# छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड

*(छत्तीसगढ़ शासन का एक उपक्रम)*

सी.आई.एन:U 14103 CT 2001 SGC 014691,
ई–मेल:cmdcraipur@gmail.com,
वेबसाइट : www.cmdc.co.in

मुख्य कार्यालय :
सेक्टर 24, तृतीय तल, ब्लॉक नं0 7 ए,
अटल नगर नवा, रायपुर
(छ.ग.)–492015

क्रमांक/ 1194 /बाक्सा0/2024 नवा रायपुर, दिनांक 30-1-2024

**To,**

**The Member Secretary,**
**EAC(Non-Coal Mining Sector),**
**MoEF&CC, Indira Paryavaran Bhawan,**
**3rd Floor, Vayu Wing, Jor Bagh Road,**
**Aliganj , New Delhi-110003**

**Sub:- Proposal No. IA/CG/MIN/417404/2023 Regarding.**

**Ref:- 1. Minutes of 12th EAC(Non-Coal Mining) meeting, dated 29.09.2023**
**2. Site visit of Sub-Committee: 17.08.2023 to 19.08.2023**
**3. Minutes of 12th EAC(Non-Coal Mining) meeting held during 21 & 22 March 2023**

**Dear Sir,**

With respect to the above mentioned subject we would like to bring to your kind notice that as per Minutes of 12th EAC (Non-Coal Mining) meeting held during 21-22 March, 2023, the EAC opined that the Ministry may constitute a sub-committee and submit its report to enable the committee to take a decision on the proposal. Based on the above discussions held, the EAC **deferred** our proposal of Mukam Bauxite Mine area 110.563 Ha. and was of the view that proposal may be considered only after the submission of the additional information along with the report of site visit by the sub-committee. The reply and compliance of the above has been attached as **Annexure-I.**

2/ Further, the Sub-committee constituted by the EAC (Non-Coal Mining) has visited the site (Mukam Bauxite Mine 110.563 Ha.) on 17.08.2023 to 19.08.2023 and submitted their report before EAC. The proposal was again considered by EAC on 20th meeting dated 21&22.09.2023 and vide MoM dated 29.09.2023, EAC has sought further some information by the project proponent. The point wise reply/compliance of the above is attached as **Annexure-II**

It is important to mention that CMDC has to execute Mining Lease Deed on or before 26.03.2024 else this mine will be goes under lapsed category.

3/ Therefore in view of the above facts it is requested to kindly consider our proposal as an special case in the upcoming EAC meeting.

**Encl.** : As above.

**(P.S. Yadav)**
**Chief General Manager**

**Annexure-I**

## Mukam Bauxite Mine

As per Minutes of 12th EAC (Non-Coal Mining) meeting held during 21-22 March, 2023, the EAC opined that the Ministry may constitute a sub-committee and submit its report to enable the committee to take a decision on the proposal. Based on the above discussions held, the EAC **deferred** the proposal and was of the view that proposal may be considered only after the submission of the following additional information along with the report of site visit by the subcommittee: -

## Observation of EAC, MoEF&CC

| S. No. | Additional Information | Compliance by Project Proponent |
|---|---|---|
| I. | The Project Proponent needs to submit the valid Letter of Intent (since the LoI expiring on 27.03.2023) for further consideration of the proposal before the EAC. | Government of Chhattisagarh, Mineral Resource Department vide Letter No. F-3-03/2021/12, Dated 27.03.2023 has issued Grant Order in favour of CMDC for Mukam Bauxite Mines 110.563 ha. Which is valid for 01 year i.e. upto 26.03.2024. The Grant Order Dated 27.03.2023 is attached herewith as **Article–I** for your kind perusal. |
| II. | The Project Proponent needs to submit the action plan for rehabilitation of mined out areas and year wise backfilling plans and sections along with the timeline. | Action plan for rehabilitation of mined out areas and year wise backfilling plans and sections along with the timeline is attached as **Article–II** for your kind perusal (Conceptual Plan). |
| III. | The Project Proponent needs to explore the possibility of deploying the Ripper and Dozer combination to eliminate the drilling and blasting in view of close proximity of the Mukam village and the Forest/Wildlife. | The PP is agreed to explore the possibility of deploying the Ripper and Dozer combination to eliminate the drilling and blasting in view of close proximity of the Mukam village and the Forest/Wildlife. As CMDC is allready in practice the above in one of the Bauxite mines. Potographs attached as **Article–III**. |
| IV. | The Project Proponent needs to submit the action plan to monitor the movement of tigers in the vicinity of the mine lease area and the Project Proponent needs to ensure the tiger corridors passing in the study area from Digital Support System (DSS) available in NTCA website. | An action plan has been prepared to monitor movement of tigers in the vicinity of the mine lease area. The main objective of the action plan is to conserve & protect tigers and minimizing the conflict between mining activity and wildlife. To monitor the tiger movement in mine lease area & its closes vicinity and tiger movement in buffer Zone area of mine lease area i.e. 10 km radius area of mine lease falling in territorial forest jurisdiction of Chhattisgarh, which is forest area of Taregaon and Pandariya forest Range of Kawardha Forest Division has |

| S. No. | Additional Information | Compliance by Project Proponent |
|---|---|---|
| | | been dealt separately. An additional budget provision has been made for the prescribed works. A copy of the Action Plan is attached as **Article–IV.**<br><br>The distance of Phen Wildlife Sanctuary from the boundary of Mukam bauxite mine lease area is 4.10 km and Kanha Achanakmar Tiger Corridor is approximately 5.89 Km. A map prepared with the help of Digital support system (DSS) available in NTCA Website showing distance is annexed as **Annexure-1(of Article–IV** ) of above Action plan. |
| V. | The Project Proponent needs to submit the letter from the State Forest Dept, Madhya Pradesh regarding the distance of the Tiger Corridor and ESZ along with the authenticated map and authenticated list of flora and fauna since the study area of the 10km radius of the buffer zone falling in the State of Madhya Pradesh. PP also needs to submit the letter from the State Forest Dept, Chhattisgarh regarding the list of flora and fauna by indicating the type of Schedule species found in the study area. | The study area of Mukam Bauxite mine i.e. 10 km. radius area from the periphery of mine lease area situated in two states, Chhattisgarh & Madhya Pradesh. Separate wildlife conservation and Management Plan has been prepared for each state.<br><br>a. The Wildlife conservation and Management Plan for study falling in Madhya Pradesh has been submitted to PCCF Wildlife M.P through the D.F.O. and Field Director Kanha National Park Mandla and it has been approved. The said Wildlife Conservation and Management Plan contains list of flora & Fauna (Containing List of schedule-I animals in **Annexure II** and **Annexure III (of Article-VI)** respectively.<br>**A** forest map of 1:50,000 scale showing 10 km radius area from the periphery of the mine lease area and the map showing the Kanha Achanakmar Tiger Corridor and Eco Sensitive zone of Phen Wildlife Sanctuary using DSS from NTCA in **Article -V.** A copy of Wildlife Conservation and Management Plan for study area falling in M.P. has been approved and enclosed herewith as **Article–VI** for your kind perusal.<br><br>b. The wildlife conservation and Management Plan for study falling in C.G. has been Submitted to PCCF Wildlife C.G. |

| S. No. | Additional Information | Compliance by Project Proponent |
|---|---|---|
| | | through DFO Kabirdham and CCF Durg and is under active consideration before the PCCF Wildlife for approval. The said Wildlife Conservation and Management Plan contains the list Flora & Fauna (containing List of schedule-I animals in **Annexure II and III (of Article-VII)**. A copy of Wildlife Conservation and Management Plan for study area falling in C.G. has been enclosed as **Article–VII** |
| VI. | The Project Proponent needs to submit the map showing the transport route of the mineral from the mine lease area to the destination, impact of details of habitation at a distance of 100m from the center on both sides of road, details of no. of trips/day to and fro, capacity of the dumper/tipper to be deployed and the dimensions of the road and the carrying capacity of the road. | 1. A Copy of transportation route and detailed study report of traffic density survey & carrying capacity and impact of transportation on environment etc. is attached as **Article–VIII**.<br>3. As per approved mining plan the peak rated production of the mine is around 2,88,461.00 tonn (Bauxite) per year. Considering 300 working days in a year and 8 hours in a day the hourly production will be around 120 tonn. To cope-up the hourly production CMDC will required 06 trips of 18/20 Tonner tippers/dumper. It is proposed in the approved around fleet of 10 tippers/dumpers will be required. |
| VII. | The Project Proponent needs to submit the map indicating the location of garland drains, retaining walls and silt check dam along with the timeline for construction. | CMDC will construct garland drains, retaining walls and silt check dam as per the provisions contained in the approved mine plan (in first five years). The map indicating the location of garland drains, retaining walls and silt check dam is attached as **Article–IX.** |
| VIII. | The Project Proponent needs to the revise the activity-wise time-bound action plan on the issues raised and commitment made during public hearing in compliance of the Ministry's OM F.No.22-65/2017-IA.III dated 30th September, 2020 over a period of 3 years. The Project proponent shall ensure that the activities proposed under the public hearing is different from the CSR activities. | Time-bound action plan on the issues raised and commitment made during public hearing is attached **Article–X** for your kind perusal |
| IX. | The Project Proponent needs to submit the employment scheme/skill development plan to be adopted for employing the local persons in mine | The employment scheme/skill development plan is attached herewith as **Article–XI** for your kind perusal. |

| S. No. | Additional Information | Compliance by Project Proponent |
|---|---|---|
| | and its action plan to implement the same. Further, PP shall provide the details of employment to be provided to the local people with timeline. | |
| X. | The Project Proponent needs to submit the Wildlife Conservation and Management Plan in PARIVESH portal. | CMDC has prepared Wildlife Conservation and Management Plan for both the States i.e. Madhya Pradesh and Chhattisgarh. Wildlife Conservation and Management Plan for Madhya Pradesh is being approved by PCCF(Wildlife), Madhya Pradesh attached and another Wildlife Conservation and Management Plan for Chhattisgarh State is under process for its approval (Duly approved by CCF, Durg Circle, C.G.). Both the prepared Wildlife Conservation and Management Plan is attached and uploded on Parivesh Portal as **Article–VI and Article–VII** respectively for your kind perusal. |
| XI. | PP shall submit dust pollution mitigation measure for villages nearby the mine lease (eg. Mukam Village is located approx. at a distance of 0.5 km from the mine lease area). | The dust pollution mitigation measure for villages nearby the mine lease is attached in **Article–XII** |
| XII. | The site visit report of the sub-committee. | The site visit report (MoM Dated 29.09.2023) of the sub-committee is attached herewith as **Article–XIII** for your kind perusal. |

**Annexure-II**

## Observation of Sub-committee (Visit Date 17.08.2023 to 19.08.2023)

| S.No | Information sought by Sub-committee | Compliance by Project Proponent |
|---|---|---|
| 1 | The Project Proponent shall undertake a survey to count the number of trees present in the lease area. | Tree counting has been conducted and completed by the Forest Department. Tree counting sheet duly signed by the concerned DFO has been submitted by CMDC. Tree counting sheet is attached as **Document-I** |
| 2 | The project proponent should take permission before felling of trees and shall submit the action plan for compensatory afforestation. | It is important to mention that no forest land involve in the lease boundary of Mukam Bauxite Mine. Therefore no forest clearance and compensatory afforestation is required to operate the mine. CMDC further ensures to the committee that during the mining operation no tree within the mining lease area shall be felled. |
| 3 | During site visit, habitation and school are seen near the mine lease area. Project proponent should submit the precaution measures with an action plan. | In this regards CMDC has informed to the sub-committee members that mining operation will be carried out through ripper and rock breaker combination. So there will be no harm to the nearby habitation. It is important to mention that at present CMDC is practicing the same combination one of its bauxite mine which is located in district Surguja. Photographs of ripper mining is attached as **Document-II** |
| 4 | To maintain the dust free environment, the committee was of the opinion that project proponent should include provision for permanent sprinklers for the entire mineral transportation route. | To maintain the dust free environment CMDC ensure to carry out regular water sprinkling on the haul/transport road inside the lease and even on the roads outside the lease boundary in close proximity to village. Further, to minimize the impact of dust it is proposed to develop a green belt by dense plantation throughout the safety zone. |
| 5 | The Committee was of the opinion that the project proponent may explore the expand the road width and accordingly a plan needs to be submitted along with timeline and cost. | Since the road outside the lease area is a public road and belongs to State Government. Chhattisgarh Mineral Development Corporation will surely approach to the Government of Chhattisgarh for its widening through District Mineral Fund (DMF) and the decision of the same will be communicated to the MoEF&CC. |

| | | |
|---|---|---|
| 6 | The Project Proponent needs to submit the sequence of mining as the mine lease area involves an area of 67.401 ha of agriculture land and shall submit the action plan for restoration of ecology. | CMDC ensures that mining activities will be taken up as per approved mining plan by IBM, Raipur. |
| 7 | The Project Proponent needs to submit the letter from the State Forest Dept, Madhya Pradesh regarding the distance of the Tiger Corridor and ESZ along with the authenticated map and authenticated list of flora and fauna since the study area of the 10km radius of the buffer zone falling in the State of Madhya Pradesh. PP also needs to submit the letter from the State Forest Dept, Chhattisgarh regarding the list of flora and fauna by indicating the type of Schedule species found in the study area. | The map showing distance of Phen Wildlife sanctuary and Kanha Achanakmar Tiger Reserve from the lease boundary also the list of flora and fauna duly signed by PCCF (Wildlife), Madhya Pradesh and PCCF(Wildlife),Chhattisgarh are attached herewith as **Document-III & Document-IV** respectively. |
| 8 | The project proponent needs to seek comments from the State DMG, if any illegal mining done by Project Proponent or not. | The Certificate issued by State DGM, Chhattisgarh regarding no illegal mining activities in the Mukam Bauxite Mine by CMDC is attached herewith as **Document-V** for yur kind perusal. |
| 9 | The project proponent needs to provide the exact distance of school and Mukam village near the mine lease area | The exact distance of school and Mukam village are around 173.50 m & 547.74 m respectively. The map showing the distance of School and Mukam Village is attached herewith as **Document-VI** for your kind perusal. It is stated by CMDC in point no. 3 to minimize the impact of mining operation CMDC will operate the mine by ripper and rock breaker combination. |

**Article I**

पंजीकृत डाक द्वारा

# छत्तीसगढ़ शासन
## खनिज साधन विभाग
## मंत्रालय
## महानदी भवन, नवा रायपुर, अटल नगर,
## जिला रायपुर–492002

क्रमांक एफ 3–03/2021/12. नवा रायपुर, अटल नगर, दिनांक 27 MAR 2023

प्रति,

कलेक्टर,
जिला कबीरधाम, छत्तीसगढ़ ।

विषयः–जिला–कबीरधाम, तहसील–बोड़ला, ग्राम– मुकाम के कुल उपलब्ध रकबा 110.563 हेक्टर क्षेत्र पर खनिज बाक्साईट का खनिपट्टा स्वीकृति बाबत् – मेसर्स छत्तीसगढ़ मिनरल्स डेव्हलमेंट कार्पोरेशन लिमिटेड ।

संदर्भ :–आपका पत्र क्रमांक 418/ख.लि./खनिज/2020, कबीरधाम, दिनांक 01.09.2020 एवं क्रमांक 366/ख.लि./खनिज/2022, दिनांक 17.03.2022 एवं विभागीय समसंख्यक पत्र दिनांक 11.04.2022

---

कृपया संदर्भित पत्रों का अवलोकन करें । जिला–कबीरधाम, तहसील–बोड़ला, ग्राम–मुकाम के रकबा 132.811 हेक्टर (सीएमडीसी के पत्र दिनांक 19.02.2019 द्वारा संशोधित रकबा 125.760 हेक्टर एवं पत्र दिनांक 27.12.2021 द्वारा संशोधित रकबा 110.563 हेक्टर) क्षेत्र पर खनिज बाक्साइट का खनिपट्टा स्वीकृति हेतु मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड द्वारा आवेदन पत्र दिनांक 28.11.2018 को प्रस्तुत किया है, जिसे संचालनालय भौमिकी तथा खनिकर्म के पत्र दिनांक 12.11.2021 द्वारा शासन निर्णय हेतु प्रेषित किया है।

2/ संचालनालय भौमिकी तथा खनिकर्म के प्रस्ताव दिनांक 12.11.2021 एवं आपके संदर्भित पत्र दिनांक 01.09.2020 एवं दिनांक 17.03.2022 के अनुसार छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड के द्वारा जिला कबीरधाम, तहसील बोड़ला के ग्राम मुकाम के अंतर्गत आवेदित रकबा 125.76 हेक्टर (सीएमडीसी के पत्र दिनांक 19.02.2019 द्वारा संशोधित) क्षेत्र में से प्रतिबंधित क्षेत्र छोड़ने के उपरांत रकबा 110.560 हेक्टर क्षेत्र पर खनिज बाक्साइट का खनिपट्टा स्वीकृति हेतु उपलब्ध होता है । आवेदित एवं उपलब्ध क्षेत्र का विवरण निम्नानुसार हैः–

| ग्राम का नाम | आवेदित भूमि रकबा(हे.में) | शासकीय भूमि रकबा(हे.में) | निजी भूमि रकबा (हे.में) | योग रकबा (हे.में) |
|---|---|---|---|---|
| मुकाम | 125.760 | 49.209 | 76.551 | 125.760 |
| उपलब्ध क्षेत्र | | 43.162 | 67.401 | 110.563 |

3/ सीएमडीसी द्वारा उपर्युक्त आवेदित क्षेत्र सार्वजनिक उपक्रमों के माध्यम से काम करने के लिए सुरक्षित क्षेत्र के अंतर्गत आता है। सीएमडीसी द्वारा आवेदित समस्त क्षेत्र निजी तथा शासकीय भूमि है। अतः इस पर वन संरक्षण अधिनियम, 1980 का प्रावधान लागू नहीं होता है।

एमएमडीआर एक्ट, 1957 (यथा संशोधित) की धारा 17ए(2ए) तथा खनिज (सरकारी कंपनियों द्वारा खनन) नियम, 2015 के नियम–4(1)में निहित प्रावधानानुसार राज्य सरकार द्वारा आरक्षित क्षेत्र के अंतर्गत शासकीय कंपनियों को 50 वर्ष की अवधि के लिए खनिपट्टा स्वीकृत किया जा सकता है।

....02

4/ कार्पोरेशन के पत्र दिनांक 21.01.2022 के परिप्रेक्ष्य मे विभागीय पत्र क्रमांक एफ 3–7/2021/12, दिनांक 23.03.2022 द्वारा छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड को एमएमडीआर एक्ट, 1957 (यथा संशोधित) की धारा 17ए(4) के द्वितीय परन्तुक में प्रदत्त अधिकारों के तहत सीएमडीसी को खनिपट्टा स्वीकृत करने हेतु अधिनियम में निर्धारित समय सीमा दिनांक 28.3.2022 में आगामी 01 वर्ष (दिनांक 27.3.2023 तक) की वृद्धि प्रदान किया गया है।

5/ उपर्युक्त के परिप्रेक्ष्य में विभागीय पत्र दिनांक 11.04.2022 द्वारा मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड को जिला कबीरधाम, तहसील बोड़ला, ग्राम मुकाम के अंतर्गत उपलब्ध रकबा 110.563 हेक्टर क्षेत्र पर खनिज बाक्साईट का खनिपट्टा स्वीकृति हेतु अनुमोदित मायनिंग प्लान प्रस्तुत करने एवं साथ ही पर्यावरण संरक्षण अधिनियम, 1980 के अतर्गत जारी एन्वायरमेंट इम्पेक्ट नोटिफिकेशन दिनांक 14.9.2006 के तहत आवश्यक अनुमति प्राप्त कर उपलब्ध कराये जाने हेतु लेख किया गया।

6/ मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड के पत्र दिनांक 31.10.2022 द्वारा भारतीय खान ब्यूरो, रायपुर के पत्र क्रमांक कबीरधाम/बॉक्सा/खयो–1335/ 2022–रायपुर/242, रायपुर, दिनांक 07.09.2022 द्वारा अनुमोदित मायनिंग प्लान प्रस्तुत किया गया है।

7/ सीएमडीसी ने पत्र दिनांक 27.02.2023 एवं 17.03.2023 के द्वारा जिला कबीरधाम, तहसील बोड़ला, ग्राम मुकाम के अंतर्गत कुल रकबा 110.563 हेक्टर क्षेत्र में खनिज बाक्साईट के खनिपट्टा स्वीकृति हेतु जारी आशय पत्र दिनांक 11.04.2022 के अनुकम में पर्यावरणीय स्वीकृति की बाध्यता के संदर्भ में निम्नांकित शर्तों के अधीन खनिपट्टा स्वीकृति आदेश जारी करने का अनुरोध किया गया है :–

*"बिना पर्यावरणीय स्वीकृति के सीएमडीसी द्वारा खनन कार्य प्रारंभ नहीं किया जावेगा।"*

8/ सीएमडीसी के उपर्युक्त पत्र पर विभागीय समसंख्यक पत्र दिनांक 15.03.2023 के परिप्रेक्ष्य में संचालनालय भौमिकी तथा खनिकर्म, रायपुर के पत्र दिनांक 21.03.2023 द्वारा मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड के पक्ष में जिला कबीरधाम, तहसील बोड़ला, ग्राम मुकाम के अंतर्गत कुल रकबा 110.563 हेक्टर क्षेत्र पर खनिज बाक्साईट का खनिपट्टा स्वीकृति हेतु सशर्त निम्नानुसार अनुशंसा सहित प्रस्ताव प्रेषित किया गया है :–

1. संस्थान द्वारा खनिपट्टा स्वीकृति (Mining Lease) हेतु जारी आशय पत्र अंतर्गत पर्यावरण स्वीकृति के अतिरिक्त शेष समस्त शर्तें/अपेक्षाएं पूर्ण कर दी गई है। अतः उपर्युक्त क्षेत्र पर राज्य सरकार खनिपट्टा स्वीकृत कर सकता है।
2. सीएमडीसी द्वारा पर्यावरणीय स्वीकृति प्राप्त करने के पश्चात् ही राज्य शासन की ओर से जिला कलेक्टर द्वारा अनुबंध निष्पादन की कार्यवाही किया जा सकेगा।
3. राज्य को प्राप्त होने वाले राजस्व को ध्यान में रखते हुए सीएमडीसी को राज्य सरकार द्वारा जारी खनिपट्टा स्वीकृति आदेश के एक वर्ष के भीतर पर्यावरणीय स्वीकृति प्राप्त किया जाना अनिवार्य होगा अन्यथा यह आदेश स्वयंमेव समाप्त माना जावेगा।

9/ संचालनालय भौमिकी तथा खनिकर्म, रायपुर के पत्र दिनांक 21.03.2023 द्वारा प्रेषित प्रस्ताव अनुसार भारत सरकार, पर्यावरण मंत्रालय की अधिसूचना दिनांक 14.09.2006 के शेड्यूल में उल्लेखित पैरा–02 उदधृत किया गया है, जो कि निम्नानुसार है :–

**Requirements of Prior Environmental Clearance (EC) :-**

The following projects or activities shall require prior environmental clearance from the concerned regulatory authority, which shall hereinafter referred to be as the Central Government in the Ministry of Environment and Forests for matters falling under Category 'A' in the Schedule and at State level of the State Environment Impact Assessment Authority

(SEIAA) for matters falling under Category B in the said Schedule, ***before any construction work, or preparation of land by the project management except for securing the land, is started on the project or activity;***

उपर्युक्त के मुख्य आधार पर संचालनालय भौमिकी तथा खनिकर्म, रायपुर के द्वारा खनिपट्टा स्वीकृति की सशर्त अनुशंसा की गई है। उल्लेखनीय है कि सीएमडीसी राज्य सरकार का सार्वजनिक उपक्रम है। सीएमडीसी को आरक्षित क्षेत्र की अधिसूचना समाप्ति की अवधि दिनांक 27.03.2023 को संज्ञान तथा राज्य को प्राप्त होने वाले राजस्व एवं खनिज विकास की दृष्टि से संचालनालय भौमिकी तथा खनिकर्म एवं कार्पोरेशन द्वारा प्रस्तुत खनिपट्टा स्वीकृति का प्रस्ताव मान्य योग्य प्रतीत होता है।

10/ संचालक, भौमिकी तथा खनिकर्म के प्रस्ताव दिनांक 21.03.2023 में वर्णित तथ्यों एवं प्रस्ताव पर विचारोपरान्त मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड (सीएमडीसी) को खनिज बाक्साईट के विषयंतर्गत खनिपट्टा क्षेत्र जिस पर संस्थान को पर्यावरणीय स्वीकृति प्राप्त नहीं हुई है इन क्षेत्र पर निम्नानुसार शर्तों के अधीन खनिपट्टा स्वीकृति हेतु विचार किया गया है :–

10.1 मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड को राज्य सरकार द्वारा जारी खनिपट्टा स्वीकृति आदेश दिनांक से 01 वर्ष के भीतर पर्यावरणीय स्वीकृति प्राप्त किया जाना अनिवार्य होगा अन्यथा यह आदेश स्वमेव समाप्त जावेगा।

