synedra spp.*
11.	*Tetradon spp.*
12.	*Zygnaema spp.*

Sl. No.	ANGIOSPERM SPECIES	LOCAL AVAILABILITY
1.	*Acorus calamus*	Common
2.	*Ceratophyllum sp.*	Very Common
3.	*Hydrilla sp.*	Abundant
4.	*Ipomoea aquatica*	Rare
5.	*Jussiaca sp.*	Rare
6.	*Potamogeton pectinatus*	Abundant
7.	*Typha angustifolia*	Common

Source: field survey

The taxonomic diversity of fauna in this ecosystem includes zooplanktons 09 species, annelid 01 species, mollusc 01 species and fishes 16 species (**Table 1.73**).

Table 1.73: Aquatic fauna recorded in the project area during winter season, 2017

S. no.	GROUP	SPECIES
1	Zooplankton	*Bosmina spp.*
		Cyclops spp.
		Euglaena spp.
		Filinia spp.
		Horerlla spp.
		Merocyclops spp.
		Nauplius spp.
		Bosmina spp.
		Cyclops spp.
2	Annelida	*Pheritima posthuma*
3	Mollusca	*Pila sp.*

1.31.9 Fish Diversity

The documentation of fishery resource was done covering three seasons – monsoon (2018), Winter (2017) and Pre-monsoon (2018). The information on piscine diversity was collected for the rivers of the project area through experimental fishing conducted at the selected sites using cast and gill nets, fishes caught by the local fishermen, market survey at fish markets located at Seondha, published data and opinions of the active fishermen and experts.

Most of the fish species recorded from the river Sindh are common to the rivers of Indo-Gangetic river systems. **(Table 1.74)** The important commercial fish species in the river are *Cirrhinus mrigala*, *Catla catla*, L*abeo rohita* and *Labeo calbasu.* However, fishing is prohibited during rainy season due to breeding period of fishes.

Table 1.74Ichthyofauna (fish species) recorded in the project area during entire study period, 2017-18

Sl. No.	LOCAL/ ENGLISH NAME	SCIENTIFIC NAME	LOCAL AVAILABILITY	IUCN STATUS
1.	Catla	*Catla catla*	Common	NA
2.	Channa	*Channa marulius*	Very Common	LC
3.	Sol	*Channa striata*	Rare	LC
4.	Chal	*Chela laubuca*	Rare	NA
5.	Mrigal	*Cirrhina mrigala*	Common	NA
6.	Common Carp	*Cyprinus carpio*	Common	VU
7.	Bata	*Labeo bata*	Common	LC
8.	Kalbos	*Labeo calbasu*	Common	LC
9.	Krusa	*Labeo gonius*	Common	LC
10.	Rohu	*Labeo rohita*	Abundant	LC
11.	Tengra	*Mystus cavacius*	Very Common	*NA*
12.	Chital	*Notopterus chitala*	Very Common	LC
13.	Kotra	*Punctius sarana*	Common	NA
14.	Kotri	*Punctius sophor*	Common	NA
15.	Karwadi	*Punctius tincto*	Common	NA
16.	Bam	*Mastacembelus armatus*	Common	LC
17.	Magur	*Clarias batrachus*	Common	LC
18.	Dandai	*Rasbora daniconius*	Rare	LC
19.	Sarangi	*Lepidocephalichthys guntea*	Very common	LC
20.	Kotri	*Anabus testudineus*	Common	DD
21.	?	*Barilius bendelisis*	Common	LC
22.	?	*Barilius vagra*	Rare	LC
23.	?	*Barilius barila*	Rare	LC

Source: field survey
Rare=<20% of the total population, Common=20-50% of the total population, Abundant=50-70% of the total population, Very abundant= >70% of the total population, NA= not assessed yet for IUCN red list; LC= Least concern; NF= not found in the catalogue of IUCN
Note: The above listed species are not included in any schedule of Wild Life (Protection) Act, 1972.

1.31.10   EXISTENCE OF PROTECTED AREA NETWORK

No National Park, Sanctuary or Biosphere Reserve is situated in the project area. There is no specific barrier and corridor of the wildlife in the project site. (Raghav and Richa, 2016).

1.31.11   AGRI-HORTICULTURE IN THE PROJECT AREA

The agriculture in the project area is entirely rainfed and dry land type. It belongs to semi-arid ecosystem agro-ecological region (Bundelkhand uplands) with alluvium-derived soil. The monsoonal rains are the only source of water forirrigation of the agricultural crops which is received during July-September to about 90 per cent of the total annual rainfall.

Agriculture is the main source of employment and socio economy for the local people in the project area. Except some progressive farmers, people of the area practice traditional farming systems. The major agri-horticultural crops are as follows:

Agricultural crops

Kharif season- Paddy, Urd, Maize, Jowar, Bajra, Til and Moong.
Rabi season- Wheat, Barley, Gram, Mustard and Lentil (Masoor).

Horticultural crops

Vegetables – Cabbage, Rai, Chilli, Potato, Tomato, Radish, Pea, Garlic, Brinjal, Pumpkin, Bitter Gourd, Ridge Gourd.

Fruit species- Mango, Jamun, Ber, Amrood, Amla, Bel, Imli, Kathal, Papita, Lemon, Banana.

1.31.12   EXTENT OF BIOTIC PRESSURE ON VILLAGES ON FOREST RESOURCE

The forests in the buffer area are under biotic pressure. The local people depend on these forests for fuel wood, small timber, construction timbers and several NTFP items. Similarly the cattle populations of the area depend solely on grazing. Stall feeding is not practiced in the area. Besides these pressures, forest fire occurs repeatedly every year which destroys the humus content of the soil and also damages the regeneration.

1.31.13   NTFP COLLECTION, METHOD OF OF COLLECTION AND IMPACT ON WILDLIFE

NTFPS include leaves, seeds fruits edust collection has been obres like Tendu leaf including the fruits, gum and resin, and some medicinal plants are a major source of income generation for the villagers in these medicinal plants aren as mahua seeds, mahua leaves, tendu leaves, etc. and the other commercially important associates found in the forests are: Palas for propagation of lac, Dhaora for gum, and Khair for manufacture of kathare included in the NTFPs. Collection and selling of these NTFPs form a significant portion of the income for the villagers. However, NTFPS collection and selling is an unorganized sector and hence, accountability is a major issue.

Collection of NTFPs in an unorganized manner has a negative impact on the forest habitat. Unorganized collection leads to habitat degradation and disturbance causing food shortages for wild animals in the forest. Even, it can also lead to outbreak of forest fires.

There are numerous incidences of forest fires due to the collection of Mahua flowers. Similarly, during the collection of Kendu leaves, in order to encourage new flush of Kendu leaves, forest fires are induced. During our surveys in the villages in the buffer zones, we found most of the villagers collect the seasonal NTFPs depending on availability. They also agreed NTFP collection is an additional source of income for them.

Types of NTFP collected in the forested areas of the buffer zones

(a) Leaves

(b) Flowers

(c) Fruits

(d) Oil seeds

(e) Barks

(g) Resin

Species that are primarily collected during NTFP collection

(1) Tendu (Diospyros melanoxylon) leaves & fruits

(2) Sal (Shorea robusta) seeds, leaves & resins

(3) Karanj (Pongamia glabra) seeds

(4) Mahua (Madhuca indica) flowers and seeds

(5) Bamboo (Dendrocalamnus)

(6) Palas (Butea monosperma)

(7) Dhaora (Anogeissus latitolia)

(8) Khair (Acacia ferruginea)

(9) Kusum (Schleichera oleosa)

Collection of NTFP has been assigned to JFMC (Joint Forest Management and Protection Committee) through a resolution of Forest Department, Govt. of Madhya Pradesh. However, it is not well organized and so villagers clean the forest floor by sweeping/igniting fire, which destroy the ground vegetation, as well as restrict the regeneration of tree species. Repeated use of this method adversely impacting herbivore population. Due to the impact of this cleaning process, the ground becomes completely barren at places.

Cattle population & grazing habit heavy grazing by the cattle razing habitas may create severe food shortage for wild animals. Heavy grazing pressure forest areas may create severe layer of soil and reduce natural regeneration of the forest. According to the traditional practice the cattle from villages in the buffer zones are left to graze in the forest. Since villagers in the buffer zone keep a significant number of cattle, their activity is also higher. However, in the core areas their activity is minimal.

CHAPTER 2

2 ANTICIPATED ENVIRONMENTAL IMPACTS & MITIGATION MEASURES

In river valley projects, most of the activities occur in the construction phase and decreases significantly after the construction. The identification of the impacts, therefore, has been divided broadly into two categories, *viz.* impacts during the construction phase and impacts during operational phase. Impacts due to project location have also been discussed in the chapter. Wherever possible, the anticipated impacts have been quantified and otherwise, qualitative assessment has been undertaken.

2.1 IMPACTS DUE TO PROJECT LOCATION AND MITIGATION

The environmental impacts before the construction are identified during planning phase. This happens due to identification of the project in a location which may be susceptible to adverse impacts due to natural environment conditions. Impacts of the project due to its location are as follows:

(i)   Displacement of People

(ii)   Loss of land

(iii)   Geological Risk

(iv)   Risk due to seismicity & earthquake

2.1.1 Displacement of people

The project submergence area and the seat of the dam comprises of 1305.142 ha of forest land, 1127.218 ha of Govt. land and 752.848 ha private land, which includes settlements as well. Due to project sixteen villages shall be partially submerged and people in eight villages shall be dislocated. Thus, the project involves displacement of 3879 peoples. The location of dam has been finalized keeping in view minimum displacement of people. The displaced families shall be resettled at suitable locations and shall be adequately compensated as per provision of RFCT_LARR, 2013

2.1.2 Loss of land

Due to project, there shall be loss of 752.848 ha agricultural land and consequently loss of production from the land. The project affected families shall be adequately compensated for land loss and cost of land to be acquired as per provision under RFCT_LARR 2013. Besides this, 799.59 ha of forest land shall be diverted for project component and under submergence along with trees of mixed and teak species. For compensating, loss of forest lands Divisional Forest Officer, Datia requires compensatory Afforestation in lieu of equivalent forest land purposed to be diverted for the project. For mitigating loss due to forestland compensatory afforestation plan has been formulated, which shall be implemented by the Forest Department. The revenue land under submergence is barren /non agricultural land.

2.1.3 Geological Risk

Since, the project is in seismic zone II as per Seismic Zonation Map of India and designing of the dam and reservoir will be as per design code. Therefore, possible occurrence of earthquake shall not pose any danger to the civil structures as suitable seismic co-efficient has been

accounted for in the design. Since no underground construction is involved the chances of geological surprises are not much.

The intensity of anticipated environmental impact on geology of the area will be weak and extent of anticipated impact will be local. No impact is anticipated on the geology of the area during the operation phase

2.1.4 Risks due to seismicity and earthquake

The project area is in seismic zone II as per Seismic Zone Map 2014. For the design of earthquake resistance dam/hydraulic structures, applicable relevant standards and guidelines as per IS: 1893:2002 have been considered.

2.2 IMPACTS ON LAND ENVIRONMENT

2.2.1 Changes in land use and land cover

The land use class of forest land, agriculture land (private land) and barren land (revenue) falling in submergence shall change into waterbody while for dam seat and other project components it shall change to built-up area. The change shall be permanent and irreversible. The forest land cover within the submergence area shall reduce due to project during construction. However, due to implementation of reservoir rim, catchment area treatment plan and green belt plan there shall be improvement in vegetal cover in the project area. There shall be no change in land use and landcover of the land temporary acquired for main canal and distribution system comprising of pipes which shall be laid underground.

2.2.2 Immigration of Labour

During the construction phase congregation of approximately 1000 workers is likely to take place in the project area, for which semi-permanent / temporary accommodation would be required. Due to labour inflex, pressure on land and water resource would occur. The disposal of sewage, solid waste would be required. If the labour force is not provided with proper fuel arrangements, the pressure on adjoining forest for fuel wood may take place. To reduce the dependence on forest the project proponent / contractors shall provide alternate fuel substituting fuelwood with LPG for cooking and domestic electricity connection for lighting. Conflict between the migrants and the local population may occur for employment. To mitigate the adverse impact due to labour immigration the labourers shall be provided accommodation in labour colony equipped with safe drinking water supply and sanitation arrangement with installation of STP. Medical facilities shall be provided to workforce by establishing a small dispensary near labour colony for which provisions has been made under the EMP. The impact due to labour immigration during construction shall be of temporary nature and shall cease to exist after the completion of the work as the labour shall be repatriated from the construction site

In the operation phase the project will have full-fledged infrastructure to meet the requirement of the reduced strength of 50 project workers Labour engaged in construction activity will also move away once the project work is completed; therefore, no additional impact is expected.

2.2.3   Quarry operation and Muck Disposal

The excavated material from approach and exit channel shall be fully consumed in their filling reaches and substantially in protection bund. Out of total muck generated from tunnel 70 % shall be consumed in making aggregates while the balance 30 % shall be stacked at suitable place as reserved stock to be used in emergent situation. The stock pile shall be properly retained with the help of Random Rubble Dry stone masonry wall at the toe and area properly fenced. The excavated material from foundation and C.O.T excavation shall be fully utilized in main dam/saddle dams. Thus, muck disposal shall neither be problematic nor cause any impact on the environment.

To meet the demand of earth and clay, it is proposed to be drawn from within the reservoir area, where cultivated area shall come under submergence and from borrow area located outside the reservoir. It is advantageous to have the borrow area within the reservoir as this will not require additional acquisition of land over and above the submergence area and shall require no remedial measures on completion of dam as the borrow area within the submergence shall be naturally filled with the settling sediments in due course of time. The mitigation measures have been suggested under the borrow area plan and muck management plan under EMP.

2.2.4   Change in Land Quality including Waste Disposal

Due to excavation activities in water conductor system, dam complex and piped main canal and distribution system there shall be disturbance to the land profile which triggers land erosion. The soil erosion in the catchment area of the reservoir and transport of detached material through the drainage network generally gives rise to a series of problems, notably depletion of flow capacity, steady loss of storage capacity. The lack of proper vegetal cover is a factor to cause degradation and thereby results in severe run off/soil erosion, and subsequently premature siltation of the reservoir. Another key factor that adds to the sediment load and which contributes to soil degradation is grazing pressure. Considering the sediment rate of 0.04762 ham/ sq. km/ year a well-designed Catchment Area Treatment (CAT) Plan is essential to ameliorate the above-mentioned adverse cause and process of soil erosion. For reducing the soil erosion in the command area, Command Area Development Plan has been conceived. The project activities shall not create any waste per se. The solid waste shall generate from project and labour colony which shall be disposed in designated landfill after segregation. The sewage waste shall be disposed after treatment through STP.

Other source of waste during construction will be construction waste primarily including waste (arising out of the batching & mixing plant), slurry and washings from bins of coarse and fine aggregates etc. If not properly managed, construction waste can reduce land fertility of the project area. Increased dust also deteriorates the land fertility if proper mitigation measures are not taken. The leakage of POL and washings of workshop floors bring oil and grease with it. It shall be collected in oil separators before disposal on land. The soil contamination with oil shall be totally avoided.

2.2.5   Impact Due to Submergence

Due to submergence, the major impacts will be on river regime which will change from riverine to lacustrine state, which implies that the area of water body shall increase as the existing land use under agriculture, barren and forest shall change to water body. The change in land use shall be permanent. The increased water surface area will result in reducing the aridity of the area near the reservoir.

2.3   IMPACTS ON WATER ENVIRONMENT

2.3.1   Change in surface and ground water Quality

Stratification can limit the mixing of the water body, leading to depletion of DO levels. This can lead to reducing conditions in waters. Since the depth of the proposed reservoir is not very high, the annual variation up to MDDL would prevent formation of any significant temperature stratification. Thus, no problems related to reservoir stratification are anticipated. Enrichment of impounded water with organic and inorganic nutrients will be the main water quality problem immediately on commencement of the operation. However, this phenomenon is likely to last for a short duration of few years from the filling up of the reservoir. Therefore, any significant impact on reservoir water quality is not anticipated.

Another significant impact, which can accrue in the reservoir, is the problem of eutrophication in the reservoir. This occurs mainly due to the disposal of nutrient rich effluents from the agricultural fields. However, within the catchment, the proportion of agriculture land irrigated is low. The ago-chemical dosing is low in the area. Even in the post project phase, use of fertilizers in the project catchment area is not expected to raise significantly in view of the maximum rainfed crops being grown in the area. Considering the low fertilizer usage in the area, significant loading of nutrients is not anticipated. Thus, problems due to eutrophication are not anticipated in the proposed project

Apart from ground water recharge from the reservoir area and from application of water in command area, the quality of ground water will also improve in the entire area as the quality of surface water to be applied conforms to class "C" water as per IS:2296-1982.

2.3.2   Steps to Develop Pisciculture and recreation facilities

The reservoirs invariably offer scope for inland fish production, if managed on scientific lines and for various other kinds of enhancement leading to higher productivity and income generation for the local community. They have the advantage of enabling quick enhancement of yield due to their small size and easy maneuverability of fish stock. As per State Policy of the Fisheries, Irrigation reservoirs from 100 ha to 1000 ha water spread, shall be managed by the concerned Zila Panchayat and beyond that by the Fisheries Department. The proposed reservoir, having the productive water area of about 3149.648 ha at FRL, shall be managed under the aegis of Fisheries Department by leasing out the reservoir to the registered fishermen co-operative societies for a period of 10 years. For promoting pisciculture and to generate economical help and to maintain fishing rights of tribal, Fisheries management plan has for a budgetary provision of Rs 422 lakh has been incorporated in the EMP.

2.3.3 Change in Hydraulic Regime and Downstream Flows

The project has been conceived with a view to harness the monsoon flows for irrigation purpose, by damming the river. This shall bring a stark change in hydraulic regime of the river particularly during monsoon months. The flows downstream of the dam shall be reduced to the volume (246.95 MCM) stored behind the dam for consumptive use.

The construction of water storage project will be very beneficial for ground water recharge. This will build up the water levels and will improve the yields in the wells in the area. In the post construction stage of project, as per GEC, 1997, the quantum of irrigation water applied (237.87 MCM) during Rabi crop season shall recharge the ground water by 30% i.e., by 72.86 MCM.

2.3.4 Water Pollution Due to Disposal of Sewage

The untreated sewage and other solid waste increases, if discharged to the waterbody increases its BOD loading and render water un-potable without conventional treatment and disinfection. The project colony during construction shall be developed for 50 staff and thus house a population of about 150 people. The domestic water requirement for the project staff shall be of the order of 150 m^3/day @ 100 lpcd. Assuming that about 80% of the water supplied will be generated as sewage, i.e., 120 m^3/day. The quantum of environmental flow is not appreciable to dilute it during monsoon season when filling of dam shall take place. Thus, the disposal of untreated sewage can lead to water pollution, resulting in increase in coliforms and other various pathogens, which can lead to incidence of water borne diseases. For avoiding this situation provision of STP has been made in the EMP.

2.3.5 Water Pollution from Labour colonies/Camps and Washing Equipment

The labour colonies shall be located at appropriate place in the project area. Around 25 labourers are expected to reside in the labour colonies with their families and 75 numbers in bachelor accommodation at any given time, during the peak construction phase of the project. Proper care must be taken to manage the solid waste generated from the labour colony for a population of 150 residential persons and 10 floating population i.e. for 160 persons.

The domestic water requirement for the construction worker and the technical staff migrating into the project area is of the order of 160 m^3/day @ 100 lpcd. Assuming that about 80% of the water supplied will be generated as sewage, i.e., 128 m^3/day. The BOD load contributed by domestic sources will be about 18 mg / liter, assuming per capita BOD contribution as 45 g/day.

Thus, the disposal of untreated sewage can lead to water pollution, resulting in increase in coliforms and other various pathogens, which can lead to incidence of water borne diseases. Therefore, project authorities would be taking appropriate measures to check such disposal into the river. To avoid any deterioration in water quality due to disposal of untreated sewage from labour camps, appropriate sewage treatment facilities will be commissioned in the labour camps.

The leakage of POL and washings of workshop floors and washing of vehicle and equipment bring oil and grease with it and shall increase the concentration of oil and grease in water, if discharged into the river section. Therefore, it shall be collected in oil separators provided in

the concrete drains before disposal on water body/ land. The water and soil contamination with oil and grease shall be totally avoided. Even during construction period vigil should be taken by not allowing washing of any vehicle in the river section in the reservoir reach up-stream of the dam axis. The workshop shall be planned away from the river.

2.4   IMPACTS ON AIR ENVIRONENT

2.4.1   Change in Ambient air and GLC

The air pollution impact of excavation in ordinary earth and boulders and rock is directly dependent upon construction methodology, annual rate of excavation, mode of transport within the construction site, mode of screening and method of crushing. The air pollution sources at the proposed dam site can be broadly classified into three categories, viz. area source, line source and instantaneous point source.

Extraction of stone by various activities in dam complex area is construed as an area source which includes excavation pit(s) and activities happening in the excavation area like drilling, blasting, hauling and loading/unloading. The dust emission from these areas will be fugitive in nature. The excavator operations, loading/unloading operations will also cause dust emission though it will be confined to the area of operation of the machinery. The gaseous emission from their operation shall be minimal and limited within the mine.

Transportation of excavated material from the dam site to either dumping sites or the stone crusher unit are categorized as line source. Since the dumper movement on haul road will be within the dam complex area, no adverse impact shall be felt in the settlement area.

Blasting is the major source of instantaneous emission sources of particulate matter and NOx. The large quantity of dust will be wind borne. With the proposed control measures, the fugitive emissions will be minimized in terms of their impact on environment

2.4.1.1   Dust Dispersion Modelling for Excavation Operation

In the present study, United States Environmental Protection Agency (USEPA–42 series) approved mathematical equations have been used to predict concentrations for different operations in mining including the mineral transportation. To predict the particulate emissions, Lakes Environmental Aermod View ver. 6.2 (Air Dispersion Modelling Software) an interface based on ISCST3 - was used to predict changes in air quality i.e., maximum ground level concentration (GLC's) of Particulate Matter. Short term model options were opted for uniform emissions rates. The concentration of other gaseous pollutants i.e. SO_2 and NOx was found to be much lower than the threshold limit (80 µg/m3), the air modelling was restricted to determination of particulate matter i.e. PM_{10} in the present case. The emission factors adopted for various mining operations are mentioned below:

Emission Factor for Drilling and Blasting

For drilling operations, the default value of PM_{10} has been adopted as 0.31kg/hole.

For blasting the default value of PM_{10} has been adopted as

$EFPM_{10}$ = 0.000114 X A1.5, in kg/blast, where A is the area blasted

Emission Factor for Excavation and Material Loading

For excavation and material handling the emission factor for PM_{10} has been adopted as per USEPA – 42 series.

For Dozing Operation:

$EFPM_{10}$ (kg/hr) = 0.34 X s1.5 (%) / M1.4 (%)

Where,

$EFPM_{10}$ (kg/hr) = emission factor in kg/hr

S = silt contents in percentage by weight

M = moisture content in percentage by weight

For Material Loading:

$EFPM_{10}$ (kg/hr) = 0.34 [0.119 / M0.9]

Where,

$EFPM_{10}$ (kg/hr) = emission factor in kg/tonne

M = moisture content in percentage by weight.

Emission Factor for Material Haulage within Mine:

The emission rate is dependent on several factors which include soil properties, climatic conditions, vehicular traffic, wind forces and machinery operation. The Empirical equation for calculation of emission rate is as under.

E= k*(1.7) *(s/12) *(S/48) *(W/2.7)0.7*(W/2.7)0.7 (w/4)0.5 * (365-p/365) g/VKT

Where,

E=Emission Rate

K = Particle size multiplier

s=Silt Content of the Road surface material

S= Mean Vehicle Speed (km/hr)

W=Mean Vehicle Weight (tons)

w=Mean number of wheels

p= Number of days with at least 0.254mm of precipitation per year

Emission Factor for Stone Crusher:

The default emission factor for PM_{10} has been adopted as 0.004 kg/tonne and 0.012 kg/tonne in respect of primary and secondary crushing

The maximum GLC due to excavation activities and crushing was found to be 25.70 µg/m3, inside dam complex excavation area.