10.2 सीएमडीसी द्वारा पर्यावरणीय स्वीकृति प्राप्त करने के पश्चात ही खनिपट्टा क्षेत्र का अनुबंध निष्पादन राज्य शासन की ओर से जिला कलेक्टर के द्वारा किया जायेगा।

11/ उपर्युक्त वर्णित तथ्यों के परिप्रेक्ष्य में छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड (सीएमडीसी) के पक्ष में एमएमडीआर एक्ट, 1957 (यथा संशोधित) की धारा–8A(2) एवं धारा–17A(2A) तथा खनिज (परमाणु और हाइड्रोकार्बन ऊर्जा खनिज से भिन्न) रियायत (चौथा संशोधन) नियम, 2021 के नियम, 73(1) के प्रावधानों के जिला कबीरधाम, तहसील बोड़ला, ग्राम मुकाम के अंतर्गत उपलब्ध रकबा 110.563 हेक्टर (संलग्न नक्शें में दर्शित कोआर्डिनेट्स अनुसार) क्षेत्र पर उपरोक्त पैरा–10 में उल्लिखित शर्तों के अधीन एवं निम्नांकित शर्तों के अधीन 50 वर्ष की अवधि के लिए खनिज बाक्साईट का खनिपट्टा राज्य शासन एतद् द्वारा स्वीकृत किया जाता है :–

| | | | |
|---|---|---|---|
| 11.1 | आवेदक का नाम एवं पता | – | मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड, सेक्टर–24, आफिस कैम्पस, ब्लॉक–7ए, तृतीय तल, नवा रायपुर अटल नगर(छत्तीसगढ़) |
| 11.2 | स्वीकृत क्षेत्र का विवरण | – | पैरा–02 की तालिका में उल्लेखित विवरण अनुसार |
| 11.3 | खनिज का नाम | – | बाक्साईट |
| 11.4 | स्वीकृत अवधि | – | 50 वर्ष |
| 11.5 | रायल्टी डेडरेंट आदि | – | नियमों में प्रावधानित दर से |

11.6 स्वीकृत क्षेत्र का डी.जी.पी.एस.(DGPS) से सर्वेक्षण/सीमांकन सुनिश्चित किया जाये।

11.7 आवेदक कंपनी द्वारा MMDR(Amendment) Act, 2015 सहपठित खनिज(परमाणु और हाइड्रोकार्बन ऊर्जा खनिजो से भिन्न) रियायत नियम, 2016 एवं खनिज संरक्षण तथा विकास नियम, 1988 के प्रावधानों सहित अन्य संबद्ध अधिनियमों एवं नियमों का पालन सुनिश्चित किया जाएगा।

11.8 खनिज(परमाणु और हाइड्रोकार्बन ऊर्जा खनिजो से भिन्न) रियायत नियम, 2016 के

नियम 8(3)(क) के प्रावधानों के तहत अनुमानित संसाधनों के मूल्य के 0.50 प्रतिशत के बराबर राशि हेतु राज्य सरकार को अनुसूची 4 में विनिर्दिष्ट रूप विधान में बैंक प्रतिभूति के रूप में अथवा प्रतिभूति निक्षेप के रूप में कार्यपालन प्रतिभूति उपलब्ध कराएगा, जिस कार्यपालन प्रतिभूति को नियम 8(3)(ख) के तहत भारत सरकार, खान मंत्रालय के निर्देशों के अनुरूप राज्य शासन के द्वारा दिनांक 21.12.2016 को प्रकाशित खान विकास उत्पादन करार(एमडीपीए) के और खनन पट्टा विलेख के निबंधनों और शर्तों के अनुसार राज्य सरकार द्वारा उपयोग किया जा सकेगा। कार्यपालन प्रतिभूति को प्रत्येक पांच वर्ष में समयोजित किया जाएगा जिसमें कि यह अनुमानित संसाधनों के पुनः निर्धारित मूल्य के 0.50 प्रतिशत के सदृश बनी रहें।

11.9 खनिज (परमाणु और हाइड्रोकार्बन ऊर्जा खनिजो से भिन्न) रियायत नियम, 2016 के नियम 8(3)(ख) के प्रावधानों के तहत उपनियम 8(3)(क) में विनिर्दिष्ट शर्तों के अनुपालन के पश्चात् राज्य शासन व्दारा विनिर्दिष्ट रूप विधान में राज्य सरकार के साथ खान विकास उत्पादन करार(एमडीपीए) पर हस्ताक्षर करेगा ।

11.10 खनिपट्टा क्षेत्र में समाहित शासकीय निस्तार भूमि पर खनन अनुमति जिला कलेक्टर द्वारा छत्तीसगढ़ भू–राजस्व संहिता 1959 की धारा 237 के प्रावधानांतर्गत नियमानुसार प्रदान किया जावेगा ।

11.11 भारतीय खान ब्यूरो, रायपुर के पत्र क्रमांक कबीरधाम/बॉक्साइट/खयो–1335/2022–रायपुर/242, रायपुर, दिनांक 07.09.2022 द्वारा माइनिंग प्लान अनुमोदित करते समय लगाई गई, शर्तों का पालन सुनिश्चित किया जाएगा एवं अनुमोदित खनन योजना के अनुरूप ही कार्य किया जाएगा।

11.12 राज्य स्तरीय पर्यावरण प्रभाव आंकलन प्राधिकरण, रायपुर छत्तीसगढ़ भारत सरकार, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय द्वारा पर्यावरणीय स्वीकृति हेतु अधिरोपित शर्तों का पालन सुनिश्चित किया जाएगा तथा उक्त पत्र में उल्लेखित शर्तों को खनिपट्टा के अनुबंध में अतिरिक्त रूप से जोड़ा जाये।

11.13 खनिपट्टा क्षेत्र में यूएनएफसी गाईडलाईन के तहत् खनिजों के अन्वेषण एवं रिपोर्टिंग के लिए भारत सरकार, खान मंत्रालय के पत्र क्रमांक F.No.10/75/2008-MV, दिनांक 23.12.2010 में उल्लिखित शर्तों को खनिपट्टा के अनुबंध में सम्मिलित किया जाये।

11.14 खनन कार्य हेतु कार्य अनुमति जल प्रदूषण (निवारण एवं नियंत्रण) अधिनियम, 1974, वायु प्रदूषण (निवारण एवं नियंत्रण) अधिनियम, 1981, पर्यावरण संरक्षण अधिनियम 1986 एवं वन संरक्षण अधिनियम, 1980 के अंतर्गत नियमानुसार जो भी अनुमति प्राप्त किये जाने की आवश्यकता हो, तत्संबंधी आवश्यक अनुमति सक्षम प्राधिकारी से प्राप्त करने के उपरांत ही प्रदान की जाये।

11.15 भारत सरकार, खान मंत्रालय, इंडियन ब्यूरो ऑफ माइन्स, क्षेत्रीय कार्यालय, रायपुर द्वारा लगाई गई शर्त अनुसार लीज डीड के निष्पादन के पूर्व खनिज संरक्षण और विकास नियम, 2017 के नियम–27 के तहत आवेदक कंपनी द्वारा Financial Assurance (वित्तीय आश्वासन) की राशि (नियमानुसार यदि आवश्यक हो तो) रीजनल ऑफिस, इंडियन ब्यूरो ऑफ माईन्स, रायपुर, छत्तीसगढ़ को जमा कराया जाना सुनिश्चित किया जाएगा।

11.16 आवेदक कंपनी द्वारा MMDR, (Amendment) Act, 1957 सहपठित खनिज (परमाणु और हाइड्रोकार्बन ऊर्जा खनिजो से भिन्न) रियायत नियम, 2016 एवं खनिज संरक्षण और विकास नियम, 2017 के प्रावधानों/उपबंधों एवं निर्देशों सहित अन्य संबद्ध अधिनियमों एवं नियमों का पालन सुनिश्चित किया जाएगा।

11.17 कंपनी अधिनियम, 2013 के तहत प्रावधान अनुसार सीएसआर के अंतर्गत खनिपट्टा की स्वीकृति से सीधे तौर पर प्रभावित ग्राम /ग्राम पंचायत के क्षेत्र एवं तत्पश्चात

अन्य प्रभावित ग्रामों में सामुदायिक विकास के कार्यो यथा शिक्षा, स्वास्थ्य, पेयजल, सड़क आदि–आदि पर जिला कलेक्टर के निर्देशानुसार तथा इस सम्बन्ध में समय–समय पर जारी निर्देशों के तहत व्यय की जायेगी।

11.18 भारत सरकार, खान मंत्रालय, नई दिल्ली एवं राज्य शासन द्वारा समय–समय पर जारी किए गये अधिनियमो, नियमों एवं निर्देशों का पालन बाध्यकारी होगा।

12/ यह सुनिश्चित कर लें कि पैरा–10 में उल्लिखित शर्तों की पूर्ति संस्थान द्वारा किये जाने के उपरांत ही निष्पादित किये जाने वाले अनुबंध(लीज डीड) में इस पत्र के पैरा–11 में उल्लिखित शर्तों का समावेश अतिरिक्त कंडिका के तौर पर अनिवार्य रूप से किया गया है।

13/ इस खनिपट्टा स्वीकृति आदेश से सीएमडीसी को उपर्युक्त खनिपट्टा क्षेत्र पर खनन संक्रियाएं संपादित करने का अधिकार तब तक प्राप्त नही होगा जब तक कि उपरोक्त पैरा–10 में उल्लिखित शर्तों की पूर्ति होने पर खनिपट्टा अनुबंध का निष्पादन नहीं कर लिया जाता।

14/ उपरोक्त पैरा–10 में उल्लिखित शर्तों की पूर्ति समयावधि में नहीं होने की स्थिति में यह आदेश स्वमेव समाप्त हो जायेगा।

संलग्न :– नक्शा।

छत्तीसगढ़ के राज्यपाल के नाम से
तथा आदेशानुसार

23/3/23

( एम0चन्द्रशेखर )
अवर सचिव
छत्तीसगढ़ शासन,
खनिज साधन विभाग
नवा रायपुर, दिनांक मार्च, 2023

पृ0 क्रमांक एफ 3–03/2021/12

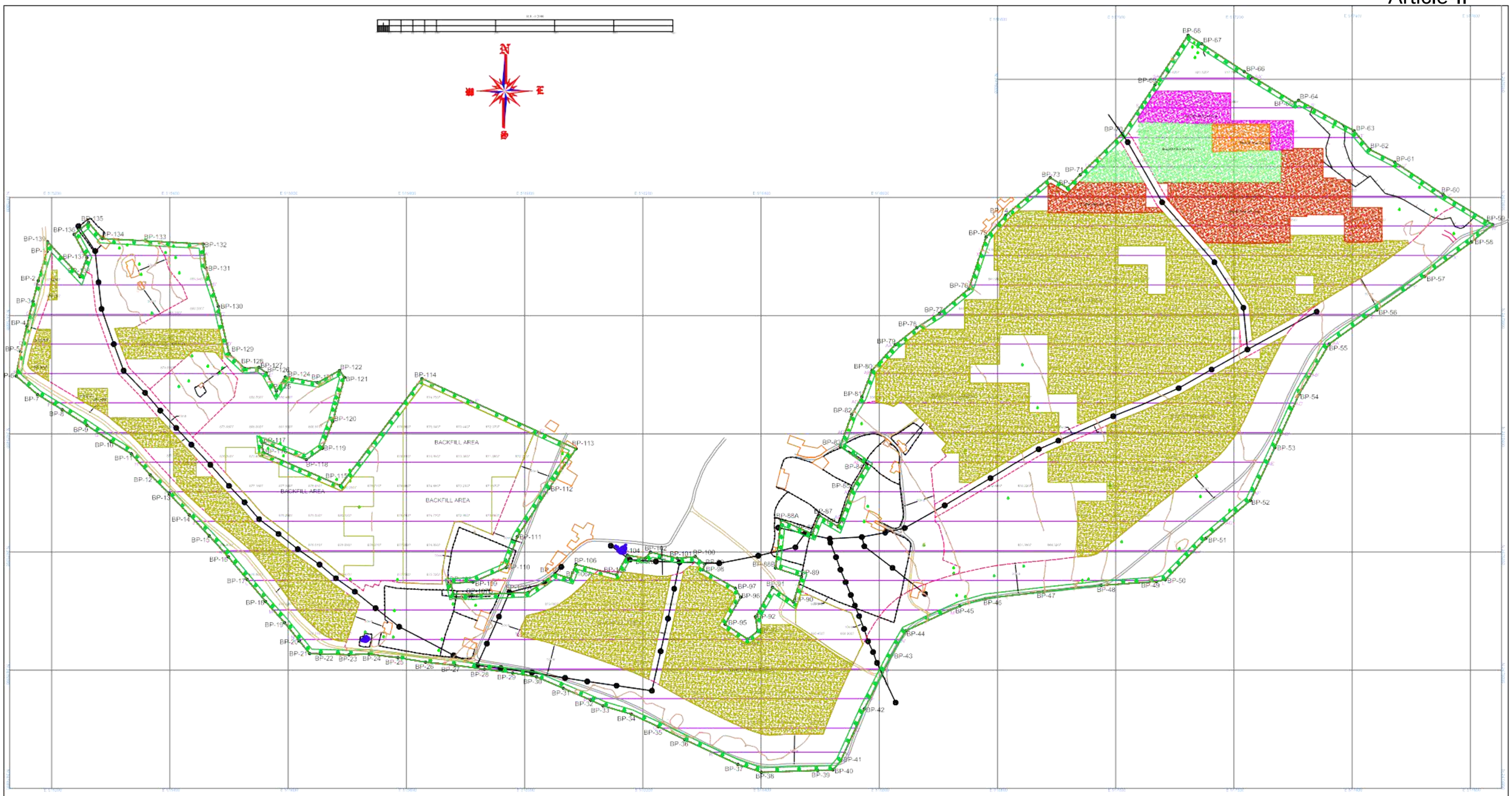
प्रतिलिपि :–

1. सचिव, भारत सरकार, खान मंत्रालय, शास्त्री भवन, नई दिल्ली
2. सचिव, भारत सरकार, वन एवं पर्यावरण मंत्रालय(एफसी डिवीजन) पर्यावरण भवन सीजीओर काम्प्लेक्स, लोधी रोड, नई दिल्ली,
3. सदस्य सचिव, छत्तीसगढ़ पर्यावरण संरक्षण मंडल, पर्यावास भवन, सेक्टर–19, नवा रायपुर अटल नगर, जिला रायपुर(छत्तीसगढ़)
4. क्षेत्रीय खान नियंत्रक, भारतीय खान ब्यूरो, दूसरी मंजिल, जीएसआई फील्ड प्रशिक्षण केन्द्र, महालेखाकार ऑफिस कॉम्पलेक्स, पोस्ट विधानसभा, रायपुर(छत्तीसगढ़)
5. खान सुरक्षा निदेशक, सीपत रोड, एसईसीएल परिसर, बिलासपुर(छत्तीसगढ़)
6. संचालक, भौमिकी तथा खनिकर्म, इन्द्रावती भवन, नवा रायपुर अटल नगर(छत्तीसगढ़) की ओर उनके पत्र क्रमांक 2065/एमसीसी–2/एफ नं.–1/2021, दिनांक 21.03.2023 के संदर्भ में सूचनार्थ एवं आवश्यक कार्यवाही हेतु अग्रेषित।
7. अतिरिक्त प्रधान मुख्य वन संरक्षक (भू–प्रबंध), नोडल अधिकारी वन संरक्षण अधिनियम, 1980 छत्तीसगढ़ अरण्य भवन, जेल रोड, रायपुर(छत्तीसगढ़)
8. मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड, सेक्टर–24, नवा रायपुर अटल नगर(छत्तीसगढ़)

की ओर आवश्यक कार्यवाही हेतु सूचनार्थ।

9. गार्ड फाईल।

अवर सचिव
छत्तीसगढ़ शासन
खनिज साधन विभाग




## LEGENDS

- LEASE BOUNDARY
- STATUTORY BARRIERS
- GRID LINES
- CONTOUR LINES
- PLANTATIONS
- BUILTUP/SHED
- KACHHA RASTA
- METAL ROAD
- WATER POND
- ELECTRIC LINE
- SPOT LEVEL
- PIT POSITION
- FENCING
- PROPOSED PLANTATIONS
- BACKFILL AREA
- 50mtr BARRIERS
- PROPOSED BACKFILL AFTER 2nd YEAR
- PROPOSED BACKFILL AFTER 3rd YEAR
- PROPOSED BACKFILL AFTER 4th YEAR
- PROPOSED BACKFILL AFTER 5th YEAR

PLATE NO.- 12

**CONCEPTUAL PLAN**

**MUKAM BAUXITE MINE**

LEASE AREA :- 110.563 Hect.

CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LIMITED

R.F. :- 1: 2000 | SURVEY DATE :- 08-06-2022

VIL. MUKAM, TEHSIL :- BORIA, DIST :- KABIRDHAM, STATE :- CHHATTISGARH

This is certified that the plan is prepared based on the lease map authenticated by the State Govt. and are correct to the best of my knowledge.

(Surveyor) | (Deepak Kumar Yadav) (Mining) | (Ajay Tripathi) (Mining)

**Article – III**

# ACTION PLAN

(To Monitor the Movement of Tigers in the vicinity of the Mukam Bauxite Mine Lease Area, District Kabirdham.)

enviro greens

HARESH CHANDRA TIWARI
I.F.S. (RETD.)

## MUKAM BAUXITE MINES

M/S. Chhattisgarh Mineral Development Corporation Ltd. (CMDC)
Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh

# ACTION PLAN

## To Monitor the Movement of Tigers in the vicinity of the Mukam Bauxite Mine Lease Area, District Kabirdham.

### Brief description of the project area :

Mukam Bauxite mine is located in village Mukam, Tensil Bodla, District Kabirdham Chhattisgarh. The mine lease area comprises of agricultural land with partly rocky and barren government wastelands. The total mine lease area is admeasuring 110.583 Hectares. Mine lease area is called the "core zone" and the 10-kilometer radius area from the periphery of the mine lease area is called the "buffer zone" (Study Area). Out of the total buffer zone area, approximately 70 % area is situated in territorial forest jurisdiction of Chhattisgarh State and rest 30% area in territorial forest jurisdiction of Madhya Pradesh State.

### A. Buffer Zone Area of Chhattisgarh :

The buffer zone area of Chhattisgarh is spread across the two forest ranges of Kawardha Forest Division Namely, Taregaon and Pandariya and some area of Chhattisgarh Forest Development Corporation Division Kawardha.

### B. Buffer Zone Area of Madhya Pradesh :

The buffer zone area of Madhya Pradesh falls within the area of Phen Wildlife Sanctuary and Kanha-Achanakmar Tiger Corridor Area (Area of East Mandla Forest Division Range-Mawai).

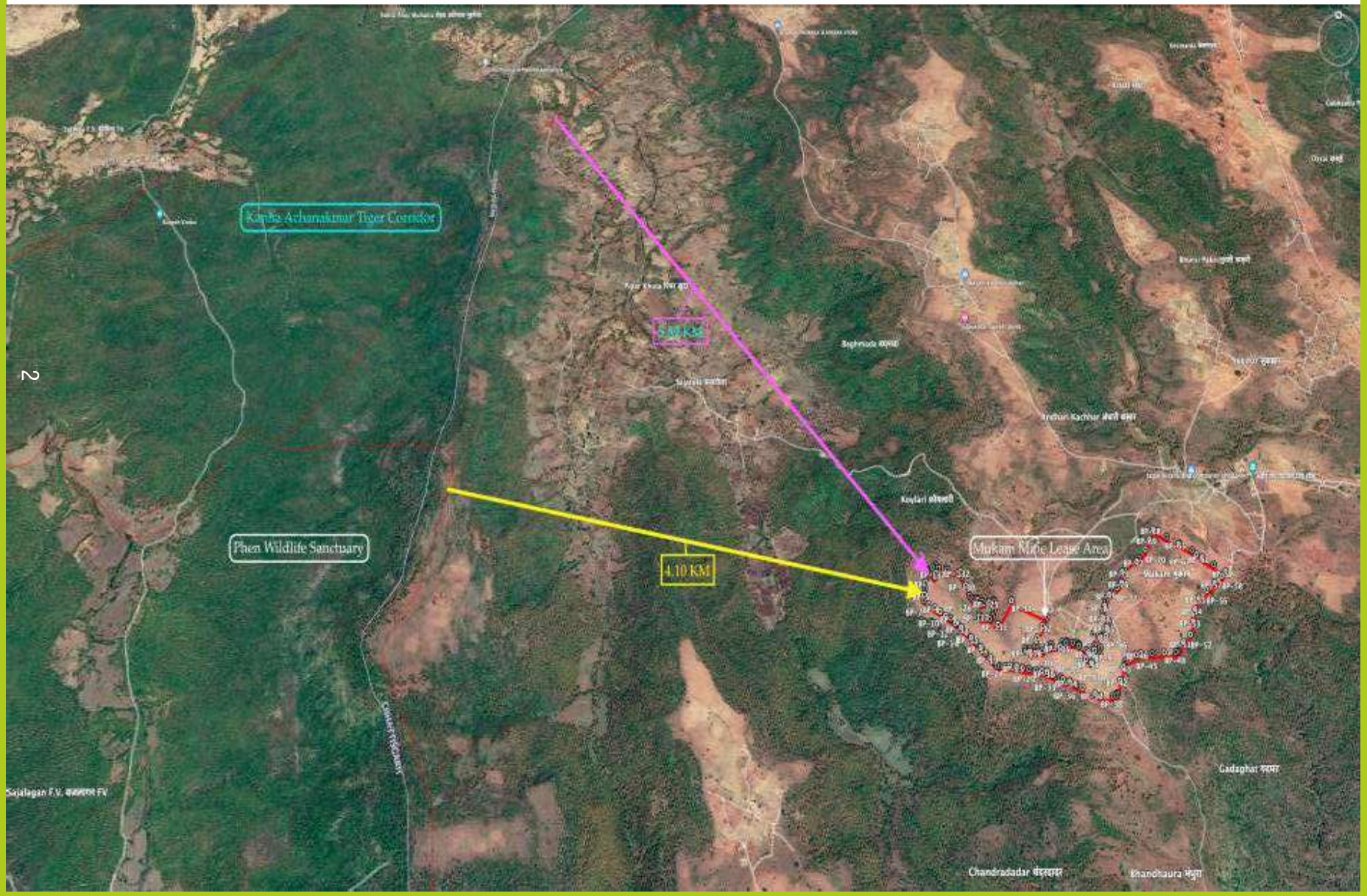
The distance of Phen Wildlife Sanctuary from the boundary of the Mukam Bauxite Mine Lease Area is 4.10 Kilometer and Kanha Achanakmar Tiger Corridor is approximately 5.89 Kilometers. **A map prepared with the help of Digital Support System (DSS) available in NTCA Website showing the distance is annexed as Annexure-1.**

ANNEXURE - I

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

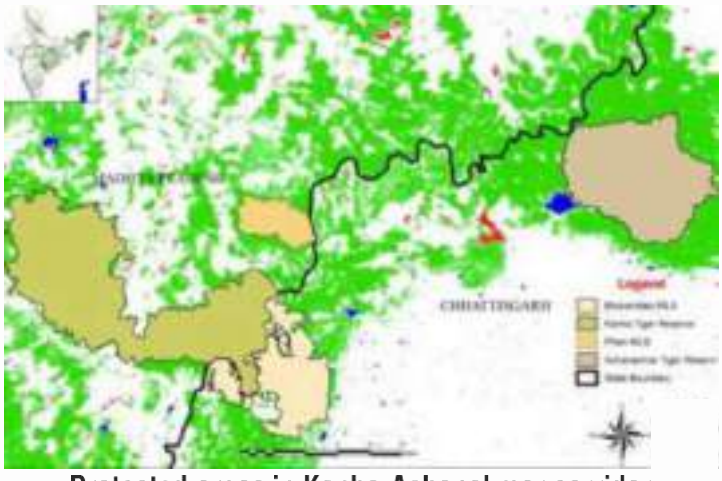
Map showing distance of Phen Wildlife Sanctuary & Kanha Achanakmar Tiger Corridor from mine lease area.



In recent times conservation efforts have been targeted towards tiger due to their dwindling status. Though tiger is an apex species in the food web of most of the territorial ecosystem and conservation of tiger as an umbrella species provides safeguard to the overall ecosystem, our understanding on the cascading effect of human induced change to populations of this carnivore species is negligible. Tiger also faces threats from habitat loss, intense poaching for body parts and has resulted in decline in their population. Also lack of estimation of population size of these large carnivore makes it difficult for taking appropriate conservation actions.

Due to their ecological traits, large carnivores require larger area for their survival, breeding dispersal. Therefore, for a tiger population to recover, tigers living outside protected areas also need to be protected. A primary intervention in such scenarios would be to minimize conflicts between people and tigers.

Phen Wildlife Sanctuary forms the satellite micro core of larger Kanha Tiger Reserve and is an important region in terms connectivity between Kanha and Achanakmar Tiger Reserve. It plays a significant role in Kanha Achanakmar Corridor as a major stepping stone area. Tigers which disperse or move out from Kanha, either use Bhoramdeo Wildlife Sanctuary or Phen to move further along the Kanha Achanakmar Corridor. Phen has connectivity to Kanha through Motinala Buffer Forest and further establish a linkage to Forest of Dindori and Mawai. Thus it is crucial to secure and preserve the Kanha Achanakmar Corridor for long term survival of tigers in landscape.



**Protected areas in Kanha-Achanakmar corridor**

## Objective of Action Plan :

The objective is to ensure the conservation and protection of tigers while minimizing potential conflicts between mining activity and wildlife. The Plan includes a combination of field-based monitoring techniques, technology driven approaches, community engagement, and collaboration with relevant stake holders. The plan emphasizes the importance of regular data collection, analysis and adoptive management to informed decision making and conservation efforts.

## I. Monitoring of tiger movement in mine lease area and close vicinity :

The monitoring of tiger shall be done by mining staff and security personal after getting training from forest department. As soon as they receive any information regarding tiger sighting or movement either by direct evidence or by indirect evidences, they shall report to the Forest Officials. The nearby villagers shall also be made aware about tiger and its movement by training and awareness program run by the Forest Department. The financial support for these awareness program shall be provided by the project proponent.

## II. Monitoring of tiger movement in buffer zone area of mine lease area in Chhattisgarh :

The forest area of Taregaon and Pandariya Forest Range of Kawardha Forest Division falls in buffer zone area of mines in Chhattisgarh. During the survey for preparation of Wildlife Conservation and Management Plan for Mukam Bauxite Mine, interviews of local villagers and field forest officials and perusal of forest records was conducted exhaustively. The said exercise reveled that there is no evidence of either tiger sighting or movement in last 10 years. Nonetheless owing to the situation of the buffer zone area of mines adjacent to the Kanha Achanakmar Tiger Corridor Area, there may be an eventuality and possibility of tiger movement in the said buffer area in future. The present action plan is aimed to address the aforesaid possibility of tiger movement, howsoever bleak, but as an abundant precaution following measures are being postulated to address the possibility. The forest staff of Taegaon and Pandariya Range shall be trained for monitoring the Tiger Movement. They shall be trained for collecting observing indirect evidence of tiger and direct evidence by using trap camera.

***Following actions are proposed in the co-ordination of Forest Deptt.:***

A. Identify key stake holders, including local communities, Mine Operators, Wildlife Conservation Organizations and Forest Department.

B. By establishing communication channels and forums for regular information exchange.

C. Promote awareness and participation of stakeholders in monitoring and conservation efforts.

D. By establishing a network of trained field staff.

E. By designing and implementing systematic monitoring protocols for tiger tracking.

F. Conducting regular monitoring using camera trap, sign survey and scat analysis.

G. By collecting data on tiger presence, movement patterns and habitat use.

H. Engaging local communities in tiger conservation initiatives.

I. Conducting educational program to raise awareness about the importance of tiger conservation and minimize human tiger conflicts.

J. By establishing community-based reporting system to gather information on tiger sighting or conflicts.

K. Providing incentives for community members who contribute to monitoring efforts.

## Budgetary Provision for Action Plan

In Wildlife Conservation And Management Plan of Mukam Bauxite Mine Lease Area, the budget provision to establish information center, awareness creation measures, hiring of inspection and monitoring vehicles has already been postulated, but the following additional budgetary allocation is being made for the above described works of the action plan.

| S. No. | Description of the Item of Work | No. / Quantity | Year Wise Budget Provisions (₹ Lakh) | | | | | Total ₹Lakhs |
|---|---|---|---|---|---|---|---|---|
| | | | 1st | 2nd | 3rd | 4th | 5th | |
| 1. | Training and Awareness Program | L/S | 0.40 | 0.40 | 0.40 | 0.40 | 0.40 | 2.00 |
| 2. | Purchase of Trap Camera and other Contingency Expenses | L/S | 2.00 | 0.25 | 0.25 | 0.25 | 0.25 | 3.00 |
| | | Total | 2.40 | 0.65 | 0.65 | 0.65 | 0.65 | 5.00 |

The budget shall be deposited in DFO PD Account and shall be used for monitoring tiger movement in Taregaon and Pandariya Range.

ENVIRO GREENS RAIPUR

**(Haresh Chandra Tiwari)**
IFS (Retd.)
Managing Partner
Envirogreens
Raipur (C.G.)

enviro greens

**Haresh Chandra Tiwari** I.F.S. (Retd)

**ENVIRO GREENS**

Centre for Conservation of Forests Wildlife & Environment

222, Officer's Colony, New Airport Road, Dharampura, Raipur (CG)

Contact : +91 94252 26796, Email: hareshctiwari@gmail.com

**Annexure-B**

# छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड

*(छत्तीसगढ़ शासन का एक उपक्रम)*

सी.आई.एन.U 14103 CT 2001 SGC 014691,
ई–मेल:cmderaipur@gmail.com,
वेबसाइट : www.cmdc.co.in

मुख्य कार्यालय :
सेक्टर 24, तृतीय तल, ब्लॉक नं0 7 ए,
अटल नगर नवा, रायपुर
(छ.ग.)–492015

क्रमांक/ 286 /खनि0/2023 नवा रायपुर, दिनांक 16-5-2023

**To**

**The Additional Principal Chief Conservator of Forests (Wildlife),**
**Office of the PCCF Wildlife Madhya Pradesh,**
**MP Nagar,**
**Bhopal (M.P.)**

**Sub: Mukam Bauxite Mines of M/S Chhattisgarh Mineral Development Corporation Limited for mining of Bauxite with total Excavation of 802977.5 TPA in the Mine Lease Area of 110.563 Hectares, located at villages Mukam Tehsil-Bodla, District Kabirdham Chhattisgarh-ToR Regarding.**

**Ref: Your Letter numbered no/WL/DM/Mine-150/4250 Bhopal Dated 09.05.2023**

**Through: The Field Director, Kanha Tiger Reserve, Mandla.**

In furtherance of your letter under reference, it is humbly submitted that as per the observations mentioned in the letter under reference, a revised Wildlife Conservation and Management Plan along with a revised budgetary provision addressing the aforementioned observations has been reformulated and is being submitted to your good office for your kind consideration.

In light of the aforementioned it is sincerely requested to approve the Wildlife Conservation and Management Plan so as to obtain Environmental Clearance from the MoEFCC, Government of India.

We shall be highly obliged if you consider our kind request.

Thanking You in anticipation

**Enclosed:**

1. **Five Copies of Revised Wildlife Plan**
2. **Three Copies of Location Map in 1:50,000 Scale.**

**Sincerely**

Upendra Kumar
16/05/2023

**(Deputy General Manger)**

Office of The Field Director,
Project Tiger, Kanha Tiger Reserve,
Mandla

पृ.क्र./मा.नि./1990 मण्डला, दिनांक/28.05.2023

महोदय,

मूलतः संशोधित वाईल्डलाईफ प्लान में इस्तमरार उपरोंत आवश्यक कार्यवाही हायर संप्रेषित है।

23/5/2023

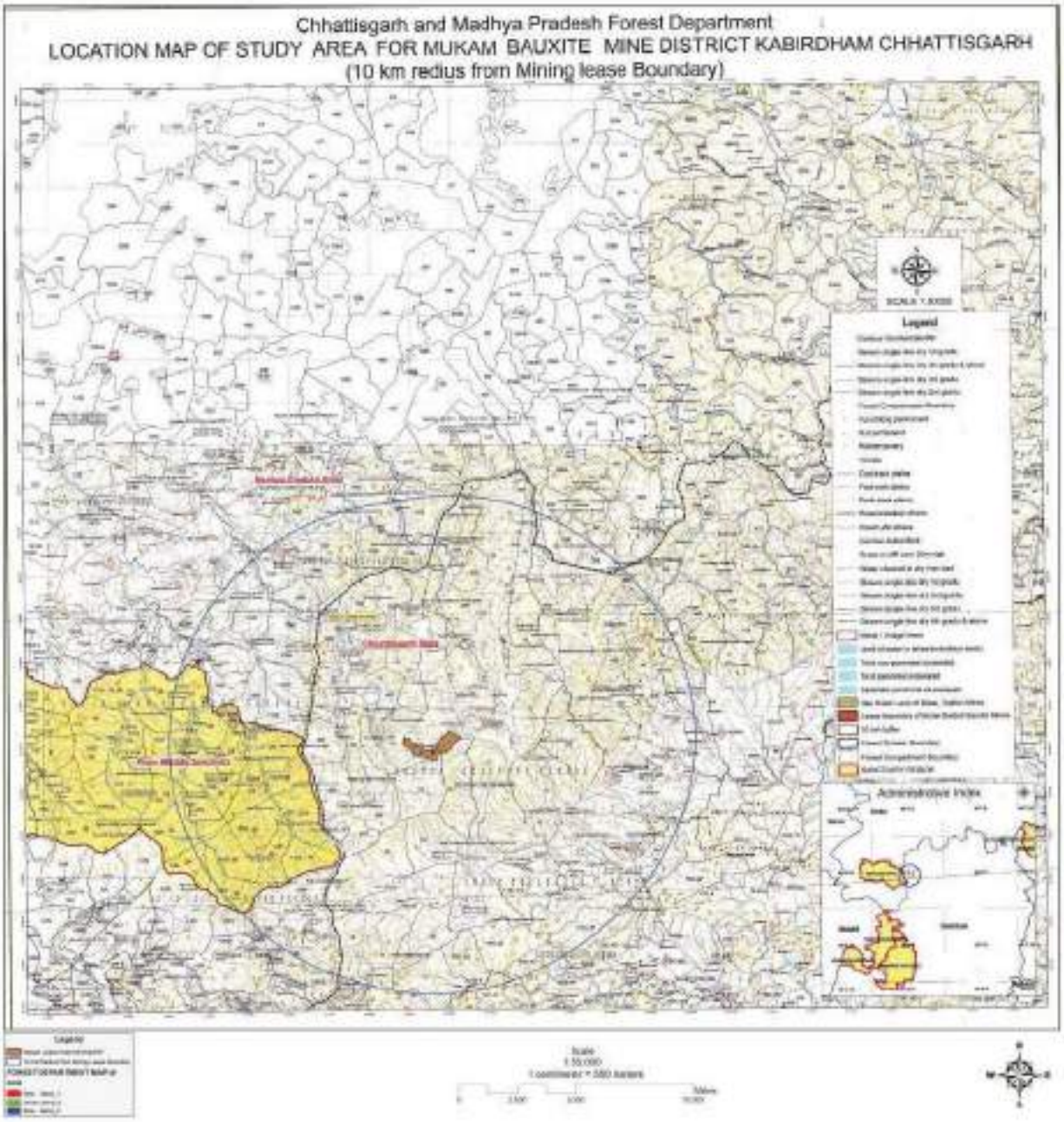
वन संरक्षक

ANNEXURE - IV

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh



ANNEXURE - V

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

**Map showing distance of Phen Wildlife Sanctuary & Kanha Achanakmar Tiger Corridor from mine lease area.**

# Annexure-C

## कार्यालय मुख्य वन संरक्षक (क्षेत्रीय), दुर्ग वृत्त, दुर्ग (छ.ग.)

E-mail – cof.durg@gmail.com, Phone No. 0788-2210160 & Fax- 0788-2210814

क्रमांक/तक.अधि./3113 दुर्ग, दिनांक 03/05/2023

प्रति,

प्रधान मुख्य वन संरक्षक,
(वन्यप्राणी)
छ.ग.नवा रायपुर, अटल नगर

विषय :— **Mukam Bauxite mine of M/s Chhattisgarh Mineral Development Corporation Ltd. for mining of Bauxite with total Excavation of 802977.5 TPA (384615.4 TPA (ROM) & OB 418362.1 TPA) in the mine lease area of 110.563 Ha. , located at Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh-Terms of Refrence (Tor) regarding.**

संदर्भ :— व.म.अ.कवर्धा का कार्या. पत्र क्रमांक/तक.अधि./1052 दिनांक 02.05.2023.

⅄ ⅄ ⅄

विषयांतर्गत निवेदन है कि, वनमण्डलाधिकारी, कवर्धा के संदर्भित पत्र द्वारा प्रकरण के संबंध में लेख किया है कि, छत्तीसगढ़ मिनरल डेव्हलपमेंट कॉर्पोरेशन लिमिटेड, रायपुर द्वारा ग्राम मुकाम तहसील बोड़ला जिला कबीरधाम छ.ग. में 110.563 हे. क्षेत्र में बॉक्साईट माईनिंग किया जाना प्रस्तावित है। उक्त माईनिंग क्षेत्र में वन्यजीव एवं वनस्पतियों पर प्रस्तावित योजना से पड़ने वाले प्रभावों का अध्ययन एवं उपचार हेतु वन्यप्राणी संरक्षण एवं प्रबंधन योजना तैयार किया जाकर इस कार्यालय को प्रेषित किया गया है। प्रस्तावित मुकाम बॉक्साईट माईनिंग क्षेत्र का स्थल निरीक्षण कराया जाकर वनमण्डलाधिकारी द्वारा अनुशंसा सहित प्रतिवेदन प्रेषित किया गया है।

अतः वनमण्डलाधिकारी, कवर्धा से प्राप्त प्रतिवेदन एवं वन्यप्राणी संरक्षण एवं प्रबंधन योजना की 03 प्रतियॉं आवश्यक अग्रिम कार्यवाही हेतु संलग्न सम्प्रेषित है।

संलग्न :— उपरोक्तानुसार।

मुख्य वन संरक्षक,
दुर्ग वृत्त, दुर्ग (छ.ग.)
3/5/23

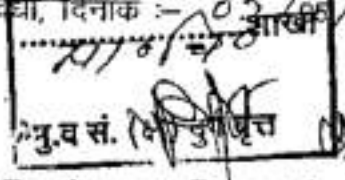
# —:: कार्यालय वनमंडलाधिकारी कवर्धा वनमंडल कवर्धा (छ.ग.) ::—

Tel No.: 232230 E-mail : dfokabirdham@gmail.com

क्रमांक / तक.अधि. / ..... 1052 कवर्धा, दिनांक :— 02/05/2023

प्रति,

मुख्य वनसंरक्षक
दुर्ग वृत्त दुर्ग




विषय :— **Mukam Bauxite mine of M/s Chhattisgarh Mineral Development Corporation Ltd. for mining of Bauxite with Total Excavation of 802977.5 TPA[384615.4 TPA (ROM) & OB 418362.1 TPA] In the mine lease area of 110.563 Ha., located at Village- Mukam, Tehsil- Bodla, District-Kabirdham, Chhattisgarh-Terms of Reference (Tor) regarding.**

संदर्भ :— मुख्य महाप्रबंधक, छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड, रायपुर का प.क्र./ 1350 / बाक्सा. / 2023 दिनांक 16.02.2023 ।

—✡✡✡—

निवेदन है कि विषयांतर्गत प्रकरण में संदर्भित पत्र के माध्यम से मे. छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड, रायपुर द्वारा ग्राम मुकाम तहसील बोड़ला जिला कबीरधाम छ0ग0 में 110.563 हे. क्षेत्र में बाक्साईट माईनिंग किया जाना प्रस्तावित है। उक्त माईनिंग क्षेत्र में वन्यजीव एवं वनस्पतियों पर प्रस्तावित योजना से पड़ने वाले प्रभावों के अध्ययन एवं उपचार हेतु वन्यप्राणी संरक्षण एवं प्रबंधन योजना तैयार किया जाकर 05 प्रतियों में इस कार्यालय में प्रेषित की गई है। प्रस्तावित मुकाम बाक्साईट माईनिंग क्षेत्र का स्थल निरीक्षण उपवनमंडलाधिकारी कवर्धा के द्वारा किया जाकर प्रतिवेदन अपनी अनुशंसा सहित प्रस्तुत किया गया है। प्रस्तुत प्रतिवेदन के अनुसार आवेदित स्थल के आस–पास के वनक्षेत्र का विवरण निम्नानुसार है :—

(1) आवेदित माईनिंग लीज क्षेत्र के आस–पास के वनक्षेत्र में Schedule-I Species के अनुसार निम्नानुसार वन्यप्राणी पाये जाते है :— 1) तेन्दुआ, 2) हाथी, 3) भालू, 4) मोर।

(2) आवेदित माईनिंग लीज क्षेत्र रकबा 110.563 हे. के अंतर्गत वनक्षेत्र नहीं आता है, किन्तु माईनिंग लीज क्षेत्र से परिक्षेत्र तरेगांव के कक्ष क्रमांक आर.एफ. 17 की दूरी 54 मीटर, आर.एफ. 18 की दूरी 10 मीटर, आर.एफ. 23 की दूरी 50 मीटर एवं आर.एफ. 24 से 103 मीटर की दूरी पर है।

(3) आवेदित माईनिंग लीज क्षेत्र के 10 कि0मी0 परिधि के अंतर्गत छत्तीसगढ़ राज्य में राष्ट्रीय उद्यान, अभ्यारण्य, बायोस्फियर रिजर्व, टायगर रिजर्व, हाथी रिजर्व, Habitat for migratory birds, नहीं आता है, लेकिन माईनिंग लीज क्षेत्र से लगे कक्ष क्रमांक आर.एफ. 17, 18 एवं 24 से होकर कान्हा अचानकमार टायगर रिजर्व वाईल्ड लाईफ कॉरीडोर जाती है एवं माईनिंग लीज क्षेत्र की 10 कि0मी0 की परिधि में मध्य प्रदेश राज्य अंतर्गत फेन वन्यजीव अभ्यारण्य स्थित है।

अतः आवेदक संस्थान से प्राप्त वन्यप्राणी संरक्षण एवं प्रबंधन योजना की 04 प्रतियों अनुशंसा सहित आपकी ओर आवश्यक कार्यवाही हेतु सादर सम्प्रेषित है।

सहपत्र :— उपरोक्तानुसार
04 प्रतियों में।

वनमण्डलाधिकारी
कवर्धा वनमण्डल कवर्धा

प.क्र. / तक.अधि. / 1053 कवर्धा, दिनांक :— 02/05/2023

प्रतिलिपि:— मुख्य महाप्रबंधक, छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड, रायपुर, सेक्टर 24, तृतीय तल, ब्लॉक नं. 07 ए, अटल नगर, नवा रायपुर के पत्र.क्र./ 1350 / बाक्सा. / 2023 दिनांक 16.02.2023 के संदर्भ में सूचनार्थ प्रेषित।

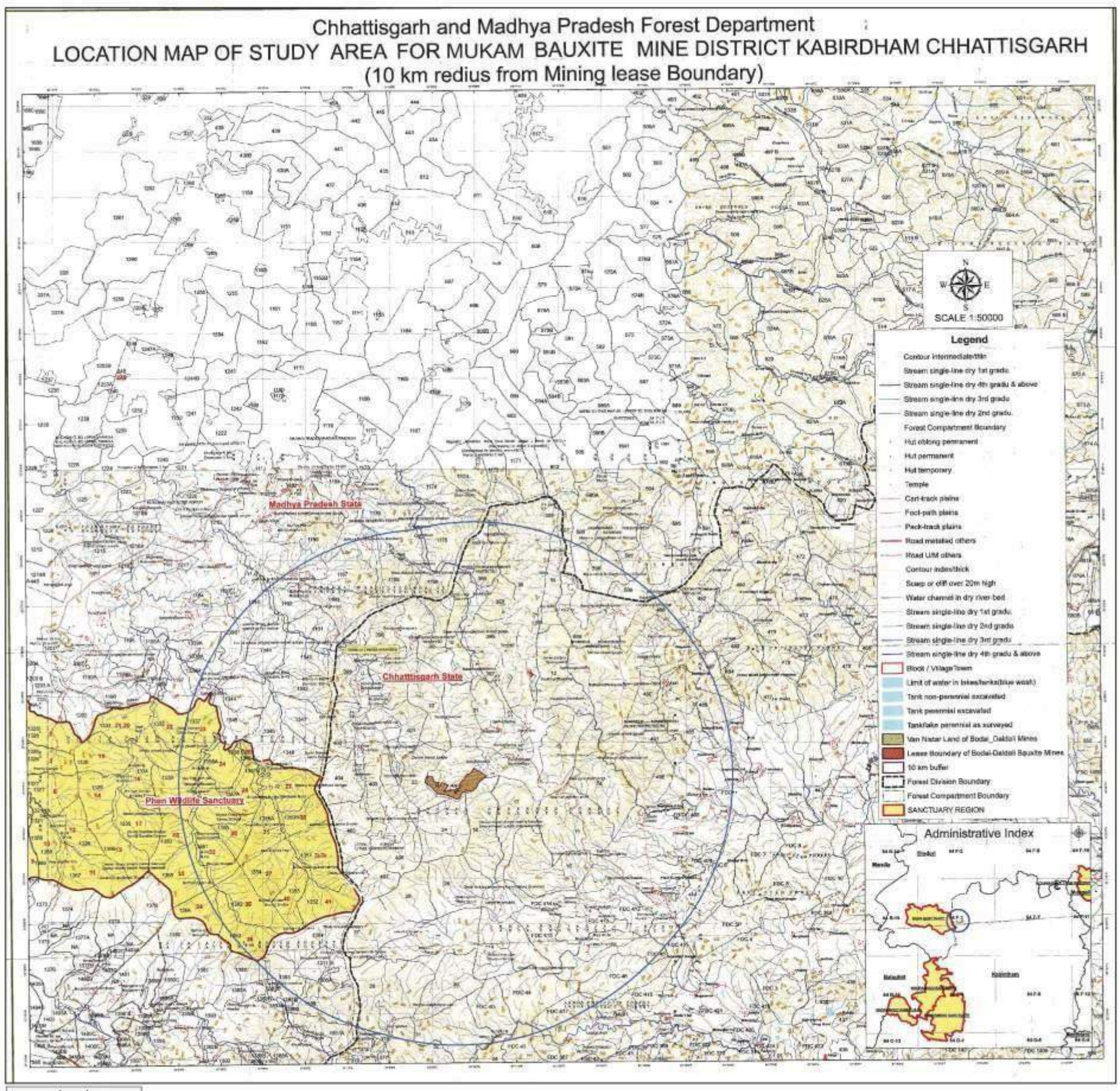
वनमण्डलाधिकारी
कवर्धा वनमण्डल कवर्धा

Article-V

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgar




जनमण्डलाधिकारी
पूर्व सामान्य वन मण्डल, मण्डला

क्षेत्र संचालक,
कान्हा टायगर रिजर्व,
मण्डला

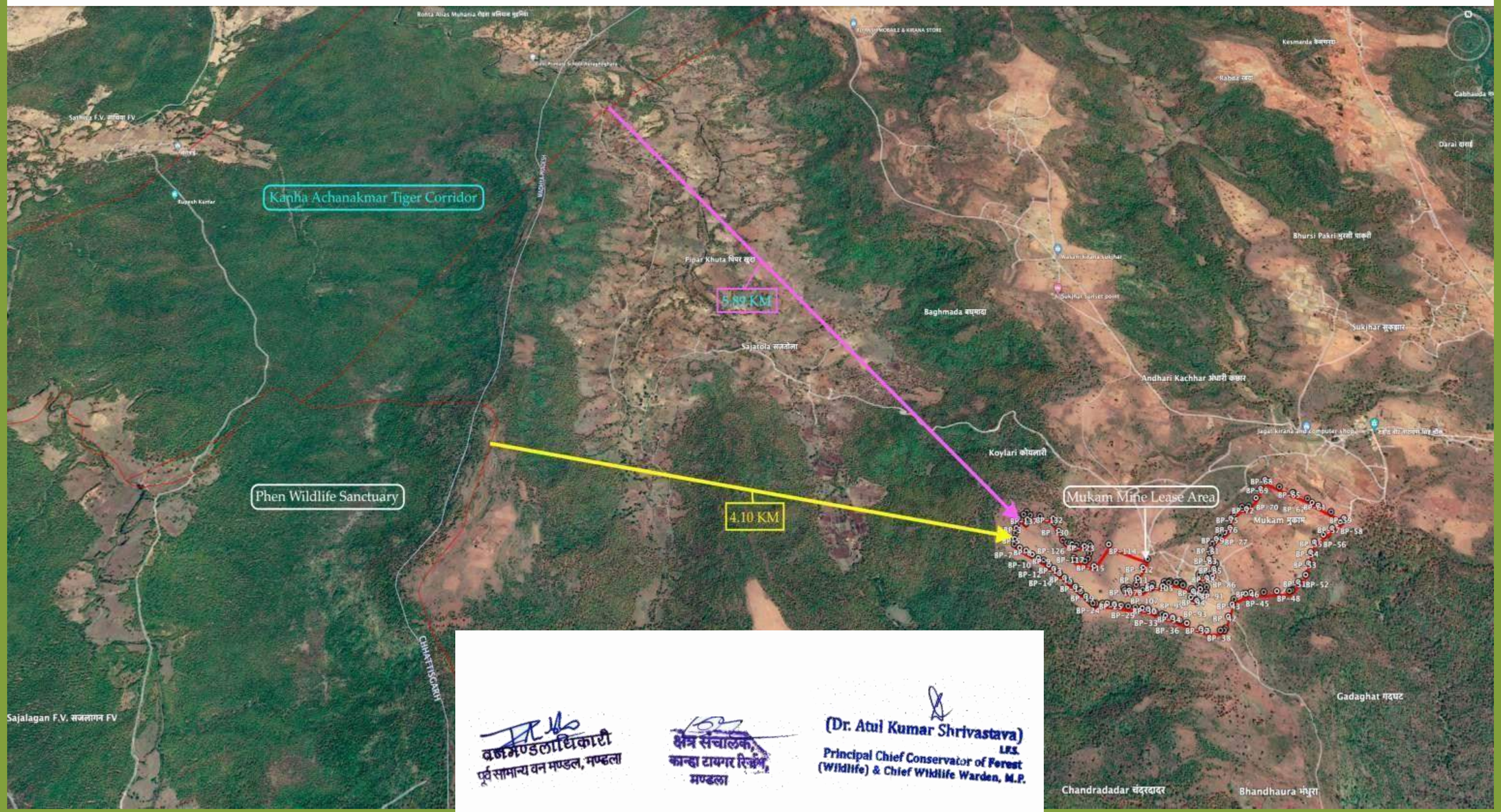
(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

**Article-V**

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

### Map showing distance of Phen Wildlife Sanctuary & Kanha Achanakmar Tiger Corridor from mine lease area.




वनमण्डलाधिकारी
पूर्व सामान्य वन मण्डल, मण्डला

क्षेत्र संचालक,
कान्हा टायगर रिजर्व,
मण्डला

(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

Article-VI

# WILDLIFE
## CONSERVATION & MANAGEMENT PLAN

enviro greens

HARESH CHANDRA TIWARI
I.F.S. (RETD.)