2.4.1.2 Resultant Impact

The resultant impact due to construction activities (excavation and crushing) on the ambient air quality for PM_{10} at the Dam complex is presented in **Table 2.1** which shows that, the resultant concentration level at each of the locations are within the NAAQS.

Table 2.1: Resultant levels due to excavation at dam complex

Station Name	Sampling Station	Max. Conc.	Predicted GLC (PM_{10})	Resultant concentration	NAAQS ($\mu g/m^3$)
Dam	AQ-2	46.2	25.7	71.9	100

2.4.1.3 Mitigation Measures

Following mitigation measures shall be adopted during activities to control air pollution load below the prescribed limits:

Dust generated due to drilling, blasting, ripping, and vehicular movements will be suppressed by water spraying during and after the operations.

Water sprinkling will be done on the haul road and other roads at regular intervals.

To avoid the dust generation during the drilling operations, wet drilling method will be practiced or wet drill machine will be used.

- Dust mask will also be provided to the workers.
- Proper regular maintenance of machineries will be done.
- Speed of the vehicles will be kept within the prescribed limits.
- Trucks/ dumpers will not be over loaded.
- At the feeding points stone crusher air mist spray shall be carried out and hooded conveyer belts shall be used.

2.4.2 Effects on Soil Materials, Vegetation and Human Healthy

The gaseous pollutant Oxides of Nitrogen (NOx) react in the atmosphere to form Nitrogen Dioxide (NO_2) which can have adverse effects on health, particularly among people with respiratory illness. NOx are pollutants that cause lung irritation and weaken the body's defenses against respiratory infections such as pneumonia and influenza, can cause shortness of breath and chest pains and increase a person's susceptibility to asthma.

Carbon monoxide (CO) is a product of incomplete combustion and at low concentrations it may pose a health risk and is especially dangerous to the elderly, people with cardiovascular disease or other circulation disorders, anemic individuals, young infants, and pregnant women. CO reduces the blood's oxygen carrying capacity, and, when inhaled, blocks the transport of oxygen to the brain, heart, and other vital organs in the body. Extreme levels of exposure, such as might occur due to blockages in tailpipes, can be fatal. Fetuses, newborn children, and people with chronic illnesses are especially susceptible to the effects of CO. In addition, carbon monoxide is directly linked to visual impairment, reduced work capacity and mental dexterity, poor learning ability, nausea, headaches, dizziness, and even death.

Sulfur dioxide can react in the atmosphere to form fine particles and poses the largest health risk to young children and asthmatics. Exposure to SOx can create many health problems,

including sweating, papillary constriction, muscle cramps, excessive salivation, dizziness, labored breathing, nausea, vomiting, convulsions, and unconsciousness, as well as possibly being absorbed by the skin and creating severe diarrhea. In addition, it may cause effects on the nervous system, resulting in respiratory depression. It is also quite deleterious for the environment.

Particulates are tiny solid particles consisting of particles of soot and metals which can bind to and clog the respiratory tract. These are detrimental when found in both fine ($PM_{2.5}$) and coarse (PM_{10}) forms as it accumulates in the respiratory system, and can lead to decreased lung function, respiratory disease and even death. $PM_{2.5}$ consists of particles less than one-tenth the diameter of a human hair and poses the most serious threat to human health, particularly among those with existing respiratory disorders, as they can penetrate deep into lungs. Of the pollutants emitted by off-road vehicles, particulates are of special concern because their small size makes them easily respirable and thus deliverable directly into the lungs, causing any number of the aforementioned maladies.

2.4.3 Impacts of Emissions from DG Sets used for Power during construction, if any on environment

The total requirement of construction power will be about 200 KW which shall be required at different consumption points. The power can be utilized from the existing sub-station near dam site, near village Chauki or a separate transformer shall be located for the construction power for the project work. In emergent situation resulting due to grid failure or load shedding diesel generator sets (2x 125KVA) shall be deployed for captive power generation.

Emissions from diesel generator sets are a mixture of gases primarily comprising of Carbon Monoxide (CO), Oxides of Nitrogen (NOx), unburned Hydrocarbons (HC), and soot particles i.e. particulate matter). Their impact on human health has been brought out in sub-section 2.4.2.

The emission norms in India cover CO, NOx, PM, and HC and are specified based on the number of grams of these compounds present in diesel exhaust when one kilowatt-hour of electricity is generated. These norms have been revised in December 2013 (G.S.R. 771 (E) / 11th Dec 2013 notification), its amendment vide GSR 232 (E) dated 31st March, 2014 and GSR (E) dated 7th March, 2016 and have come in force from 1st July 2016. These norms are presented in **Table 2.2.**

Table 2.2: Emissions Limits for DG Sets

Power Category	Emission Limits (g/kWh)			Smoke Limit (Light absorption co-efficient per meter)
	NOx+THC or NOx+NMHC or RHC	CO	PM	
Up to 19 kW	≤ 7.5	≤3.5	≤ 0.3	≤0.7
More than 19 kW Up to 75 kW	≤4.7	≤3.5	≤0.3	≤0.7
More than 75 kW Up to 800 kW	≤4.0	≤3.5	≤0.2	≤ 0.7

NOx also contributes to smog formation, the formation of particulate matter, acid rain, can damage vegetation and contributes to ground level ozone formation. Nitrogen oxides also upset the chemical balance of nutrients in the water, which can cause problems with the

animals and plants that are dependent upon the water, leading to reduction of the fish and shellfish population. When carbon monoxide meets oxygen, carbon monoxide is formed which fall in category of greenhouse gases which contribute to global climate change.

To mitigate adverse impact DG sets should be located from the consideration of prominent and first prominent wind direction so that on the downwind direction the human habitats are least impacted by the flue gas emissions. The norms prescribed by the CPCB in respect of fixing the minimum stack height for generator, should be strictly complied with. In no case, it should be lesser than the 20% of the under root of generator capacity in KVA added to the height of the building where it is installed

2.4.4 Pollution Due to Fuel Combustion in Equipment and Vehicle

The increased traffic load in any particular segment of the road will result into direct increase in pollutants released from the vehicles. The rate of emissions of several types of vehicles is presented in **Table 2.3**. However, the extent of these impacts, at any given time will depend upon the rate of vehicular emission within a given stretch of the road; and the prevailing meteorological conditions. The impacts will have strong temporal dependence as both factors vary with time. The temporal dependence would have diurnal, seasonal as well as long-term components.

Table 2.3: Emission factors by vehicle type (gm/km/vehicle)

CPCB/ ARAI (Automotive Research Association of India) - Emission Factor development for Indian Vehicles – 2008						
Type of vehicle	Make considered	Emission norms	Emission Factors (g/km)			
			CO	NO_2	PM_{10}	SO_2*
Trucks (HCV Diesel driven)	Post 2000	BS-II	6.00	9.30	1.24	0.03
Passenger Cars (Diesel driven)	Post 2005	BS-II	0.06	0.28	0.015	0.004
Buses (HCV Diesel driven)	Post 2005	BS-II	3.92	6.53	0.30	0.026

Note: Emission Factor of SO2 is calculated based on Sulphur content calculations considering Bharat Stage IV fuel norms

California Line Source Dispersion Model (Caline 4 ver.2.1) was used to assess the emission load for PM10 and NOx due to increased transportation. During construction phase, 300 tipper trucks (20 tons) shall be deployed on the road for carriage of muck &, construction material (cement and steel), earth for dam and crushed stone aggregate/sand. The model was run for one hour considering worst case angle. The receptors location and model results for worst case wind angle are shown in **Table2.4**. The results show that at 25 m predicted concentration is 12.4 μg/m³, which reduces to 7.7 μg/m³, 4.7 μg/m³ and 1.4 μg/m³ at 50m, 150m and 500m respectively. Thus, the impact on the pollutant level (PM_{10}) due to increased traffic due to transportation of mineral shall be minimal. The increased GLC in respect of NOx were insignificant being 0.13 μg/m³ up to 25m and 0.11 μg/m³ up to 50m and 0.10 μg/m³ up to 1km.

Table 2.4: Receptor Locations and Model Results (Worst Case Wind Angle)

Distance from the Road (m)	Incremental GLC PM	Incremental GLC NOx (μg/m³)

	$_{10}$(ug/cum)	
25	12.4	0.13
50	7.7	0.11
100	4.7	0.10
150	3.4	0.10
200	2.8	0.10
300	2.0	0.10
400	1.6	0.10
500	1.4	0.10
750	1.2	0.10
1000	1.1	0.10

Following control measures have been suggested to prevent air pollution due to the transportation activities:

- Transport trucks/tippers shall be properly maintained.
- Only PUC certificate issued vehicles shall be used.
- Avoiding of overloading of trucks beyond stipulated capacity by installing weighbridges at the check posts or near to it.
- Strict compliance of traffic rules and regulations

Operation Phase

The ambient air quality during the operation phase either at dam site or the muck disposal site is expected to improve as the fugitive dust and flue gas emission sources of air pollution shall be conspicuously absent

2.4.5 Fugitive Emissions from Various Sources

Basically, dust sources in excavation at construction site can be categorized as primary sources that generate the dust and secondary sources, which disperse the dust and carry it from place to place called as fugitive dust.

Impacts of surface excavation with or without drilling and blasting on air quality are cause for concern mainly due to fugitive emissions of particulate matter. The major operations producing dust are drilling and blasting, pit excavation, segregation and screening of material, loading and transporting. Exhaust emissions from vehicles deployed are also likely to result in inconsequential increase in the levels of SO_2, NOx, and CO.

2.4.6 Impact on Micro-Climate

Major construction activities involve surface excavation and concreting works at dam site and excavation in borrow areas. These activities shall not affect the ambient temperature, humidity, rainfall, wind speed and direction and other meteorological parameters during construction.

Wind Speed: The wind speed in any area is dependent upon local topography and is intimately connected with the development as high and low-pressure zones. The controlling factors for the pressure changes lie much beyond the mining operation in small mining area which stands inconsequential as compared to the vast extent of a region in general. Thus, no adverse impact on the regional wind speed is anticipated due to the construction activities.

Rainfall: The trend of rainfall follows a regional pattern and is mainly governed by the south west monsoon and disturbances in the Arabian Sea. The construction activities, therefore, are not likely to have any adverse impacts on rainfall pattern.

Humidity: The pattern of relative humidity depends mainly on the rainfall, wind, temperature and other weather phenomenon that are regional in behavior. The excavation activities are not likely to have any impact on the relative humidity in the surrounding. However; the humidity in the area may slightly increase due to creation of waterbody. The change in land use pattern due to submergence will have impact on the local climate due to marginal increase in humidity.

Temperature: There shall be felling of trees in the reservoir area in the last year of construction before filling of the reservoir which may cause a localized temperature increase which shall be moderated by the trees in the green belt around the reservoir periphery. The temperature pattern is a regional behavior and is not likely to be affected appreciably by the construction activity.

2.5 IMPACTS DUE TO NOISE AND VIBRATION

2.5.1 Impact on Noise Level

A cumulative effect of surface excavation activities at Dam complex generates enormous noise and vibration in the project area and its surrounding areas. Prolonged exposure to high noise levels over a period of years invariably causes permanent damage to the auditory nerve and/or its sensory components (Banerjee and Chakraborty, 2006; Krishna Murthy et al,). The irreversible damage, commonly referred as noise-induced hearing loss (NIHL), is the commonest occupational diseases amongst the construction workers especially at such sites which have multiple noise sources. Besides this the fauna of surrounding area is also affected by noise as the wildlife is more sensitive to noise and vibration than the human beings (Mathur, 2005).

Noise Due to Drilling

The drilling is contemplated to be carried out by Jack hammer rock drills with air compressor which entail a noise level of 88.0 dB(A) and will be a worst-case scenario. Nonetheless, the noise generated duty to drilling is within the standards prescribed by Occupational Safety and Health Administration (OSHA) for 8-hour exposure i.e. 90 dB (A). It is worth mentioning here that mining shall be carried in a shift of 8 hours and the equivalents noise level exposure during the shift shall be less than the safety limit of 90 dB(A),

Noise due to Blasting

Blasting generates instantaneous and impulsive noise and is site specific dependent on many factors like the dimension of the holes, type and quantity of explosive i.e. charge/delay and degree of stemming in the hole. At the blast site with the given diameter of holes and their pattern, the noise levels are expected to be in the range of 120-130 dB (A) and tend to decrease with increase in distance of receptor. As the blasting is envisaged over a fixed time in a day the blasting is considered to last for 2-3 minutes for one blasting operation depending on

the charge. The noise levels over this time would be instantaneous and short duration thus implying that impact on noise levels from blasting are not of concern.

Noise due to crushing, Screening and Loading Plant

The average noise levels generated due to proposed crushing activities will be about 88.5 dB(A) which is within the exposure limit of 90 dB(A). The crusher within the mine shall be housed in a shed to contain noise. Screening activities shall generate average noise level of about 96.5 dB (A). Workers in the noise generating zone will be provided with earmuffs/earplugs besides dust mask.

Noise due to excavation and transportation

To predict ambient noise levels due to the mining activities from various sources at different location within the mine the noise dispersion modeling has been done on the assumption that all noise sources are acting as a single source generating approximately 91 dB(A). Noise generated due to deployment of rock breaker, excavators, loaders and dump trucks are shown in **Table 2.5.**

Table 2.5: Standard Values of Noise Levels

S.No.	Machinery/ Activity	Noise Produced in dB(A) at 50 ft. from source*
1.	Excavator/Shovel	85
2.	Front end loader	85
3.	Dump Truck/ Tippers (at full throttle)	92
4	Near Haul road (while dumpers are moving)	88
5	Dozer (when dozing)	102
6	Drill machine (drilling with Jack hammer)	88
7	Aggregate processing unit / Stone Crusher (outside crusher cabin)	100
8	Aggregate processing unit / Stone Crusher (inside crusher cabin)	86

*50 feet from source = 15.24 meters

Source: U.S. Department of Transportation (Federal Highway Administration) – Construction Noise Handbook

Model for sound wave propagation during construction

For an approximate estimation of dispersion of noise in the ambient air from the point source, a standard mathematical model for sound wave propagation is used. The noise generated by equipment decreases with increased distance from the source due to wave divergence. An additional decrease in sound pressure level with distance from the source is expected due to atmospheric effect or its interaction with objects in the transmission path.

For hemispherical sound wave propagation through homogenous loss free medium, one can estimate noise levels at various locations, due to different source using model based on first principles, as per the following equation:

$LP2 = LP1 – 20 Log (r2 / r1) - AE$ ……………………………. (1)

Where,

LP2 and L P1 are the Sound Pressure Levels (SPL) at points located at r2 and r1 from the source. AE is attenuations due to Environmental conditions (E). The combined effect of the entire source can be determined at various locations by the following equation.

LP (total) = 10Log (10 (Lpa)/10 + 10 Lpb)/10 + 10 Lpc)/10 + ………)   (2)

Where Lpa, LPb, LPc are noise pressure levels at a point due to various sources.

Environment Correction (AE)

The equivalent sound pressure level can be calculated from the measured sound pressure level (Leq measured) averaged over the measurement surface area 'S' and from corrections K1 and K2 and is given by;

(Leq measured) = (Leq measured) – K1 – K2   (3)

Where,

K1 = Factor for the background noise correction. The correction was not applied in this modeling exercise, as it was not possible to measure the background noise levels by putting off machines hence it was considered as zero.

K2 = Environmental correction

In the present study dhwani PRO Version 3.6, a noise propagation modelling software developed to undertake construction, industrial and traffic noise propagation studies. A variety of scenarios can be created quickly in dhwani PRO, allowing the user to determine the impact of changing the source, layout and adding /removing the effects of shielding due to noise mitigation devices such as barriers.

Input for the model

Base Map, Point Source and Receptors

Base maps identifying the location of the site, noise sources, receptors and other important characteristics of the surrounding area is the foremost requirement. In this study jpeg raster maps created in Google map showing the locations of the construction site where the maximum excavation is to be carried out has been captured and imported for registering the map and setting up of the scale. The point source is the location where the maximum noise generating construction equipment is to be operated. The receptors are the nearby settlements where the impact of propagation of noise is to be evaluated.

Hourly noise level

Hourly nose levels observed for 24 hours at the point source have been observed and adopted in studies. The noise levels to be generated intermittently due to running of construction equipment for different hours have also been incorporated. Besides this, the background levels at the receptors have been entered the corresponding windows.

Model outputs

After running the model, the graphical results in the form of noise level contours **(Figure 4.2 and Figure 4.3)** have been produced which has been captured and exported. Besides this the output in the tabular form showing the estimated noise levels at dam site receptor owing to the impact of operation of construction machinery has been generated. **(Table 2.6)**

Table 2.6: Modelling Output

```
MODELING OUTPUT

Project Title:      NOISE MODELLING FOR MAA RATANGARH PROJECT
Project Subtitle:   IRRIGATION PROJECT MP
Client:             MPWRD
Source Noise Level: Default
--------------------------------------------------------------------------------
  Receptor          Zone            X       Y       Estimated    +Backgound* Standards   Standards
                                    meter   meter   Level dB(A)  Level dB(A)*Lday dB(A)  Lnight dB(A)
--------------------------------------------------------------------------------
  R_001             Residential area 2375.0  628.7   27.0         44.0        55.0        45.0
--------------------------------------------------------------------------------
```

Inference and Mitigation Measures

It is evident from the graphical results that the noise level of 91 dB (A) gets attenuated to 38 dB(A) and 35 dB(A) about 200m and 400 m respectively from the point source (dam site). The estimated noise levels including the background level at Maa Ratangarh project, due to running of construction machinery, shall be 44 dB (A) which is less than the standard values. The estimated noise levels including the background level at dam site receptor due to running of construction machinery, shall be 44 dB (A) which is less than the standard values.   Thus, there will be marginal impact of running of construction & transport machinery for excavation operation.

The following control measures will be adopted at the points near to the source of noise to keep the ambient noise levels below permissible limits 75 dB (A).

- Provision and maintenance of thick tree belts to screen noise.
- Avenue plantation within the project area to dampen the noise.
- Proper maintenance of noise generating transport vehicles.
- Regular noise level monitoring shall be carried out periodically for taking corrective action
- To check the noise, pollution noise filters may be erected around crushing and batching plants and regular maintenance of heavy earth vehicles may be adopted to reduce noise levels

To protect the workers from exposures to higher noise levels the following measures will be adopted.

- Provision of protective devices like ear muffs/ear plugs to those workers who cannot be isolated from the source of noise
- Reducing the exposure time of workers to the higher noise levels by rotation.
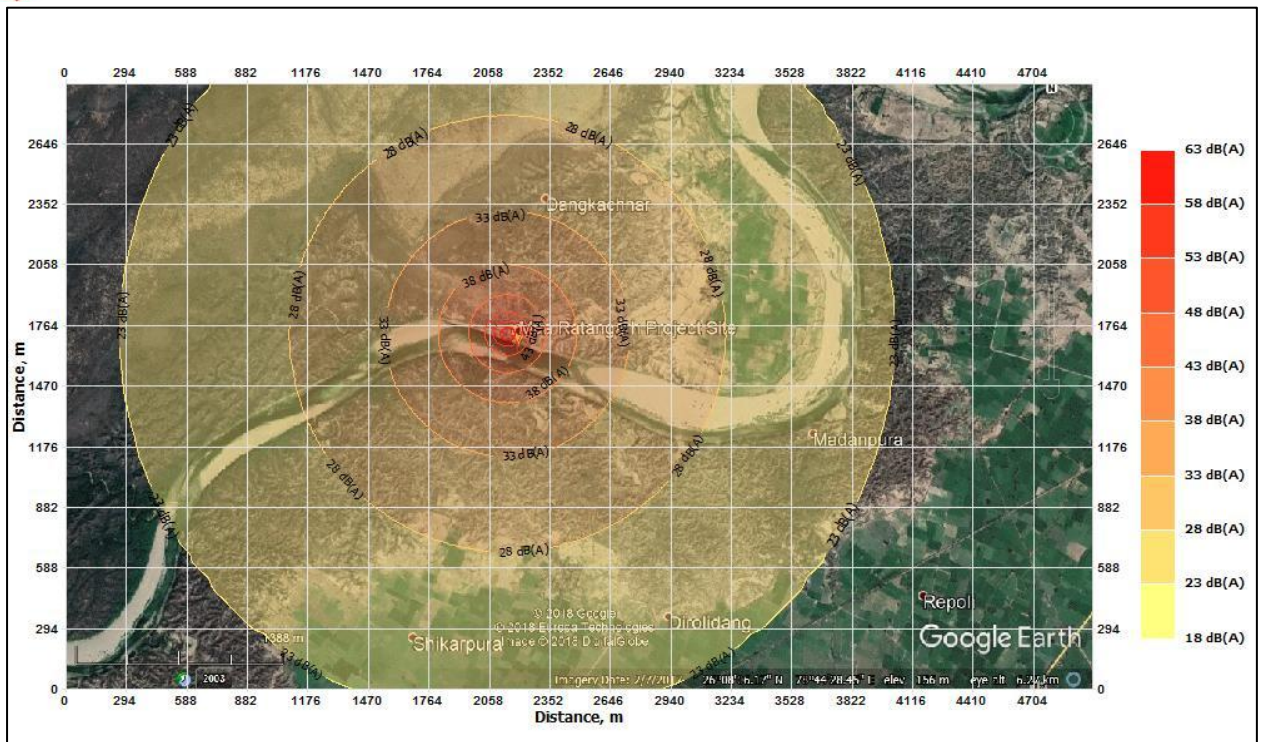
Figure 2.1: Noise Graphical Results at Dam Site

During Operation Phase

After completion of the project and during the operational phase the noise levels shall not be impacted as there are no noises emitting sources except the noise created during passing of surplus discharge through spillway, which shall persist for a few hours till the flood subsides.

At the proposed dam site, the existing leq day and night noise level is 43.50dB(A) which is mainly due to the noise generated due to rural activities and passing of vehicles. During the operation phase, due to filling of the reservoir the obtaining situation shall lead to reduction of the noise level owing to change in flow regime i.e. from riverine to lacustrine state. It is only during the opening of gates in flood season for spilling the water through spillway, the noise level shall increase.

2.5.2 Impacts due to Ground Vibration (due to blasting)

The ground vibrations, noise and fly rock constitutes the chief environmental impact of blasting. When an explosive charge detonates the chemical reaction takes place and the chemical energy is converted into shock and gas energy thereby setting prolific dynamic waves around the blast hole mainly brought by sudden acceleration of stationary rock mass. While a small portion of energy liberated during blasting is consumed in fragmentation of rock mass and fly rock apart from dissipation through ground vibration and air over pressure (noise) heat and light. The ground vibration sets the ground in transverse, longitudinal and vertical direction and which in turn causes the foundation of structure to vibrate in these directions and damage the structures.

Air overpressure is transient impulse, which traverses through the atmosphere and is both audible and inaudible and has the energy to vibrate a structure like ground vibration and is much of concern as animals are more sensitive than human being. This is mainly manifest as

energy released from unconfined explosives such as uncovered detonating cord trunk. It is also caused due to various other factors like too small burden, excessive powder factor, insufficient stemming length, incorrect drilling etc., which are controllable if properly addressed by the blaster.