PLAN PERIOD : TEN YEARS

**FOR MUKAM BAUXITE MINES**

( FOR 10 KM RADIUS AREA, BUFFER ZONE IN MADHYA PRADESH )

**M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)**

**Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh**

# WILDLIFE

## CONSERVATION

## & MANAGEMENT

## PLAN

**HARESH CHANDRA TIWARI**
**I.F.S. (RETD.)**

PLAN PERIOD : TEN YEARS

FOR MUKAM BAUXITE MINES

(For 10 km. Radious Area Buffer Zone in MP)

**M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)**

Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh

# कार्यालय प्रधान मुख्य वन संरक्षक (वन्यप्राणी), मध्य प्रदेश

भू–तल, सी–ब्लॉक, वन भवन, लिंक रोड़ नं.–2, तुलसी नगर, भोपाल–462003
*दूरभाष : 0755–2674318, 2674337, फैक्स : 0755–2766315*
***E-mail : pccfwl@mp.gov.in***

क्रमांक / व.प्रा. / माचि. / MINE-150 / 8387 भोपाल, दिनांक 21.9.2023

प्रति,

मुख्य महाप्रबंधक,
छत्तीसगढ़ मिनरल डेव्हलपमेंट कॉर्पोरेशन लिमिटेड,
सेक्टर 24, तृतीय तल, ब्लाक नं. 7ए,
अटल नगर नवा रायपुर (छग)–492015

**विषय :–** **Mukam Bauxite Mines of M/s Chhattisgarh Mineral Development Corporation Limited for Mining of Bauxite with total Excavation of 802977.5 TPA [3844615.4 TPA (ROM) and OB 418362.1] in the Mine lease area of 110.563 hectares, located at villages Mukam Tehsil-Bodla, District Kabirdam Chhattisgarh-Tor Regarding.**

संदर्भ :– क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला का पत्र क्र0 / मा.चि. / 2849 दिनांक 01.08.2023

---

उपरोक्त विषयांतर्गत मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड, छत्तीसगढ़ को ग्राम मुकाम, तहसील–बोदला, जिला–कबीरधाम में मुकाम बाक्साइड माइन क्षेत्र 110.563 हेक्टेयर में बाक्साइट उत्खनन हेतु भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय (इम्पेक्ट असेस्मेंट डिविजन) नई दिल्ली द्वारा जारी टी.ओ.आर. दिनांक 28.11.2022 में अधिरोपित शर्तो के अनुसार से आपके द्वारा प्रस्तावित माइन क्षेत्र की निकटतम संरक्षित क्षेत्र से दूरी दर्शाता अभिप्रमाणित रंगीन मानचित्र, माईन क्षेत्र से 10 कि.मी. की परिधि में पाये जाने वाले फ्लोरा–फॉना की अभिप्रमाणित सूची एवं माइन क्षेंत्र से 10 कि.मी. की परिधि में पाये जाने वाले फ्लोरा–फॉना के संरक्षण एवं संवर्धन हेतु श्री हरीशचन्द्र तिवारी, भा.व.से. (सेवानिवृत्त) द्वारा तैयार की गई 10 वर्षों के लिए रूपये 55.00 लाख की वन्यप्राणी संरक्षण योजना का अनुमोदन चाहा गया है, जो क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला के माध्यम से अनुशंसा सहित संदर्भित पत्र से इस कार्यालय को प्राप्त हुई है।

प्रकरण मे क्षेत्र संचालक, कान्हा टाइगर रिजर्व, मण्डला द्वारा प्रेषित जानकारी के अनुसार प्रस्तावित माइन क्षेत्र से 10 कि.मी. की परिधि में 4.10 कि.मी. की दूरी पर फेन अभयारण्य एवं 5.89 कि.मी. की दूरी पर कान्हा–अचानकमार टाइगर कॉरीडोर स्थित है, जो मानचित्र पर दर्शित है। माइन क्षेत्र से 10 कि.मी. की परिधि में पाये जाने वाले फ्लोरा–फॉना की अभिप्रमाणित सूची संलग्न प्रेषित की गई है तथा इन फ्लोरा–फॉना के संरक्षण एवं संवर्धन हेतु श्री हरीशचन्द्र तिवारी, भा.व.से. (सेवानिवृत्त) से रूपये 55.00 लाख की 10 वर्षों के लिए संशोधित वन्यप्राणी संरक्षण योजना प्रेषित की गई है। उक्त वन्यप्राणी संरक्षण योजना में प्रावधानित मुख्य घटक एवं प्रावधानित वर्षवार राशि का विवरण निम्नानुसार है:–

## Budget Provision for Wildlife Conservation & Management Plan for Phen Sanctuary (Kanha T.R.)

| S. No. | Details of Proposed Works | Com. No. | Qty. | Year Wise Fund Allocation (Rupees in Lac) | | | | | | | | | | | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | Total | |
| 1 | Bela to Neempani forest road upgradation (WBM) | 178, 179 | 1 Km | 15.00 | - | - | - | - | - | - | - | - | - | 15.00 | For forest & wildlife protection & communicati on to remote area |
| 2 | Bolder Soiling work on Bordah to Neempani forest raod | 35, 36 | 2 Km | - | 5.00 | - | - | - | - | - | - | - | - | 5.00 | |
| 3 | Bolder Soiling work Karwamatta to Bordah forest road | 30, 32 | 2 Km | - | - | 5.00 | - | - | - | - | - | - | - | 5.00 | |
| 4 | Madmadi/Lantana Eradication at Sajalagan | 31 | 50 Ha. | - | 2.50 | - | - | - | - | - | - | - | - | 2.50 | For developme nt & manageme nt of meadows |
| 5 | Madmadi/Lantana Eradication at Sajalagan (After Care First Year) | 31 | 50 Ha. | - | - | 1.20 | - | | - | - | - | - | - | 1.20 | |
| 6 | Madmadi/Lantana Eradication at Sajalagan (After Care Second Year) | 31 | 50 Ha. | - | - | | 1.30 | - | - | - | - | - | - | 1.30 | |
| 7 | Maintance & Minor Repairing of forest road | - | L/S | - | - | - | 1.00 | 1.00 | 1.00 | 0.50 | 0.50 | 0.50 | 0.50 | 5.00 | Forest, wildlife protection & communica tion to remote area |
| | | Total | | 15.00 | 7.50 | 6.20 | 2.30 | 1.00 | 1.00 | 0.50 | 0.50 | 0.50 | 0.50 | 35.00 | |
| Budget Provision for Wildlife Conservation and Management Plan for Kanha- Achanakmar Tiger Corridor (East Mandla Territorial Division) | | | | | | | | | | | | | | | |
| 1 | Health/Veterinary Services of Wildlife | - | L/S | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 2.50 | - |
| 2 | Improvement of Fodder availability & pasture development one place in each year. | - | 5 No. | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | - | - | - | - | - | 7.50 | - |
| 3 | Fire Protection | - | L/S | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 5.00 | - |
| 4 | Prophylactic Inoculation | - | L/S | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | - | - | - | - | - | 1.25 | - |
| 5 | Awareness Generation/Capacit y building of Local Populace and other expenses | - | L/S | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 3.75 | - |
| | | Total | | 3.00 | 3.00 | 3.00 | 3.00 | 3.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 20.00 | |
| | | | | | | | | | | | | Grand Total | | 55.00 | |

क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला द्वारा अभिप्रमाणित मानचित्र एवं अनुशंसित वन्यप्राणी संरक्षण योजना के पृष्ठ क्रमांक 156 से 174 में उल्लेखित फ्लोरा–फौना की सूची को अभिप्रमाणित कर तथा इनके संरक्षण एवं संवर्धन के लिये वन्यप्राणी संरक्षण योजना के पृष्ठ क्रमांक 131 से 133 पर दर्शाये गये कार्यों के लिए प्रावधानित रूपये 55.00 लाख की 10 वर्षों की वन्यप्राणी संरक्षण योजना का अनुमोदन किया जाता है। अनुमोदित वन्यप्राणी संरक्षण योजना की एक प्रति मुख्य वन संरक्षक, मध्य वृत्त जबलपुर, क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला, एवं वनमण्डलाधिकारी, पूर्व मण्डला वनमण्डल को उपलब्ध करायें।

प्रकरण में भारत सरकार/राज्य शासन की अंतिम स्वीकृति उपरांत, माइन प्रारंभ होने के पूर्व समय–सीमा में संशोधित वन्यप्राणी संरक्षण योजना में वन्यप्राणी प्रबंधन हेतु प्रावधानित राशि रूपये 55.00 लाख एक मुश्त मध्यप्रदेश टाइगर फाउंडेशन सोसायटी के भारतीय स्टेट बैंक, मुख्य शाखा टी.टी. नगर, भोपाल के बचत खाता क्रमांक 10571048460 आई.एफ.एस.सी. कोड SBIN0001308 में जमा करायी जाकर क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला, वनमण्डलाधिकारी, पूर्व मण्डला वनमण्डल एवं इस कार्यालय को अवगत कराया जाना सुनिश्चित करेंगे।

संलग्न :–उपरोक्तानुसार।

21/9/2023

**(डॉ. अतुल कुमार श्रीवास्तव)**
मुख्य वन्यप्राणी अभिरक्षक एवं
प्रधान मुख्य वन संरक्षक (व.प्रा.), म.प्र.

पृ0 क्रमांक/व.प्रा./मा.चि./MINE-150/ 8398 भोपाल, दिनांक 21.9.2023

प्रतिलिपि :–

1. वैज्ञानिक–ई, भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय (इम्पैक्ट असेस्मेंट डिविजन) इंदिरा पर्यावरण भवन, अलीगंज जोर बाग रोड नई दिल्ली–110003 की ओर उनके के पत्र क्रमांक J-11015/37/2022-IA-II(NCM) दिनांक 28.11.2022 से जारी टी.ओ.आर. के क्रम में सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।
2. अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध) सतपुड़ा भवन, भोपाल की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित। उपरोक्त प्रकरण में वन संरक्षण अधिनियम, 1980 के अंतर्गत आपके स्तर से जारी अंतिम अनुमति में अनुमोदित वन्यप्राणी संरक्षण योजना में प्रावधानित राशि रूपये 55.00 लाख आवेदक संस्था द्वारा क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला एवं वनमण्डलाधिकारी, पूर्व मण्डला सामान्य वनमण्डल को एक मुश्त उपलब्ध कराने की शर्त अधिरोपित करने का कष्ट करें।
3. अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध), छत्तीसगढ़, सेक्टर–19 नार्थ ब्लाक नवा, रायपुर–492002 की ओर सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।
4. मुख्य वन संरक्षक, मध्यवृत्त जबलपुर की ओर अनुमोदित वन्यप्राणी संरक्षण योजना की एक प्रति सहित सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।
5. क्षेत्र संचालक, कान्हा टाइगर रिज़र्व, मण्डला एवं वनमण्डलाधिकारी, पूर्व मण्डला सामान्य वनमण्डल की ओर उक्त अनुमोदित वन्यप्राणी संरक्षण योजना एक प्रति सहित सूचनार्थ एवं आवश्यक कार्यवाही हेतु प्रेषित।

   प्रकरण में भारत सरकार/राज्य शासन की अंतिम स्वीकृति उपरांत माइन प्रारंभ होने के पूर्व वन्यप्राणी संरक्षण योजना में प्रावधानित राशि एक मुश्त आवेदक संस्था से प्राप्त कर प्रावधानित कार्यों का समय सीमा मे क्रियान्वयन किया जाना सुनिश्चित करें।

21/9/2023

मुख्य वन्यप्राणी अभिरक्षक एवं
प्रधान मुख्य वन संरक्षक (व.प्रा.), म.प्र.

## ACKNOWLEDGEMENT

I have taken efforts in this Wildlife Conservation And Management Plan. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

I am highly indebted to **Shri Asheem Shrivasrav, I.F.S., Principal Chief Conservator of Forests (Wildlife), CWLW** Government of Madhya Pradesh for his guidance and constant personal supervision as well as for providing necessary information regarding the formulation of the Plan & also for his support in completing the project.

I would like to express my gratitude towards **Shri S.K. Singh, IFS, Chief Conservator of Forests & Field Director Kanha Tiger Reserve, Madhya Pradesh** and his subordinate staff for their kind co-operation which helped me in completion of this project.

I would like to express my special gratitude and thanks to the Office of the **M/s. Chhattisgarh Mineral Development Corporation Ltd. (CMDC) Raipur,** for giving me such attention and time.

My thanks and appreciations also go to my colleagues in developing the project and people who have willingly helped me out with their abilities.

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# CITATION

Ministry of environment, forest and climate change (Impact Assessment Division) Government of India, New Delhi has put forward following conditions vide its **file number IA-J.11015/37/2022-IA-II(NCM) dated 28.12.2022** while issuing ToR (Terms of Reference) for Environmental Clearance in favour of **M/s. Chhattisgarh Mineral Development Corporation Ltd. (CMDC)** Village-Mukam, Tehsil-Bodla, District-Kabirdham Chhattisgarh.

**Standard ToR for mining projects**

**Class IV Forest :**

17. PP shall submit a certificate from the CCF regarding involvement of forest land in the mining lease area if any.

20. The vegetation in RF/PF areas in the study area with necessary details should be given.

**Clause V Wildlife :**

26. A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.

27. A detailed biological study of the study area [core zone and buffer zone] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. PP shall submit list of Schedule-1, species present in core and buffer zone duly authenticated by CWLW. In case of any

Scheduled-1 fauna found in the study area the necessary plan along with budgetary provision for their conservation should be prepared in consultation with State Forest/Wildife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost. Proof of its submission of conservation plan to the CWLW needs to be submitted.

28. PP shall submit a certificate from Chief Wildlife Warden regarding distance of mining lease from the protected area falling within 10 KM of the mining lease. In case project requires clearance under Wildlife (Protection) Act. 1972 then copy of application made for the same need to be submitted.

This Wildlife Conservation and Management Plan is prepared in accordance with the above conditions only.

**Raipur**
**10 Feb. 2023**

**Haresh Chandra Tiwari**
IFS (Retd.)
Managing Partner
Envirogreens

# CHAPTER - I

## Introduction

Wildlife resources constitutes a vital link in the survival of the human species and have been a subject of much fascination, interest, and research all over the world. Today, when wildlife habitats are under severe pressure and a large number of species of wild fauna have become endangered, the effective conservation of wild animals is of great significance. Because every one of us depends on plant and animals for all vital components of our welfare, it is more than a matter of convenience that they continue to exist, it is a matter of life and death. Being living units of ecosystem plants and animals contribute of human welfare by providing:

- Material benefit to human life.
- Knowledge about genetic resources and their preservation; and
- Significant contributions to the enjoyment of life (e.g. recreation).

Human society depends on resources for virtually all of its food; nearly half of its medicines, much of its clothing in some regions, all of its fuel and building materials; and part of its mental and spiritual welfare.

Considering the way, we are galloping ahead, oblivious of what legacy we plan to leave for future generations, the future does not seem too bright. Statisticians have projected that by 2030, the human population will have increased by more than half, and the arable fertile land and tropical forest will be less than half of what they are today. Genetic resources are treated as inexhaustible mineral resources, but we need to care about them. It is here that the concept of management and conservation of wildlife comes into play, because anything that is not human of undomesticated is 'wildlife'.

Presence or absence of an animal or plant in a region is determined by ecological and historical factors. Animals and plants are living indicators of the characteristics of their environment: their ranges mark the places where environmental condition is the same or similar.

One of the key underlying assumptions about wildlife management is that native species and ecological process have to be maintained in their native state. To maintain and strengthen the fragile ecosystem, the present wildlife management recommendations are primarily aimed at managed forests. The recommendations are designed to promote long term stand level maintenance and recruitment of important structural attributes such as wildlife diversity of species, spatial or unique habitats for floral and faunal wealth, riparian areas and wetland, coarse woody debris, horizontal and vertical diversity.

Wildlife management is interdisciplinary that deals with protecting endangered and threatened species and subspecies and their habitats, as well as the non-threatened agricultural animals and game species. The Wildlife Management program emphasizes both applied and basic research in wildlife ecology, management, education and extension.

Wildlife management takes into consideration the ecological principles such as carrying capacity of the habitat, preservation and control of habitat, reforestation, predator control, re-introduction of extinct species, capture and reallocation of abundant species and management of “desirable” or “undesirable” species.

There are two general types of wildlife management:

**Manipulative management** involves regulating numbers of animals directly by harvesting or by influencing numbers by altering food supply, habitat, density of predators etc.

**Custodial management** is preventive or protective and minimized external influences on the population and its habitat. It is done by setting up national parks where ecological conditions are protected and threatened species are conserved by law.

The Wildlife Management program focuses on the following:

- Predator-prey relationship
- Migratory wildlife species
- Urban and suburban wildlife
- Wildlife-human interaction
- International wildlife

**Elements of Wildlife Management**

Management of wildlife depends on certain elements such as public support and awareness to protect wildlife and their habitats.

**Public Participation :** It is necessary to make local people realize and accept the idea and importance of wildlife protection. Public interaction can help in making local people responsible and cooperate in enforcement of wildlife management laws and regulations. Their feedback should also be taken for effective functioning of wildlife management.

**Public Awareness :** People should understand the concept of conservation of natural resources. The wildlife managers and other responsible persons should held public discussions, shown, and talks and should held public discussions, shown, and talks and should also take help of other media like newspapers, magazines, radio and television to make people aware about the basic concepts behind wildlife management. This can stop people from exploiting natural resources, which is the major threat to wildlife and their habitats.

**Education :** The role of education in public awareness programs is very important. There should be environmental subjects based on wildlife conservation in school and college curricula. The well-educated and trained specialists on environmental and forest issued should participate in public training and interaction with people and solve their queries to make them more responsible towards their wildlife management duties.

**Nature Interpretation Centers :** Nature interpretation centers may include setting up to educational camps or exhibition in nearby regions of protected areas such as zoological gardens, parks and wildlife sanctuaries. It is usually taken up by the concerned forest departments. The interpretation centers should be handled by qualified and trained staff in order to explain and motivate the concepts of wildlife management to the tourists and people of the nearby-protected areas.

**Coordination :** Wildlife management is operated at four basic levels – local, state, national and international Government agencies plan the policies of protecting, conserving and managing wildlife. All the management levels participate in passing wildlife management tools and many a time, conflicts arise.

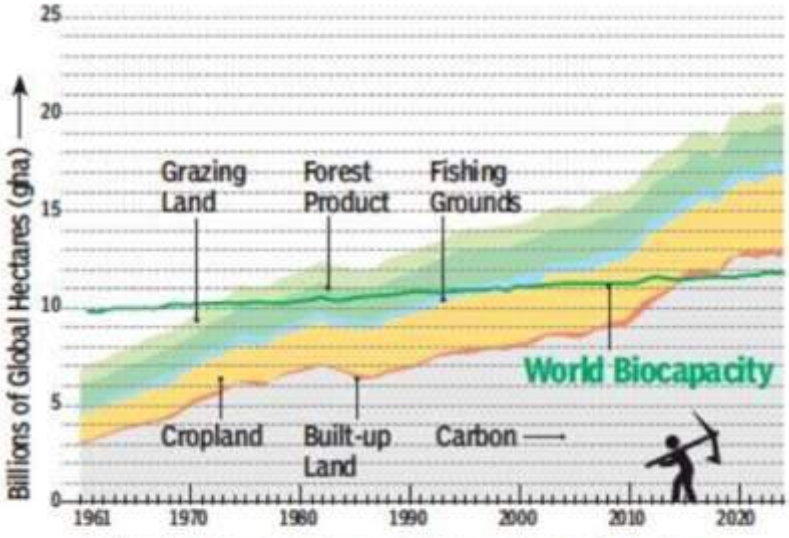
National parks, sanctuaries and conservation reserves are notified under the Wildlife Protection Act 1972 as Protected Areas which are rich in and represent the unique biodiversity of that place. Such protected areas are considered very important for conservation of biodiversity, and for ensuring the healthy population of its floral and faunal components for sustenance of the present and the future generations alike. However, the rising human population and its growing demands for socio-economic development puts an ever-increasing stress on forests including protected areas both directly and indirectly. This calls for a balance that has to be struck between development and conservation implying that any activity involving use or diversion of any part of notified protected area shall be considered only under most exceptional circumstances, after taking fully into consideration its implementing impact on the biodiversity of the area, and the consequent effect on the management of the protected areas. A critical part of this balanced approach is to spell out the feasibility of mitigation to address the impacts without compromising the management activities of the protected area. The activities to be taken up in the identified wildlife habitats also needs to comply with the orders of the Hon'ble Supreme Court in addition to the statutory mandate as provided in the Wildlife Protection Act 1972.

The extraordinary richness of life that surrounds us in the form of diverse arrays of organisms, ecologic al communities and natural landscapes are called biodiversity. Bio- means life and diversity- means variety. Biodiversity is the term used to describe the variety of life on earth from genus to species to broader scales of ecosystem. It includes every plant and animal as well as all microorganisms.

Conservation of Bio-Diversity has become the most important requirement of the present-day world. This is because survival of the man depends upon the bio-diversity. Bio-diversity consists of two components: rich ness, or taxonomic diversity, and evenness, or the distribution of individuals among taxa

The incredible growth in population, the global economy and consumption - what scientists call the Great Acceleration - has in just the last five decades fundamentally altered the Earth's intrinsic systems. Despite positives like increasing lifespans and the rise of the middle classes, this leap has come at a huge cost, especially in terms of loss of biodiversity. That is cause for some alarm since biodiversity is key to life on Earth. Humans are stretching nature to a thin, jeopardizing capacity.

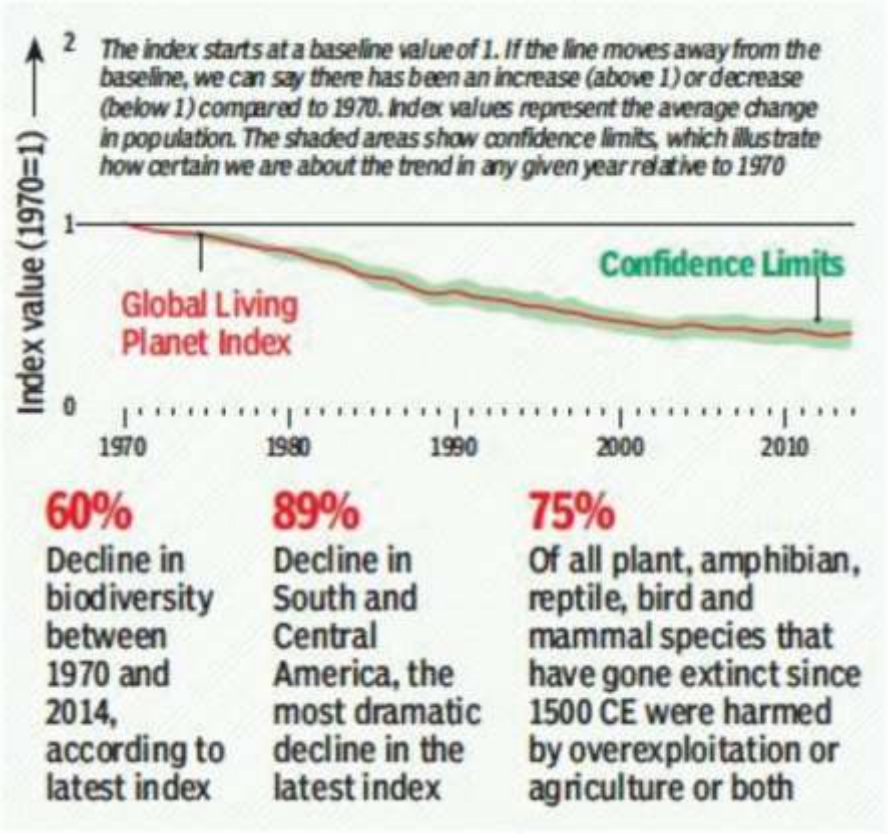
**Bio-capacity,** measured in global hectares (g ha), is the ability of an ecosystem to renew itself and **ecological footprint** is a measure of our consumption of natural resources. Together biocapacity and ecological footprint allow us to compute whether humanity is living within the means of the planet. Biocapacity has increased by 27% in the past 50 years with new technology and food management practices. But so has our ecological foot print has grown at 190% in the last 50 years nearly 10 times of the growth rate of biocapacity.



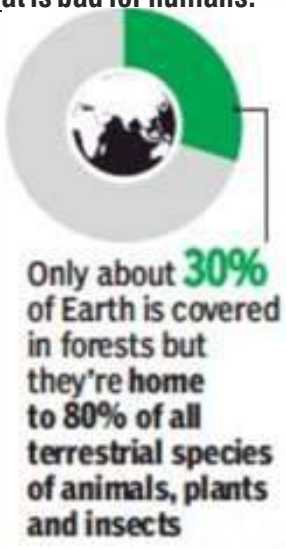

*World ecological footprint of consumption by area type in global hectares, 1961-2024. The largest contribution to the ecological footprint is carbon emissions from fossil fuel burning (60%)*

**Since 1970 biodiversity has only been headed one way- Down**

The living planet index tracks the state of global biodiversity and the planet's health, considering the populations of thousands of mammal, bird, fish, reptile and amphibian species. It recognizes five types of threats: Habitat loss is the most commonly recorded threat, followed by overexploitation which combined accounts for two-thirds of all threats.




**There is huge pressure on earth, and that is bad for humans.**



Large-scale farming has destroyed 40% of forests between 2000 to 2010 in tropical and sub-tropical countries. Since 1971, global production of wheat and rice have grown by 116% and 133% respectively, to meet rising food demand and a growing population, expected to hit 9.8 billion in 2050.

**THE 'SIXTH MASS EXTINCTION'**

Species are becoming extinct 100 times faster than they would without human impacts. Populations of wild animals have more than halved since 1970, while the human population has doubled. Only five times before in our planet's history have so many species and so much biodiversity been lost so quickly. The fifth was when the dinosaurs were wiped out. That is why scientists and conservationists call what is happening now the 'sixth mass extinction'. Some have even described the loss of biodiversity today as 'biological annihilation' causing rapid decrease in the biodiversity of the Earth. Such an event is identified by a sharp change in the diversity and abundance of multicellular organisms. It occurs when the rate of extinction increases with respect to the rate of speciation.

Chhattisgarh State has almost tropical humid climate, a climate good to support a good bio-diversity. The State has *teak*, *sal* and mixed forests as climax communities. Further, more than fourty one percentage of its land area is covered with forests. However, only a fragmentary knowledge of bio-diversity of the State is there. In the animal kingdom, richness component of almost all the mammals is known. Listing of some *amphibia* and fishes are also available, but for other groups of animals, very little or almost no record is available. Similarly, among plants, Botanical Survey of India has published flora for some of the districts of the state. There are several publications on the medicinal plants and some publications on the edible mushrooms of the State, but for other group of plants, although some research work has been done in the universities but there are no published records of their wealth.

**Postulates for special consideration of Bio-Diversity Conservation are:**

1. Conservation of an area should be to the extent that it develops into an ecosystem, which is climatic climax of the area. Ultimate aim of conservation is sustainable ecosystem.

2. Emphasis should not be given to the conservation of a single species. This may require altered maintenance of an ecosystem, which may lead, ultimately to the destruction of the ecosystem.

3. With the shrinking of the habitat, development and maintenance of extensive corridor is essential for the conservation of the species, which requires a large home range. This is essential because a single, reduced habitat may not be able to sustain species, requiring a large home range, for a longer period.

4. Conservation of forests is never anti-thesis to the exploitation, utilization or extraction. Most important is to know the productivity of the eco-system. Exploitation of eco-system up to or below the level of its productivity will maintain it at **sustainable** level. Exploitation equal to its productivity is also called the **carrying capacity** of the system. Exploitation of the system, more than its productivity will lead to the reorganization of the system. It is necessary also to know the resilience ability of the system so that in case of any large **natural perturbation** its ability to return to its normal condition may be evaluated.

5. However basic too many conservation plans used to know the status and required optimum biodiversity of the area. Serious efforts must be made to evaluate these two parameters: the status and required optimum biodiversity of the area, planned for conservation.

6. It is now the role of the policy makers to frame policy and to allocate appropriate funds to evaluate the status and required optimum biodiversity of the area, marked for conservation.

## Need For Wildlife Conservation Plan

This Wildlife Conservation and Management Plan has been prepared as per the mandate by **Ministry of environment, forest and climate change (Impact Assessment Division) Government of India, New Delhi, File number IA-J.11015/37/2022- IA-II(NCM) dated 28.12.2022 (Annexure - I).**

Wildlife has paid maximum to accommodate the development. It is but natural that land for expansion, mainly for agriculture is available only with the forests. Horizontal expansion of agriculture is continuously encroaching up on the forest land. This is resulting in fragmentation and reduction of the available habitat to the wildlife. This with poaching is causing heavy loss on the density and variety and evenness component of the biodiversity. Industry is essential for development; however, a compromise step has to be taken to industrialized as well as to preserve the nature with its biodiversity.

## Objectives Of The Study

1. Listing the existi ng flora and fauna of the study area that is 10 km radius of the **Mukam Bauxite Mine Lease Area (CMDC),** Village-Mukam, Tehsil- Bodla, District-Kabirdham (CG)
2. To explore whether the study area forms a part of an ecologically sensitive area or migratory corridor ofany endangered fauna.
3. To prepare a comprehensive conservation plan for endangered, endemic and economically important plant and animal species.

**Based on the above studies objectives of conservation plan will be fixed as follows:**

1. Improve the habitat in the buffer zone to provide better living conditions to the wildlife.
2. To augment amenities in the buffer zone resulting in better settlement of the wildlife displaced from the Study Area.
3. Prescribe corridors for safe movement of wildlife from one habitat to another habitat.
4. Suggestions to reduce man animal conflicts.
5. Suggestions to reduce dependence of local people on forest which intern will reduce local people forest employee conflicts.

## SCOPE OF THE WORK

The Scope of the work includes Biodiversity Survey and preparation of Wildlife Conservation and Management Plan for **Mukam Bauxite Mine Lease Area (CMDC),** Village-Mukam, Tehsil- Bodla, District-Kabirdham (CG)

The study area includes the area under 10 km radius of the **Mukam Bauxite Mine Lease Area (CMDC),** for preparation of Wildlife Conservation Plan.

No conservation plan can mitigate all the impacts of the developmental activities. Similarly, a conservation plan is prepared keeping in view the present conditions. Basic requirement of a conservation plan is to maintain an ecosystem as natural as possible. Hence, the present plan has been prepared as better as can be, under the present conditions.

# CHAPTER - II

## Location, Accessibility And Details of the Study Area

Mukam bauxite mine is located at Village Mukam, Tehsil – Bodla, District – Kabirdham Chhattisgarh. Mine lease area is 110.536 Hectares. The mining of bauxite in Mukam Bauxite mines is total excavation of 8029775 TPA [384615.4 TPA (ROM) and OB 418362.1 TPA]. The instant mine lease area falls under the category "A" as the inter-state boundary of Madhya Pradhesh and Chhattisgarh is located at a distance of 4.1 kilometer west from the mine lease area and appraised at central level.

Mukam bauxite mine is situated in Bodai-Daldali Plateau which is about 60 kilometers from the district headquarters of Kabirdham and about 136 kilometers from Amarkantak. It forms the central part of Maikal Range and falls in seismic zone-II.

**Location Coordinates :** The mine lease area is located between

| | | | |
|---|---|---|---|
| Latitude | $22^0$22'45.72558" N | to | $20^0$23'26.25876" N |
| Longitude | $81^0$08'49.47502" E | to | $81^0$10'16.84813" E |

Survey of India Toposheet Number 64F/3

**Land Use and Land Cover of Mine Lease Area :**

| | |
|---|---|
| Private Agriculture Land | 67.401 Hectares |
| Government Waste Land | 43.162 Hectares |
| **Total Mine Lease Area (MLA)** | **110.563 Hectares** |

Nearest village/town/highway/railway station/water bodies:

| Particulars | Particular's Name | Distance & Directions |
|---|---|---|
| Nearest Village | Mukam | Approx 0.5 km form project boundary |
| Nearest National highway | NH-12 Bodla to Daldali | 42 km |
| Nearest Railway Station | Bilaspur | 110 Km approx. |
| | Raipur | 135 km approx |
| Nearest Airport | Bilaspur Airport | 106.80 km SE approx |
| Nearest Waterbodies | Manai River | 3.1 km NWN |
| | Lilari River | 2.6 km NW |
| | Hanp River | 4.4 km ENE |

**Climate**

During peak summer the temperature rises to 42$^0$C, while winter temperature falls down to 03$^0$C (average 15$^0$C). The precipitation is confined to the rainy season from July to September and annual rainfall average is 1200 mm.

**Topography**

The plateau of Mukam forms the central part of Maikal range. The average elevation of the area is 940 MSL. The plateau trending N-S has irregular margin and bounded by steep escarpments. It is about 12 km long N-S linear plateau with width varying from 0.5 to 2.0 km.

**Regional Geology**

The area constitutes central part of the extensive laterite-capped plateau of the Maikal Range hills. In plains to the north-western part of the area around Mawai and Kathaitola, gneissose and schistose rocks form the core of the range, whereas around Kukrapani and Taregaon in the south-east, phyllite, slates and quartzites belonging to Chilphi Group are exposed. In the lower part of the plateau, narrow patches of Lametas, represented by calcareous gritty sandstones and pink & white clays are seen in the Kanai river section at Kukri. These are overlain by horizontally disposed basaltic lawa flows of Deccan Trap. Good exposures of Deccan Trap are noticed along the Kukrapani Daldali ghat section. The traps are capped by about 25 m thick laterite. Bauxite is normally found within upper part of the laterite capping.

**The geological sequence of the area is as under :**

**Geological Sequence**

| | | |
|---|---|---|
| Upper Tertiary | High level laterite & bauxite | Clay, laterite & bauxite |
| Lower Eocene to upper Cretaceous | Deccan Trap | Basaltic rocks and intertrappeans |
| Cretaceous (Turonian) | Lameta | Calcareous & gritty sandstone and clay |

**UNCONFORMITY**

| | | |
|---|---|---|
| Precambrian | Chilphi Group Archaean basement complex | Phyllite, slates & quartzites Gneisses and schists |

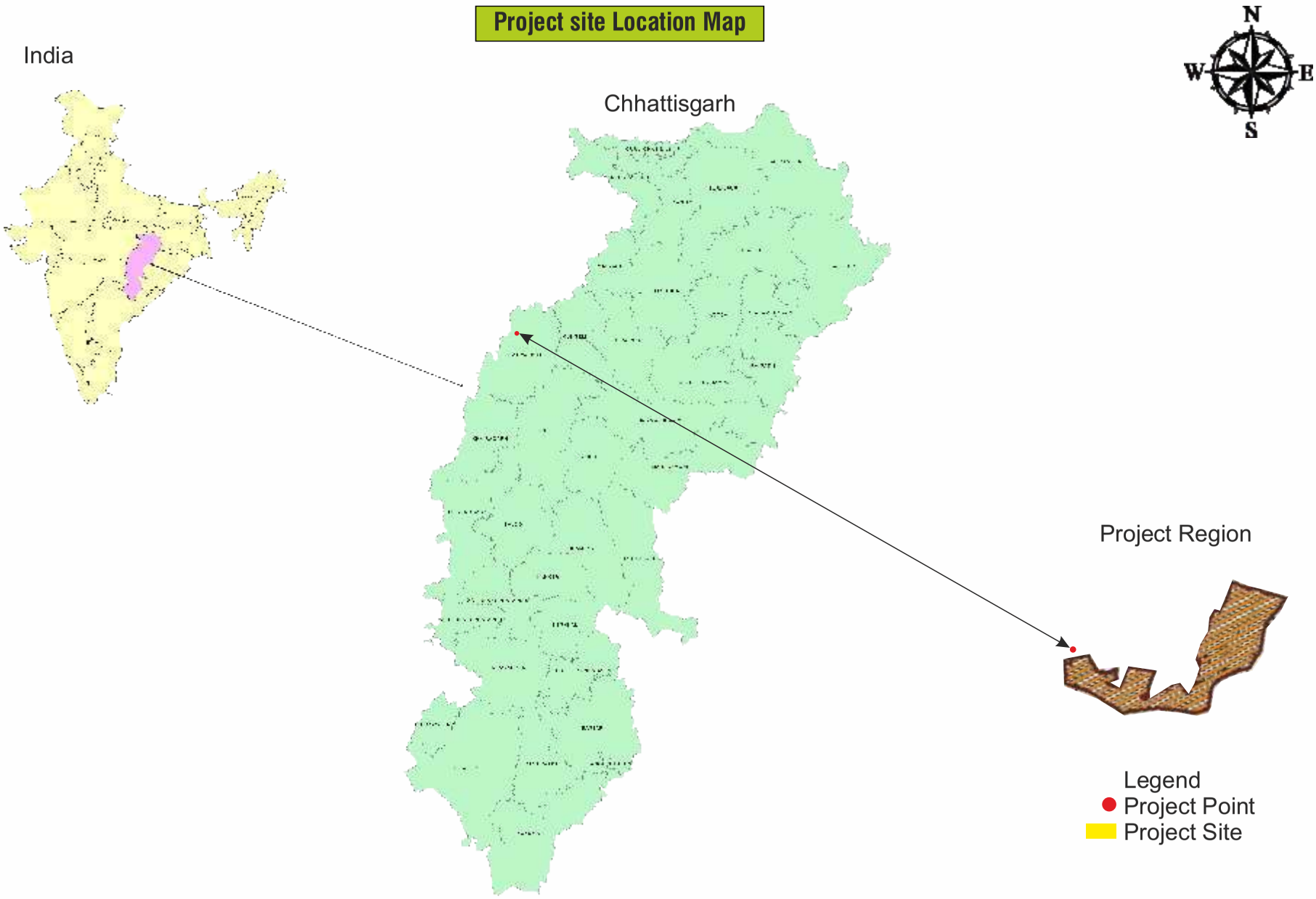
**A typical profile of the leased out area is summarized as under:**

| Lithology | Thickness | Description |
|---|---|---|
| Top soil | 0.00 -2.00 m | Dark gray grading downwards into laterite soil |
| Upper laterite | 0.00 - 1.00 m | Pisolitic, loose or undulated, scoraceous contains pebbles and boulders of the bauxite and shows undulating but sharp contact with the underlying bauxite |
| Bauxite | 0.00 - 3.30 m | Massive, sometimes pisolitic, hard and compact, denser than the laterite vesicular and pitted; displays shades of light gray and pink colour |
| Lower laterite | 0.00 - 3.30 m | Massive locally oolitic and pisolitic, moderately hard to soft vermicular and scoraceous, porous and shows darker shades of red, yellow and brown colour |
| Litho merge | 0.00 -15.3 m | Light gray, yellow & red clay, laminated; laminae impersistent; highly porous |
| Trap | + 30 m | Weathered, at the contact with the Lithomerge, followed downwards by fresh unaltered trap |

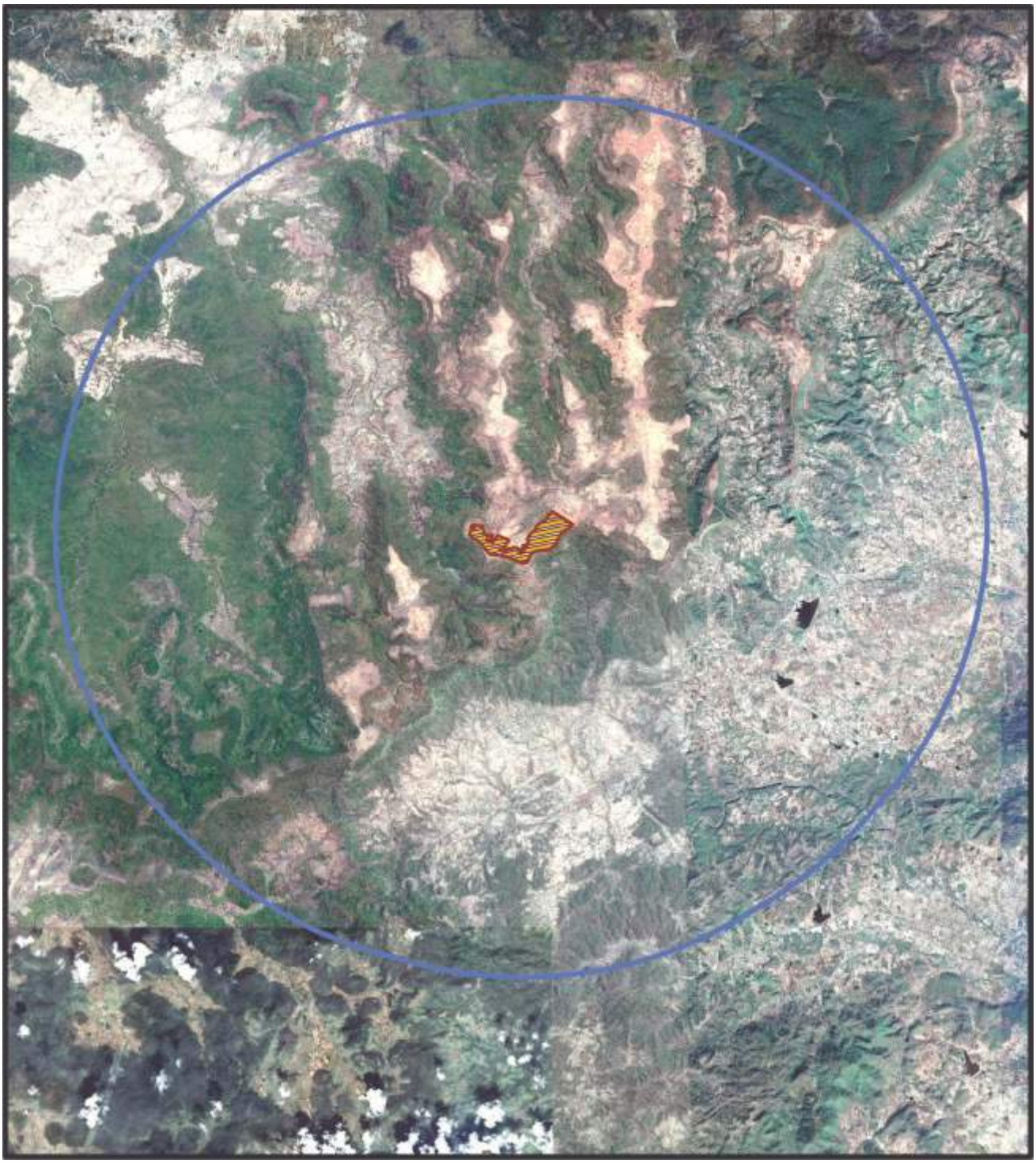
## ENVIRONMENTAL SENSITIVITY

| S.No | Particulars | Details |
|---|---|---|
| 1 | Longitude/ Latitude | Latitude $22^0$22'45.72558" N to $20^0$23'26.25876" N<br>Longitude $81^0$08'49.47502" E to $81^0$10'16.84813" E |
| 2 | Elevation above MSL | 920 M |
| 3 | Climate Conditions (IMD Raipur) | Annual max Temp- 41.9°C<br>Annual Min Temp- 12.7°C<br>Annual Total Rainfall- 1252.7 mm |
| 4 | Land use of Mine Site | Barren Land and Partly Agricultural land |
| 5 | Nearest Highway | NH-12 Bodla to Daldali 42km. |
| 6 | Nearest Railway station | Bilaspur 110 Km |
| 7 | Nearest Airport along with distance in km | Bilaspur 106.80 km SE approx |
| 8 | Nearest Town/ city, District Headquarters along with distance In km | Kawardha, 55.0 km, S |
| 9 | Hills/Valley | Maikal range |
| 10 | Ecologically Sensitive Area | Within 4.5 Km range Eco senstive area of phen wildlife santury |
| 11 | Protected area as per wild life protection Act 1972 | Within 4.5 Km range pehn wildlife santury |
| 12 | R&R Factors | No additional R&R required |
| 13 | Densely populated or built-up area | Nil |
| 14 | Areas which are important or sensitive of ecological reasons – wetlands, water courses or other water bodies, coastal zone, biospheres, mountains, forests (within 10 Km radius) | **(i)Forest** Daldali R.F (5 km)<br>Litari R.F (5.9 km, SW) Marpha R.F (7.9 km, N)<br>Dhaba R.F (8.0 km, NE)<br>Phen Wildlife Sanctuary lies within the 10 km<br>**(ii) Water body**<br>Lilari River 2.6 Km |
| 15 | Water Source | Manai River 3.1 Km NWN<br>Lilari River 2.6 Km NW<br>Hanp River 4.4 Km ENE |
| 16 | Defence installations | Nil within 15 Km range |
| 17 | Major Industries | Nil within 15 Km range |
| 18 | Seismic Zone | Zone – II (as per IS-1893, Part I :2002) |

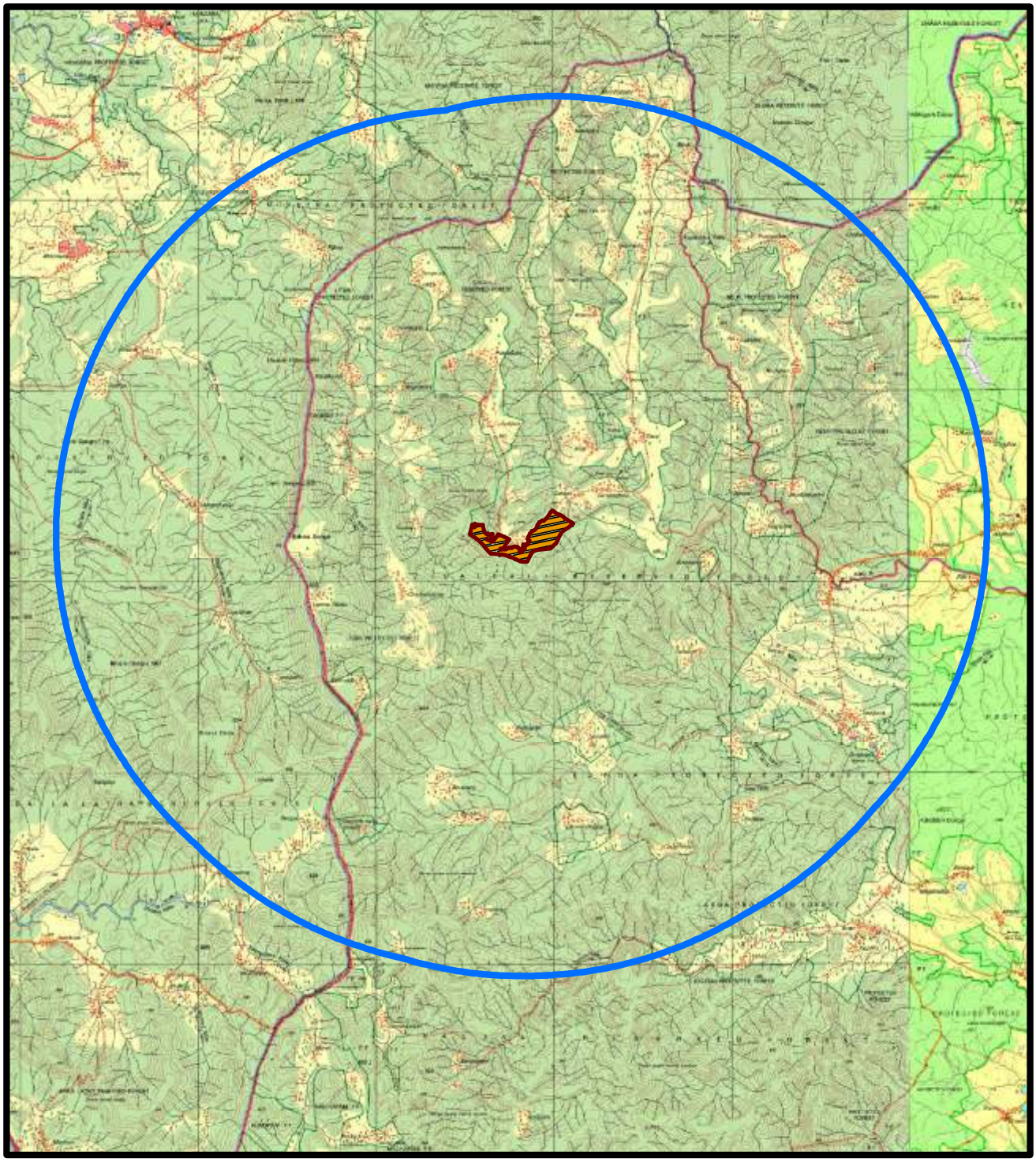
## Project site Location Map



## MUKAM LEASE BOUNDARY AREA SUPERIMPOSE ON GOOGLE IMAGE



## MUKAM LEASE BOUNDARY AREA SUPERIMPOSE ON SOI TOPOSHEET



**Legend**

- Mukam Lease Area BOUNDARY
- 10 KM Radius from Mining Lease Boundary

**SOI TOPOSHEET MAP NO. : 64F/7**

**RGB**

- Red: Layer_1
- Green: Layer_2
- Blue: Layer_3

**SOI TOPOSHEET MAP NO. : 64F/3**

**RGB**

- Red: Layer_1
- Green: Layer_2
- Blue: Layer_3

Scale
1:121,000
1 centimeter = 1,210 meters

0 2,500 5,000 10,000 Meters

**Study Area :**

Study Area is divided into two parts ,i.e., Core Zone and Buffer Zone.