The fly rock comes from face and top of bench and is often associated with improper blast design, inadequate burden, insufficient and ineffective stemming, wrong blast hole sequence. Sometimes it is caused when the explosive energy is rapidly vented through a plane of weakness in the rock. Thus, it is also controllable if properly addressed by the blaster. Thus, it is also controllable if properly addressed by the blaster

Ground vibrations are acoustic waves that propagate through rocks. Although the difference in accelerations, amplitude, particle velocities and the frequencies in three directions result into damage to structures but the peak particle velocity and frequency are normally taken into consideration for evaluating the structural response. The various aspects of ground vibration triggered by open cast blasting and consequent-damaging effects on different types of structures is usually computed based on the value of the Peak Particle Velocity (PPV) induced at the foundation of the distant structure. PPV criteria are considered the best predictor for ground vibration caused by blasting. It takes into consideration the total energy of ground motion induced around a blast and is a function of the distance of the location of blast from the gauge point and quantity of explosive per blasting. In case of surface excavation at the dam site the PPV is worked out based on various empirical formulas. In the present case, the PPV has been worked out based on following empirical equation.

$V = 880 \, (D/\sqrt{Q})^{-1.265}$ mm/s, where,

D=Distance (m) between location of blast and gauge point

Q=Quantity (kg) of explosive per blasting

The resulting value of PPV has been compared with the limiting values for dominant excitation frequency less than 8 Hz as prescribed by the Director General of Mines Safety, India (DGMS) in Circular 7 of 1997. The study shows PPV at a distance of 500m from dam site is 1.26 mm/sec. It is evident from the following **Table 2.7.**

Table 2.7 Computation of Peak Particle Velocity at Nearest Settlement from Dam Site

Name of nearest Site	Quantity of explosives / delay (kg)	Distance (D) from mine Site (m)	Peak Particle Velocity in mm/s observed	Limiting value of PPV (mm/s) prescribed by DGMS, India
Maa Ratangarh dam site	8	500	1.26	5

To minimize vibration, the following shall be adopted:

- Blast holes shall be initiated by non-electric (NONEL down-the-hole (DTH) delay detonators.
- Care shall be taken to ensure that effective burden is not excessive and the face shall be kept sufficiently long.

- Optimum charge per delay shall be kept as low as possible.
- Adoption of two row blasting and V pattern of firing
- The firing of maximum possible no. of blast holes towards free face.
- Use of milli-second delay detonators between the holes and rows of blasting.

2.5.3 Air Blast over Pressure

Propagation of blast induced air over pressure has been studied by various investigators and is generally reported as cubic root rather than square root scaled distance. In context of mining operation in the cluster the overpressure is predicted by equations applicable for confined bore hole charges.

$p=3.3 \, [3\sqrt{Q}/R]^{1.2}$, where,

p= pressure in Kpa

Q=Explosive charge in kg

R= is a distance from the charge

Based on the distance and charge per delay the predicted air over pressure values are shown in **Table 2.8**

Table 2.8: Predicted Air over Pressure

S. No.	Nearest Village	Distance (R) from dam Site (m)	Charge / Delay (kg)	Predicted Air over pressure in dB(A)
1	Maa Ratangarh dam site	500	8	106.8

The predicted air over pressure in dB(A) shall be lower due to attenuation and the blasting being carried out at pit level which are lower than the elevation of Dugraho and Maa Ratangarh which are higher level than the river bed which is subject to blasting on account of rock excavation.

2.6 IMPACT ON BIOLOGICAL ENVIRONMENT

2.6.1 Impacts on Flora

- It is evident from this study that from the submergence and influence zone of the proposed project, none of tree, shrub, herb, or any climber or grass species are either vulnerable or endangered category.

- Interestingly the vegetation composition of the submergence zone is also widely distributed in the influence zone in abundance, and there will be no significant loss in the habitat. However, any loss of riverine vegetation during the project activity period will be recovered in the reservoir periphery in due course of time.

- Due to construction of proposed dam, riverine regime of submergence area will change into lacustrine environment.

- The floral abundance of the project area in post construction phase will increase by many folds as the plantation under catchment area treatment, reservoir rim treatment, green belt, restoration and landscaping will be completed.

- A total 799.59 ha and 2538.04 ha of forestland and non-forestland shall be brought under submergence/canal alignment along with trees. For mitigating loss to forestland, compensatory afforestation plan has been formulated which shall be implemented by the Forest Department.

2.6.2 Impacts on Fauna

- As the project activity will not submerge all the major habitats, there is little concern for the niche birds. As the both banks of the river upto 10 km u/s and on d/s have very sparse human habitation and very little project related activities above the dam site is expected, there will be no alteration to the existing habitat of the faunal species. There is also no wildlife sanctuary, national park and biosphere reserve near the project area.

- During survey, the encounter rate of butterflies was more in dense forests than in open habitats. The area will continue to support the present population of butterfly species. As butterflies prefer habitat with more pollen and nectar producing flowering species and moist conditions, increase in the humidity in and around reservoir, and development of green belt will further enhance the butterfly diversity. As the project is having its submergence mostly along the valley, the project is not likely to be a threat to any of the recorded butterfly species.

- A few mammalian species were recorded during the survey. The primary reason for this low figure could be large-scale anthropogenic pressures: disturbance due to agricultural activities, road construction, etc. It is anticipated that with the upliftment of rural economy the dependency of local people on forest will reduce poaching and ease out pressure on wild life. The anticipated impacts on the present status of fauna during and after construction are summarized below :

Construction Phase

- Increase in temporary stress levels of wildlife during construction phase due to noise, human interference and reduction in present habitat.
- Threat due to poaching might increase.

Operational Phase

- Improved habitat for mainly water birds, reptiles, mammals, amphibians and planktons, due to development reservoir.

- Improvement in food chain of some reptiles, birds and carnivorous mammals due to development of reservoir and increase in humidity level.

- The butterfly diversity in the area would be enhanced as scrub rich habitat around the submergence will receive substantial amount of moisture, which will help in natural regeneration of forest canopy and associated species of plants and animals.

2.6.3 Impacts on Aquatic life

- The completion of the proposed project would bring about significant changes in the riverine ecology, as the river is transformel from a fast-flowing water system to

a quiescent lacustrine environment. Such an alteration of the habitat would bring changes in physical, chemical and biotic life. Among the biotic communities, certain species will survive the transitional phase and can adapt to the changed riverine habitat. There are other species amongst the biotic communities, which, however, for varied reasons related to feeding and reproductive characteristics cannot acclimatize to the changed environment, and may reduce in population in the early years of impoundment of water. The micro-biotic organisms especially diatoms, blue-green and green algae before the operation of project, have their habitats beneath and around the boulders, stones, fallen logs along the river, where depth is such that light penetration can take place conveniently.

- The construction of project shall have impact on the fishery resource as the movement on upstream of dam shall be hindered. However, there shall be no impact in movement of fishes at Maa Ratangarh dam since as there will be a provision of fish ladder.

- The proposed project would envisage construction of labour camps to accommodate labourers engaged in the project. Sewage generated from the labour colony may have impact on the aquatic ecology, if discharged directly into the river without any treatment or in case of open defecation.

- The congregation of labour force in the project area may result in enhancement in indiscriminate fishing in the project area.

- The reduced flow on downstream shall reduce the availability of nutrients on flood plain and bed of the river, thus, lower the primary productivity of the river

- On development of the reservoir and after implementing the fisheries development plan, it shall continue a habitat for the indigenous faunal species as well as reservoir fish species.

2.7 IMPACTS ON SOCIO-ECONOMIC ASPECTS

2.7.1 Impacts on Local Community including Demographic Profile

During the construction phase, a large labour force, including skilled, semi-skilled and un-skilled labour force of the order of about 1000 persons, is expected to work in the project area at peak construction activity period. It is expected that 90% of the total work force shall be locally available and manpower to the tune of 100 persons shall migrate from other parts of the district or adjacent districts of the state. This will lead to a small change in demographic profile of the area albeit during construction phase only. The temporary labour camps will be established at suitable location in the project area. The fuel need of the labourers/ workers shall be attended in an organized manner by providing LPG and safe drinking water so that any altercation between migrated labour and locals' overuse of natural resources and facilities is averted.

Hindus constitute the pre-dominant religious community of the study area. They have deep religious faiths and celebrate festivals with great fervors and enthusiasm. During construction phase, migratory population though in limited numbers, is expected from other parts of the state having different cultural habits. However, no cultural conflicts are foreseen due to the

migratory population, as they will be largely settled in separate conglomerates having all inbuilt facilities. Since major work force will be drawn from the local populace, which by interaction with outside labour during course of construction, shall develop affinity and friendship with the outside workers, thus, minimizing the chances of conflict.

2.7.2 Impacts on Socio-Economic Status

Apart from direct employment, the opportunities for indirect employment will also be generated which would provide great impetus to the economy of the local area. Various types of business-like shops, food-stall, tea stalls, etc. besides a variety of suppliers, traders, transporters will concentrate here and benefit immensely as demand will increase significantly for almost all types of goods and services. The business community as a whole will be benefited. The locals will avail these opportunities arising from the project and increase their income levels. With the increase in the income levels, there will be an improvement in the infrastructure facilities in the area.

2.7.3 Impact on Human Health due to Water/Waterborne Diseases

Construction of the proposed project may cause impacts on health of local residents and the work force. Fuel and dust emission may cause respiratory problems like asthma for which mitigating measures like wet excavation of exposed surfaces shall be deployed. Frequent water sprinkling at least thrice a day shall be carried out on haul roads in the project activity area. All approach roads to site shall be metaled. Migrant workers might act as carriers of various diseases like AIDS, VDS, etc. The project authority should follow proper quarantine and screening procedures.

The scheme involves a dam, where the flowing discharge is made to impound upstream into a reservoir to be diverted through irrigation sluice at the lowest sill level for conveying water through piped main canal for irrigating command area. Thus, the reservoir level shall be subjected to fluctuation and the chances of water surface being still are not there. However, localized stagnation in borrow pit areas is expected during construction in some of the areas, which may require sprinkling of anti-bacterial/insecticides to control propagation of bacteria related disease. The influx of labour-force during construction warrants proper sanitation and hygiene facilities to avoid diseases related to sewage pollutants such as Typhoid, Cholera & Gastroenteritis.

2.7.4 Impact on Increased Traffic

Increased use of existing public infrastructure i.e. road due to vehicular traffic involved in transportation of construction materials and muck and earthmovers may cause congestion on roads. However, the state highway and the national highways in the district in general have been designed keeping in view the futuristic vehicular traffic. The traffic load will increase in Seondha –Dangdroli road due to project activities. The increased traffic shall cause more fugitive dust emission and gaseous pollution, which when added to the existing concentrations resultant concentration shall be within the limits. Regular maintenance of road and copious sprinkling of water shall be carried. Transport trucks/tippers shall be properly maintained. Only PUC certificate issued vehicles shall be used. Avoiding of overloading of trucks beyond stipulated capacity by installing weighbridges at the check posts or near to it. Strict compliance

of traffic rules and regulations shall be ensured. The movement of trucks/trippers/tractors for loading /transportation within the project area and haul road area shall be regulated by a trained supervisor who shall be responsible for the safety of vehicle movement and prevention of accidents or incidents associated with the vehicular movement.

2.7.5   Impact on Holy Places and Tourism

The project is located in district Datia with dam and reservoir situated in rural set up and connected to Seondha Tehsil headquarter via Tar road of approximately 11 Km and thereafter by Datia- Seondha via SH-19. The nearest place of tourist's importance is Kanhargarh fort, Maa Ratangarh temple, Peetambara Devi Temple & Behat, birth-place of Tansen. The proposed project shall create a substantial increase in tourism due to reservoir. For attracting people for picnic excursion, some picnic park shall have to be developed near dam with facility for water sports.

2.7.6   Impact of Blasting

Blasting is accompanied by the generation of the dust and the fumes and fly rock which pose a significant danger to the people who are in the vicinity of the work site. It also leads to ground vibrations which cause the ground to vibrate in transverse, longitudinal and the vertical direction leading to its damage. Due to blasting the people of the nearby villages are always physiologically impacted as they are constantly under apprehension of damage to their structures. Blasting also causes air overpressure is a transient impulse that travels through the atmosphere. Much of the air overpressure produced by blasting has a frequency below the audible limit of 20 Hz. Air overpressure, both audible and inaudible, can cause a structure to vibrate in much the same way as ground vibrations It is a frequent cause of the complaints as a person senses air overpressure more than vibrations. The noise due to air over pressure is instantaneous a short lived and may cause annoyance to vulnerable people

2.7.7   Positive and Negative Impacts likely to be accrued due to Project

The advent of project shall herald overt changes in the socio-economic conditions of the affected people and the population, living in command area, and the project affected zone who shall be directly benefitted. Some of prominent positive impacts are: -

- Additional irrigation potential shall be created in area (9900ha)
- Better living Standards for famers of command area.
- Employment opportunities/fisheries.
- Benefits to economy and commerce.
- Access to improved infrastructure facilities.
- Recreation and tourism potential
- Improvement in environment through implementation of CAT, Compensatory Afforestation, Green belt Development and different other plans.
- Command Area Development.
- Better opportunities for cattle rearing.
- Increase in groundwater level

The pang of involuntary displacement shall cause many social pressures and stress on the PAFs because they shall lose their roots from their ancestral land and move in bewilderness of new place and environ to which they may adapt in due course of time. Some of prominent major negative impacts are: -

- Eight villages shall be partially affected due to acquisition of land for project purpose.
- Due to project 999 families shall be displaced.
- The loss of agriculture land (930.80 ha) and agriculture produce.
- Loss of livelihood and income.
- Loss of homestead and other assets over which the PAFs/DPs have developed affinity
- The change of river status from riverine to lacustrine regime
- The loss of forest due to construction of dam, reservoir and appurtenant works
- Likely decrease in agriculture and horticulture production due to air pollution
- Disturbance to the fauna of the study area during construction
- Pressure on the existing Provincial / Link road will increase.

CHAPTER 3

3   MANAGEMENT OBJECTIVES AND MITIGATION STRATEGIES

3.1   MANAGEMENT OBJECTIVES AND MITIGATION STRATEGIES

Wildlife mitigation refers to actions implemented in order to minimize the negative impacts on environment and biodiversity due to the project. It is a balancing act to outweigh the negative cumulative impact of the project through positive conservation actions. Further, a wildlife mitigation plan should aim to improve the environment, thereby enhancing the biodiversity value of the place. The present chapter aims to address the threats and impacts discussed in chapter 2 of the site-specific Wildlife Conservation Plan (Site-Specific Conservation Plan). It also aims to provide safe passage and to reduce disturbance to the existing wildlife both in the Mine lease area as well as the surrounding forest areas. It also proposes to improve the habitat in both the core zones as well as buffer zones, in order to ensure the availability of sufficient food and water to the wildlife. The proposed measures will be carried out within the Core Area (Mine Lease Area) by the project proponent while in the areas beyond the Core Area (Buffer zones) by the Forest Department with the financial support provided by the user agency.

3.2   OBJECTIVES OF MANAGEMENT TO ADDRESS ISSUES OF WILDLIFE CONSERVATION

The principal objective of the mitigation plan is the conservation of existing ecosystem in the best possible state by adopting best practices during operation of the project. Another important objective is to ensure that the project is run in an eco-friendly manner, maintaining the optimal biodiversity value and habitat. Taking due consideration of the impacts due to the project activities, the following are the objectives of the proposed plan:

- To enumerate the priority measures to be undertaken by the project proponent.
- To list the measures that will be undertaken by the Forest Department to alleviate the anticipated long-term impacts of the project on wildlife and their habitat.
- To address different types of pollution in the Study Area and various control measures adopted to reduce the pollution both at the Core Area and the buffer areas.
- To address the disturbances caused to the wildlife in the vicinity of the Core Area.
- Restore or enhance degraded habitats to provide suitable conditions for wildlife.
- To address over-dependency of local people on forests especially for NTEP collection
- Wildlife mitigation plans often aim to minimize conflicts between wildlife and human activities. Development of a strategy and action plan to reduce human wildlife conflict at a national level and in selected states.
- Pilot application of a holistic approach and instruments to mitigate human wildlife conflicts at pilot sites.

3.3   STRATEGIES TO MITIGATE THE ADVERSE IMPACTS ON WILDLIFE

Control of Air Pollution:

The Project activity includes Blasting, Drilling, movement of heavy vehicles and machineries etc. These activities will produce large amount of dust. Such dust mixed will cause air pollution. Large amount of Dust will also settle on the Grasses and other fodder plants making these plants/grasses unpalatable. Appropriate measures need to be taken to minimize this hazard. It is proposed to use water spraying to suppress dust at the point of generation. The proposed measures include pre and post blast spraying, spraying of haul roads and wet drilling. The area already has good cover of bushes. The tree and bush cover will also help in arresting of dust. With these measures, it is expected that ambient air quality will remain well below prescribed limits.

Control of Water Pollution:

Selected water quality parameters of ground water resources within 10-km radius of the study area have been studied for assessing the water environment. Water samples were examined for physico-chemical, heavy metals and bacteriological parameters in order to assess the effect of industrial and other activities on ground water. Small stone and earthen bunds will be constructed in existing seasonal water courses, so that any rain wash off is arrested well before perennial courses in the plains.

Control of Noise Pollution:

The Environmental Management Plan sets out that, there will be no impact of Noise produced in the construction process. The Noise Levels are proposed to be kept within permissible limits. However, operation of heavy machinery and Blasting in the construction area will produce large amount of sound which may cause disturbance to wild animals. Blasting shall have adverse impact on fauna using the area contiguous with the surrounding habitation area as habitat. The noise generation has an adverse impact on terrestrial fauna and avi-fauna. Intervention in the project area will impact butterflies and birds which are quite sensitive to noise and human presence. The traffic noise has detrimental effect on the survival rates and breeding success of such fauna which reside in the small habitats along road side communicating using acoustic signals. Sometime as a result of habitat loss and physical disturbance, the fauna shall move from the habitat along road side. Based on the field observations and interaction with local people and forest officials it was noted that the project area does not constitute part of any wildlife migratory routes and mining activities won't affect animal movement.

All precautions shall be taken as envisaged under the relevant acts in respect of handling of explosive material and blasting which shall invariably be carried out by a qualified blaster.

So, necessary mitigative measures will be taken to control it.

Soil & Moisture Conservation:

The construction activity will involve removal of all the forest cover, top soil and digging of large pits. Major part of the forest land will come under the mining pit setting aside the safety zone. Due to digging of large pits a lot of soil erosion including formation of gullies is bound to take place which is required to be treated properly.

Similarly due to construction activity there will be large scale evaporation from the exposed soil. The moisture retention capacity of the soil along the periphery of the mine pits will reduce. The sub-soil water will also be reduced which may lead desiccation condition and destruction of some more vegetation.

Waste Management:

Due to various activities in the construction process, movement of large number of work force and vehicles within the mining area, a large quantity of waste and garbage will be generated within the construction area. The Garbage includes Solid Wastes such as over burden, mine waste, sub-grade ore. Besides some amount of Bio degradable waste and Hazardous waste such as used oil, used batteries, oily sludge, filter materials containing oil are likely to be generated within the Core Area. Waste material is properly disposed eith proper muck disposal plan.

3.4 HUMAN- WILDLIFE CONFLICT MITIGATION METHODS

1. The use of fences

The use of fences is to mitigate the HWC in communities to help minimize contact between humans and wildlife. Moreover, communities that inhabits these areas report to conservation management when threats arise. In doing so, both humans and wildlife are protected.

2. Education

Dissemination of information is vital for mitigate human-wildlife conflict situations through trainings, workshops, newsletters, television shows and so on.

3. Control and Regulation Policies

The collective efforts from the Government regulatory bodies to develop policies that address HWC. With the advent of technology remotely monitoring of animal movement has become easy.

Wild Boar Conservation Strategies

Introduction

Indian Wild boar (Sus scrofa cristatus) lives in grass or scanty bush jungle, sometime in forest: after the rains, quite commonly in high crops. They are omnivores, living on crops, roots, tubers, insects, snakes, offal, and carrion. They feed in the early morning and late in the evening and, where much disturbed, chiefly at night. These raid the agricultural field and eats crops and tubers. No animal is more destructive to crops and in cultivated areas, it is impossible to make a plea for its protection.

Threat:

    I.   Hunting for meat, sport or in revenge for crop damage.

II.   Habitat loss.

Conservation issue:

I.   Habitat loss hence enters into agricultural field.

II.   Increases in population.

III.   Awareness for conservation.

Mitigation Measures for Human- Wild Boar Conflict –

1. Placing Dried Coconut bunches with coconut fruits

This new method of controlling wild pigs is based on placing a physical deterrent around a tree or where the pigs are thought to enter the field. The best deterrent is coconut fruit bunches together with dried coconut leaves. Several coconut fruit bunches are tied together, with the fingers pointing outward. The tied-up bunches are placed around the base of a plant, or the probable point of entry to a field. Be sure that the fingers of the coconut fruit bunches are pointing outwards. The fingers will hurt the nose or eyes of wild pigs if they attempt to dig the roots of the plant.

Merits of the Technology-This method is simple, low-cost, and environmentally friendly. Farmers can easily learn it with a simple demonstration.

2. Human Hair as Deterrent

Wild boar with poorly developed sight and hearing mechanism has to depend on its smell sensory mechanism only for movement as well as locating of food. In this process, it moves from one place to another place only by a way of sniffing on the ground thereby getting guided into the desired routes. Spreading of human hair collected from local barber shops is an effective and low-cost traditional method being followed by farmers. Technically this indigenous method does have scientific logic which clearly suggests that the human hair in the movement routes of the wild boar gets sucked through nostrils causing severe respiratory irritation. Due to this the wild boar gets totally disturbed and loses its track by making distress calls, which will ward off other wild boars entering into the cropped area. Several farmers are extensively practicing this method in different crops and controlling the damage caused by wild boar to the extent of 40-50%.

3. Spraying of local pig's dung solution

Territoriality is very high in wild boars which are being exploited under this method. The dung collected from local pigs will be made into a solution and should be sprayed on the soil to the width of 1 ft. around the crop. This will confuse wild boars with a false assumption of entering into the territory of other pigs; thereby their movement will be prevented to avoid territorial conflict. For sustained effectivity, it is desirable to go 2-3 sprays with 7 days interval between each spray. This method effectively controls the wild boar up to 50%.

4. Erection of used colored sarees

This method also is a farmer's innovation, which has a behavioural background as far as wild boar is concerned. By arranging used sarees of different colors around the crop will make wild

boars assume human presence in the area thereby not preferring to enter into such areas. Even though, not feasible in all situations it has some marginal benefit in the areas of human movement. By using this, the extent of damage by wild boar can be minimized to the level of 30-55%.

5. Burning of dried dung cakes

The dried cakes made from local pig dung are burnt in earthen pots. This will ensure the slow generation and spreading of smoke during dusk time. The smoke coupled with the smell of local pig dung helps in sensitizing wild boar about the presence of local pigs. As a result, to avoid territorial conflict, the wild boars don't prefer to move in such areas and extent of damage by wild boar can be minimized to the level of 35-50%.

6. Arrangement of three rows in "NIWAR" soaked in Kerosene

The NIWAR should be soaked in Kerosene solution for about 2 hrs. and will be arranged around the crop in 3 rows by keeping 1 ft. distance between rows with the help of wooden poles. Sufficient care should be taken to drain off excess kerosene. The dominating smell of the kerosene does not allow wild boars to identify the crop. This method is generally effective for 10-15 days extent of damage by wild boar can be minimized to the level of 25-45%.

7. Planting of thorny bushes and xerophytes around the crop

Different xerophytic species like Cacti sp (Euphorbia caducifolia, E. merifolia), opentia spp. (Opuntia elatio, 0.dilleni), Zizipus spp. (Ziziphus oenopolia, mauritiana), and agave sp (Agave americana, Caesalpinia cristata) can be planted on the bunds around the crop which will not allow the wild boars due to their thorny in nature. The wild boars after the unsuccessful trial of entry get injuries and making alarming calls, which makes the other animals to flee. This method effectively controls the wild boar up to 50-70%.

8. Traditional use of local dogs for scaring away wild boars

In endemic areas of wild boar attacks, farmers do follow using trained dogs on a community basis to scare away the approaching wild boars. In selected cases, this method proved to be effective and sustainable. By using this method control the wild boar damage up to 50%.

9. Creation of sounds and light through bonfire:

To scare away the wild boars from damaging their crops farmer's employee methods such as using firecrackers, making sounds through local drums, empty tins, making bonfires and shouting. This type of method has proven to effective on community basis in protecting farmers' fields from the wild boars and effectively controls the crop damage up to 40-60%.

Crocodile Conservation Strategies

Crocodilians (crocodiles, alligators, caimans, and gharials) are prominent and widespread occupants of tropical and subtropical aquatic habitats. Crocodilians have some unique aspects of natural history that create special challenges for their conservation. They are the largest predators in their habitats and can threaten humans and their livestock. Crocodile (Crocodyiusplustris) is a threatened species in India and protected under Schedule I in Indian Wildlife Protection Act of 1972. Crocodiles are wild, aquatic,

carnivorous animals that have been flourishing in close proximity to humans, allowing for a noteworthy case study of the human-Mugger relationship.

Crocodile Survey

Buffer zone of the study area has been reported as a habitat of Schedule I species Crocodile (Crocodylusplustris) commonly known as Mugger, more effort was made to assess their status in term of movements and habitat use in and around the river. At first, a detailed biological survey of the core zone and buffer zone (10 km radius from periphery of the project site) was carried out to understand the status distribution of the species in the study area. Also, questionnaire survey was carried out to understand the recent status of Crocodile sightings and their movements. Overall, 15 people from three villages were interviewed randomly and also gathered information related to crocodile from forest department. The conclusion of the survey discussed the potential sightings & habitat use, and movement and food habits of Crocodile in the Sindh River and in the study area.

Habitats in the Study Area

No crocodile sighted in the core zone area. All the direct sightings of the Crocodile were located in river.

The River Sindh

The Sindh originates on the Malwa Plateau in Vidisha district, and flows north-northeast through the districts of Guna, Ashoknagar, Shivpuri, Datia, Gwalior and Bhind in Madhya Pradesh to join the Yamuna River in Jalaun district, Uttar Pradesh, just after the confluence of the Chambal River with the Yamuna River. It has a total length of 470 kilometers (290 mi), out of which 461 kilometers (286 mi) are in Madhya Pradesh and 9 kilometers (5.6 mi) are in Uttar Pradesh.

Food Habits

All crocodilians are very effective aquatic predators. At smaller sizes they often eat aquatic insects, small fish and crustaceans and as they grow larger they tend eat more vertebrates, including fish, turtles, birds and mammals. Crocodiles attempt to maintain their body temperature within narrow limits by basking in the sun when cool and seeking shade when hot. Crocodilians have complex behaviors including social interactions, dominance hierarchies, and vocalization, coordinated feeding, and well developed maternal behavior.

Threats in the Study Area

No perceptible threats were identified during survey. Forest department also kept board for information regarding crocodile in Sindh River. So, that local as well as tourist people are aware. Currently the Mugger populations in this region seem to be doing fine, however no threats have been identified from present. The Direct human influences such as poaching of muggers for their skin and collection of eggs for food or medicinal purpose are not reported. It is fortunate enough for muggers, that when most of the wild creatures are becoming victim of humans, it is somewhat safe from human's evil intentions. The local villagers are not involved in fishing, and pose no threat to the muggers. As per interaction with

local people no flooding observed in this area. Local residents are against hunting or poaching of the crocodile, as per our understanding.

Study Area as a Crocodile Habitat (Buffer Zone) - Conclusion

Present survey of the Crocodile in the buffer zone of the project site cleared that crocodile use Sindh River within the buffer zone. However, the following points can give an insight on the overall status of Crocodile in the study area and thereby plan for better management strategies related to proposed project activities. People of the surveyed area were well aware of the habits and habitats of Crocodile in the study area. Moreover, local people are against hunting and poaching of the Crocodile. In the buffer zone, Crocodile uses Sindh river habitats as a feeding and breeding ground.

Peacock Conservation Strategies

Indian Peafowl (Pavo Cristatus)

Classification:

Kingdom: Animalia

Phylum: Chordata

Class: Aves

Order: Galliformes
Family: Phasianidae
Genus: Pavo
Species: Pavo cristatus

Introduction:

The Indian Peafowl appears so frequently in religion, folklore, art and craft, that it is possibly the most recognized bird across India. Having been declared the national bird in 1963, the species also finds itself under the highest level of legal protection in the country, being placed in Schedule I of the Wildlife (Protection) Act, 1972 and further amendments. Peacock which belongs to Schedule-I of the Wildlife (Protection) Act 1972 is commonly found in the buffer zone of study area.

Habitat:

In the undergrowth in deciduous forests near streams, Tall trees for roosting size of the male tail feathers, its coloration and numbers of eyes presents determine the dominance of the male in peacock hierarchy. The females are believed to be attracted towards the male with longest and most colourful tail feathers.

Conservation Status IUCN:

Least Concern IWPA: Schedule I CITES: Not listed, Peacocks are gregarious by nature. In the breeding season they are usually seen in small parties of one male with three to five females whereas in the non-breeding season they remain in separate parties of adult males and females with juveniles. Peacocks roost in tall trees and emerge from the dense thickets to feed in fields and openings in forests and fields.

Food Habits

Pea fowls are omnivores, eating plant parts, flower petals, seed heads, insects and other arthropods, reptiles and amphibians. Moreover, local people are against hunting and poaching of the Peacocks. In the study area peafowl uses agriculture (adjacent to village) as a feeding and breeding ground. Some of the peacocks are taking shelter in the village adjacent habitats while some prefer to forest habitats.

Conservation Plan:

Peacock is a large and beautiful flying bird and rightly crowned as the National Bird. It occurs all over India both in forest and non-forest areas. The Peacocks worshipped as the Vahana carriers of Karthikeya / Subrahmanya Swamy/ Murugan in India, Nepal and Sri Lanka. Hence, there is no threat from locals. In the project under consideration, Peacocks were found in the buffer zone where they are protected.

There are two major or kinds of threats to Peacock. One is illegal poaching for meat and feathers and the other is due to consumption of pesticide treated seeds sown by farmers. In spite of the above, there are healthy populations according to the State of India's Birds 2020 report and there is no risk of extinction. If allowed to domesticate, Peacocks shall become pet birds and their numbers can increase very rapidly.

Peacocks are of widespread occurrence and there is no specific conservation plan for Peacocks similar to the specific conservation plan of wild animals. The project proponents are prohibited by law to capture the Peacocks and domesticate them or breed them under captivity. Any plan designed to conserve and manage a Schedule I species should take in to the account the basic scientific principles and criteria. Conservation does not mean preservation. Species conservation implies sustainable management under in-situ conditions. When an isolated male or female is found in one place within the buffer zone, no one can conserve the species by taking care of that solitary bird without violating the Wildlife Protection Act, 1972. The conservation plan should be formulated on need based, realistic, practically feasible and in scientific manner.

In case of Peacocks found in the buffer zone, the only thing that the project proponent can do is to create of awareness among the public in general and the project dependent people in particular about the need to conserve them and to motivate them to act as protectors of Peacocks through mass media, social media, public education and Nature clubs.

Increasing the tree cover in the buffer area for shelter and roosting of peacocks. This will be achieved by planting of tree groves (a group of trees that grow close together, generally without many bushes or other plants) in buffer area. Some local species such as Neem, Ardu, Shesham, Dhak, Peepal tree etc. will be planted. Planting of tree groves in school compounds in the villages of buffers area will be planted as per the plantation programme. Carrying out census and research projects to know the potential threats and population status of the species.

Provision of veterinary care and cages for injured or sick deformed birds. Suggest strategies to minimize negative impacts of changing environment in nearby area of peacock populations and to promote conservation of peacock habitats Provision will be made in Environmental

Management Plan for various activities to be undertaken every rear. These activities of conservation plan will be integrated with the cost of environmental management measures to be implemented for the project.

Eagle Conservation Strategies

Black Kite (*Milvus migrans*)

Scientific classification

Kingdom: Animalia

 Phylum: Chordata

Class: Aves

Order: Accipitriformes

Family: Accipitridae

Genus: Milvus

Species: M. migrans

Introduction:

The black kite (Milvus migrans) is a medium-sized bird of prey in the family Accipitridae, which also includes many other diurnal raptors. It is thought to be the world's most abundant species of Accipitridae, although some populations have experienced dramatic declines or fluctuations. This species is very commonly found in human settlements as well as around agricultural habitats and scrublands near human habitations. This species is given special attention as it is included under Schedule-I of the Wildlife Protection Act-1972.

Habitat:

Black kites are most often seen gliding and soaring on thermals as they search for food. The flight is buoyant and the bird glides with ease, changing directions easily. In India, the population of M. migrans is particularly large especially in areas of high human population. The Indian populations are well adapted to living in cities and are found in densely populated areas. Large numbers may be seen soaring in thermals over cities.

Conservation Status IUCN:

Least Concern IWPA: Schedule I CITES: Not listed. The breeding season of black kites in India begins in winter (mainly January and February), the young birds fledging before the monsoons. Peacocks roost in tall trees and emerge from the dense thickets to feed in fields and openings in forests and fields. After pairing, the male frequently copulates with the female.

Food Habits

Black kites are most often seen gliding and soaring on thermals as they search for food. The flight is buoyant and the bird glides with ease, changing directions easily. They will swoop down with their legs lowered to snatch small live prey, fish, household refuse and carrion, for which behaviour they are known in British military slang as the shite-hawk. They are opportunist

hunters and have been known to take birds, bats, and rodents. They are attracted to smoke and fires, where they seek escaping prey.

Conservation Plan:

Direct and indirect approach is required to provide effective conservation, which is recommended as under:

- Increasing the tree cover in the study area which will provide shelter and roosting to the Black Kite. This can be achieved by planting of trees (a group of trees that grow close together, generally without many bushes or other plants) in buffer area. By encouraging people for plantation of some local species such as Neem, Shirish, Khakhro, Haldu, Amli, Banyan, Peepal and Peeper or other Ficus sp.Vacant places such as edges of agricultural fields, village Gauchar, Panchayat's common land, neighbourhood of people inhibiting, road side avenue tree plantation, open scrubs, ravines, school compounds can be selected for practicing the plantation activity.

- Awareness programmes (community and school level) for conservation of Bird of Preys in the study area as well as negative effects of Chemical pesticide and how it is harmful to the food chain of such species is very essential and the same can be achieved through organizing competitions during "Wildlife Week" and "Van Mahotsav" celebrations by active involvement of local community.

- Some provision of rewards to informers for the control of poaching and illegal trade in wildlife.

- Carrying out census and research projects to know the potential threats and population status of the species in collaboration of local schools, colleges, Panchayats and forest department.

- Provision of veterinary care and cages for injured or sick deformed birds especially during 'Uttarayan' – A Kite flying festival where the birds are prone to thread injuries.

- Suggest strategies to minimize negative impacts of changing environment in nearby area of Black Kite populations and to promote conservation of habitats.

- Another way to help preserve the endangered species is to create society dedicated to ecological ethics. All the conservation measures will be implemented with the help of and in the consultation of the district forest department

CHAPTER 4

4   PROPOSED MANAGEMENT STRATEGIES WITHIN THE CORE AREA. (TO BE IMPLEMENTED BY THE PROJECT PROPONENT WITHIN THE CORE AREA)

4.1 GENERAL

The activities taken up in the Core Area will pose considerable threat to wildlife and its habitat. It is therefore necessary to minimize such threats. In view of the nature of the project, following measures are suggested for mitigating and minimizing impacts in the lease area arising during the operational phase of the project. The responsibilities of implementation and monitoring including actions and measures for reducing the impacts of the project lay with the Project proponent. The following are the strategies which will be employed by the project proponent. Some of the management strategies will also be implemented in the Buffer Areas, in particular the villages in the buffer zone.

4.2 MINIMIZING POLLUTION

To undertake all the measures related to mitigate the effect of pollution of various kinds as proposed in the plan. Major challenges concerning pollution would be to mitigate and minimize air pollution, water pollution and noise pollution not only in the Study Area but also adjoining areas. To undertake measures to minimize noise pollution, drilling machines will be equipped with wet drilling arrangements, Controlled blasting will be adopted and optimum use of explosive energy will help in

reducing the air pollution, Haul roads & loading & unloading areas will be regularly sprayed with water to arrest dust from becoming air-borne, Preventive maintenance of vehicles will be done to reduce gaseous emissions, personal protective equipment like dust masks will be provided to employees, periodic air quality monitoring will be carried out. Fugitive dust emissions from the material loading and unloading will be controlled by water sprinklers. Monitoring of Ambient air may be carried periodically to check whether the pollution levels are within the prescribed limits.

4.3 CREATION OF GREEN BELT

Apart from the above mitigation measures, green belt around the periphery of the mining area will be created to protect the adjoining wildlife habitat from the dust generated during the mining process, to arrest the spread of the dust as well as absorb the noise generated during various mining processes such as drilling, vehicular movement etc.

4.4 EXCESSIVE LIGHTING

Proper measures will be undertaken to reduce disturbance due to lights at night from lamp posts or moving vehicles. In order to ensure the disturbance is minimal, the mining activity is only carried out during day time. Hence lighting of the area will be minimal, since the vehicular movement will also be minimal. Since the use of headlights of vehicles disturbs the nocturnal animals, only dippers will be allowed during night.

4.4 WASTE MANAGEMENT

Effective Solid waste and garbage Management measures should be carried out. Garbage not only creates problems for the wildlife but also creates problems for mining activity. Hence proper Garbage Management is also an important activity in Mining process. Prescribed steps to be taken for garbage management are as follows Entry of non-biodegradable materials which are likely to produce Garbage such as Polythene bags, Aluminium foils, Tin foils etc. are restricted into the Mining area, the Garbage generated in the Mining area is regularly collected and segregated into Bio degradable and non-degradable materials, the non-degradable materials if any are sent for recycling, the Bio-conversion of waste in to manure. The Manure obtained from these pits will be utilized for plantation purpose.

4.5 SOIL EROSION AND WATER CONSERVATION

To ensure that the piers of the bridges/culverts/weirs are not constructed in streambed with flowing water to the extent it is possible so that continuity of channels and free flow of water is not obstructed or changed which may be harmful to the aquatic animals. There will be substantial loss of moisture as well as heavy soil erosion due to mining activity. Hence, for enhancing seepage of water and to reduce soil erosion the rainwater will be channelized through garland drains provided around the dumps to the settling tanks through a series of check dams. Check-dams will also be provided on the natural channels in order to prevent soil erosion in the safety zone. As rainwater harvesting pits are already maintained by the project proponent only the channels have to be maintained periodically.

4.6 RECLAMATION

Some physiographic change of the land is bound to take place after the mine closure. The available topsoil and overburden will not be sufficient to fill up the mine pits, In order to address this problem a systematic procedure will be adopted at the time of back filling. Reclamation plans should address the following concerns: drainage control, preservation of topsoil, segregation of waste material, erosion and sediment control, solid waste disposal, control of fugitive dust, and restoration of waste and mining areas. The plan must also consider the effects of mine subsidence, vibration (induced by mining, processing, transport, or subsidence), and impact on surface water and groundwater.

4.7 ENSURING SAFE PASSAGE OF EXISTING WILD-LIFE

It is very important to save the existing wild animals available within the lease area and to divert them to safer locations. It can be possible to achieve such objective by commencing the mining activities from locations situated away from the Forest areas. Thereby the medium and large wild animals present within the lease area will find their way to nearby Forest areas.

Provision of hired vehicle for Rapid Response Team

It is proposed to make a hired vehicle available to the DFO for movement of Rapid Response Team. It is to ensure safe passage of wild animals if ever they happen to enter the Core Area.

Steps to prevent fall of animals in the mining pits.

In order to prevent accidental fall of animals in the mine pits the following steps shall be taken-It is proposed to erect and maintain solar electric fencing around the entire area to prevent entry of large and medium animals and maintain the same during the plan period. In spite of the precautions taken, in case of accidental fall of any wild animal into the mine pit, the workers will be educated to inform the local forest authorities and act as per their advice.

4.8 BIODIVERSITY AWARENESS AND HEALTH CAMPS

The mining staff will be educated about the wildlife laws by the project proponents and wildlife authorities so that they don't indulge into any illegal activities such as poaching or hunting in the adjoining forest areas. However, one person will be exclusively deployed for the purpose of keeping watch on wild animals and forest fire, at the cost of project proponent. Biodiversity awareness programme especially for Conservation of reptiles and birds in the study area will be carried out in the adjoining villages. Health camps and Cattle immunization camps will be organized in the forest fringe villages to get pro-active support for wildlife protection and conservation by engaging suitable institutions/agencies.

4.9 PHYSIOGRAPHIC CHANGE OF HABITAT (LAND MANAGEMENT)

Some physiographic change of the land is bound to happen after the mine closure. The available top soil and overburden will not be sufficient to fill up the mine pits. In order to address this problem, a systematic procedure will be adopted at the time of back filling.

- After a mine pit is abandoned, refilling with the available OB should be done. Only after the pit is refilled completely, refilling of the next pit will be done. Partial refilling is to be avoided.
- The surface level of the reclaimed land should be same as the surrounding area with adequate provision for compaction.
- Some of the mine pits will have to be left as such which can serve the purpose of water body.

Steps to prevent fall of animals in the mining pits:

In order to prevent accidental fall of animals in the mine pits the following steps shall be taken.

> The periphery of the mine lease area will be fenced. It is proposed to erect and maintain solar electric fencing around the entire area to prevent entry of large and medium animals and maintain the same during the plan period.

> However small animals like Squirrel, Mongoose etc, and Reptiles may enter in to the area. The working labourers and staff will be educated to protect these animals and divert them towards the forest area.

> In-spite of the precautions taken, in case of accidental fall of any wild animal in to the mine pit, the workers will be educated to inform the local forest authorities and act as per their advice.

<u>Anti-poaching /anti-depredation activity:</u>

The mining area is well guarded and entry of outsiders is restricted. The staff and the workers will be educated and motivated to prevent any attempt of Poaching within the mining area. Hence no poaching can be possible within this area. However, one person will be exclusively deployed for the purpose of keeping watch on wild animals and forest fire.

4.10   BUDGET

The project proponent will take up above noted activities at his own cost as per the EC Specific Condition no. A (xxiv). The annual work programme and annual outlay for component is provided in Chapter 6 under the heading "To be implemented by project proponent".

Wildlife conservation activities implemented by Project Proponent

- Fire Tender Vehicle will be provided to DFO Datia and DFO Gwalior to combat fire situation in the forest area

  No. of units-01

  Fund Provided-50 lakh

- A vehicle is being provided to range forest officers, Datiya and Gwalior forest Division for patrolling in the Buffer Area.

  No. of Units- 02

  Fund Provided - 24 lakh

- Rescue equipment's will be purchased for safety ie. Small cages-3, medium cages-2, big cage-1.

  No. of Units- 02

  Fund Provided-6 lakh

- Patrolling kit will be provided to the front-line staff.

  No. of units- 120

  Fund-provided- 8.4 lakh

- Fund will be provided for biodiversity awareness for different stakeholders

  Fund provided-20 lakh

CHAPTER 5

5 PROPOSED MANAGEMENT STRATEGIES WITHIN THE BUFFER AREA

(To be implemented by the Divisional Forest Officer within the Buffer area)

River valley project is considered one of the important activities directly affecting the flow & quality of water in water streams and the level of groundwater also gets impacted. It has been gathered from the field team's discussion with the locals that water availability in water streams has considerably reduced in recent years, thereby adversely affecting the agricultural activities that are traditionally dependent on the monsoon. It has also been gathered from discussion with locals that water in many streams gets dried by October and November leaving vast tracts of area without any water, which has equally affected forest dwellers and wildlife. The decrease of vegetation cover and canopy density over a long period of time is one of the major factors limiting the flow of water in Nallas for a few months as told by locals to our team during field interactions. It is therefore imperative that water and soil-conservation activities as mentioned above be given top priority in projects related to the improvement of wildlife habitat, rehabilitation of degraded forests, and rejuvenation of drying up water streams, which have been adversely affected by anthropogenic activities. Forestry strategies proposed for mitigation measures are based on the scientific assumption that recharging of groundwater is vital for the revival of flora and fauna and for boosting agriculture activity, on fringe areas, for reducing biotic pressure on our natural forests. Improvement in moisture regime will help in the regeneration of natural forest and in the enrichment of their canopy density. Improved quality of natural forests will help in improving the overall quality of eco-services. Water availability in the forest area can be improved by erecting rubble/concrete check dams at suitable intervals of 100-300m, at level ground on all water streams emanating from forest areas. These small reservoirs may act as water holes and as micro water-irrigation dams for crops. Such small structures will not only conserve soil and water but will also ensure the availability of water to the small ground-dwelling animals during drought periods by improving the moisture regime in the area. Improved moisture regimes may also bring down fire incidences to a considerable extent. Enhancement of canopy density for enhancing sequestration capacity for getting better eco-service from adjoining natural forests, by undertaking the following activities:

- Aided natural regeneration activities in the one-third area of natural forest on the slopes of Sitapatore mine.
- Construction of a series of check dams on small perennial/seasonal nalas emerging from the foothills of Sitapatore mine.
- The water of these nallas has to be channelized in such a way that before going down it is used to completely recharge the old water reservoir, which may be desilted if required. Installation of solar lights/solar water pumps at suitable locations
- Existing Forest establishments have to be strengthened by way of providing new vehicles for patrolling
- Extensive publicity and extension activities are proposed to be carried out for make people more aware of the need to protect forests and to raise fruit-bearing plants in their vacant land.
- The Forest Department will ensure the safety of animals if ever they happen to enter the Study Area.
- WLA should further ensure that appropriate measures were taken by the Project Proponents to ensure the safe passage of wild animals.
- The Forest Department will ensure that all works prescribed for ameliorating the habitat degradation, enhancing the biodiversity value of the protected areas, and

extension works including people's participation in natural resources conservation are implemented and completed in a fixed time frame and desired results are achieved.

MITIGATION MEASURE

Based on above mentioned facts following forestry and related interventions are being proposed

5.1 Provision for Providing fire tender to combat forest fire

During field work it was recorded that there is a big problem of forest fire in the summer season. So, to combat this situation there is a provision for availing fire tender to DFO.

5.2 Silvicultural Operations

Cleaning of Bamboo Clumps It has been observed that plantations can neither be an alternative to forests which are being damaged by mining activity nor can help in reviving the area. Lost/damaged biodiversity Silvicultural operations on the other hand have proved to be a better strategy for Data improving canopy density by maintaining and reviving the biodiversity of natural forests. Data released by the Forest Survey of India also shows that natural forest of higher canopy density has a higher capacity for sequestering atmospheric carbon. It has also been observed from working plan documents and from field visits that some areas of Balaghat South Forest Division have bamboo as an associate of natural forest, which is the favorite food of wild elephants and is one of the most reliable partners for sequestering atmospheric carbons. Silvicultural management of bamboo may help in the enrichment of canopy density at a much faster rate than any plantation activity can achieve. Moreover, the annual cleaning of dried and decayed bamboo clumps will create abundant fodder for wild animals in the natural forest. Cleaning of Bamboo clumps is being proposed as one of the most appropriate mitigation activities in the light of the above-mentioned facts. The team has not conducted any survey of suitable areas for bamboo cleaning operations. Before carrying out the work DFO, Datiya & DFO, Gwalior will prepare an APO for bamboo cleaning operations of suitable areas, as per SOR, within the prescribed financial limit as mentioned in the budget in Chapter 6.