**Core Zone :**

The mine lease area comprises of agricultural land with partly rocky and barren government wasteland. The total mine lease area is 110.563 Hectares which is situated in Mukam Village. There is no forest land including ***"Chhote aur Bade Jhad ke Jungle"*** in the core zone area.

**LAND BREAKUP**

| Govt. Waste Land (Ha.) | Private Agriculture Land (Ha.) | Total (Ha.) |
|---|---|---|
| 43.162 | 67.401 | 110.563 |

**Buffer Zone :**

The buffer zone area is the 10-kilometer radius from the periphery of the mine lease area. Out of the total Buffer zone area, 70% area of buffer zone falls in the territorial limits of the state of Chhattisgarh and the rest 30% of the buffer is within the territorial limits of the neighboring state of Madhya Pradesh.

**A. Details of the Buffer Zone Area of Chhattisgarh**

It is situated in two forest ranges of Kawardha Forest Division and some area of Chhattisgarh Forest Development Corporation Kawardha.

**B. Buffer zone area of Madhya Pradesh falls in Phen wildlife sanctuary and East Mandla Forest Division.**

Division wise details of forest compartment in buffer zone are as follows:

**Phen Wildlife Sanctuary**

Forest Compartment Numbers are as follows :

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 18 Part | 19 Part | 22 | 23 | 24 | 25 | 27 | 28 | 30 | 31 | 32 | 34 Part |
| 35 Part | 36 | 37 | 38 | 39 | 40 | & | 41 | | | | |

**Buffer Zone Area of Kanha**

Forest Compartment Numbers are as follows :

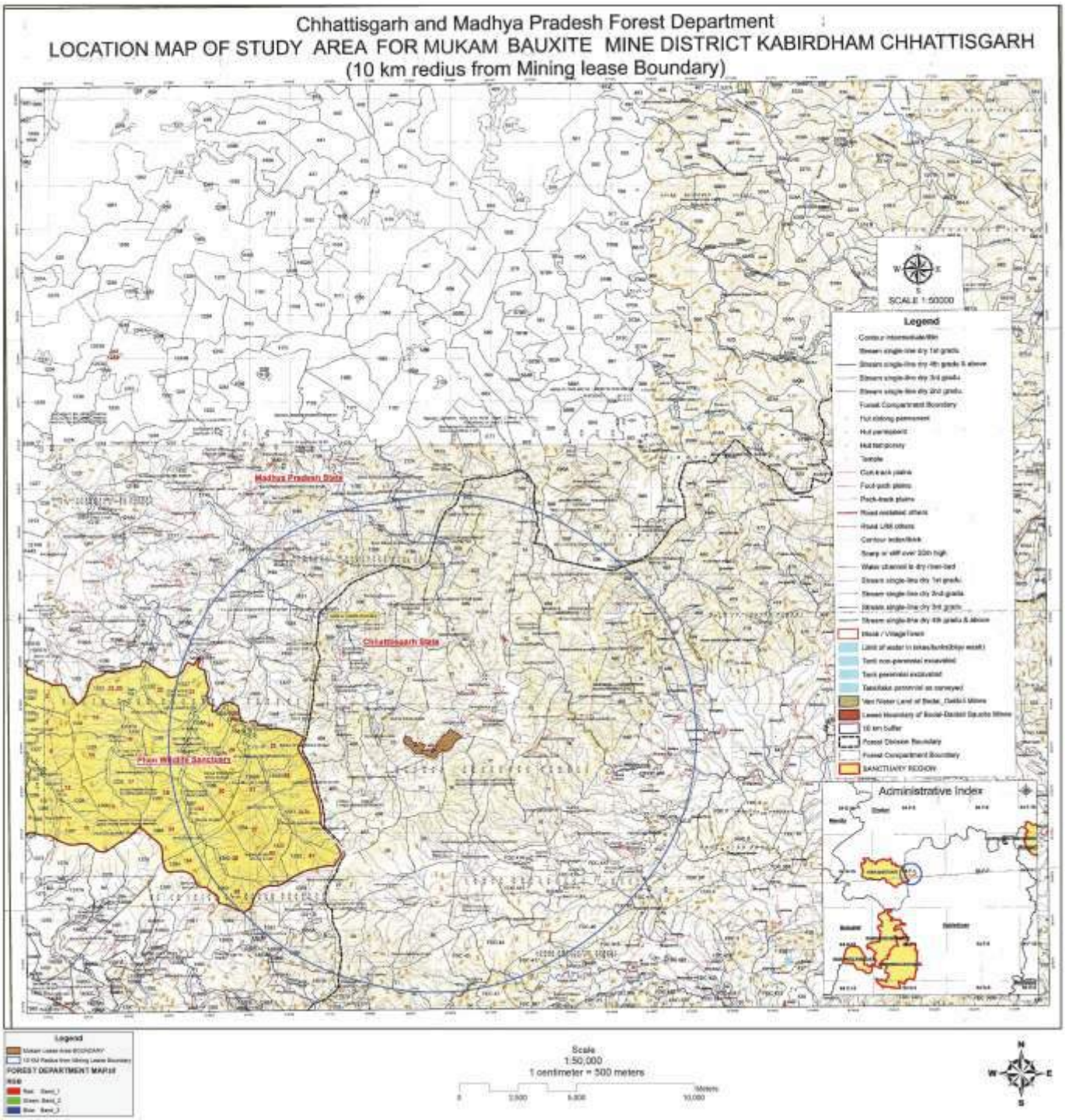
| | | | |
|---|---|---|---|
| 1383 | 1384 | 1385 | 1386 Part |

**East Mandla Forest Division**

**Range - Mawai**

Forest Compartment Numbers are as follows :

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 1341 | 1342 | 1343 | 1344 | 1345 | 1346 | 1347 | 1348 | 1190 | 1191 | 1192 | 1188 |
| 1189 | 1187 | 1171 | 1172 | 1340 Part | | 1175 Part & 1176 Part | | | | | |


Chhattisgarh and Madhya Pradesh Forest Department
LOCATION MAP OF STUDY AREA FOR MUKAM BAUXITE MINE DISTRICT KABIRDHAM CHHATTISGARH
(10 km redius from Mining lease Boundary)
SCALE 1:50000
Legend
Administrative Index
Madhya Pradesh State
Chhattisgarh State
Scale
1:50,000
1 centimeter = 500 meters

# CHAPTER - III

## Methodology Followed

### Rapid ecological study

This ecosystem is a dynamic one with both rich floral and faunal biodiversity with respect to its diversity of species composition and visible succession stages. An ecosystem can be studied from different angles. This report has endeavored to explore the various aspects of the study area to understand mostly the structural aspects of this forest ecosystem and associated ones. For this study sampling technique was followed as provided below.

### Faunal Study

An ecological survey of the study area for understanding the fauna of the study area was conducted, particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area in the following manner.

- Direct Count Method
- Transect Method
- Photographic-survey Based
- Dropping/scat
- Collection of dissociable body parts
- Interviewing Local Villagers
- Geo-reference:
- Equipments: Nikon D5000, Tamron VR-II 150-600 mm Lens, Olympus 10x42, Leica 10x42 ED, Garmin Oregon 550 and Garmin - 12, Voice Recorder.

The studies were conducted in the study area, i.e., 10 km radius area of **Mukam Bauxite Mines Lease Area (CMDC),**The study was conducted during study period daily before sunrise to late night (5:30am to 11.30pm). The adults of Odonata, Lepidoptera and Hymenoptera were collected in the field with aspirator, manually and aerial sweeping nets. The collected insec ts were killed by using benzene and preserved in insect collection boxes for further examination in the laboratory.

The common Odonata, Lepidoptera and Hymenoptera species were identified in the field and only very limited unidentified species representatives were collected. Mollusca, Amphibians and Reptiles were collected with the help of forceps manually and Fishes with the help of Aquatic net and all the materials preserved in 70% Alcohol. The random collection and field observation were also made on different groups of the fauna of the study area. The Reptiles, Aves and Mammals were identified by using Binocular (10mmx25mm) and field guides of concerned faunal group and their presence also recorded by taking photographs.

The presence of some Mammals species is also ascertained on the basis of pugmarks, interview with wildlife and forest officials, and villagers residing in study area. Discussion with forest staff posted in study area was also helpful in surveying.

**Estimation Of Carrying Capacity**

The number of individuals of a population (species) which an area/habitat can carry or support during the pinch-period is known as carrying-capacity of that habitat for that particular species. All numbers produced in excess of the carrying-capacity are obviously subject to loss.

There is tendency in every species to grow in numbers beyond the carrying-capacity but the decimating-factors/environmental-factors seize such tendency cheking species-abundance from exceeding the optimum number and density of the species in that particular habitat. Since reproduction adds many new individuals through breeding-potential and productivity of the species, we can ensure their maximum survival if we keep the total population below the carrying-capacity or balancing the herd with available range. Thus, carrying-capacity is a concept which relates a specific area to a particular species. To understand carrying-capacity very well, we can suppose a particular habitat as a ball in which certain population (number of individuals) of a species is growing. This ball may also be suitable and favourable in resect of food, water and shelter for a fixed number, due to productivity etc. there will be increase in number in the population of that species and thus crowd inside the ball will arise.

To minimize this crowed, there will be intraspecific-competition as wall as as adverse effects posed by decimating-factor/environmental-factors and ultimately excess numbers will die or migrate. Therefore, just before reaching such stage, the surplus numbers of the individuals of a population are to be harvested, the situation will be normal and the species will again grow upto that stage. In this way, harvesting will be useful for getting revenue and saving the individuals from dying uselessly.

The carrying-capacity is variable as per the season or time. When the season is of marked adverse conditions (adverse climatic/factors such as cold, hot etc.) the carrying-capacity will drop accordingly during unfavourable season; and when the favourable season is reached, the carrying-capacity will rise. In this way, fluctuations in population take place. Generally wild animals are accustomed to this annual-fluctuation of carrying-capacity bringing their young to the beginning of season of high carrying-capacity (favourable condition). If the habitat-ball grows means increases its capacity, the population also expands accordingly through reproduction, productivity and growth to keep it in full.

Though, the carrying-capacity is the attributes of a species habitat, it is being increased with the seasons and may also be increased by proper management or manipulation of the habitat to suit the increasing number of density of the species brought about by its productivity whenever, it is not possible or done artificially, there is no chance to survive the excess number of individuals which are beyond the carrying capacity. In this way; carrying-capacity controls the population-density, etc. are altogether linked to each-other. The consideration of all these factors is needed primarly and positively on priority basis during applying management/improvement/manipulation techniques in the field of wildlife.

Method of Estimation of Carrying-Capacity

The carrying-capacity of a babitat is carried out in the following steps:-

(a) First of all the total area of the habitat and the area of vegetation found within the habitat are estimated.

(b) After this, the amount of the vegetation found in the pinch-period of the habitat is calculated by transect or sampling or any other suitable method and, in this way, the total amount of the vegetation in one year is found out. Hence, the total amount of vegetation in one year is found out. Hence, the total amount of vegetation available in a year on the basis of pinch-period is calculated.

(c) Afterwards; on the basis of food consumed in one day by one individual of the species, the total quantity of food consumed by individual animal required for one year is calculated.

(d) On the basis of amount of food in one year for one individual and the total amount of food (vegetation) available in one year (as calculated); the number of individuals are calculated to be sustained in a year in that habitat and, thus, carrying-capacity is estimated.

It is estimated in the term of biomass of the herbivorous animals of the habitat (biomass is the total weight of the population in unit area of the habitat). It means that the total weight of all the herbivores available in the area (habitat) is found out and then biomass per kilometer is calculated, as an average in unit area. This method is used specially in comparing with the other habitats.

**Study of Forest Type**

In the whole study area, random samples were taken to study intensively various ecological parameters so as to understand largely the ecological structure of the study area and get some sample idea of the ecological functions. In some places where anthropogenic activities are low species available are recorded as per the findings of transverse walk.

In most cases random sampling was done with the help of Satellite Imagery and topo-sheet of the area. Samples were studied within the buffer area i.e. 10Km radius of the **Mukam Bauxite Mine Lease Area (CMDC)**. Studies were done for understanding the phytosociology, inventorization of faunal species as well as their habitat and ethno botanical study within the villages surround within the buffer area.

**Quadrate sampling**

Quadrate sampling was done in the study area, where there are both forest areas and non-forest areas. At the outset a species area curve was prepared in eastern side of the hill to find out the minimum size of the quadrate required for the study of three layers (considered as separate communities) such as tree, shrub and herb. It was inferred that for tree layer the minimum size of the quadrate required for study was 100 sqmtrs (10mtrs x 10mtrs) for trees, (5mtrs x 5mtrs) 25 sqmtrs for shrubs and (1mtr x 1mtr) 1 sqmtrs for herbs. In each of the sample sites a quadrate of 100 sqmtrs (10mtrs x 10mtrs) was laid in the north-south direction to study the tree community for the parameters like Importance Value Index

(IVI), Diversity Index, Canopy cover statistics and later on the data generated was used to calculate similarity index of the three layers of the study area. In each of the tree quadrate, four shrub quadrates were laid on alternate sides and similarly five herb quadrates were for study of herb layer. Each quadrate was given a code and marked by GPS reading. For GPS reading GARMIN-12 handset is used and all the readings are recorded.

**Taxonomic identification of plant species**

Plant species will be identified following standard flora by Hooker (1872-1897)[1], Verma et al. (1985)[2] and Kumar et al (2005)[3]. Names of the plant species were verified using Bennet (1987)[4]. The help of scientists of Botanical survey of India (BSI), Allahabad was taken.

**Calculation of Importance Value Index (IVI)[5] of Trees**

This index utilizes 3 characteristics such as Relative frequency, Relative Density and Relative dominance.

A. Relative dominance = (Total basal area of $i^{th}$ species/Total basal area of the species) x 100
B. Relative density = (Number of individual of $i^{th}$ species/Number of individuals of all species) x 100
C. Relative abundance = Number of occurrence of $i^{th}$ species/ Number of occurrences of all species) x 100 The above three values are added to get Importance Value Index (IVI).

**Important Value Index (IVI) = Relative dominances + Relative Density + Relative Abundant.**

**Canopy Statistics**

Canopy cover is an important indicator of the forest habitat condition. The movements and behavioral patterns of large mammalian herbivores as well as birds and several groups of insects are dictated to a large extent, by the status of canopy cover. The overall forest cover may easily be estimated from the satellite imagery. The satellite maps of the study area shows that the overall canopy cover in the forested areas is well above 40%. However, within the forest area, different patches of the forest understandably

1. Hooker J.D.1872 - 1897. Flora of British Inda, London (Reprinted Edition 1973)
2. Verma D.M. P.C. Pant and M.I. Hanfi. 1985. Flora of Raipur, Durg and Rajnandgaon. Botanical Survey of India, Howrah.
3. Kumar, A., K.K. Khanna, and A.K. Jha. 2005. Floristic Diversity of Chhattisgarh (Angiosperms). Bishen Singh and Mahendra Pal Singh, Dehradun. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Bennet S.S.R 1987 Name changes of flowering plants of India and adjacent region. Triseas Publishers, Dehradun.
5. Philip, E.A. (1959) Methods of Vegetation study. Henry Holt & Co. Inc.

showed different characteristics, depending on the floral composition, age structure of the stand, and the history and degree of perturbation like fragmentation, felling, etc. Instead of depending on the generalized satellite estimation, a more direct and authentic estimate of canopy cover was undertaken by the study team by physically measuring the canopy spread.

We have adopted a geometric measurement to estimate CC, by directly measuring the crown diameters at right angles, in a specified quadrate. Half of the averages of these two diameters give the mean radius of the canopy, whence the mean canopy area of each tree can be calculated as $\pi r\ i^2$(where ri is the mean canopy radius for the $i^{th}$ individual tree). The total canopy cover area (c) in a sample quadrate equals the sum total of the canopy area of the trees within the quadrate $\Sigma \pi r\ i^2$. Thus, the Canopy Cover Index (CC) is the ratio of C to A, Where A = XY, (X and Y denoting axes of the quadrate being measured). Open canopy is inferred when CC<0.4.

**Life form study**

The life form composition of the community is the manifestation of the adaptations of its component species to the climatic condition, contributes to community architecture (Jamir et al. 2006)[6]. Life form spectrum is the sum of adaptations of plants to the climate. Following the system of Braun-Blanquet's (1951)[7] system the area possesses five major classes like

| | | | | | |
|---|---|---|---|---|---|
| I. | Phanerophytes | II. | Therophytes | III. | Hydrophytes |
| IV. | Hemicryptophytes | V. | Geophytes | | |

**Ethno botanical Study**

This is the study related to use of different plant species by local people mostly for food, medicine, and other traditional uses.

---

*6.Jamir, S.A., Upadhaya, K. and Pandey, H.N. 2006. Life form composition and stratification of montane humid forests in Meghalaya, northeast India. Trop. Ecology 47(2), pp 183-190.*

*7.Braun Blanquet, Josias (1964): Pflanzensoziologie, Grundzuge der Vertationskunde. (3. Auflage). Springer Verlag, Wien, 865 pages)*

**Method of procuring ethnobotanical information**

The procedure of gathering data, in general, was same as mentioned by Jain (1963a[8], 1964a[9] , 1965a[10], and 1967a[11]). It included either interviews of the informants or witness of the uses during the period of work in the field.

Information on plants associated with food, medicine, material culture and worship. The conservation aspects of the community, natural history, ethnology has been done by rapid ethnobotanical appraisal (REA) as suggested by Martin (1995)[12]. REA is a method by which quick assessment of ecological knowledge and resource use can be studied and assessed. This technique is adopted from various disciplines to form a collaborative approach.

Informants were requested to accompany the author in field, to detect the plants. Alternatively a particular plant was picked up and quarries made as to how it was useful for them. The reply was either description of the uses in details in all respects or a reply in negative. When discussion on one plant was over, a second plant was taken up, and so on, where possible both a man and women were engaged, as the women were supposed to know the foods, vegetables, medicine etc. and the men the materials in wood working, housing as well as medicine.

**Information from secondary sources**

Ethnobotanical information has been collected for this study from following sources also. These are (i) Old literatures and (ii) Oral history. Herbarium specimen and field notes on herbarium sheets also proved to be a good source of ethnobotanical information. In many cases the observation on plant are made by previous botanical explorers were noted on herbarium labels. This information were not published and remained unnoticed. Much useful information on plants associated with people of extent past has gone in written accounts of those items. Sometimes this information is scattered and exists in rather obsolete literature, such as, travel accounts, forest department reports, natural history, ethnologist, etc. In the present study all the tools mentioned above have been taken as source of information.

*8.Jain, S.K. 1963a. Studies in Indian ethnobotany: Less known fuses of fifty common plants from the tribal areas of Madhya Pradesh. Bull. Bot. Surv. India 5: 223-226.*
*9.Jain, S.K. 1964a. The role of botanist in Folklore research. Folklore 5 (4): 145-150.*
*10.Jain, S.K. 1965a. Medicinal plant and Folklore of the tribal's of Baster. Econ. Bot. 19: 236-250.*
*11.Jain, S.K. 1967a. Ethnobotany: Its scope and study. Indian Mus. Bull. 2(1): 39-43.*
*12.Martin, G.J. 1995. Ethnobotany. Chapman & Hall: London, UK.*

# CHAPTER - IV

# STATUS OF FLORAL DIVERSITY

## STATUS OF FLORAL DIVERSITY

The climatic, edaphic and biotic factors generally determine the type and distribution of the natural vegetation of this tract. By far the most important factor which influences composition of the forest, in addition to rainfall, is the underlying parent rocks and soils derived from them. Wherever water retentive soils are found, the growth of the vegetation is luxuriant, both in quality and stocking. Soils of poor water holding capacity even under high annual rainfall, support only low-quality vegetation of sparse density.

The topography also plays a great role in determining the composition of the forests. For example, the percentage of Sal in the crop is generally inversely proportional to the degree of the slopes.

Aspect also plays a significant role in determination of composition and stocking of the forests. The northern aspect presents generally the moister and cooler conditions as compared to the southern or south-western aspects.

The vegetation occurring in the buffer area of the Mukam Mines situated in Madhya Pradesh, belings to moist peninsular sal forest type 3C/C2e. The main species of the moist peninsular sal forest is sal. The distribution of sal mainly depends upon the normal distribution of climate. The local distribution depends upon geology and the type of soil. The primary climatic condition for sal distribution is rainfall which is approximately 1400 mm to 1900 mm. The average relative humidity is 60% to 70% throughout the whole year and in the month of March it is 45% to 60%. The main associates of sal are Saja, Bija and Landia. These species form the top canopy of the forest. In the middle canopy Jamun and Roli are the dominant species. The ground flora mainly consists of Roli, Bhant, Amura species etc. The main climbers found in the study area are MahulBel (*Bauhina vahlii*), Satawar (*Asparagus racemosus*), Palash (*Butea superba*), Ramdatun (*Smilax zeylanica*). Grass is important in the seral stage of succession. Fire plays main role in this stage of succession.

The moist peninsular sal forest is classified into three sub-types of forest :

- **Moist Peninsular high level sal forest - 3C/C2e(i)**
- **Moist Peninsular low level sal forest - 3C/C2e(ii)**
- **Moist Peninsular valley Sal Forest - 3C/C2e(iii)**

**Floral diversity in study area of Madhya Pradesh is provided in Annexure - II**

Photographs of Moist Peninsular high level Sal Forests

Photographs of sal forest in buffer area.

# CHAPTER - V

## STATUS OF FAUNAL DIVERSITY

Thestate of Chhattisgarh falls under the Deccan Bio-Geographical zone of Rodger et al (2002)[13] of its forest, 11% are under the protected area network. The occurrence of wild animals and composition of its species depends directly upon the plant and vegetative composition of its species, depends directly upon the plant and vegetative composition of that area. Therefore, we can say that occurrence of animals are directly related to the vegetation types and climate along the geomorphology of earth in that part. The study area with it's extensive area and remoteness once had the reputation for abundance of wildlife. Now there is a remarkable depletion of wild animals. The reasons for the disappearance of the wild animals are attributed to indiscriminate shooting and destruction of forest for extension of agriculture and other developmental activities. The important factor which is mainly responsible for the disappearance of the wild animals is the hunting by local tribals & sarguja state. They hunt by bows and arrows and also by laying traps. The natural calamities such as animal diseases have also contributed to the depletion of Wildlife.

## STATUS OF MAMMALS REPTILES, AVIFAUNA, SPIDERS AND BUTTERFLIES

### MAMMALS

The study area is mostly reserve forest and is subjected to severe pressure from the villagers. The grazing pressures are immense and livestock grazing is prevalent in all the areas of the project site. Though the habitat reveals that it should be supportive of mammalian fauna but owing to the pressures the population status of mammal is very low in the project area. Large herds of cattle and livestock can be seen virtually daily in the entire project area. The Rocky and boulder areas in the project site appeared suitable for sloth bears which are quite common in the Project areas as well as in the entire forested tract in buffer zone and surrounding area.

Forested areas in the vicinity of the human settlements are good habitats for Jackals.

[13] *Rodgers, W.A. and Panwar, H.S. 1988. Planning a Wildlife Protected Area Network in India. A report prepared for the Ministry of Environment and Forests & Wildlife, Government of India, Volumes 1 and 2.*

## REPTILES

Among reptiles there were direct sighting of Rat Snakes, Cobra, Common Krait in the study area. Few mounds of a Rat snake (*Ptyas mucosus*) were also found in the study area. House Gecko (*Hemidiactylus flaviridis*) was commonly seen in the entire study area. Common Skink (*Mabuya carinata*) and Garden Lizards were also commonly seen in project area. Discussions with local people did confirm the presence of Krait (*Bungarus careuleus*), Saw's scaled viper (*Echis carintus*). Russell's viper (*Vipera russelii*) in the report. As per the reports of local people the sightings were not very common and not many people had seen snakes in the proposed project area. The reptilian species seen in the study area are given in **Annexure-III** based on the direct sightings, indirect evidence and discussions held with the local people during the survey. Rat snakes were fairly common in the forest area close to the human settlements as the people store paddy in their houses which attracts rats and bandicoots and in turn attract rat snakes.