5.3 Distribution of Fruit Grafts

During field visits, it has been observed that plants of fruit grafts planted by the local people are successful in the area. These successful fruit varieties of fruit grafts of mango, pears, etc., may be distributed among the local communities adjoining the Core Area to enhance their source of income. The time schedule and year-wise financial breakup for the distribution of fruit grafts have been provided in the budget of the mitigation plan.

5.4 Distribution of Solar Pump/Solar Panel

During the field visit, it was observed that a proper supply of electricity is a common scarcity in all villages adjoining Core Areas, which is a big deprivation for all inhabitants especially students who have to study. It is necessary that solar panels/solar lanterns of appropriate size/technology be made available to these villagers at the community level for proper lighting arrangement during the night. This measure will help not only spread education among these ecological people but will also spread awareness about the conservation of forests, wildlife, and the environment as a whole. The schedule and year-wise financial breakup for the distribution of fruit grafts have been provided in the budget of the mitigation plan.

5.5 Reclamation of Areas

It will also be ensured by F/WLA that all the funds provided by the project proponent for implementing Mitigation plans are utilized for this purpose only by keeping these in a separate account, duly approved by the competent authority. The execution of the recommended forestry and soil conservation activities will be prepared at SOR and wage rates prevalent in the state government, after technical and administrative approval or competent levels. WLA will also be bound to abide by any other prescriptions if made by the State Wildlife Board or National Boards of Wildlife while according to clearance to the proposal, as the case may be.

5.6 Utilisation of Mitigation Plan Funds

Water resource detartment will ensure that the reclamation plan is prepared and implemented with a set of activities on the line of forestry works recommended to be carried out by the state through DFO, Datiya & DFO, Gwalior. These Works will be executed at the Water resource detartment cost. A copy of the plan of recommendation of the area to be carried out annually will be provided to the DFO, for information and for technical advice.

5.7 Monitoring Mechanism for Progress of Mitigation Activities

An effort has been made to ensure that the most appropriate mitigation activities are identified for containing the anticipated impacts on wildlife. Timely implementation of the mitigation plan and its regular monitoring may ensure its intended results. The roles of both the Project Proponent Authority and Wildlife team have been clearly elaborated in chapter 6 of the report to avoid any ambiguity in their duties. Budgetary provisions have also been made for the DFO office for Monitoring and Evaluation of mitigation activities. A monitoring mechanism may be set up at division level under the Conservator of Forests with the concerned Divisional Forest Officer and Project Administrator, Maa Ratangarh P.I.U., Mau (Water Resource Department) to review of progress of mitigation activities, and for any technical advice if required by Water Resource Department. An independent third-party monitoring of the implementation plan may also be conducted in the 3rd and 7th year of the plan for impact assessment and any revisions if required.

5.8 Budget

The component identified to be implemented by Forest Department is provided in Chapter 6.

Wildlife Management Activities Implemented By forest Department

A. Forestry and soil conservation work

- ***Bio-fencing***
  No. of units for forest division, Datia – LS

  No. of units for forest division, Gwalior – LS

  Fund provided for forest division, Datia - 10 lakh

  Fund provided for forest division, Datia - 8 lakh

- ***Lantana weed removal & plantation***
  No. of units for forest division, Datia – LS

  No. of units for forest division, Gwalior – LS

  Fund provided for forest division, Datia - 10 lakh

Fund provided for forest division, Gwalior - 8 lakh

B. Engaging community for controlling forest fire, illegal felling, wild animal depredation and poaching etc. and incentivizing them

- *Incentivizing the JFMCs/Eds*
  No. of units for forest division, Datia – 30

  No. of units for forest division, Gwalior – 20

  Fund provided for forest division, Datia - 15 lakh

  Fund provided for forest division, Gwalior - 10 lakh

- *Awareness program with the help of local NGOs –*
  No. of units for forest division, Datia – LS

  No. of units for forest division, Gwalior – LS

  Fund provided for forest division, Datia - 10 lakh

  Fund provided for forest division, Gwalior - 10 lakh

C. Eco- development work/ Capacity building

- *Voltaic wire fencing*
  No. of units for forest division, Datia – LS

  No. of units for forest division, Gwalior – LS

  Fund provided for forest division, Datia - 20 lakh

  Fund provided for forest division, Gwalior - 15 lakh

- *Construction of water holes with borewell and solar pump*
  No. of units for forest division, Datia – 2

  No. of units for forest division, Gwalior – 2

  Fund provided for forest division, Datia - 6 lakh

  Fund provided for forest division, Gwalior - 6 lakh

- *Entry point activities (Water purifier etc.)*
  No. of units for forest division, Datia – 10

  No. of units for forest division, Gwalior – 6

  Fund provided for forest division, Datia - 5 lakh

  Fund provided for forest division, Gwalior - 3 lakh

Miscellaneous administrative & monitoring expenses (2 % of the total costs)

Fund provided- 2.69 lakh

The comprehensive detail has been given in **Chapter 6.**

CHAPTER 6

6   PROPOSED FINANCIAL BUDGET

A.   PART A (TO BE IMPLEMENTED BY PROJECT PROPONENT)

B.   PART B (FORESTRY WORKS) TO BE IMPLEMENTED BY FOREST DEPARTMENT

The recommendations presented in the above preceding paragraphs, outline a best management strategy to address the adverse impacts to the adjoining forested areas of the project. The planning framework envisages the due focus on ecosystem conservation, sustainable resource development and livelihood improvement supported by institutional development; communication, in improving research and public awareness. The mitigation strategy is proposed to address ecological conservation, habitat management, biodiversity conservation, ecotourism development, improvement of quality of life of the riparian communities, sustainable resource development and livelihood improvement.

A total of Rs. 270.15 Lakh (Two crore seventy lakh fifteen thousand only /-) budget is proposed to carry-out the above-mentioned activities and projects. The budget along with the physical targets is detailed in this section. The budget for each proposed activity has been calculated taking into account for a period of 10 years. The cumulative total of the financial forecasts is calculated for a plan period of 10 years.

Breakup of the financial Budget

 Part A TO BE IMPLEMENTED BY PROJECT PROPONENT

A total of Rs.108.4 Lakh (One crore eight lakh fourty thousand only/-) budget is proposed to carry-out the above-mentioned activities and projects.

 Part B (FORESTRY WORKS) TO BE IMPLEMENTED BY FOREST DEPARTMENT

 A total of Rs.137.19 Lakh (One crore thirty seven lakh nineteen thousand only) budget is proposed to carry-out the above-mentioned activities and projects.

Cost-escalation (@10% of the total budget- **24.56 lakhs (Twenty Four Lakh fifty six thusand only/-)**

PART A (To be taken up by the Forest department)															
To be implemented by the Forest department															
Financial budget breakup for Ten years under Site-Specific Wildlife Conservation & Management Plan															
Part-A (Strengthening infrastructure)	Unit	No. of Units	Cost per unit (Lakhs)	Total (Lakhs)	Ist year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
FOR FOREST DIVISION, DATIA															
A. STRENGTHENING OF INFRASTRUCTURE FOR WILDLIFE CONSERVATION															
Fire Tender Vehicle to combat fire situation in the forest area (Proposed for Datia and Gwalior Forest Division)	Nos.	0.5	50	25	25	0	0	0	0	0	0	0	0	0
Purchase of patrolling vehicle for range forest officers, Katangi (Bolero)	Nos.	1	12	12	12	0	0	0	0	0	0	0	0	0
Purchase of rescue equipment (3 small-size cages, 2 medium cages, 1 big cage)	Nos.	1	3	3	3	0	0	0	0	0	0	0	0	0
Purchase of Patrolling kit for forest guards like Trekking shoes, bags, water bottles, etc for RO	Nos.	70	0.07	4.9	4.9	0	0	0	0	0	0	0	0	0
FOR FOREST DIVISION, GWALIOR															
Fire Tender Vehicle to combat fire situation in the forest area	Nos.	0.5	50	25	25	0	0	0	0	0	0	0	0	0
Purchase of patrolling vehicle for range forest officers, Katangi (Bolero)	Nos.	1	12	12	12	0	0	0	0	0	0	0	0	0
Purchase of rescue equipment (3 small-size cages, 2 medium cages, 1 big cage)	Nos.	1	3	3	3	0	0	0	0	0	0	0	0	0
Purchase of Patrolling kit for forest guards like Trekking shoes, bags, water bottles, etc for RO	Nos.	50	0.07	3.5	3.5	0	0	0	0	0	0	0	0	0
Subtotal (Section 1 A)	Nos.			88.4	88.4	0	0	0	0	0	0	0	0	0

B. WILDLIFE AWARENESS & TRAINING														
Biodiversity Conservation & awareness Programme for Local primary school students (school wall painting)														
FOR FOREST DIVISION, DATIA	LS	0	0	10	1	1	1	1	1	1	1	1	1	1
FOR FOREST DIVISION, GWALIOR	LS	0	0	10	1	1	1	1	1	1	1	1	1	1
Subtotal (Section B)				**20**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Total (Section A+B)				**108.4**	**90.4**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**2**
Rs. One crore Eight lakh only														

PART B (To be taken up by the Forest department)														
To be implemented by the Forest department														
Financial budget breakup for Ten years under Site-Specific Wildlife Conservation & Management Plan mine														
Part-B (Forestry work)	Unit	No. of Units	Cost per unit (Lakhs)	Total (Lakhs)	Ist year	2nd year	3rd year	4th year	5th year	6th year	7th year	8th year	9th year	10th year
FOR FOREST DIVISION, DATIA														
Bio-Fencing	LS	0	0	10	5	5	0	0	0	0	0	0	0	0
Lantana weed removal & Plantation	LS	0	0	10	10	0	0	0	0	0	0	0	0	0
Incentivizing the JFMCs/EDCs	Nos.	30	0.5	15	15	0	0	0	0	0	0	0	0	0
Awareness programme with help of local people	LS	0	0	10	1	1	1	1	1	1	1	1	1	1
Voltaic wire fencing	LS	0	0	20	10	10	0	0	0	0	0	0	0	0
Construction of water holes with bore well and solar pump	Nos.	2	3	6	3	3	0	0	0	0	0	0	0	0
Entry point activities (Water purifier etc)	Nos.	10	0.5	5	5	0	0	0	0	0	0	0	0	0

FOR FOREST DIVISION, GWALIOR														
Bio-Fencing	LS	0	0	8	4	4	0	0	0	0	0	0	0	0
Lantana weed removal & Plantation	LS	0	0	8	8	0	0	0	0	0	0	0	0	0
Incentivizing the JFMCs/EDCs	Nos.	20	0.5	10	10	0	0	0	0	0	0	0	0	0
Awareness programme with help of local people	LS	0	0	10	1	1	1	1	1	1	1	1	1	1
Voltaic wire fencing	LS	0	0	15	7.5	7.5	0	0	0	0	0	0	0	0
Construction of water holes with bore well and solar pump	Nos.	2	3	6	3	3	0	0	0	0	0	0	0	0
Entry point activities (Water purifier etc)	Nos.	6	0.5	1.5	1.5	0	0	0	0	0	0	0	0	0
Subtotàl (Part- B)				134.5	84	34.5	2	2	2	2	2	2	2	2
Miscellaneous Administrative & monitoring expenses (2% of the total costs)				**2.69**										
Total (Part B)				**137.19**										
Grand Total(Part A+B)				**245.59**										
EScalation cost and unforeseen @10% of total				**24.56**										
budget cost Grand total (total+escalation)				**270.15**										
Rs. Two crore Sventy lakh only														

ANNEXURE I: COPY OF APPROVED TOR

To

The Engineer-in-Chief
Office of the Engineer-in- Chief
Water Resources Department
Jal Sansadhan Bhawan
Tulsi Nagar, Bhopal - 3.
e-mail : encwrbpl@mp.nic.in

Sub: **Sindh (Seondha) Barrage in Datia District of Madhya Pradesh by Water Resources Department, Government of Madhya Pradesh for ToR - regarding.**

Sir,

This is with reference to your letter No. 61/Env/Cade/2017 dated 17.2.2017 on the above mentioned subject.

2.   The said proposal was appraised by the Environment Appraisal Committee (EAC) for River Valley and Hydro Electric Power Projects (RV&HEP) in its meeting held on 12th April, 2017. The comments and observations of EAC may be seen in the minutes of the meeting which are available on the Ministry's web-site.

3.   The project envisages construction of 29 m high barrage across river Sind near Seonda town of Datia District of Madhya Pradesh. The gross command area (GCA) is 66,575 ha and Culturable Command Area (CCA) is 43,275 ha. The total land requirement for the project is 2311.42 ha, of which 525 ha is forestland. Total submergence area is envisaged to be about 2211.42 ha, of which 425 ha is forestland, 1100.42 ha is Government revenue land and 686 ha is private land. An area of 100 ha which is part of forestland has been envisaged for construction of buildings and roads. Total 23 villages are coming under submergence. Out of these, 8 villages are coming under full submergence. A total of 766 families are likely to be affected due to this project. The total cost of the project is about Rs. 1,696.82 Crores.

4.   Based on recommendations of the EAC, the Ministry of Environment Forest & Climate Change hereby accords a Terms of Reference for pre-construction activities at the proposed site as per the provisions of the Environmental Impact Assessment Notification, 2006 and

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subsequent amendment in 2009 along with the following conditions for preparation of EIA/EMP report:

(a)   The EIA/EMP report should contain the information in accordance with provisions & stipulations as given in the **Annexure-I**.

(b)   The Consultant engaged for preparation of EIA/EMP report has to be registered with Quality Council of India (QCI)/NABET under the scheme of Accreditation & Registration of MoEF. This is a pre-requisite.

(c)   Consultants shall include a "Certificate" in EIA/EMP report regarding portion of EIA/EMP prepared by them and data provided by other organization(s)/ laboratories including status of approval of such laboratories.

(d)   The draft EIA/EMP report prepared as per the **Annexure-I** should be submitted to the State Pollution Control Board Committee concerned for conducting Public Consultation as per the provisions stipulated in EIA Notification of 2006. Public Hearing which is a component of Public Consultation shall be held district wise at the site or in its closed proximity as prescribed in Appendix (IV) of EIA Notification, 2006. The draft EIA/EMP report is to be submitted to SPCB etc sufficiently before the expiry of the ToR validity so that necessary amendments in EIA/EMP can be undertaken based on public hearing and the same is submitted to MoEF &CC before expiry of validity.

(e)   All issues discussed in the Public Hearing/Consultations should be addressed and incorporated in the EIA/EMP Report. Final EIA/EMP report should be submitted to the Ministry for Environmental Clearance only after incorporating these issues before the expiry of validity of ToR.

(f)   The ToR will remain valid for a period of 4 years from the date of issue of this letter for submission of EIA/EMP report along with public consultation. The ToR will stand lapsed on completion of 4 years time in case final EIA/EMP is not submitted and the validity is not extended.

(g)   In case of any change in the Scope of the Project such as capacity enhancement, shifting of dam site, change in submergence, etc., fresh scoping clearance has to be obtained by the project proponent.

(h)   Approval of Forest Clearance Stage-I for the forest area involved in the project is one of the mandatory pre-requisites for grant of Environmental Clearance.

(i)   The PP shall submit a copy of TEC of the DPR along with EIA/EMP report.

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(j)   Information pertaining to Corporate Environmental Responsibility and Environmental Policy shall be provided in the EIA/EMP Report as per this Ministry's OM No.J-11013/25/2014-IA-I dated 11.8.2014 (**Reference as Annexure-II**).

(k)   The EIA/EMP Report must contain an Index showing details of compliance of all ToR conditions. The Index will comprise of page no., etc., vide which compliance of a specific ToR is available. It may be noted that without this index, EIA/EMP report will not be accepted.

(l)   In case the validity is to be extended, necessary application is to be submitted to Regulatory Authority before expiry of validity period together with an updated form -I based on proper justification.

This has approval of the Competent Authority.

Yours faithfully,

(Dr S. Kerketta)
Director

Copy to:

1.   The Secretary, Ministry of Water Resources, RD & GR, Shram Shakti, Bhawan, Rafi Marg, New Delhi - 110 001.
2.   The Principal Secretary (Water Resources Department), Government of Madhya Pradesh, Secretariat, Bhopal -462 016.
3.   The Secretary, Department of Environment, Government of Madhya Pradesh, Secretariat, Bhopal - 462 016.
4.   The Chief Engineer, Project Appraisal Directorate, Central Water Commission, Sewa Bhawan, R.K. Puram, New Delhi-110 066.
5.   The Additional PCCF (Central), Regional Office (WR), Ministry of Environment, Forest & Climate Change, Kendriya Paryavaran Bhavan, Link Raoad No-3, Ravi Shanker Nager, Bhopal - 462 016.
6.   The Member Secretary, Madhya Pradesh State Pollution Control Board, Paryavaran Parisar, E-5, Arera Colony, Bhopal - 462 016.
7.   NIC Cell - uploading in MoEFCC's website.
8.   PPS to JS (GB)/ Director (SKK)/ DD (SP).
9.   Guard file.

(Dr. S. Kerketta)
Director

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TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR 'A' CATEGORY RIVER VALLEY PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

(1) Scope of EIA Studies

The EIA Report should identify the relevant environmental concerns and focus on potential impacts that may change due to the construction of proposed project. Based on the baseline data collected for three (3) seasons (Pre-monsoon, Monsoon and Winter seasons), the status of the existing environment in the area and capacity to bear the impact on this should be analyzed. Based on this analysis, the mitigation measures for minimizing the impact shall be suggested in the EIA/EMP study.

(2) Details of the Project and Site

- General introduction about the proposed project.
- Details of project and site giving L-sections of all u/s and d/s projects of River with all relevant maps and figures. Connect such information as to establish the total length of interference of Natural River and the committed unrestricted release from the site of diversion into the main river.
- A map of boundary of the project site giving details of protected areas in the vicinity of project location.
- Location details on a map of the project area with contours indicating main project features. The project layout shall be superimposed on a contour map of ground elevation showing main project features (viz. location of dam, Head works, main canal, branch canals, quarrying etc.) shall be depicted in a scaled map.
- Layout details and map of the project along with contours with project components clearly marked with proper scale maps of at least a 1:50,000 scale and printed at least on A3 scale for clarity.
- Existence of National Park, Sanctuary, Biosphere Reserve etc. in the study area, if any, should be detailed and presented on a map with distinct distances from the project components.
- Drainage pattern and map of the river catchment up to the proposed project site.
- Delineation of critically degraded areas in the directly draining catchment on the basis of silts Yield Index as per the methodology of All India Soil and Land Use Survey of India.
- Soil characteristics and map of the project area.
- Geological and seismo-tectonic details and maps of the area surrounding the proposed project site showing location of dam site and powerhouse site.
- Remote Sensing studies, interpretation of satellite imagery, topographic sheets along with ground verification shall be used to develop the land use/land cover pattern of the study using overlaying mapping techniques viz. Geographic Information System (GIS), False Color composite (FCC) generated from satellite data of project area.

- Land details including forests, private and other land.
- Demarcation of snow fed and rain fed areas for a realistic estimate of the water availability.

(3) **Description of Environment and Baseline Data**

To know the present status of environment in the area, baseline data with respect to environmental components air, water, noise, soil, land and biology & biodiversity (flora & fauna), wildlife, socio-economic status etc. should be collected with 10 km radius of the main components of the project/site i.e. dam site and power house site. The air quality and noise are to be monitored at such locations, which are environmentally & ecologically more sensitive in the study area. The baseline data should be collected for 3 seasons (Pre-Monsoon, Monsoon and Post-Monsoon). Flora-Fauna in the Catchment and command area should be documented. The study area should comprise of the following:

- Catchment area up-to the dam site.
- Submergence Area
- Project area or the direct impact area should comprise of area falling within 10 km radius from the periphery of reservoir, land coming under submergence and area downstream of dam upto the point where Tail Race Tunnel (TRT) meets the river.
- Downstream upto 10 km from tip of Tail Race Tunnel (TRT).

(4) **Details of the Methodology**

- The methodology followed for collection of base line data along with details of number of samples and their locations in the map should be included.
- Study area should be demarcated properly on the appropriate scale map.
- Sampling sites should be depicted on map for each parameter with proper legends.
- For forest classification, Champion and Seth (1968) classification should be followed.

(5) **Methodology for collection of Biodiversity Data**

- The number of sampling locations should be adequate to get a reasonable idea of the diversity and other attributes of flora and fauna. The guiding principles should be the size of the study area (larger area should have larger number of sampling locations) and inherent diversity at the location, as known from secondary sources (e.g. eastern Himalayan and low altitude sites should have a larger number of sampling locations owing to higher diversity).
- The entire area should be divided in grids of 5km X 5km preferably on a GIS domain. There after 25% of the grids should be randomly selected for sampling of which half should be in the directly affected area (grids including project components such as reservoir, dam, powerhouse, tunnel, canal etc.) and the remaining in the rest of the area (areas of influence in 10 km radius form project components). At such chosen location, the size and number of sampling units (e.g. quadrats in case of flora/transects in case of fauna) must be decided by species area curves and the

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details of the same (graphs and cumulative number of species in a tabulated form) should be provided in the EIA report. Some of the grids on the edges may not be completely overlapping with the study area boundaries. However these should be counted and considered for selecting 25% of the grids. The number of grids to be surveyed may come out as a decimal number (i.e. it has an integral and a fractional part) which should be rounded to the next whole number.

- The conventional sampling is likely to miss the presence of rare, endangered and threatened (R.E.T.) species since they often occur in low densities and in case of faunal species are usually secretive in behaviour. Reaching the conclusion about the absence of such species in the study area based on such methodology is misleading. It is very important to document the status of such species owing to their high conservation value. Hence likely presence of such species should be ascertained from secondary sources by a proper literature survey for the said area including referring to field guides which are now available for many taxonomic groups in India. Even literature from studies/surveys in the larger land-scapes which include the study area for the concerned project must be referred to since most species from adjoining catchments is likely to be present in the catchments in question. In fact such literature form the entire state can be referred to. Once a listing of possible R.E.T. species form the said area is developed, species specific methodologies should be adopted to ascertain their presence in the study area which would be far more conclusive as compared to the conventional sampling. If the need be, modern methods like camera trapping can be resorted to, particularly for areas in the eastern Himalayas and for secretive/nocturnal species. A detailed listing of the literature referred to, for developing lists of R.E.T. species should be provided in the EIA reports.
- The R.E.T. species referred to in this point should include species listed in Schedule I and II of Wildlife (Protection) Act, 1972 and those listed in the red data books (BSI, ZSI and IUCN).

(6) Components of the EIA Study

Various aspects to be studied and provided in the EIA/EMP report are as follows:

A. Physical and Chemical Environment

(i) Geological & Geophysical Aspects and Seismo – Tectonics:

- Physical geography, Topography, Regional Geological aspects and structure of the Catchment.
- Tectonics, seismicity and history of past earthquakes in the area. A site-specific study of the earthquake parameters will be done. The results of the site-specific earthquake design shall be sent for approval of the NCSDP (National committee of Seismic Design Parameters, Central water commission, New Delhi for large dams.
- Landslide zone or area prone to landslide existing in the study area should be examined.
- Presence of important economic mineral deposit, if any.

- Justification for location & execution of the project in relation to structural components (dam height).
- Impact of project on geological environment.

(ii) Meteorology, Air and Noise:

- Meteorology (viz. Temperature, Relative humidity, wind speed/direction etc.) to be collected from nearest IMD station.
- Ambient Air Quality with parameters viz. Suspended Particulate Matter (SPM), Respirable Suspended Particulate Matter (RSPM) i.e. suspended particulate materials <10 microns, Sulphur Dioxide (SO_2) and Oxides of Nitrogen (NOx) in the study area at 6 locations.
- Existing noise levels and traffic density in the study area at 6 locations.

(iii) Soil Characteristics

- Soil classification, physical parameters (viz., texture, porosity, bulk density and water holding capacity) and chemical parameters (viz. pH, electrical conductivity, magnesium, calcium, total alkalinity, chlorides, sodium, potassium, organic carbon, available potassium, available phosphorus, SAR, nitrogen and salinity, etc.) (6 locations).

(iv) Remote sensing and GIS Studies

- Generation of thematic maps viz., slope map, drainage map, soil map, land use and land cover map, etc. Based on these, thematic maps, an erosion intensity map should be prepared.
- New configuration map to be given in the EIA Report.

(v) Water Quality

- History of the ground water table fluctuation in the study area.
- Water quality for both surface water and ground water for (i) Physical parameters (pH, temperature, electrical conductivity, TSS); (ii) Chemical parameters (Alkalinity, Hardness, BOD, COD, NO_2, PO_4, Cl, SO_4, Na, K, Ca, Mg, Silica, Oil & Grease, phenolic compounds, residual sodium carbonate); (iii) Bacteriological parameter (MPN, Total coliform) and (iv) Heavy Metals (Pb, As, Hg, Cd, Cr-6, total Cr, Cu, Zn, Fe) (35 locations).
- Delineation of sub and micro-watersheds, their locations and extent based on the Government of India. Erosion levels in each micro-watershed and prioritization of micro-watershed through silt yield index (SYI) method of AISLUS.

B.   Water Environment & Hydrology

- Hydro-Meteorology of the project viz. precipitation (snowfall, rainfall), temperature, relative humidity, etc. Hydro-meteorological studies in the

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catchment area should be established along-with real time telemetry and data acquisition system for inflows monitoring.

- Run off, discharge, water availability for the project, sedimentation rate, etc.
- Basin characteristics
- Catastrophic events like cloud bursts and flash floods, if any, should be documented.
- For estimation of Sedimentation Rate, direct sampling of river flow is to be done during the EIA study. The study should be conducted for minimum one year. Actual silt flow rate to be expressed in ha-m km^2 year-1.
- Sedimentation data available with CWC may be used to find out the loss in storage over the years.
- Set up a G&D monitoring station and a few rain gauge stations in the catchment area for collecting data during the investigation.
- Flow series, 10 daily with 90%, 75% and 50% dependable years discharges.
- A table of 10-daily water discharges corresponding to 90% dependable year showing the intercepted discharge at the barrage, the environmental flow to be released and the other flow releases downstream of the barrage and spills to be provided in hydrology section of EIA.
- Norms for release of Environmental flows, i.e. 30% in monsoon season, 20% in lean season and 25% in non-monsoon & non-lean season to be followed corresponding to 90% dependable year. A site specific study on minimum environment flow should be carried out.
- Hydrological studies/data as approved by CWC shall be utilized in the preparation of EIA/EMP report. Actual hydrological annual yield may also be given in the report.
- A minimum of 1 km distance from the tip of the reservoir to the tail race tunnel should be maintained between upstream and downstream projects.

C. Biological Environment

Besides primary studies, review of secondary data/literature published for project area on flora & fauna including RET species shall be reported in EIA/EMP report.

(i) Flora

- Characterization of forest types (as per Champion and Seth method) in the study area and extent of each forest type as per the Forest Working Plan.
- Documentation of all plant species i.e. Angiosperm, Gymnosperm, Pteriodophytes, Bryophytes, Lichens (all groups). All species list may be provided.
- General vegetation profile and floral diversity covering all groups of flora including lichens and orchids. A species wise list may be provided.
- Assessment of plant species with respect to dominance, density, frequency, abundance, diversity index, similarity index, importance value index (IVI) , Shannon Weiner index etc. of the species to be provided. Methodology used for

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calculating various diversity indices along with details of locations of quadrates, size of quadrates etc. to be reported within the study area in different ecosystems.

- Existence of National park, Sanctuary, Biosphere Reserve etc in the study area, if any, should be detailed.
- Economically important species like medicinal plants, timber, fuel wood etc.
- Details of endemic species found in the project area.
- Flora under RET categories should be documented using International Union for the Conservation of Nature and Natural Resources (IUCN) criteria and Botanical Survey of India's Red Data list along-with economic significance. Species diversity curve for RET species should be given.
- Biodiversity study, a sub-component of EIA study, is to be carried-out by associating a reputed organisation/institution as recommended by WII, Dehradun or by ICFRE, Dehradun. A list of such institutes is available on MoEF"s website.
- Cropping pattern and Horticultural Practices in the study area.

(ii) Fauna

- Fauna study and inventorization should be carried out for all groups of animals in the study area. Their present status along-with Schedule of the species.
- Documentation of fauna plankton (phyto and zooplankton), periphyton, benthos and fish should be done and analysed.
- Information (authenticated) on Avi-fauna and wildlife in the study area.
- Status of avifauna their resident/ migratory/ passage migrants etc.
- Documentation of butterflies, if any, found in the area.
- Details of endemic species found in the project area.
- RET species-voucher specimens should be collected along-with GPS readings to facilitate rehabilitation. RET faunal species to be classified as per IUCN Red Data list and as per different schedule of Indian Wildlife (Protection) Act, 1972.
- Existence of barriers and corridors, if any, for wild animals.
- Compensatory afforestation to compensate the green belt area that will be removed, if any, as part of the proposed project development and loss of biodiversity.
- Collection of primary data on agricultural activity, crop and their productivity and irrigation facilities components.

D. Aquatic Ecology

- Documentation of aquatic fauna like macro-invertebrates, zooplankton, phytoplanktons, benthos, etc.
- Fish and fisheries, their migration and breeding grounds.
- Fish diversity composition and maximum length & weight of the measured populations to be studies for estimation of environmental flow.
- Conservation status of aquatic fauna.

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E. Socio-Economic

- Collection of baseline data on human settlements, health status of the community and existing infrastructure facilities for social welfare including sources of livelihood, job opportunities and safety and security of workers and surroundings population.
- Collection of information with respect to social awareness about the developmental activity in the area and social welfare measures existing and proposed by project proponent.
- Collection of information on sensitive habitat of historical, cultural and religious and ecological importance.
- The socio-economic survey/ profile within 10 km of the study area for demographic profile; Economic Structure; Developmental Profile; Agricultural Practices; Infrastructure, education facilities; health and sanitation facilities; available communication network etc.
- Documentation of demographic, Ethnographic, Economic Structure and development profile of the area.
- Information on Agricultural Practices, Cultural and aesthetic sites, Infrastructure facilities etc.
- Information on the dependence of the local people on minor forest produce and their cattle grazing rights in the forest land.
- List of all the Project Affected Families with their name, age, educational qualification, family size, sex, religion, caste, sources of income, land & house holdings, other properties, occupation, source of income, house/land to be acquired for the project and house/land left with the family, any other property, possession of cattle, type of house etc.
- In addition to socio-economic aspects of the study area, a separate chapter on socio-cultural aspects based upon study on Ethnography of the area should be provided.

(7) Impact Prediction and Mitigation Measures

The adverse impact due to the proposed project should be assessed and effective mitigation steps to abate these impacts should be described.

(i) Air Environment

- Changes in ambient and ground level concentrations due to total emissions from point, line and area sources.
- Effect on soil, material, vegetation and human health.
- Impact of emissions from DG set used for power during the construction, if any, on air environment.
- Pollution due to fuel combustion in equipments and vehicles
- Fugitive emissions from various sources
- Impact on micro-climate

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(ii) Water Environment

- Changes in surface and ground water quality
- Steps to develop pisci-culture and recreational facilities
- Changes in hydraulic regime and downstream flow.
- Water pollution due to disposal of sewage
- Water pollution from labour colonies/ camps and washing equipment.

(iii) Land Environment

- Adverse impact on land stability, catchment of soil erosion, reservoir sedimentation and spring flow (if any) (a) due to considerable road construction / widening activity (b) interference of reservoir with the inflowing stream (c) blasting for commissioning of HRT, TRT and some other structures.
- Changes in land use / land cover and drainage pattern.
- Immigration of labour population.
- Quarrying operation and muck disposal.
- Changes in land quality including effects of waste disposal.
- River bank and their stability.
- Impact due to submergence.

(iv) Biological Environment

- Impact on forests, flora, fauna including wildlife, migratory avi-fauna, rare and endangered species, medicinal plants etc.
- Pressure on existing natural resources.
- Deforestation and disturbance to wildlife, habitat fragmentation and wild animal's migratory corridors.
- Compensatory afforestation-identification of suitable native tree species for compensatory afforestation and green belt.
- Impact on fish migration and habitat degradation due to decreased flow of water.
- Impact on breeding and nesting grounds of animals and fish.

(v) Socio-economic aspects

- Impact on local community including demographic profile.
- Impact on socio-economic status.
- Impact on economic status.
- Impact on human health due to water / vector borne disease
- Impact on increase traffic.
- Impact on Holy Places and Tourism.
- Impacts of blasting activity during project construction which generally destabilize the land mass and leads to landslides, damage to properties and drying up of natural springs and cause noise population will be studies. Proper record shall be maintained of the baseline information in the post project period.
- Positive and negative impacts likely to be accrued due to the project are listed.

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(8) Environmental Management Plans

- **Catchment Area Treatment (CAT) Plan** should be prepared micro-watershed wise. Identification of free draining/ directly draining catchment based upon Remote Sensing and Geographical Information System (GIS) methodology and Sediment Yield Index (SYI) method of AISLUS, Deptt. of Agriculture, Govt. of India coupled with ground survey. Areas or watersheds falling under 'very severe' and 'severe' erosion categories should be provided and required to be treated. Both biological as well as engineering measures should be proposed in consultation with State Forest Department for areas requiring treatment. Year-wise schedule of work and monetary allocation should be provided. Mitigation measures to check shifting cultivation in the catchment area with provision for alternative and better agricultural practices should be included.

- **Command Area Development (CAD) Plan** giving details of implementation schedule with a sample CAD plan.

- **Compensatory Afforestation** shall be prepared by the State Forest Department in lieu of the forestland proposed to be diverted for construction of the project as per the Forest (Conservation) Act, 1980. Choice of plants for afforestation should include native and RET species, if any.

- **Biodiversity and Wildlife Conservation and Management Plan** for the conservation and preservation of rare, endangered or endemic floral/ faunal species or some National Park/Sanctuary/ Biosphere Reserve or other protected area is going to get affected directly or indirectly by construction of the project, then suitable conservation measures should be prepared in consultation with the State Forest Department.

- **Fisheries Conservation and Management Plan** – a specific fisheries management measures should be prepared for river and reservoir. If the construction of fish ladder/ fish-way etc. is not feasible then measures for reservoir fisheries will be proposed. The plan will detail out the number of hatcheries, nurseries, rearing ponds etc. proposed under the plan with proper drawings. If any migratory fish species is getting affected then the migratory routes, time/season of upstream and downstream migration, spawning grounds etc will be discussed in details.

- **Resettlement and Rehabilitation Plan** needed to be prepared on the basis of findings of the socio-economic survey coupled with the outcome of public consultation held. The R&R package shall be prepared after consultation with the representatives of the project affected families and the State Government. Detailed budgetary estimates are to be provided. Resettlements site should be identified. The plan will also incorporate community development strategies. *R&R Plan is to be formulated as per Land Acquisition, Rehabilitation and Resettlement Act, 2013 which came into force on 01.01.2014.*

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- **Green Belt Development Plan** along the periphery of the reservoir, approach roads around the colonies and other project components, local plant species must be suggested, with physical and financial details. Local plant species suitable for greenbelt should be selected.

- **Reservoir Rim Treatment Plan** for stabilization of land slide/ land slip zones, if any, around the reservoir periphery is to be prepared based on detailed survey of geology of the reservoir rim area. Suitable engineering and biological measures for treatment of identified slip zones to be suggested with physical and financial schedule.

- **Muck Disposal Plan** suitable sites for dumping of excavated materials should be identified in consultation with State Pollution Control Board and State Forest Department. All muck disposal sites should be minimum 30 in away from the HFL of river. Plan for rehabilitation of muck disposal sites should also be given. The L-section/cross section of muck disposal sites and approach roads should be given. The plan shall have physical and financial details of the measures proposed.

- **Restoration Plan for Quarry Sites and landscaping** of colony areas, working areas, roads etc. Details of the coarse/fine aggregate/clay etc. required for construction of the project and the rock/clay quarries/river shoal sites identified for the project should be discussed along-with the Engineering and Biological measures proposed for their restoration with physical and financial details. Layout map showing quarry sites vis-à-vis other project components, should be prepared.

- **Study of Design Earthquake Parameters:** A site specific study of earthquake parameters should be done. Results of the site specific earthquake design parameters should be approved by National Committee of Seismic Design Parameters, Central Water Commission (NCSDP), New Delhi.

- **Dam Break Analysis and Disaster Management Plan** The outputs of dam break model should be illustrated with appropriate graphs and maps clearly bringing out the impact of Dam Break scenario. The action plan will include Emergency Action and Management plan including measures like preventive action notification, warning procedure and action plan for co-ordination with various authorities.\

- **Water, Air and Noise Management Plans** to be implemented during construction and post-construction periods.

- Mitigating measures for **impacts due to Blasting** on the structures in the vicinity.

- **Ground Water Management Plan.**

- **Public Health Delivery Plan** including the provisions of drinking water supply for local community.

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- **Labour Management Plan** for their Health and Safety.

- **Sanitation and Solid waste Management plan** for domestic waste from colonies and labour camps etc.

- **Local Area Development Plan** to be formulated in consultation with the Revenue Officials and village Panchayat. Local skill development schemes should be given. Details of various activities to be undertaken along with its financial out lay should be provided.

- Environmental safeguards during **construction activities** including **Road** Construction.

- **Energy Conservation Measures.**

- **Environmental Monitoring Programme** with physical & financial details covering all the aspects of EMP. A summary of Cost Estimates for all the plans, cost for implementing all the Environmental Management Plans.

(9) In the EMP, a sample CAD plan for a distributary outlet command is also included. Such a plan is to show the alignment of irrigation and drainage channels. The components of the On Farm Development (OFD) works to be undertaken may be clearly mentioned along with a time schedule for their completion vis-&-vis the progress of irrigation development.

(10) Additional Conditions:

  i. Land acquired for the project shall be suitably compensated in accordance with the law of the land with the prevailing guidelines.
  ii. PP has proposed use of micro irrigation. A detailed irrigation management plan should be worked out.
  iii. Surplus water is available in the project; but there is not much land to be irrigated. Therefore, the cropping pattern may be reviewed and water should be utilized optimally.
  iv. An earthen dam shall be constructed for which soil shall be taken from the submergence area. As per the rules, necessary permission shall be obtained for getting the borrow materials from the submergence area. Care should be taken to ensure that the groundwater table is not intersected during mining of minor minerals.
  v. Information regarding borrowing boulders, etc. should be obtained and accordingly permission be obtained as per the Rules.
  vi. The lift involved is 70 m. Economic viability of the project should be worked out based on the guidelines issued by CBIP, New Delhi, in April 2002 or so in regard to the planning and design of large lift irrigation schemes. The true (not subsidized) cost of electricity is to be considered for economic analysis.
  vii. Conjunctive water use should also be investigated for optimal water use in the command area.

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No.J-11013/25/2014-IA.I
Government of India
Ministry of Environment & Forests

Indira ParyavaranBhawan,
JorBagh Road, Ali Ganj,
New Delhi-11003

Dated the 11th August, 2014

OFFICE MEMORANDUM

Subject: **Environment sustainability and CSR related issues-guidelines**

The Environment Impact Assessment (EIA) Notification 2006, issued under the Environment (Protection) Act 1986, as amended from time to time, prescribes the process for granting prior environment clearance (EC) in respect of certain development projects / activities listed out in the Schedule to the notification.

2.   Sustainable development has three components, viz., social, economic and environmental. All the three components are closely inter-related and mutually re-enforcing. Considering this, the general structure of EIA document, under Appendix-III to the notification, prescribes inter-alia public consultation, social impact assessment and R&R action plan besides environment management plan (EMP).

3.   It is noticed that while there is clarity on the guidelines on EMP, as regards sustainability related issues, different formulations have been prescribed in the conditions in EC letters for the projects under different sectors listed out in Schedule to the EIA Notification, 2006. Thus, there is a need to issue guidelines on the subject.

4.   Section 135 of the Companies Act, 2013 deals with corporate social responsibility and Schedule-VII of the Act lists out the activities which may be included by companies in their CSR Policies. The activities relating to "ensuring environmental sustainability", are listed in this schedule. Further, Ministry of Corporate Affairs has also notified the Companies (Corporate Social Responsibility Policy) Rules, 2014.

5.   The concept of CSR as provided for in the Companies Act, 2013 and covered under the Companies (Corporate Social Responsibility Policy) Rules, 2014 comes into effect only in case of companies having operating projects and making net profit as also subject to other stipulations contained in the aforesaid Act and Rules. The environment clearance given to a project may involve a situation where the concerned company is yet to make any net profit and / or is not covered under the purview of the aforesaid Act and Rules. Obviously, in such cases, the provisions of aforesaid Act and Rules will not apply.

6.   The matter has been further examined in the Ministry of Environment, Forests & Climate Change (MoEF&CC). It has been decided that in respect of valid concerns expressed during the public consultations, mitigation issues emerging from social impact assessment and R&R Plan, the project proponents, in EIA / EMP report will clearly state the activity-wise costs involved (both capital as well as recurring costs), the phasing of these activities along with costs and also as to how such expenditure would be met. The costs and the timelines for various activities as prepared by the project proponent may be looked into by the concerned Expert Appraisal Committee (EAC) for their reasonableness and appropriate recommendations in the matter reflected in the minutes of EAC meeting. In case these activities (or some of these activities) are proposed to be covered by the project proponent under CSR activities, the project proponent should commit providing for the same. In either case, the position regarding the agreed activities, their funding mechanism and the phasing should be clearly reflected in the EC letter.

7.   The obligation on part of the project proponents, as mentioned in para5 above, should be stated at the TOR stage itself as one of the TORs for the project.

8.   All Sectoral EACs will follow the aforesaid procedure on environment sustainability and CSR related issues while appraising the projects and do away with the existing practices being followed on the subject, if any.

9.   These guidelines will apply mutatis mutandis to SEACs/SEIAAs.

10.   This issues with the approval of the Component Authority.

(Dr. Satish C.Garkoti)
Scientist 'F'

To

1. All the Officers of IA Division
2. Chairpersons / Member Secretaries of all the SEIAAs / SEACs
3. Chairman, CPCB
4. Chairpersons / Member Secretaries of all SPCBs / UTPCCs

Copy to:

1. PS to MEF
2. PPS to Secretary (EF&CC)
3. PPS to AS(SS)
4. PPS to JS(AT)
5. Website of MoEF&CC
6. Guard File

— 16—

No. J-12011/21/2016-IA-I (R)
Ministry of Environment, Forest & Climate Change
Government of India
(IA.I Division)

Indira Paryavaran Bhawan
3rd Floor, Vayu Wing
Jor Bagh Road
New Delhi-3

Date: 15th October, 2018

To

The Engineer-in-Chief
Office of the Engineer-in- Chief
Water Resources Department
Jal Sansadhan Bhawan
Tulsi Nagar, Bhopal - 3.

Subject: Maa Ratangarh Multipurpose Project in Datia District of Madhya Pradesh by Water Resources Department, Government of Madhya Pradesh - for amendment in ToR - regarding.

Sir,

This is with reference to your letter No. 3041/TS/Datia/2018 dated 7.8.2018 on the above mentioned subject. The Terms of Reference (TOR) for Sindh (Seondha) Barrage in Datia District of Madhya Pradesh was accorded on 15.5.2017 for 4 years. Your request for approval of change of scope in the project and change in the name of the project and amendment in TOR has been examined by the Expert Appraisal Committee (EAC) for River Valley & Hydroelectric Projects in its meeting held on 27.8.2018.

2.   The EAC duly considered the relevant documents submitted by you and have recommended and agreed for changes in the scope of the project and change in name of the project. Accordingly, the Ministry hereby accords amendment ToR for **"Maa Ratangarh Multipurpose Project"** in Datia District of Madhya Pradesh with the same TOR as communicated vide letter dated 15.5.2017 with the following corrections:

i. The project envisages construction of 31 m high barrage across river Sind near Seonda town of Datia District of Madhya Pradesh. The Culturable Command Area (CCA) is 78,484 ha. The total land requirement for the project is 3337.63 ha, of which 799.59 ha is forestland. Total submergence area is about 3337.63 ha (799.59 ha is forestland + 1235.25 ha is government land + 1302.79 ha is private land). A total of 23 villages are coming under submergence. Out of these, 8 villages are coming under full submergence. A total of 766 families are likely to be affected due to this project. The complete canal system is pressurized

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irrigation system to achieve the optimum utilization of water. The total cost of the project is about Rs. 2244.97 Crores.

ii. The EAC also recommended the following Additional Conditions:

- The baseline data so collected may also be used in the preparation of EIA/EMP report, apart from fresh three seasons base line data.
- Land acquired for the project shall be suitably compensated in accordance with the law of the land with the prevailing guidelines. Private land shall be acquired as per provisions of Right to Fair Compensation & Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.
- Recharge of groundwater in the command area be planned and included in the EMP.
- The project involves 799.59 ha of forest area. Therefore, forest clearance should be obtained for the entire forestland as per the prevailing norms.

3. All other terms and conditions of the Scoping/TOR clearance stipulated in letter No. J-12011/21/2016-IA-I (R) dated 15.5.2017 shall remain unchanged.

This has approval of the Competent Authority.

(I.S.)		S.E. (A)	
E.-(N.M.)		C.P.O.	
C.E.(P)		E.E. (V)	
S.E.(Major)		E.E. (B)	
S.E.(W)	Sr.P.A.	S.A. (EDP)	

1 5 NOV 2018

Yours faithfully,

(Dr S. Kerketta)
Director   16/11/18

Copy to:

1. The Secretary, Ministry of Water Resources, RD & GR, Shram Shakti, Bhawan, Rafi Marg, New Delhi - 110 001.
2. The Principal Secretary (Water Resources Department), Government of Madhya Pradesh, Secretariat, Bhopal -462 016.
3. The Secretary, Department of Environment, Government of Madhya Pradesh, Secretariat, Bhopal - 462 016.
4. The Chief Engineer, Project Appraisal Directorate, Central Water Commission, Sewa Bhawan, R.K. Puram, New Delhi-110 066.
5. The Additional PCCF (Central), Regional Office (WR), Ministry of Environment, Forest & Climate Change, Kendriya Paryavaran Bhavan, Link Raoad No-3, Ravi Shanker Nager, Bhopal - 462 016.
6. The Member Secretary, Madhya Pradesh State Pollution Control Board, Paryavaran Parisar, E-5, Arera Colony, Bhopal - 462 016.
8. Guard file.

(Dr. S. Kerketta)
Director

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862 दिनांक 12-11-2018

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ANNEXURE II: FOREST PROPOSAL APPLICATION

FORM - A

Form for seeking prior approval of Central Government under section 2 of the Forest(Conservation) Act,1980 for Diversion of fresh forest area

PART - I
(To be filled up by User Agency)

A. General Details

A-1. Project Details

(i). **Proposal No. :** FP/MP/IRRIG/40397/2019

(ii). **Name of Project for which Forest Land is required :** MAA RATANGARH MULTIPURPOSE PROJECT

(iii). **Short narrative of the proposal and Project/scheme for which the forest land is required :** Maa Ratangrah project is designed to sustain all the possible uses .Dam is proposed to be constructed across Sindh River near SEONDHA town of Datia District.