Of all the species of reptiles seen and reported from the area are monitor lizard & Indian Rock Python is protected under Schedule 1 of WPA 1972. No conclusive data could be collected with respect to the total population estimate of Python. Interviews with villagers only confirmed the presence of the species. No one however reported sighting python in last five years in the project area. In the last ten years people do not recollect any incidence of snake bite case also in the project area. The sightings that people had in past were mostly in the vicinity of village areas close to water bodies.

## AVIFAUNA

A total of 37 species of birds were recorded in the study area during the survey. The project area is quite rich in avian diversity, but mostly only generalist species are seen in area. One species belonging to Schedule I of the Wildlife Protection Act (1972), namely Indian Peafowl is found in the buffer zone. This is naturally protected by local people as it is pilgrimage site. Few individuals of India Peafowl were seen in this area. Apart from this no species belonging to Schedule I of the WPA 1972 is reported to be found in the study area.

## BUTTERFLIES

A total of 20 species of butterflies were recorded from the study area during the survey. The butterfly richness was higher in the areas that appeared to be disturbed by human and livestock interference. In the disturbed areas openings are created and these openings act as good habitat for butterflies by letting enough sunlight reach the ground. Butterflies need open sunlight and prepare habitats which will provide food plants and sunlight. All such openings in the forest area provide excellent feeding and breeding habitat the butterflies.

Natural Small openings in forest also provide excellent habitat for basking and flowering plants to come up in these forests. The moist patches in riverine areas also attract butterflies. Possibly these moist patches act as source of minerals for butterflies as many of them can be seen sitting over such patches. Areas is vicinity of natural drains close to the village provide excellent habitats for butterflies.

**OVERALL HABITAT STATUS**

Overall habitat condition in the study area is not good, owning to tremendous amount of grazing pressure all over the area. There is also tremendous hunting pressure in the area. Tribals move with bow and arrow and almost everyone encountered in the forest narrated some or the other story of hunting. Local people now feel that it is not so easy to get wild animals as they have moved out to the denser and deeper areas. The disturbance signs are prevalent and can be seen in the entire stretch of the project area. There is also immense lopping pressure in the area. Charcoal making is also one of the activities being carried out by some villagers in the area.

The status of any wild animal over a given area can be obtained through its population estimation and status survey. In survey of 10 km radius area of **Mukam Bauxite Mines Lease Area (CMDC).** The wildlife recorded and listed in different schedule of Indian Wildlife is provided in **ANNEXURE-III.**

**Phen Wild Life Santuary**

Total area of the Phen Wild Life Sanctuary is 110.75 Km.. It was established by F.D. No. 15-5.83- x-2 dated 10.3.1983 under the provision of the section 18 (I) wildlife (Protection) Act 1972 Chital, Barking Dear, Sambhar, Chow Singha, Bison, Black Nap Hare, Wild Dog, Panther, Sloth Bear are commonly seen in this sanctuary, two tigers are also seen in this Sanctuary regularly.

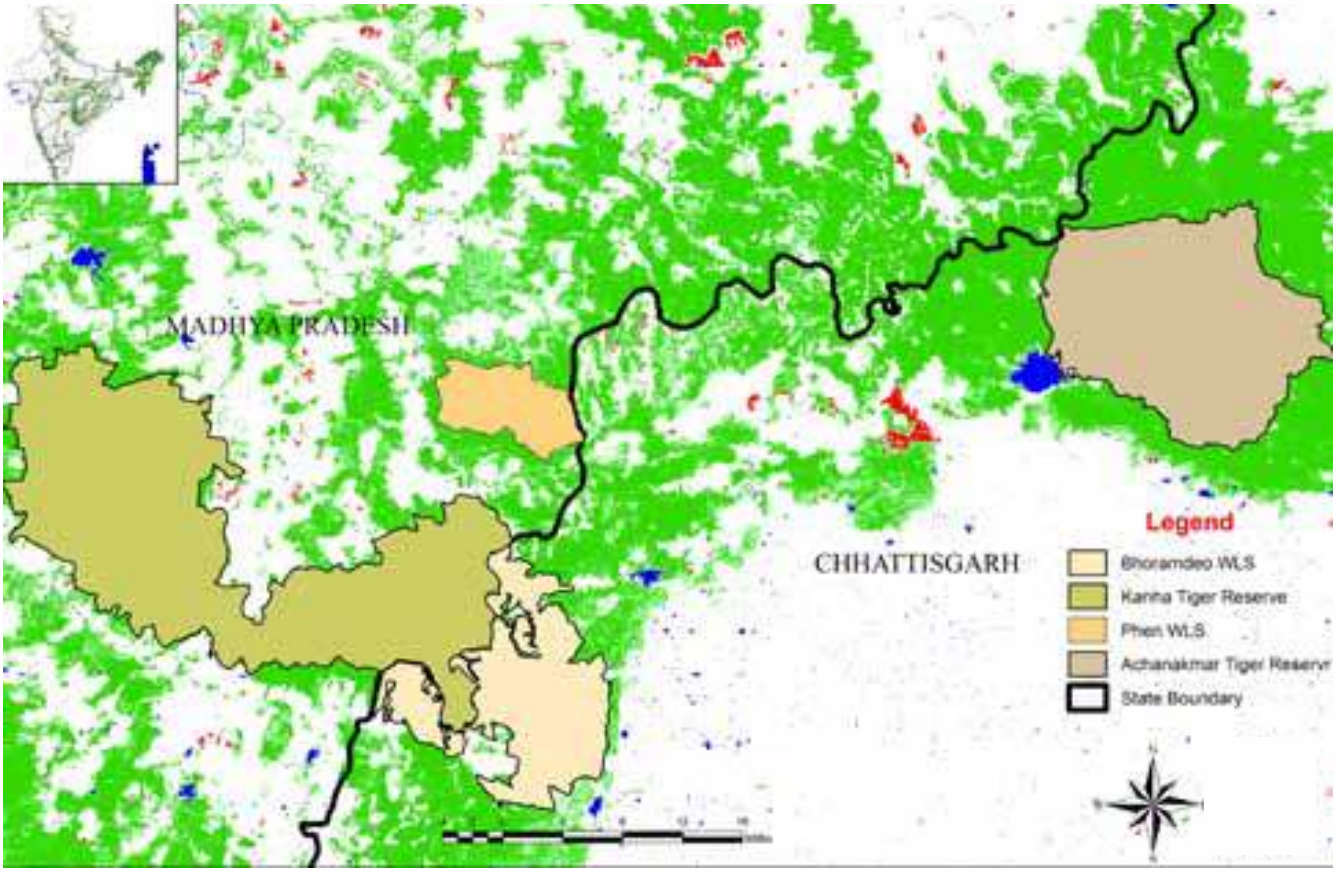
Phen is surrounded and connected to Kanha Tiger reserve through Motinala buffer range as well as territorial range. The connectivity extends and forms a connective linkage for the Kanha-Achanakmar corridor through Mawai range in north as well in south and Rajnandgaon of Chattisgarh part. The connectivity with Kanha through the buffer ranges (Motinala and Mawai) in east and north provides continuity for the Kanha-Achanakmar corridor.

Phen WLS forms the satellite micro-core of larger Kanha Tiger Reserve and is an important region in term of connectivity between Kanha and Achanakmar Tiger Reserve. It plays a significant role in Kanha-Achanakmar corridor as a major stepping stone area. Tiger's which disperse or move out from Kanha, either use Bhoramdeo Wildlife Sanctuary or Phen to move further along the Kanha-Achanakmar corridor. Phen has connectivity to Kanha through Motinala buffer forest and further establish a linkage to the forest of Dindori and Mawai. Thus, it is crucial to secure the Kanha-Achanakmar corridor for long term survival of tigers in the landscape. The sanctuary status of Phen provides some degree of protection to wildlife in comparison to the other reserve forests in corridor area and this is apparent from a relatively intact forest structure and frequent animal sightings. The predominant forest is miscellaneous type with Sal patches interspersed by small grass lands. The ground cover has revived after complete removal of Daihan (settlements with huge livestock rearing and grazing). Tiger and other large carnivore presence have been recorded from time to time in Phen, but systematic understanding of population structure has not been documented so far. For past few years though tiger pugmark has been reported from the sanctuary, but not found regularly every year. However, presence of leopards and prey species was quite frequently recorded by forest department. This report highlights the status of large carnivores and prey in Phen Wildlife Sanctuary, which forms an important habitat as well as a stepping stone for wildlife in Kanha-Achanakmar corridor.

**Kanha-Achanakmar Corridor Complex**

The Protected Areas (PA's) in Central India are geographically distributed with some degree of interconnectivity between them through contiguous as well sub-contiguous forest patches. This signifies the potential for tiger meta-population survival through genetic exchange in longer term (Sharma et al. 2013). But the forest forming the connectivity between the PA's are not entirely intact. Rather they follow a multiple land use pattern with varying degrees of anthropogenic pressures and degradation. Connectivity between source population site Kanha and Achanakmar tiger reserve is predominantly a hilly tract, mainly supporting tropical moist deciduous forests. The valleys are dominated by the Sal *(Shorea robusta)* forests, while the lower and higher slopes support the Bamboo *(Dendrocalamus strictus)* with Sal and miscellaneous species respectively (WWF-India, 2011). In addition, many plateaus support extensive grasslands, commonly known as 'dadar'. The wider inter-mountain valleys are mostly occupied by vast stretches of agricultural fields. More importantly, the entire Kanha-Achanakmar corridor area is spread over four different districts in the states of Madhya Pradesh and Chhattisgarh, and encompasses four different

PA's. Also the forest of entire corridor is managed by several territorial, production and social forestry divisions. These patches, due to their size and strategic location in the corridor, are crucial in providing refuge as well as habitat contiguity to different dispersing wild animals. Also these forests are important source of livelihood for tribal dominated communities residing in the entire tract, in the form of timber, non-timber and minor forest produce (NTFP).




**Protected areas in Kanha-Achanakmar corridor**

**Sal mix forest in Phen Wildlife Sanctuary**

## IUCN RED LIST CATEGORIES

IUCN, now known as the world Conservation Union, with Headquarters at Gland, Switzerland, is the premier coordinating body for International Conservation efforts. It produces directories of specialist who are knowledgeable about captive breeding programs and other aspects of conservation. To highlight the legal status of rare species for the purpose of conservation, the International Union for Conservation of Nature & Natural Resources (IUCN) recognized earlier in 1963, 1984 and 1988, the following five main conservation categories.

1. **Extinct** species that are no longer known to exist in the wild. Searches of localities where they were once found and of other possible sites have failed to detect the species.
2. **Endangered** species that have a high likelihood of going extinct in the near future.
3. **Vulnerable** species that may become endangered in the near future because populations of the species are decreasing in size throughout its range.
4. **Rare** species that have small total numbers of individuals often due to limited geographical ranges or low population densities.
5. **Insufficiently known** species that probably belong to one of the conservation categories but are not sufficiently well known to be assigned to a specific category.

IUCN later (2012) recognized nine Red list categories of species.

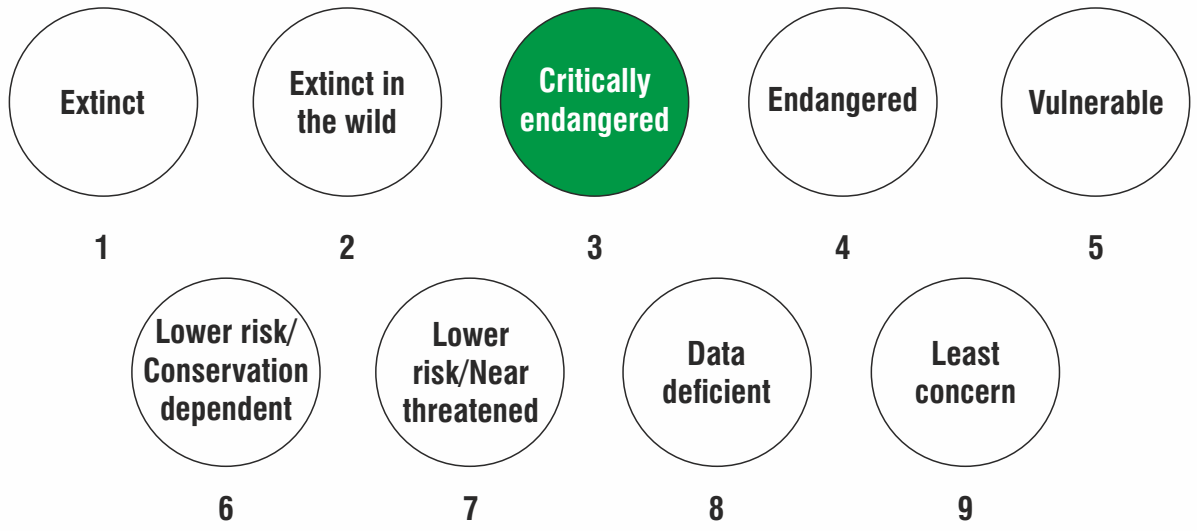



Figure: Nine risk categories of species (IUCN 2012).

**Critically endangered :** is the highest risk category assigned bythe IUCN RED LIST to wild species. There are five quantitative criteria to determine whether a taxon is threatened. A taxon is critically endangered when the best available evidence indicates that it meets any of the following criteria;

1. Populations have declined or will decrease, by greater that80% over the last 10 years or three generations.
2. Has a restricted geographical range.
3. Small population size of less that 250 individuals and continuing decline at 25% in three years or one generation.
4. Very small or restricted population of fewer than 50 mature individuals.

In the buffer zone of mines of Madhya Pradesh other than Phen Sanctuary following scheduled-I animal are present during survey:

1. **Indian monitor lizard *(Varanus benglensis)***
2. **Indian peafowl *(Pavo cristatus)***
3. **Sloth bear *(Melursus ursinus)***
4. **Elephant *(Elephas maximus)***
5. **Indian rock python *(Python molurus)***
6. **Bengal tiger *(Panthera tigris tigris)***
7. **Chousingha *(Tetracerus quadricornis)***
8. **Bison *(Bos qaurus)***
9. **Common leopard *(Panthera Pardus)***

## CONSERVATION PLAN FOR WILDLIFE BELONGING TO SCHEDULE-I

### 1. Indian Monitor Lizard *(Varanus bengalensis)*

The Bengal monitor lizard (*Varanus bengalensis*) or bis-cobra is known by various names in the local dialects, viz., Godha in Sanskrit, Goh in Hindi and Punjabi, guishaap or goshaap in Bengal, goyra in Rajasthan, ghorpad in Maharashtra, belonging to Varanidae family, is sliding fast towards extinction, due to consistent persecution for its precious skin, yummy meat, and various body parts for folk remedies, besides freak accidents on road, while the farmers in some parts of India are engaged in the conservation of this species, due to agro-friendly characteristics, like feeding on insects and common pests, inimical to crops.

Photograph of Indian Monitor Lizard (Varanus bengalensis)

This large lizard is mainly terrestrial and grows to about 175 cm from the tip of the snout to the end of the tail. Young monitors may be more arboreal but adults mainly hunt on the ground preying mainly on arthropods but also taking small terrestrial vertebrates, ground birds, eggs and fish. It is basically omnivorous and often engaged in scavenging, hence playing a key role in cleaning the environment.

**Reason for Conservation**

The Varanus bengalensis (Indian Monitor Lizard) is least concern species in the IUCN Red list of the species within the country, the species is protected under Schedule-I of the Wildlife Protection Act (1972) of India.

**Ecology and Behavior**

Monitor lizards are usually solitary and usually found on the ground, although the young are often seen on trees. *V. b. nebulosus* has a greater propensity for tree climbing. Bengal monitors shelter in burrows, they dig or crevices in rocks and buildings, whilst clouded monitors prefer tree hollows. Both races will make use of abandoned termite mounds. Bengal monitors, like other varanids, show true sleep at night and are diurnal, becoming active around 6 AM and bask in the morning sun. During winter, in the colder parts of their distribution range, they may take shelter and go through a period of reduced metabolic activity. They are not territorial, and may change their range seasonally in response to food availability.

They are usually shy and avoid humans. They have keen eyesight and can detect human movement nearly 250 m away. When caught, a few individuals may bite, but rarely do so. Captives have been known to live for nearly 22 years. Predators of adults include pythons, mammalian predators and birds.

**Food & Feeding habit**

This is a carnivorous animal. It eats any animals it can overcome. Young monitors may be more arboreal, but adults mainly hunt on the ground, preying mainly on arthropods, but also taking small terrestrial vertebrates, ground birds, eggs and fish, small turtle and snakes also. It probably seeks its prey both by smell & sight.

**Breeding Pattern**

The main breeding season is June to September. Eggs are laid from mid-April to October. Females may be able to retain sperm, and held in confinement have been able to lay fertile eggs. Males, however, begin to show combat behavior in April. Females dig a nest hole in level ground or a vertical bank and lay

the eggs inside, filling it up and using their snouts to compact the soil. The females often dig false nests nearby and shovel soil around the area. They sometimes make use of a termite mound to nest. A single clutch of about 20 eggs are laid. The eggs hatch in 168 to nearly as long as 254 days. About 40 to 80% of the eggs may hatch. The larger females, as among other reptiles, lay more eggs. Incubation period is 8 to 9 months. The newly hatched young's are common at the beginning of the monsoon.

**Threats**

Monitor lizards are hunted for skin and their body fat. Its eggs are considered a delicacy and the entire animal is also eaten.

- Unani, the Greco-Arabian system of medicine, recommends the use of various body parts of monitors to cure numerous ailments.
- The population of the Common Indian Monitor, Varanus bengalensis has alarmingly dwindled throughout the Indian sub-continent mainly due to excessive exploitation of the adults for their commercially valuable skins, as food and in traditional medicines.
- Habitat loss due to large-scale deforestation, urbanization, industrial activities and other biotic factors are also responsible for the population decline of the species.
- The population of the species of monitor lizards has drastically declined throughout their range due to illegal and extensive exploitations and adults for their commercially valuable skin, food purposes by local fisherman community and traditional medicinal values.

**Conservation and Management Plan for Indian Monitor Lizard**

- A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/monitor lizard conflict mitigation program.
- Public awareness is an important priority within the scope of overall management plans for the species. Public awareness often yields new locality information and could reduce the frequency with which this species are killed.
- Poaching should be restricted and poachers should be punished.
- Poaching and hunting of this reptile would continuous monitor and take action against it according to Wildlife Protection Act-1972. Aware local people and built effective information system against hunting and poaching activities.

- Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with monitor lizard, hunting and poaching activities.
- There is no scarcity of food or habitat to the animal. Preventing poaching will be the single most important factor in the conservation of the species, for which awareness programs should be run frequently.

**Conservation Status :** Status: Not Listed (IUCN 2000); Endangered (ESA). Schedule I Indian Wildlife (Conservation) Act, 1972.

### 2. Indian Peafowl *(Pavo cristatus)*

Peafowl is the largest gallinaceous birds. Peafowl is common word for male and female. The male is known as Peacock while female is known as Peahen and the immature offspring are sometimes called peachicks. The male bird is having a beautiful crest consisting of a row of small feathers on the crown, the color of the crown feathers is bright blue known as Peacock blue, the same color also appears on the head, neck and breast, a white patch under the eyes is a distinctive characteristic of this bird, the upper parts found barred. Lower breast, abdomen and flanks were found black and green, wings brownish black with blue tinge. Legs are dust-grey or blackish with a spur in the male. Train formed by the upper tail coverts, color of the tail feathers is metallic green with bronze and purple, sub terminal ocellus formed by a blue patch surrounded by green and purple color. It is known as eye spot. Fish tail feather is the longest feather of the train; the end is bifurcated like the tail of fish. Female and sub-adult youngs are more or less alike, the crest lore's, and upper neck brownish, each feather bordered bronze green, sides of bead and throat are white; lower neck, upper breast and upper back are metallic green; abdomen pale buff; wing blackish brown with spots.

The term 'Mayura' means a killer. It is a killer of the killer-the Snakes. The term bhujangabhuk and Bhujangabhogin means Snake-eater, peafowl has habit of eating the Snake. The name 'Neelakantha' means blue-necked, it suggests that the Peafowl is habitual eating venomous serpents hence its neck became blue by virtue of the terrible poison like Lord Shivam. The Kekin is believed to be in the Sadja, the first of the seven primary musical notes. The term 'Meghananda' means happy to see clouds. The word Sikhin and Sikhavala means possessing the crest on head. The crest considerably adds to the beauty of the bird and suggests its dignity. The term 'Candrakin' means possessing the eyes in the tail. It points to

the significance of the brilliant variegated circular spots in the feathers. The terms Barhina and Barhin suggest the most charming feather of Peacock- the pretty feathers. The name 'Silapanga' means having whiteouter- corners of the eyes, which is a sign of purity. The term 'Sikhandin' is used for having a long beautiful tail. The term 'Kalapin' means many tail covering feathers found with tail. Chitrapicchaka term indicate that the tail which is the most attractive part of the Peacock's body having variegated nature in feathers.

The Indian Peafowl (Pavo cristatus) has been an integral part of Indians and their culture, religion and mythology for centuries. In addition to this, the Indian Peafowl is well recognized for its ecological and aesthetical values, and hence aptly declared as the 'National Bird' of India in the year 1963.

Since the early 1990's, there have been reports of increasing illegal trade in Peafowl feathers, large-scale mortalities due to increased use of insecticides/pesticides in agricultural lands, poaching, and retaliatory killings by people due to alleged crop depredation by Peafowl. Several Peafowl stronghold areas in the country are now concerned about the current declining status.

The Common Indian Peafowl or the Blue Indian Peafowl belongs to the family Phasianidae and order Galliformes. There are three species of Peafowl found in the world, out of them two species belong to genus Pavo of sub-family Pavoninae.

I. The Indian Peafowl *(Pavo cristatus)* is short-legged with a marked sexual-dimorphism.
II. The Green Peafowl *(Pavo muticus)* has a longer and slimmer neck and longer legs, sexualdimorphism is slight.
III. The Congo Peacock *(Atropavo Congensis)* is the third species of Peafowl.
It belongs to Genus Aflopavo to sub-family, Afropavoninae. They are distinguished by not having typical stripes and ocellate spots in their plumage. The Peacock is probably the oldest ornamental bird, in the course of time man has raised various Peacock breeds like White Peacock, Mottled Peacock and Black Winged Peacock (Grzimeck, 1984).

Photographs of Indian Peafowl.

### Characteristics

- Both the male and the female have a fan-shaped set, known as the crest, of spatula tipped wire like feathers on top of their head. Their eyes are a dark, hazel brown. The facial skin is white. The beak and legs are brown.
- The female is mottled brown and dull looking, has a white belly, and lacks a train. She has green neck feathers.
- The male has a radiant blue neck and breast. They also have a metallic bronze green train, spotted with purplish-black markings also known as eyespots or ocelli. The train on the male is used for display to entice the female to mate with him.
- Lifespan: In the Wild 20-24 years; In Captivity same.

## Reason for Conservation

- This bird recognized under Schedule- I (Section- III) species of Indian Wild Life Protection Act, 1972.
- The survival and multiplication of this species is important to our ecosystem.
- The Indian Peafowl is listed as Least Concern species in the Red List of International Union for Conservation of Nature (Bird Life International 2008), probably owing to its widespread distribution, occurrence of locally abundant semi -feral populations, and protection from people on religious grounds.
- Although the train feathers of the Indian Peafowl are traded for various reasons, it is not included on any Appendix of the Conversation on International Trade of Endangered Species perhaps on the claim that these feathers are naturally fallen ones during annual molt of the species, and also that the scale of trade across international border is still to be understood.

## Ecology and Behavior

- The bird is found in scrub-jungles and forest edges; it shows affinity to moist and dry deciduous and semi-arid biomes. It is also found in agriculture fields, along streams with good vegetation. It generally prefers a habitat mosaic of scrub and open areas, with adequate sites for dust bathing and lekking. The Peafowl was spotted in an agricultural farm, close to the proposed project site.
- Indian peafowl stay in small flocks (harems) of 1 peacock (male) and 3-5 peahens (females).
- Peafowl run more than they fly. The only time they fly is when they have to cross a river or ravine, when trying to escape predators, and to roost up in trees.
- They forage in the early morning and shortly before sunset. In the morning they will bask on rock heaps or haystacks. They retreat to the shade and security of the forest for the hottest part of the day.
- Peafowl physically interact with each other usually during territorial disputes. They will attack each other with their beaks and claws, chasing and pecking at each other.
- Peafowl warn each other when danger approaches with loud, shrieking cries and honks. They also call during mating season.
- They usually roost in the same tree every night. They fly to the top branches of dead trees just a little after sunset and leave just before sunrise.

## Reproduction

- Peafowl reach sexual maturity at approximately 2-3 years of age.
- Indian peafowl males pair with 2 or more females. Courtship displays happen in leks, which are breeding territories in close proximity to others. Females wander through several territories before choosing a male.