(iv). **State :** Madhya Pradesh

(v). **Category of the Proposal :** Irrigation

(vi). **Shape of forest land proposed to be diverted :** Non Linear

(vii). **Estimated cost of the Project(Rupees in lacs) :** 224497

(viii). **Area of forest land proposed for diversion(in ha.):** 1305.142

(ix). **Non-forest land required for this project(in ha.):** 1840.11

(x). **Total period for which the forest land is proposed to be diverted(in years):** 99

A-2. Details of User Agency

(i). **Name :** EE HARSI HIGH LEVEL CANAL DN TWO DABRA

(ii). **Address1 :** EE HARSI HIGH LEVEL CANAL DN 2 DABRA DIST GWALIOR

(iii). **Address2 :** NIL

(iv). **State :** Madhya Pradesh

(v). **District :** Gwalior

(vi). **Pin :** 475110

(vii). **Landmark :** NEAR BUS STAND DABRA

(viii). **Email address :** eeharsihlc.gwl@gmail.com

(ix). **Landline Telephone No. :** 7524-225470

(x). **Fax No. :** 7524-

(xi). **Mobile No. :** 7869028444

(xii). **Website (if any) :** NIL

(xiii). **Legal status of User Agency :** State Government

A-3. Details of Person Making Application

(i). **First Name:** Rajesh

(ii). **Middle Name:** NIL

(iii). **Last Name:** Chaturvedi

(iv). **Gender:** Male

(v). **Designation:** Project Manager

(vi). **Address 1:** EE HARSI HIGH LEVEL DN.2 DABRA DIST. GWALIOR

(vii). **Address 2:** MAA RATANGARH P.I.U. , MAU , DISTT. BHIND

(viii). **State:** Madhya Pradesh

(ix). **District:** Bhind

(x). **Tehsil:** Mou

(xi). **Pin:** 477222

(xii). **Landmark:** NEAR HOSPITAL, MAU

(xiii). **Email Address:** eeharsihlc.gwl@gmail.com

(xiv). **Landline Telephone No.:** 0-

(xv). **Fax No.:** NIL

(xvi). **Mobile No.:** 9340899282

(xvii). **Copy of documents in support of the competence/authority of the person making this application to make application on behalf of the User Agency:** 📄

B. Details of land required for the Project

B-1. Details of proposal seeking prior approval of Central Government under the Act for diversion of forest land for the Project already submitted in the past

				List of proposal submitted in Past			
S.no	Proposal Status.	Proposal No.	Moef File No.	Area Proposed for Diversion(Ha.)	Area Diverted(Ha.)	Date of In-Principle Approval	Date of Final Approval
NIL							

B-2. Details of forest land proposed to be diverted

B-2.1 Details of Divisions involved

	Details of Divisions involved		
S.no	Division Name	Forest Land(ha.)	Non-Forest Land(ha.)
1.	Datiya(T)	981.357	1763.11
2.	Gwalior(T)	323.785	77
	Total	**1305.142**	**1840.11**

B-2.2 Details of Districts involved

	District wise breakup		
S.no	District Name	Forest Land(ha.)	Non-Forest Land(ha.)
1.	Datia	981.357	1763.11
1.	Gwalior	323.785	77
	Total	**1305.142**	**1840.11**

B-2.3 Village wise breakup

	Villages wise breakup		
S.no	Village	Forest Land(ha.)	Non-Forest Land(ha.)
1	Khamroli	0	309.51
2	Dhimarpura	5.22	6.07

3	Medpura	15.9	36.76
4	Nanat	0	133.45
5	Dhubiyai	0	89.45
6	Madikheda	0	60.42
7	Barkari	0	64.22
8	Dangdiroli	95	98.97
9	Shikarpur	174.79	38.28
10	Bisor	0	121.02
11	Basai Malik	15.36	90.34
12	Mersanikhurd	161.76	115.41
13	MersaniBujurg	57.93	124.87
14	Dhorri	41.83	0.67
15	Dhorra	25.3	0
16	Rubaha	96.161	17.07
17	Chitai	0	47.56
18	Pali	0	10.86
19	Pahadi	39.68	111.56
20	Dongarpur	0	33.24
21	Berchha	0	111.38
22	Atrenta	0	142
23	Dangseondha	272.887	0
24	Jiganiya	303.324	77
	Total	**1305.142**	**1840.11**

B-2.4 Component wise breakup

Component wise breakup			
S.no	Component	Forest Land(ha.)	Non-Forest Land(ha.)
1	Submergence	1269.582	1840.11
2	Dam	35.56	0
	Total	**1305.142**	**1840.11**

C. Maps of forest land proposed to be diverted

Division 1. : Gwalior(T)

(i). Area of forest land proposed to be diverted(in ha.) : 323.785

(ii). Nature of the Project: Non Linear

(a). No. of patches : Three

Patch wise details		
Patch No.	Area of Patch(in ha.)	Kml File of PatchesTo view KML file on google the same may be downloaded and then open if in google earth install in your computer.
1.	20.461	View File
2.	303.324	View File
3.	0	View File

(iii). Copy of Survey of India Toposheet indicating boundary of forest land proposed to be diverted:

(iv). Scanned copy of the Geo-referenced map of the forest land proposed to be diverted prepared by using GPS or Total Station:

Division 2. : Datiya(T)

(i). Area of forest land proposed to be diverted(in ha.) : 981.357

(ii). Nature of the Project: Non Linear

(a). No. of patches : Eight

Patch wise details		
Patch No.	Area of Patch(in ha.)	Kml File of PatchesTo view KML file on google the same may be downloaded and then open if in google earth install in your computer.
1.	31.973	View File
2.	0.95	View File
3.	19.609	View File
4.	2.537	View File
5.	2.214	View File
6.	183.681	View File
7.	438.467	View File
8.	301.926	View File

(iii). Copy of Survey of India Toposheet indicating boundary of forest land proposed to be diverted:

(iv). Scanned copy of the Geo-referenced map of the forest land proposed to be diverted prepared by using GPS or Total Station:

D. Justification for locating the Project in forest land and details of alternatives examined:

(i). Copy of note containing justification for locating the Project in forest land:

E. Employment likely to be generated

(i). Whether the Project is likely to generate employment ?: Yes

(ii). Permanent/Regular Employment(Number of persons): 50

(iii). Temporary Employment(Number of person-days): 2810000

F. Displacement of People due to the Project, if any

(i). Whether Project involves displacement?: No

G. Details of Cost-Benefit analysis for the Project

(i). Whether the Project requires Cost-Benefit analysis?: Yes

(a). Copy of Cost-Benefit analysis:

H. Status of Environmental Clearance

(i). Whether the Project requires Clearance under the Environment (Protection) Act 1986 ? : Yes

    (a). Status of the Environmental Clearance to the Project: EC application yet to be submitted

I. Status of Wildelife Clearance

    (i). Whether the Project or a part thereof is located in any Protected Area or their Eco sensitive zone? : No

J. Applicability of special provisions governing Scheduled Areas

    (i).Whether the Project or a part thereof is located in a Scheduled Area? : No

K. Status of settlement of rights under the Forest Rights Act,2006 on the forest land proposed to be diverted

    (i). Whether the process for settlement of Rights under the Forest Rights Acts 2006 on the forest land proposed to be diverted has been completed? : Yes

    (a). Copy of documentry evidence in support of settlement of rights under the Forest Rights Act,2006 on the forest land proposed to be diverted:

L. Details of land identified for Compensatory Afforestation

    (i). Whether non-forest or Revenue forest land is required to be provided by User Agency?: Yes

    (ii). Whether the area of non-forest land or Revenue forest land required to be provided by User Agency for raising Compensatory Afforestation is less than area of forest land proposed to be diverted ?: No

    (iii). No. of districts involved for raising Compensatory Afforestation: 3

    (iv). No. of patches: Twelve

District 1. : Bhind
(a). Village: Bajhai
(b). Area(in ha.): 22.9
(c). Copy of KML file of the patch: View File
(d). Khasra details: 748, 756/4, 1355, 356, 1358/2, 1361/1, 1363, 1428, 1429/2, 1440, 1605, 1618/2, 1621, 1623/2, 1628, 1630, 1833/2, 3408, 3420/1
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 2. : Datia
(a). Village: Dongarpur
(b). Area(in ha.): 20.645
(c). Copy of KML file of the patch: View File
(d). Khasra details: 84, 85, 168, 169, 175, 183
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 3. : Bhind
(a). Village: Piladanda
(b). Area(in ha.): 50.06
(c). Copy of KML file of the patch: View File
(d). Khasra details: 2,3,4,8,9,10,11,15,16,17,24
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 4. : Bhind
(a). Village: Chhunchhari
(b). Area(in ha.): 95.25
(c). Copy of KML file of the patch: View File
(d). Khasra details: 47,48,49,50,52,53,840,912,914,1025,910, 909,908,907,906,957,960,961,975,974,973,933,934,1192, 1194,1196,1225,1226,1227,1228,1231,1238,1252,1255,1256,1233,1237,1224
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 5. : Bhind
(a). Village: Syoda
(b). Area(in ha.): 259.502
(c). Copy of KML file of the patch: View File
(d). Khasra details: 223,225,226,233,234,235,252,253,254,255,256,257,259,290,291,735, 736,737,739,740,741,748,749,750,751,752,753,754,755,756,792,795,796, 66,71,73,74,75,76,77,125,129,130,138,140,157,158,159,151,152,153,1
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 6. : Bhind
(a). Village: Baghpura
(b). Area(in ha.): 95.6
(c). Copy of KML file of the patch: View File
(d). Khasra details: 15,17,88,91,93,94,96,125,99,100,101,102,106,107,109,110,126,111,112,114,115,116,118,119,120
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 7. : Shivpuri
(a). Village: Majhera
(b). Area(in ha.): 38.034
(c). Copy of KML file of the patch: View File
(d). Khasra details: 360
(e). Present owner: User Agency
(f). Copy of Ownership proof:

District 8. : Bhind
(a). Village: Sikhata
(b). Area(in ha.): 79

(c). Copy of KML file of the patch:	View File

(d). Khasra details: 7,10,11,42,184,956,1143,1178,1197,1200,1202,1224,1233,1243,1253,126,1273,1276,1278,1284,1285,1288,1304,1316,1319, 1335,1337,1366,1370,1376,1377,1386,1399,1400,1402,1489,1612,1616,1669,1673

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 9. : Bhind

(a). **Village:** Sikhata

(b). **Area(in ha.):** 42.984

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:** 1921,1928,1941, 1953,1954,1956,1957,1958,1959,1960,1962,1963,1964,1965,1966, 1971

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 10. : Bhind

(a). **Village:** Sankri

(b). **Area(in ha.):** 70.168

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:** 1139,1159,1160,1161,1168,1173,1174,1175,1176,1178,1179,1181,1182,1183,1184,1185,1188,1189,1190,1191,1203,1205,1206,1207,1215

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 11. : Bhind

(a). **Village:** All forest compartment of Bhind division

(b). **Area(in ha.):** NIL

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:** -

(e). **Present owner:** Others

(f). **Copy of ownership proof:** No Data

(g). **Copy of Mou/agreement executed between the Present owner and the User Agency:**

(h). **Copy of non encumberence certificate for the forest land:**

District 12. : Bhind

(a). **Village:** Bilaw

(b). **Area(in ha.):** 99.58

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:**
3515,3517,3518,,5162,5182,5183,5184,5185,5186,5187,5188,5189,5190,5191,5192,5193,5194,5195,5196,5197,5198,5200,5201,5202,5203,520s4,5205,5206,5207,5208,5209,5210,5211,5212,5213,5214,5215,5216,52

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 13. : Bhind

(a). **Village:** Bajhai

(b). **Area(in ha.):** 165.381

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:** 1849/2,2065,2066,2154,2155/3,2167,2168/2,2169,2177/2,2181,2187,2188,2189/1,2190/2, 2192/2,2193,2195,2238/1,2248,2249/2,2252/2,2253,2254,2255,2256,2293,2596,2597,2599,2606,2607, 1605,1618/2,1621,1623/2

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 14. : Bhind

(a). **Village:** Bhonpura

(b). **Area(in ha.):** 87.81

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:** 2465,2466,2467,2471,2473,2474,2475,2476,2477,2478,2752,2753

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 15. : Bhind

(a). **Village:** Nunhata

(b). **Area(in ha.):** 201.53

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:**
2436,2442,2443,2444,2445,2447,2448/1,2648,2649,2650,2651,2652,2653,2654,2655,2657,2658,2659,2660,2661,2662,2663,2664,2665,2448/2,2417,2418,2419,2422,2426,3169,2631/2,2647,2673,2642,2641,2640,26

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

District 16. : Bhind

(a). **Village:** Nahra

(b). **Area(in ha.):** 37.86

(c). **Copy of KML file of the patch:** View File

(d). **Khasra details:** 614,615,616,617,622,623,624,625,626,632,642,644,645,646,648

(e). **Present owner:** User Agency

(f). **Copy of Ownership proof:**

(v). **Scanned copy of the map of the land identified for creation of Compensatory Afforestation prepared by using GPS ot Total Station:**

(vi). **Copy of Survey of India Toposheet in 1:50,000 scale indicating location of the land identified for creation of Compensatory Afforestation:**

Hydel/Irrigation/Multipurpose Project

    (i). **Installed power generation capacity of the Project(in MW):** 9

    (ii). **Total command area of the Project(in ha.):** 78484

        (a). **Copy of the approval of competent authority to the Catchment Area Treatment Plan (CAT Plan):**

        (b). **Copy of the approved CAT plan:**

<u>Additional information Details</u>

	Documents	
S.No	**Documents**	**Remarks**
1		Reply of Your Letter No F-3/50/2019/10-11/6/1992 Bhopal dt 18/6/19
2		Reply of Letter No. F-3/50/2019/10-11/6/2149 Bhopal Dt 2/7/2019
3		Reply of Your Letter No. F-3/50/2019/10-11/6/2601 Bhopal Dt. 13/08/2019
4		Reply Of Your Letter No F-3/50/2019/10-11/6/2820 Bhopal Dt 03/09/2019
5		Reply of Your Letter No. F -3/ 50 /2019/10-11/6/3853 Bhopal Dt. 11/12/2019
6		Revenue Land received by DFO Bhind
7		Covering Letter with proposal
8		Reply of Letter No. F-3/50/2019/10-11/6/2338 Bhopal Dt 23/7/2020
9		Reply of DFO Letter No मा/वि/2072 Datia dtd. 10/8/2020
10		GEO REFERENCED MAP CANAL PORTION
11		SURVEY OF INDIA MAP CANAL PORTION
12		FRA CERTIFICATE -DATIA (CANAL PORTION)
13		FRA CERTIFICATE - GWALIOR (CANAL PORTION)
14		Reply of Query dt 30/9/2021
15		R & R Plan letter
16		Alternate sites
17		Reply of APCCF Letter dt 13/9/2022 regarding 6 point raised by MOEF

Print page

<u>Additional information Details</u>

ANNEXURE III: MINUTES OF MEETING FOR STAGE I FOREST CLEARANCE

Minutes of the Meeting of Advisory Committee meeting dated 20.10.2023

Agenda No. 1

File No. 8-16/2021- FC

Sub: Regularization of 330.33 ha. (330.1826 ha as per DGPS Survey) of forest land in Upperlakesaram Forest Block in Manthani Range of Peddapalli Division for Open Cast Mining Operations and Other Activities of SCCL in Peddapalli District in favour of M/s SCCL. (Online proposal No. FP/TG/MIN/47899/2020)

1. The above stated agenda item was considered by Advisory Committee (AC) in its meeting on 20.10.2023. The corresponding details of the agenda may be seen at www.parivesh.nic.in.

2. During the meeting, all the facts and background of the proposal, along with examination of the proposal in the DSS were presented and explained by Member Secretary before the AC. Committee was also apprised of the relevant provisions under other Acts, Rules and Guidelines relevant to the proposal and their significance.

3. The IGF (C) Sub-office, Hyderabad and Nodal Officer (FCA), Government of Telangana were present in the meeting.

4. The Advisory Committee (AC) after thorough deliberation and discussion observed that:

(i) The present proposal is for regularization of 330.33 ha. (330.1826 ha as per DGPS Survey) of forest land in Upperlakesaram Forest Block in Manthani Range of Peddapalli Division for Open Cast Mining Operations and Other Activities of SCCL in Peddapalli District. Legal Status of the proposed forest land is Reserved Forest.

(ii) The proposed 330. 1826 is part of RG Coal Mine and RG OC III and forms part of 6848.00 Ha of South Godavari Mining Lease which has been renewed for 3rd time for a period of 20 years from 01.01.2015 to 31.12.2034, vide G.O Ms. No.02 dated 12.01.2015 by the State Government.

(iii) The detailed land-use plan of 330.1826 ha is as below: -

SL No.	Description	RG Coal mine (Ha)	RG OC-III (Ha)	Total (ha)
1.	Quarry	257.996	22.055	280.0561
2.	Dump	0	0	0
3.	Safe Barriers	4.905	3.1987	8.103
4.	Nalah	0	4.326	4.326
5.	Bund	0	4.5556	4.5556
6.	Roads	0	0	0
7.	Other Infrastructures (Roads, HT lines , office buildings, Quarters etc	27.929	5.218	33.147
	Total	290.83	39.3526	330.1826
	Grand total			330.1826

I/56889/2022	2.	For External Over burden dumping	559.416
		Total	**631.392**

xiii.   That based on the recommendation of AC, the Ministry vide letter dated 01.09.2023 requested the State Govt. to explore the other alternatives over non-forest land for the same. Since, only bare minimum forest land can be allowed to be diverted therefore the State Govt. was required to examine this aspect in detail and give its recommendations along with a detailed report accordingly. However, the State Govt. vide their letter dated 04.10.2023 has forwarded the reply of User Agency which is very similar to as submitted earlier and already considered by Advisory Committee.

xiv.   The AC observed that out of 139.86 ha proposed forest area an area of 92.536 ha forest land is proposed for External Over burden dumping and a total 66% of the forest area is proposed for dumping the overburden, which is a non-site specific activity. Also a total of 46,571 numbers of trees are marked for felling proposed diversion of 139.86 ha forest land.

xv.   During the discussion AC observed that still a huge chunk of forest land i.e. 92.536 ha is proposed for diversion for overburden dump and the number of trees required to be felled is very high. Further, financial viability cannot be the criterion for using forest land when non-forest land is available for dumping in the vicinity of the mining lease.

5. **Decision of the Advisory Committee:** The AC after thorough deliberation and discussion observed that the proposal in its present form is not site specific as more than 66% of the reserve forest area which involves about 46,571 trees is proposed for dumping the overburden, which can be done over non-forest land. Keeping this in view the Committee recommended to reject the proposal.

Agenda No. 14

File No: 8-28/2021-FC

Sub: Diversion of 1305.142 ha (instead of 1248.821 ha) forest land for the construction of Maa Ratangarh Multipurpose Project in favour of Executive Engineer, Dabra under Datia and Gwalior Districts of Madhya Pradesh State (Online No. FP/MP/IRRIG/40397/2019) - regarding.

1. The agenda item was considered by the AC in its meeting held on 20.10.2023. The corresponding agenda note may be seen at www.parivesh.nic.in.

2. During the meeting, all the facts and background of the proposal, along with examination of the proposal in the DSS were presented and explained by the

Member Secretary before the AC for their examination and analysis. Committee was also apprised of the relevant provisions under other Acts, Rules and Guidelines relevant to the proposal and their significance.

3. The Dy. DGF (Central), RO, Bhopal and Nodal Officer, FCA, Government of Madhya Pradesh attended the meeting.

4. While deliberating on the proposal, AC observed that:

    i. The Government of Madhya Pradesh vide their letter No. F-3/50/2019/10-11/6/3729 dated 11.11.2021 forwarded a fresh proposal to obtain prior approval of the Central Government, in terms of the Section-2 of the Forest (Conservation) Act, 1980 on the above-mentioned subject.

    ii. The AC noted that the present project is spread over two Forest Divisions Datia (T) and Gwalior(T) and total of 51,121 no. of trees are marked for felling at FRL-4-meter Level.

    iii. Legal status of land proposed for diversion: 651.135 ha is Protected Forest land, 654.007 ha is Reserved Forest land and 1840.11 ha non-forest land is also involved in the project. Density of the area proposed for diversion is reported to be 0.3, Eco-class-03.

    iv. Proposal does not form part of any PA, Biosphere Reserve, Elephant corridor etc. No protected archaeological/ heritage site/defence establishment or any other important monuments is located in the area.

    v. Wildlife like Wolf, Wild bear and other wild animals such as Hyna, Chital, Nilgai, wild pig etc. are reported in the forest land proposed for diversion under Datia District and Blue Bull, Jackal, chinkarka, rabbit, crocodile etc. are reported under Gwalior district.

    vi. The Nodal Officer, FCA, Government of Madhya Pradesh attended the meeting and informed that the main purpose of this project is irrigation of the areas having medium to low rainfall in Bundelkhand Region.

    vii. The State has informed that due to the non-forest land given for compensatory afforestation being a ravine area, it is not possible to plant 1000 saplings per hectare on it, this note has been given by the Chief Conservator of Forests. However, in the past years, ravine areas have been used for afforestation in Morena forest division. The plantations done on these non-forest lands have been successful. Approximately 250 to 300 saplings per hectare have been planted on these non-forest lands and a large number of trees have also been grown by constructing contour trenches, contour bunds and check dams and planting seeds on them. In this regard, at the state government level on 27.09.2021, in the meeting of senior officers under the chairmanship of Principal Secretary, Forest, a committee of senior officers was proposed to be constituted to inspect the plantation done in the past years in the ravine area and give their opinion.

    viii. Accordingly, by order of Principal Chief Conservator of Forests, Madhya Pradesh dated 05.10.2021, a team of officers of the level of Additional Principal Chief Conservator of Forests was constituted. The committee presented its report on 12.10.2021, in which the proposed CA areas were recommended as suitable for plantation of 200 to 300 plants per hectare.

    ix. The Regional Officer, Integrated Regional Office, Bhopal who has conducted the Site Inspection for this proposal attended the meeting. The Site inspection report inter-alia mentions the following with regard to forest land for diversion:

a) **Gwalior Division:** soil is highly prone to erosion causing formation of ravine which is expanding on either side of the river with passage of time. Due to erosion the river is also having large quantity of Sand in it.

b) **Datia Division:** the ravine formation on the banks on either side of the river is expanding inlands. Therefore, it is suggested to provide strong bunds with suitable culverts all regular intervals with silt traps to allow the rain water to drain in with minimum silt load. This would also prevent spread of ravines further in the plain lands and also siltation of the project would be minimised.

x.   The AC observed that the Compensatory afforestation has been proposed over non forest land (Ravine land) in Bhind and Shivpuri District, Madhya Pradesh. The issue of raising plantation on ravine land was deliberated. The concerned CCF had earlier recommended that ravine areas should be avoided for raising the Compensatory Afforestation. The State thereafter constituted a committee of the senior officers, which recommended that the ravine areas can be used for planting 200-300 plants per hectare. The Regional Office has also mentioned that the areas proposed for CA are suitable for plantation.

xi.   The Nodal Officer, FCA, Govt. of M.P. informed that the plantation in the Ravine areas proposed for CA may not be possible at the rate of 1000 plants/ha but the area may accommodate about 200 to 300 plants/ha. The balance no. of plants will be planted on Degraded Forest Land.

xii.   The Member Secretary informed the committee that this proposal was considered by the Advisory Committee(AC) in its meeting held on 25.04.2023 wherein after going through the facts of the proposal and submissions made by the Nodal Officer, the Committee deferred the proposal for diversion of 1305.142 ha forest land for the construction of Maa Ratangarh Multipurpose Project and sought the following details:

a) The details of distribution network like canals and pipelines, which may further have required diversion of forest land etc. has not been given. A holistic proposal is required to be submitted as forest land may be required for laying of underground pipelines as well. The State Govt. shall therefore provide the complete lay out plan indicating all the components like canal, pipelines etc. The detail of the area requirement for these components shall also be submitted.

b) Sindh is a Tributary of Chambal River and therefore the impact of the proposed project on Chambal Wildlife Sanctuary and its surrounding water regimes shall be provided by the State Govt. along with the recommendations of the Chief Wildlife Warden of the State.

c) The detailed Compensatory Afforestation scheme for the proposed non forest land (Ravine land) and degraded forest land shall be submitted.

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xiii. The Member Secretary informed the committee that based on the recommendation of AC, the Ministry vide letter dated 15.05.2023 requested the State Government to submit the information and the State Government vide their letter dated 25.08.2023 has submitted the information.

xiv. The State Govt. has uploaded a plan in the form of Map wherein it has been reported that an area of 6.98 ha forest land is required for laying of transmission line. However, the component wise breakup for instant proposal revealed that the said forest land has not been included in the proposal.

xv. The Chief Wildlife Warden Madhya Pradesh in its recommendations dated 25.07.2023 has mentioned that a large population of Crocodiles are found in Sindh river and the construction of proposed dam the possibility of Human-Crocodile conflict will increase. Further the State Govt. has informed that a wildlife Management Plan is under preparation which will be submitted before final approval.

xvi. The AC observed that the proposed area is around 45 km away from the National Chambal Gharial Wildlife Sanctuary which is a narrow eco-reserve co-administrated by the Government of Uttar Pradesh and considering the recommendations Chief Wildlife Warden comments from the Government of Uttar Pradesh are required and mitigation measures may be decided accordingly.

5. **Decision of the Advisory Committee:** The Committee had detailed discussion and deliberation with the Dy. DGF (Central), RO, Bhopal and Nodal Officer, FCA, Government of Madhya Pradesh. After going through the facts of the proposal and submissions made by the Dy. DGF (Central), RO, Bhopal, the Committee recommended the proposal for diversion of 1305.142 ha (instead of 1248.821 ha) forest land for the construction of Maa Ratangarh Multipurpose Project with General, Standard and following specific condition:

i. The proposed area is about 45 kms away from the National Chambal Gharial Wildlife Sanctuary, therefore keeping in view the recommendations of Chief Wildlife Warden, the comments from the Government of Uttar Pradesh shall be obtained and incorporated in the Wildlife management plan.

ii. A site specific CA scheme shall be prepared meticulously looking into the site specific requirement of raising successful plantation.

iii. The reservoir created due to the construction of dam and subsequent submergence shall be declared as a Reserve Forest under the Indian Forest Act,1927 or state specific forest laws.

Agenda no. 15

Proposal No: FP/UP/Pipeline/412799/2023

Sub: -Proposal for diversion of 1.9034 ha forest land in Gumra Range of Kaimur Wildlife Division for Kadara Group of Villages Water Supply Scheme by

Uttar Pradesh Jal Nigam (Rural) under the Sonbhadra District of Uttar Pradesh State-Reg

1. The agenda item was considered by the AC in its meeting held on 20.10.2023. The corresponding agenda note may be seen at www.parivesh.nic.in.
2. During the meeting, all the facts and background of the proposal, along with examination of the proposal in the DSS were presented and explained by the Member Secretary before the AC for their examination and analysis. Committee was also apprised of the relevant provisions under other Acts, Rules and Guidelines relevant to the proposal and their significance.
3. The Dy. DGF (Central), RO, Lucknow and Divisional Forest Officer, Kaimur Wildlife Sanctuary, Government of Uttar Pradesh attended the meeting.
4. While deliberating on the proposal, AC observed that:

    i. The Govt. of Uttar Pradesh vide their letter No. P-99/81-2-2023-800(72)/2023 dated 28.03.2023 forwarded a fresh proposal to obtain prior approval of the Central Government, in terms of the Section-2 of the Forest (Conservation) Act, 1980 (received in the Ministry on 11.08.2023) for diversion of 1.9034 ha forest land in Gumra Range of Kaimur Wildlife Division (Mirzapur) for Kadara Group of Villages Water Supply Scheme by Uttar Pradesh Jal Nigam (Rural) under the Sonbhadra District of Uttar Pradesh State.
    ii. The total forest area involved in the instant proposal is 1.9034 Ha Reserved Forest land and it's component wise break-up as per online part-I is given as under:

Sr. No.	Components proposed	Forest (Ha)	Non-Forest (Ha)
1	Water Pipeline	1.8373	5.8159
2	Water treatment plant, overhead tank, Jack well plant and intake well	0.0661	1.1875
	Total Land in Ha	**1.9034**	**7.0034**

    iii. Kadara Group of Villages Water Supply Scheme, District Sonbhadra is aimed to provide water connection to each household for clean drinking water which is connected from Jackwell Plant located in Rijul and its water intake is from Son river in Shili Village. Since villages named above are having forest areas and the same could not be avoided, hence Pipeline has to be located within forest.
    iv. The complete project involving area of 8.9068 ha (1.9034 Ha forest and 7.0034 Ha non forest) is located within Kaimur Wildlife Sanctuary.
    v. The Compensatory Afforestation has been proposed on the Non-Forest Land and the CA site has been proposed in single patch comprising 2

ha area falling under the Dumar Diha village under Sonbhadra District of Uttar Pradesh State.

vi. The Member Secretary informed that the proposal for Wild life clearance is recommended with certain condition in 74th meeting of standing committee of NBWL held on 29th August, 2023.

vii. The AC observed that the user agency has made unauthorised use of forest land for non-forestry purposed and the action as per guidelines Para No. 1.21 (ii). The issue of violation was discussed in detail and the DFO, Kaimur Wildlife Sanctuary, Government of Uttar Pradesh informed that the construction activity was carried out in 0.1425 ha in the year 2022 and the project manager of Kadra GOVWSS has been found responsible for execution of work in wild life area without permission. For this negligence his services were terminated with immediate effect and a H-2 Case R.C. No- 8 & 9/2022-23 was registered against the offences and legal action was taken.

viii. The Advisory Committee observed that as per Forest (Conservation) Rules, 2022 clause d of sub-rule 5 of Rule 9 the Site inspection for the instant proposal need to be carried out by the concerned Regional office and though the Site Inspection Report of Regional Office, Lucknow was not submitted in the proposal the condition of Site Inspection Report was waived off for this particular case given the fact that the proposal is for public good of provision of potable drinking water to rural areas under the Jal Jeevan Mission.

5. **Decision of the Advisory Committee:** The Committee had detailed discussion and deliberation with the Dy. DGF (Central), RO, Lucknow. After going through the facts of the proposal and submissions made by the Dy. DGF (Central), RO, Lucknow, the Committee recommended the proposal for diversion of 1.9034 ha forest land for non-forest purpose with General, Standard and following specific condition:

i. Keeping in view the Para 1.21(ii) of the Handbook of guidelines, the Penal NPV shall be paid as per the recommendation of the DFO concerned in his violation report.

Agenda no. 16

F. No. 8-30/2022-FC

Sub: Proposal for ex-post facto approval for diversion of 96.868 hectare of forest land outside Mining Lease area (M.L. No.2396) of Donimlalai (DM) Block Forest (Near Narsinghap Village) in favour of Executive Director, M/s NMDC

Limited, Donimalai Township, Sandur Taluk, Ballari, Karnataka. (Online Proposal No. FP/KA/Others/17464/2016). –regarding

1. The above stated agenda item was considered by Advisory Committee (AC) in its meeting on 20.10.2023. The corresponding details of the agenda may be seen at www.parivesh.nic.in.

2. During the meeting, all the facts and background of the proposal, along with examination of the proposal in the DSS were presented and explained by Member Secretary before the AC. Committee was also apprised of the relevant provisions under other Acts, Rules and Guidelines relevant to the proposal and their significance.

3. The DDGF, Regional Office, Bangalore and Nodal Officer (FCA), Government of Karnataka were present in the meeting.

4. The Advisory Committee (AC) after thorough deliberation and discussion observed that:

    i.   The instant proposal is for ex-post facto approval for diversion of 96.868 hectare of forest land outside Mining Lease area (M.L. No.2396) of Donimlalai (DM) Block Forest (Near Narsinghap Village) in favour of Executive Director, M/s NMDC Limited, Donimalai Township, Sandur Taluk, Ballari, Karnataka.

    ii.   The legal status of the forest land is Reserved forest. The density of vegetation in the area proposed for diversion is 0.01. Total number of trees to be affected from the project is 17631.

    iii.   Leopard, Sloth Bear, Jackal, four-horned antelope, Hares, wild pig, Indian porcupine, Monitor lizard, State Tortoise, Pangolin, Grey Partiridge, painted bush quail and Peafowl etc. are present in the area proposed for diversion.

    iv.   No rare/ endangered/ unique species of flora and fauna found in the area proposed for diversion.

    v.   The user agency has been done the work without FC approval from the Central Government. The details of violation are as below: -
        a) Period of work done: 44 years
        b) Area of forest land involved in violation: 98.87 ha.
        c) Name of person responsible for violation: NMDC
        d) Designation: Chief General Manager
        e) Action taken against the person responsible for violation: No
        f) Whether work in violation is still in progress: Yes

    vi.   The user agency has identified C & D land (Non-Forest land) Sy. No.295 of Appenalli Village, Gudekote Hobli, Kudligi Taluk, Ballari District over an extent of 235.648 hectares. About 16% (38.04 ha) of the said area is suitable for afforestation. The remaining area adjacent to the Gudekote Sloth Bear Sanctuary and falls within the Gudekote Eco-sensitive zone. These rocky patches which are not suitable for afforestation may be used as buffer zone/wildlife corridor for the Gudekote Sloth Bear Sanctuary. Therefore, the CA amount may be used for afforestation in the degraded forest area to be identified and proposed i.e. area of 197.608 ha of DFL for balance seedling plantation.

    vii.   Component wise area of the proposed forest land is given below:

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S. No.	Component	Area in ha. (as per given information on PARIVESH)
1	Power Lines	10.49
2	Tunnel	0.57
3	Conveyor	2.74
4	Water Pipeline	0.85
5	Railway Line	0.39
6	Tailing Dam Area	43.69
7	Water Treatment Plant	2.57
8	Valley Store Area	3.42
9	Autogarage	2.32
10	Mechanical Office	2.97
11	Water Tank Area	5.17
12	Screening Plant Area	4.55
13	Borewell Area	0.33
14	Stock Yard	1.5
15	Control Room	0.15
16	Roads	15.16
17	Interlocked area between infrastructures	138.778
	Total	**235.648**

viii. Actual forest area required for regularization/diversion is only 96.87 which was occupied by NMDC without FC. Further, it was informed by the State Govt. that a large number of irregular shaped polygons which are not included in the 96.87 ha area but remain islands and leading to honey-combed situation. Such a situation is not advisable from forest protection and management point of view and is likely to result into confusion in future. It is also not in the interest of the User Agency from their management perspective. Thus, it was found better to include the 235.648 ha with the condition imposed on User Agency for maintaining the balance area (other than the actual component area) as a natural/virgin forest during the entire lease period. It will not only help in smooth processing of the proposal but also better management of the forest area.

ix. Based on the above submission made by State Govt. the Ministry vide its letter dt 07.12.2022 sought certain additional information like: -
   a. It is not clear that the additional area proposed for diversion is for which type of site-specific activities. The state government is requested to provide the rationale w.r.t. the site specificity of the proposed additional diversion of 138.78 ha of forest land.
   b. The State Govt. may also offer its comments on how the management of the forest area (138.778 ha) will be better when the forest land will be in possession of the User agency instead of Forest Department.

x. In response to this Ministry letter dt 07.12.2022, the State Govt. vide letter dt 15.10.2023 informed that as per the discussion with the Principal Chief Conservator of Forests, (Forest Conservation) & Nodal Officer (FCA), Bangalore it is decided that, it is better to keep the landlocked area of forest

land having extent of 138.778 hectares with the forest Department, instead of giving it to the User Agency. However, considering the fragmented nature of this interlocked forest area and vulnerability of the forest from incidence of forest fires, it is advisable to rope in the M/s NMDC in fire management in these forest patches during summer season. Thus, in nutshell protection and management of these interlocked forest patches will primarily be done by the forest debarment with assistance of M/S NMDC Limited whenever required. Accordingly, the effective area for regularization is 96.868 hectare of forest land.

xi.   The RO Bangalore vide letter No. 4-KRA1403/2022-BAN/334 dated 22.02.2023 submitted the Site Inspection Report and recommended the proposal.

xii. The State Govt. has not provided any information/report on the action taken against the officials who were responsible for the violation. From the additional information forwarded, it is learnt that the State Govt. has not taken any action against violation of FCA 1980.

xiii. State Govt. has recommended to impose penalty on NMDC in the instant proposal on the similar lines as imposed in another proposal of the NMDC i.e. Proposal for diversion of 53.67 ha. (originally proposed 75.92 ha of forest land) of forest land (near M.L. No.2396 of NMDC) in Donimalai (Proposal No. FP/KA/Others/14576/2015).

xiv. The State Govt. has recommended that on account of the failure of NMDC to declare and obtain clearances at various stages of FC approvals, it will be appropriate to impose suitable penalty on NMDC from the date of 1st renewal in 1997 (or any other date to be decided by MOEF & CC) wrt forest area 96.868 ha.

5. AC observed that there is a presence of wildlife as reported by the concerned DFO in and around the forest area proposed for diversion. In view of the same, the committee observed that there is a need to have an Integrate Wildlife Management Plan for forest area proposed for diversion.

6. AC deliberated that an additional condition may be imposed for protection of 138.778 Ha of forest land considering the fragmented nature of this interlocked forest area and vulnerability of the forest from incidences of forest fires. Accordingly, it is deliberated that the protection and management plan shall be prepared wrt 138.778 Ha of interlocked forest land and the cost of the implementation of same shall be borne by the User Agency.

6. AC noted that for the purpose of CA land both Non-Forest land (NFL) and Degraded Forest land (DFL) was identified in the instant proposal. NFL of 235.648-hectare C & D land Sy. No.295 of Appenalli Village, Gudekote Hobli, Kudligi Taluk, in Ballari District. Since 38.04 ha out of 235.648 hectare of NFL identified was suitable for plantation, 197.608 ha of DFL was identified for balance seedling plantation. However, the area now recommended for diversion has been reduced to 96.868 ha, therefore the balance CA land may be kept as land bank for other proposals of the user agency.

I/56889/2023 **7. Decision of the Advisory Committee**: The Committee had detailed discussion and deliberation with DDGF, RO, Bangalore and Nodal officer (FCA), Govt. of Karnataka. After going through the facts of the proposal and submissions made, the committee recommended the proposal for grant of in-principle/ Stage-I approval for diversion of 96.868 hectare of forest land outside Mining Lease area (M.L. No.2396) of Donimlalai (DM) Block Forest, subject to the general, standard and following specific conditions:

    i.   The State Govt. shall impose a penalty of five (5) times the NPV plus 12 percent simple interest till the deposit is made from the year 1997 as penalty for violation of FCA 1980 (i.e 96.868 ha area under violation) as proposed by the State Government.

    ii.   Compensatory afforestation shall be taken up by the Forest Department over 96.868 ha of Non-forest land for the CA purpose at the cost of the User Agency. The State Govt. shall submit the details of CA land (i.e. 96.868 ha) and submit the revised CA Scheme along with KML files. The State Govt. shall make balance seedling planation in the suitable DFL as identified and submit the KML files.

    iii.   A protection and management plan shall be prepared wrt 138.778 Ha of interlocked forest land and the cost of the implementation of same shall be borne by the User Agency. The protection and management plan duly approved by the State Govt. shall be submitted to this Ministry.

    iv.   Considering the fragmented nature of the interlocked forest area (i.e. 138.778 Ha) and vulnerability of the forest from incidence of forest fires, M/s NMDC is to be involved in the fire management in these forest patches during summer season. The protection and management of these interlocked forest patches will primarily be done by the forest department with assistance of M/s NMDC Limited whenever required. In this regard an undertaking must be submitted by the M/s NMDC.

    v.   The State Govt. shall prepare an Integrated Wildlife Management plan, in the surrounding of the forest area proposed for diversion and implement the same at the cost of User Agency.

(Confirmed through email)	**(Not Present)**
(Dr. Naveen Chandra Bisht)	Shri S. D. Vora
(non-official Member)	(non-official Member)
(Confirmed through email)	**(Confirmed through email)**
Shri Manoj Pant	Dr. Mehraj Shaikh
(non-official Member)	Deputy Commissioner (NRM)

(Member)

(Confirmed through email)

Shri Bivash Ranjan

Additional Director General of Forests(WL)

(Member)

(Confirmed)

Shri S. P. Yadav

Additional Director General of Forests(FC)

(Member)

(Confirmed)

Shri Ramesh Kumar Pandey

Inspector General of Forests

(Member Secretary)

(Approved)

Shri C. P. Goyal

(Director General of Forests and Special Secretary)

(Chairperson)

ANNEXURE IV: LETTER FROM FOREST DEPARTMENT TO PREPARE WILDLIFE MANAGEMENT PLAN

I/58372/2023

Government of India
Ministry of Environment, Forest and Climate Change
(Forest Conservation Division)
****

Indira Paryavaran Bhawan,
Jor Bag Road, Aliganj,
New Delhi – 110003
Dated: November, 2023

To,

The Principal Secretary (Forests),
Government of Madhya Pradesh,
Bhopal.

Subject: Diversion of 1305.142 ha (instead of 1248.821 ha) forest land for the construction of Maa Ratangarh Multipurpose Project in favour of Executive Engineer, Dabra under Datia and Gwalior Districts of Madhya Pradesh State (Online No. FP/MP/IRRIG/40397/2019) - regarding.

Madam/Sir,

I am directed to refer to the Government of Madhya Pradesh's letter No. F-3/50/2019/10-11/6/3729 dated 11.11.2021 forwarding a proposal to obtain prior approval of the Central Government, in terms of the Section-2 of the Forest (Conservation) Act, 1980 & letter No. F-3/50/2019/10-11/6/4447 dated 05.10.2023 forwarding the additional information and to say that the said proposal was placed before the Advisory Committee (AC) in its meeting held on 20.10.2023. The minutes of the meeting of the AC may kindly be seen at www.parivesh.nic.in.

After detailed deliberation on the matter, the competent authority in the Ministry has decided to reconsider the proposal after submission of complete layout plan and wildlife management plan by the State Government.

In view of the above, the State Government is requested to submit the complete layout plan and wildlife management plan for further consideration of the proposal.

This issues with the approval of competent authority.

Yours sincerely,

Sd/-
(Suneet Bhardwaj)
Assistant Inspector General of Forests

Copy to:

1. The PCCF (HoFF), Department of Forest, Government of Madhya Pradesh, Bhopal;
2. The Dy. DGF (Central), Regional Office, MoEF&CC, Bhopal;
3. The Nodal Officer (FCA), Department of Forest Government of Madhya Pradesh, Bhopal;
4. User Agency;
5. Monitoring Cell, FC Division, MoEF & CC, New Delhi for uploading on PARIVESH portal.
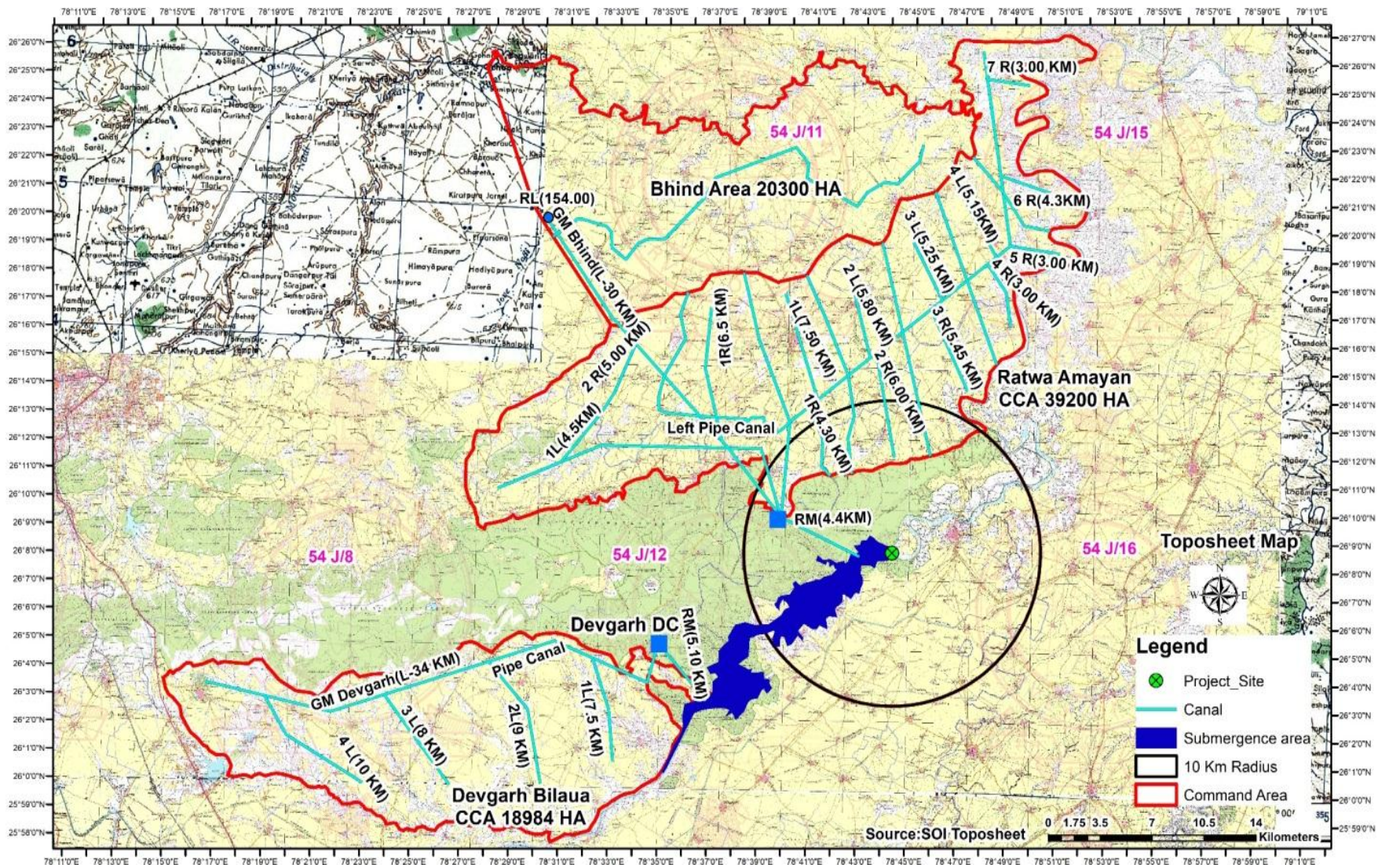
PLATE I

Study area map

Toposheet Map

Legend

- Project_Site
- Canal
- Submergence area
- 10 Km Radius
- Command Area

Source:SOI Toposheet

54 J/11
54 J/15
54 J/8
54 J/12
54 J/16

Bhind Area 20300 HA

Ratwa Amayan CCA 39200 HA

Devgarh Bilaua CCA 18984 HA

RL(154.00)
GM Bhind(L-30 KM)
2 R(5.00 KM)
1L(4.5KM)
1R(6.5 KM)
1L(7.50 KM)
2 L(5.80 KM)
2 R(6.00 KM)
1R(4.30 KM)
Left Pipe Canal
3 L(5.25 KM)
3 R(5.45 KM)
4 L(5.15KM)
4 R(3.00 KM)
5 R(3.00 KM)
6 R(4.3KM)
7 R(3.00 KM)
RM(4.4KM)

Devgarh DC
RM(5.10 KM)
GM Devgarh(L-34 KM)
Pipe Canal
4 L(10 KM)
3 L(8 KM)
2L(9 KM)
1L(7.5 KM)

0 1.75 3.5 7 10.5 14
Kilometers

PLATE II
Satellite Image

PLATE III

Photographs of the study area

(a) Riverian site

(b) Shrubby growth in depression in low ravinous area

(c) Profound growth *Acacia leucophloea*

(d) Prostate growth of a herbaceous species in flat sandy area

(e) Growth of moss species (*Funaria* species) on the calcareous site

(f) A climber species over *Capparis spp.* bush