- During courtship, the male displays his train by fully fanning and lifting it above his head and performing various body movements. After mating, the male has no other involvement with the female or the chicks.
- Nests are a shallow depression dug in the ground concealed in scrub vegetation.
- Females lay a clutch size of 3-6 eggs. Incubation lasts 28-30 days.
- About 2 hours after hatching, the chicks are able to move around and follow the mother. They stay with her for about 9 months.

**Threats**

- No direct impact on the Peafowl due to the mining activity because of no movement found in the mine site area; it is only found in buffer area in an agriculture field.
- The Indian Peafowl is under threat from various quarters that include the demand for feathers and wild meat, conflict with farmers during cropping season, increased use of chemical fertilizers and pesticides, and habitat degradation.
- Habitat degradation and loss: more significantly from conversion of their habitat to agriculture, habitation and industrial growth, poisoning to counter crop damage, consumption of eggs and fat extracts for alleged medicinal values, and killing for wild meat.

**Conservation Measures**

- Fruit and shade plants should be grown near to the Peafowl habitation like Mango, Amla, Guava, Imli, Banyan, Neem, Pipal, Jack fruit etc.
- Small grooves should be constructed on wasteland in Peafowl habitation area. Grooves are small patches of vegetation that are protected by traditional manner. The grooves should have a fencing of about 7-10 ft high, & provided with one hole for water & food for the bird.
- There is no scarcity of food or habitat to the animal. Preventing poaching will be the single most important factor in the conservation of the species, for which awareness programs should be run frequently.
- A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/ Indian Peafowl conflict mitigation program.

- Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with Indian Pea fowl, hunting and poaching activities.
- Small holes containing water should be constructed in habitation zone of Peafowl and its water quality should be maintained.
- Encourage local farmer to use bio-pesticide, bio-fertilizer and vermi-composting in agriculture practices.
- They are generally protected by religious sentiment and will forage around villages for scraps. The people living in the surrounding area should be rewarded for timely information about disturbing and/or poaching of the bird. The bird has wide range of food items, hence, improvement of and protection of the bird in the buffer zone will provide sufficient food to the animal.

Conservation Status: IUCN Red List, Least concern species. Schedule I Indian Wildlife (Conservation) Act, 1972.

### 3. Sloth bear *(Melursus ursinus)*

The sloth bear *(Melursus ursinus)*, also known as the labiated bear, is a nocturnal insectivorous bear species native to the Indian subcontinent. The Sloth Bear also has a variety of "common" names in the different countries:

- North India and Nepal: Bhalu
- India: Rincch, Reachi, Richwa, Asval, Karadi, Jouni Karadi, Chigu Bunti.

The sloth bear *(Melursus ursinus)* mainly are found in India, Nepal, Bangladesh and Shri Lanka.

Photographs of Sloth Bear

**Common Characteristics**

- The sloth bear has thick shaggy fur that is black to brown colored. Its ears are lined with long fur and it has a long snout, a long tongue, round eyes, and a large nose. Its head resembles a domesticated dog. The area around it's muzzle and eyes are cream colored. The sloth bear has a distinct 'V' or 'U'-shaped pattern displayed on its chest that is white or gold colored.
- At one time this curious species was classified as a sloth. It does have long claws, it is an excellent tree climber, and it moves slowly. However, it is definitely a member of the bear family Ursidae. Its classification is *Melursus ursinus.*
- Common habitats include grasslands, forests, and dense brush lands. They are found in India, Bangladesh, Sri Lanka, Bhutan, and Nepal.

- Their favorite food is termites, other insects, and grubs. In their habitat these are abundant and available all year long. They will also eat leafy plants, fruits, nuts, root vegetables, honey, and rodents.
- Specialized adaptations help them find their food. They have a long muzzle and nostrils that can close at will. Combined with their long tongue and lips they can penetrate termite holes and operate like a powerful vacuum cleaner to suck up the tasty insects.
- They also have long curved claws. They use their claws to detach and uncover vegetation to locate insects and prey. Their claws are larger than most bear species. Long claws are especially useful when looking for insects. They aid in prying off bark, penetrating termite and bee nests, and turning over logs and stones.
- Sloth bears do not hibernate due to their warmer climates and the availability of food sources throughout the year.
- Life span is estimated to be 20 to 30 years in the wild. Precise figures are unknown. Estimates are partially based on those in captivity, which can live to be up to 35 to 40 years old. In the wild many sloth bears succumb to survival hardships and conflicts with mankind.
- Breeding season is dependent on region. In most areas mating takes place during the summer and cubs are born in the spring.
- Litter size is usually 1 to 3. Although there have been rare sightings of up to four cubs being nurtured by a single mother, this is extremely uncommon and an extra challenge for her.
- Cubs stay with their mother for 2 to 3 years and like to hitch a ride on her back.
- Sloth bears like to escape from the heat of the day and forage for food at night. They will start to become active as the sun starts to set. This is also the time when many insects such as termites are more active.
- The sloth bear will use its excellent sense of smell to locate food. It will return to well-known feeding areas and work its way around to find insects, fruits, and other favorite foods. Often a fresh supply of bugs will replenish the ones that were sucked up during a previous raid. The sloth bear will return the next day or so to check for “second helpings”.

**Reason for Conservation**

- IUCN estimates that less than 20,000 sloth bears survive in the wilds of the Indian subcontinent and Sri Lanka. The sloth bear is listed in Schedule I of the Indian Wildlife Protection Act, 1972, which provides for their legal protection.
- The survival and multiplication of this species is important to our ecosystem.

## Ecology and Behavior

- Sloth bears do have predators, notably wild dogs, leopards, tigers and humans, while elephants and rhinos also command respect. When threatened, Sloth bears may flee or make a "bluff" charge, stopping at the last minute and rising up on their hind legs to threaten. The charge rarely ends in a full-on confrontation.
- Like all bears, the Sloth bear prefers to avoid conflict with its own species, with other bear species and with other animals. It will avoid situations where it is likely to put itself in danger, but will fight if it has to, especially if the bear is a female with cubs.
- Although the Sloth bear is an agile climber, in threat situations it is likely to avoid trees as a means of escape, since predators may be lying in wait. Leopards, in particular, pose a danger, since they are also agile climbers.
- On the whole, Sloth bears are non-aggressive towards other bears and any marking behavior would appear to be linked to social spacing rather than acting as a serious warning to other bears.
- A "huffing" sound is used as a warning and a "chuffing" sound is used as a non-aggressive "voice" when the bear is distressed. High intensity threats include roars, squeals and screams.
- Cubs yelp when distressed and a female with cubs uses a grunting "whickering" sound to communicate with them. This can be an alarm contact sound, although it may also be a reassuring communication.
- Sloth bear mothers carry cubs up to 9 months old on their backs instead of sending their cubs up trees as the primary defense against attacks by predators, such as tigers, leopards, and other bears.
- They are capable of climbing on smooth surfaces and hanging upside down like sloths. They are good swimmers, and primarily enter water to play. To mark their territories, sloth bears scrape trees with their forepaws, and rub against them with their flanks.

## Habit & Habitat

- Common sloth bears are found in forests, scrub areas and, during the dry season, grasslands. Sloth bears are mainly found in tropical forests, scrub areas and in grasslands during the dry season. They prefer areas which are remote from human beings.

## Food & Feeding habit

- The Sloth Bear is microphagous, that is to say that it eats ants and termites. Sloth bears are expert hunters of termites, which they locate by smell. On arriving at a mound, they scrape at the structure with their claws till they reach the large combs at the bottom of the galleries, and disperse the soil with violent puffs.

- The termites are then sucked up through the muzzle, producing a sucking sound which can be heard 180 m away. Their sense of smell is strong enough to detect grubs 3 ft below ground. Unlike other bears, they do not congregate in feeding groups.
- They rarely prey on other mammals.
- Sloth bears may supplement their diets with fruit and plant matter; in March and April, they eat the fallen petals of mowha trees and are partial to mangoes, sugar cane, jackfruit, and the pods of the golden shower tree.
- Sloth bears are extremely fond of honey. When feeding their cubs, sows are reported to regurgitate a mixture of half-digested jack fruit, wood apples, and pieces of honeycomb. This sticky substance hardens into a dark yellow, circular, bread-like mass which is fed to the cubs. This "bear's bread" is considered a delicacy by some of India's natives.
- The short hair on the muzzle is thought to be an adaptation to help the bear deal with the unpleasant excretions made by the termites. Long hair or fur on the muzzle would make this difficult. The bear's ability to close its nostrils protects the animal from inhaling dust, dirt and angry termites.
- The missing incisor teeth, together with the mobile lips and long tongue, make the ingestion process easy. The bear's strong claws not only smash open termite mounds, but are useful in tearing logs apart and act as digging tools when the bear is looking for food.
- The Sloth Bear may travel distances of around 10–15km every night in search of food. The bears usually feed at night, though may also be seen foraging during daylight hours.
- A female with cubs will eat during the day to avoid night-time predators such as the leopard.
- Although specially adapted to fee on ants, termites and other insects, the Sloth Bear needs a more varied diet.

**Reproduction**

- The breeding season for sloth bears varies according to location: in India, they mate in April, May, and June, and give birth in December and early January. Sows gestate for 210 days, and typically give birth in caves or in shelters under boulders. Litters usually consist of one or two cubs, or rarely three.
- Courtship is brief and is marked by play-fighting and hugging, while mating is a noisy affair.
- During the breeding season, groups of three or four males may be found near receptive females and all may breed, apparently in rank order. Females begin to breed when they reach four years of age. After a pregnancy of 5 – 7 months, the cubs are born in a den.
- Cubs are born blind, and open their eyes after four weeks. Sloth bear cubs develop quickly compared to most other bear species: they start walking a month after birth, become independent at 24-36 months and become sexually mature at the age of three years.

- Young cubs ride on their mother's back when she walks, runs, or climbs trees until they reach a third of her size. Individual riding positions are maintained by cubs through fighting. Intervals between litters can last two to three years.
- The mother bear suckles her young and may not leave them to get food for herself in the early days after the birth. When she does leave them, she stays near to the den and is only absent for very brief periods.
- The cubs vary in how quickly they achieve independence, but generally stay with their mother for at least two years and more often for two and a half years, learning from her the skills they need to survive.
- As a result, the mother bear can only reproduce every two to three years. The female raises her cubs by herself, as the male leaves after mating.

**Threats**

- Threats against the sloth bear include loss of habitat, destroyed termite and ant nests due to various development projects, widespread poaching, and persecution from crop farmers.
- Sloth bear cubs are often snatched from the wild and become unwilling victims as dancing bears.
- Sloth Bears are completely protected under Schedule 1 of the Indian Wildlife Protection Act of 1972, amended in 1986.
- The bears cannot be hunted, but can be killed in self-defense or in special circumstances where they have caused damage.

**Conservation Measures**

- All appropriate landowners within these protection boundaries should be identified. Each should be contacted in the manner that will ensure co-operation. Land owners should be made aware of the sensitivity of this species and of the value of maintain natural habitat. They should be made aware of the available conservation options.
- A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/ sloth bear conflict mitigation program.
- Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with sloth bear, hunting and poaching activities.

- Training program would be conducted to conservation expert team and local people for safe handling of this mammal.
- Small holes containing water should be constructed in habitation zone of sloth bear and its water quality should be maintained.
- It is critical that urgent efforts are made to understand the habitat and population status of the species through field based research and in situ consecration projects.

**Conservation Status**

**CITES APPENDIX :** I: Indian Wildlife (Conservation) Act, 1972 (As amended up to 2002): Scheduled I; Part I; Indian Red Data Book (IUCN 1994): Not Listed; IUCN (1998) (Proposed; Vulnerable (National) and Data Deficient (Global); IUCN (2002) (Proposed): Vulnerable (Global) based on Version 2.3 1994 (IUCN, 2003). According to Alfred et al Considering the nature and degree of threats and treads reported, it is strongly recommended to include sloth bear in one of the endangered categories of IUCN. They are particularly vulnerable to loss of habitat because of their reliance on lowland areas, which tend to be the places most readily used by people. Poaching and trade in sloth bears or their parts is also common in many parts of their range.

## 4. Elephant *(Elephas maximus)*

**Presence/Movement of Elephant in the area**

The forest of the Central province inhabited elephants in olden times. During Mughal times, the Jungles of Surguja District were the main source for supply of elephants to Mughal army. Latter accounts of the presence of elephants in Chhattisgarh are described in a travelogue "Highlands of central India" Written by Captain Forsyth. He has described the movements of elephants from Amarkantak plateau up to Udaipur forest areas. He himself has seen herds of elephants in the jungles of Pendra, Belgahaha, Ratanpur, Matin, Lafagarh, Korba and Tara forests. We do not find any evidence of the presence of elephants in Chhattisgarh from the start of twentieth century.

Actually during 1980's, due to construction of Betla dam in Jharkhand, the elephants living there, were disturbed and their herd got split into many smaller herds. One of the herd migrated towards Odisha and few of the elephants first entered Jashpur-Nagar Division and by 2000 they had spread over Korba and Surguja Districts. The first elephants in these areas were seen in 2001.

In fact scarcity of water, cover and food is forcing the elephants towards many districts of Chhattisgarh. At present these elephant herds are not following any definite route for habitat exploration but keep on roaming in search of better habitat. As per available reports. In the last two to three years the elephant herds were seen in the Kawardha Forest Division. They visit the said area by the following route- from Achanakmar Tiger Reserve to Mungeli to Kawardha Range Taregaon and Pandaria to Phen Wildlife Sanctuary to Kanha National Park and return following the same route.

## Conservation

Following are some key points in the conservation of elephants:

1. Require 150-250 kg of plant food every day, with preference for grasses..
2. Evolved to a large size, with black colour. The black colour absorbs more heat.
3. Lack sweat gland to dissipate the body heat, hence, require a shade in sunny days, or require frequent cooling through wallowing or spreading water over the body.
4. Have very poor visibility particularly during night. Their eyes do not shine in the night, because of reduced number of cones, unlike the canines like tiger, leopard and even bovid like the cow.
5. A good source of water is required also for drinking.
6. Frequent dusting of the body or mud cover over the body is required to protect the body from the biting insects.
7. Change in cropping pattern by introducing crops disliked by elephant or the plants which act as elephant repellent (e.g. Patchouli, (Pachouli) *Helignthus annus* (Sunflower) *Capsicum annum* (Chilli) *Sesamum indicum* (Til) and *Citrus* should be promoted.

## Habitat

Elephants are generalists, but use mainly scrub forest. They can be found in the jungle, but generally on the edge where open, grassy areas are accessible. They prefer areas that combine grass, low woody plants, and forest. Elephants rarely forage in one area for more than a few days in a row. In general, food, water and shade are the three basic resources that can be expected to influence the movement of the elephant (Sukumar et al, 2003). Their Home range ranges from 30-600 km.

## Elephant a part of the ecosystem

### Keystone Species

Elephants are described by ecologist as a “keystone” species. Keystone species are those animal species which are used to indicate the general condition of the habitat.

The elephant being a huge animal, not only requires large quantities of food, but also good and nutritious food. If elephants are living in a particular habitat, it would indicate the availability of a diverse and nutritious range of plant species. This would be a suitable condition for many smaller herbivores also. A large herbivore population would support a healthy carnivore population also. And show the elephant is a good indicator of the health of the habitat. A habitat that is good for elephants is considered good for many other herbivores and also carnivores such as tigers.

## Food

Elephants eat a wide variety of species of vegetation. They are herbivore, folivore and lignivore. More than 100-130 different species of plants may be eaten They prefer grasses, but they also consume bark, roots, leaves, wood, stems and leaves of trees, vines, shrubs, tubers, bamboo and barn, An average day's intake is 150-200 kg of wet vegetation. The proportions of the different plant types in their diet vary depending upon the habitat and season. Annual diet has been found to be dominated by grass. Maximum straying distance covered by the raiding elephant has been recorded up to 5.5 km.

## An appetite for salt

Elephants have a strong liking for salts and minerals. To fulfill their needs elephants, sample all sorts of substances. And in this process, if they come across something that satisfies their need, they eat it, and remember its location to return to it in future. Elephants also consume soil which is rich in minerals. As rain forests soil and plants are particularly deficient in minerals such as sodium that the elephants need, elephants in these regions are found to return to these “salt licks”. Salt licks are salt rich rocks or small patches of earth which are rich in minerals. Although elephants visit salt licks quite often, they cannot lick salt like other animals do, as their tongues are not long enough to reach around their trunks and tusks. So, elephants dig up the soil or rock with their trunks and then pick it up with their trunk tips. After this they use their molar to grind the salt and then finally swallow it. Elephants can eat such clods of salt at the rate of 23 Kg in an hour.

## Time-activity budget of elephants

Generally, they are active almost throughout the day during rainy and winter months, but during summer months they are active only in the morning and evening hours. They become active well before dawn and start their morning activities in the vicinity of the area where they spent night.

Evening hour is the time for drinking and bathing especially during summers. In summer season percentage of movement is more due to lack of fodder species and shrinkage of natural water sources.

## Food plants

Following is a list of plants reported as food by different workers. However, only the names of plants, local to the area, have been taken and the local names have been changed. Part of the plant eaten may be different for the different species.

| S.No. | Botanical Name | Local Name | S.No. | Botanical Name | Local Name |
|---|---|---|---|---|---|
| 1 | *Acacia catechu* | Khair | 33 | *Helicteresisora* | Ainthi |
| 2 | *Acacia nilotica* | Babool | 34 | *Holarrhena antidysenterica* | Korea |
| 3 | *Aegle marmelos* | Bel | 35 | *Ipomoea spp.* | Karmata |
| 4 | *Albizzia lebbek* | Kalasiris | 36 | *Imperata arundinacea* | Ulu |
| 5 | *Bambusa arundinacea* | Bans | 37 | *Kydia calycina* | BarangalPula |
| 6 | *Albizzia procera* | Safed sins | 38 | *Lagerstroemia parvflora* | SenhalS idha |
| 7 | *Bauhinia variegata* | Kachnar | 39 | *Limonia acidissima* | Kaith |
| 8 | *Bauhinia vahlii* | Mahul | 40 | *Mallow philippinensis* | Sinduri/Rohini |
| 9 | *Bauhinia malabarica* | Khatua | 41 | *Mimosa pudica* | Lajwanti |
| 10 | *Bombax ceiba* | Semal | 42 | *Mitragyna parvfolia* | Mudhi |
| 11 | *Brachiaria sp.* | Ghas | 43 | *Musa paradisiaca* | Banana |
| 12 | *Bridelia retusa* | Kasai | 44 | *Neyraudia arundinacea* | Bichhloo |
| 13 | *Careya arborea* | Kumhi | 45 | *Oryzasativa* | Dhan |
| 14 | *Cordia myxa* | Lassora | 46 | *Ougeinia oojeinensis* | Tinsa |
| 15 | *Cymbopogon fiexuosus* | Ghas | 47 | *Phoenix humilis* | Buta Chhind |
| 16 | *Cynodon dactylon* | Doob Grass | 48 | *Pithecellobium dulce* | Jangal Jalebi |
| 17 | *Dalbergia sissoo* | Shisham | 49 | *Randia dumetorium* | Mainphal |
| 18 | *Dendrocalamus strictus* | Bans I Bamboo | 50 | *Saccharum munja* | Kandi-khar |
| 19 | *Desmossachya bipinnata* | Urai/Khus | 51 | *Saccharum officinarum* | Ganna |
| 20 | *Eleusine s.* | Ghas | 52 | *Saccharum spontaneum* | Kans |
| 21 | *Emblica officinalis* | Amla | 53 | *Sansevieria sp.* | Sisal |
| 22 | *Eucalyptus spp* | Nilgiri | 54 | *Schleichera oleosa* | Kosam/Kusum |
| 23 | *Eulaliopsis binata* | Bagai Ghas | 55 | *Shorea robusta* | Sarai/Sal |
| 24 | *Feronia elephantum* | Kaith | 56 | *Syzygium cumini* | Jamun |
| 25 | *Ficus bengalensis* | Bargad/Bar | 57 | *Tamarindus indica* | Amli / Imli |
| 26 | *Ficus giomerata* | Dumar/Gular | 58 | *Terminalia tomentosa* | Saja |
| 27 | *Ficus religiosa* | Pipal | 59 | *Tectona grandis* | Sagaun/Teak |
| 28 | *Ficus rumphii* | Dufanga-hesa | 60 | *Tinospora cordfolia* | Giloe/Gurch |
| 29 | *Ficus infectoria* | Pakar | 61 | *Thysanolaena agrostis* | Hathi ghas / Pirlu |
| 30 | *Flacourtja indica* | Kanda | 62 | *Zizyphus mauritiana* | Bhander |
| 31 | *Garuga pinnata* | Kekad | 63 | *Zizyphus xylopyra* | Ghont |
| 32 | *Grewia elastica* | Dhaman | | | |

*Saccharum spontaneum, Thysanolaena maxima* and fruit parts of *Dillenia indica*, are some of the other species recorded to be preferred by elephants. Some other food plants have been reported by the villagers of elephant moving areas of Chhattisgarh state. The list includes

1. *Saccharurn officinarurn*
2. *Musa paradisica* (Kela)
3. *Oyza saliva* (Rice)
4. *Dendrocalamus strictus* (Bamboo)
5. *Ficus benghalensis* (Bargad)
6. *Ficus religiosa* (Peepal)
7. *Artocarpus heterophyllus* (Kathal)
8. *Miliusa velutina* (Bhilwa)
9. *Pterocarpus marsupium* (Bija)
10. *Zea mays* (Maka)
11. *Phoenix sylvestris* (Chhind)
12. *Phoenix acaulis* (Buta chhind)
13. *Buchanania lanzan* (Char)
14. *Goruga pinnata* (Kekad)
15. *Carica papya* (Papita)

Some of the elephants develop fascination for country made alcoholic drinks called Handia.

## Threats

The pre-eminent threats to the Asian elephant today are habitat loss, degradation, agriculture and farming, grazing, mining, human interference, trade, pollution, hunting for ivory-insurgency, corridor loss, anthropogenic pressures on the habitat, man-elephant conflict, forest fires, illegal captures of live animals etc. Poisoning and disease are some other threats to the animal.

## Causes of Human-Elephant Conflict

No single factor is responsible for conflict between human and elephants. The main factors leading to conflicts are :

1. **Reduction and fragmentation of habitat:**
   The elephant's habitat has been replaced by agricultural fields, monoculture plantations, roads, rail-tracks, mines, factories and irrigation projects that come up in these areas and across elephant migration roots. This has thus fragmented the elephant habitat and also shrunk its size. So elephants in these areas come more frequently in contact with fields and humans, thereby resulting in conflicts.

2. **Grazing**

   Cattle grazing in forest has also emerged as a major threat. This not only deprives the elephant and other wild herbivores of graze, but also spread various diseases. It also creates a scarcity of fodder, results in elephants spending less time in the forests than they usually would, inclined them to more towards fields.

3. **Lure of Crops**

   Elephants eat large quantity of food. Agricultural crops provide substantial quantity of nutritious fodder with minimal effort. This has often lured elephants to more to crop fields. Even though there might be enough fodder in the forest.

4. **Disturbances**

   There are some activities by human beings and other animals that disturb elephants. Grazing by animals and firewood cutting, leading to loss of fodder might create adverse conditions for elephants. Also, at times buffaloes urinate and wallow in elephant pools and make them unfit for elephants to drink from. These disturbances at times makes elephants, particularly groups, avoid an area.

5. **Competition for Water**

   In many parts of the country, it is seen that at night elephants' drinks water from village ponds and irrigation reservoirs and during the periods of water scarcity they turn to water from agricultural land.

6. **Poaching**

   Poaching of elephants has been a wide spread phenomenon in many Asian countries. In India, poaching has always been a factor affecting the survival of the elephants, although historically it has been either sporadic or of low intensity in most parts of the country. However, poaching is today a serious concern, especially in many reserves of South-India.

7. **The Lure of Ivory**

   Among Asian elephants, only male elephants (and not all of them) have tusks, and hence the males are selectively targeted by poachers. This selective poaching of male elephants for their tusks has led to many males being killed, which in turn has led to skewed sex ratio in the population and loss of most big males with tusks.

## Conservation status

CITES APPENDIX: 1; Indian Wildlife (Protection) Act (1972) (As amended up to 2009); Scheduled- 1; Part-I; Indian Red Data Book (IUCN, 1994); Vulnerable; (IUCN 1998) (Proposed); Vulnerable (National) and data deficient (Global); IUCN (2002) (Proposed); Endangered (Global) based on version 2.3 1994 (IUCN, 2003).

## Conservation of the elephants in the buffer zone of Mukam Bauxite Mines Lease Area (CMDC)

Habitat destruction by man has threatened the survival of the Asian Elephant Therefore, maintenance of the habitat is the first requirement in the conservation of the elephants. If proper habitat is absent or is below the desirable standard, then it may be developed. Elephants require, simultaneously, two types of habitats:

a. Dense forest with tall trees and

b. Scrub jungle and grasslands

Dense forest is required as refuge and protection from intense sun rays. While scrub and grasslands are required as a better feeding area. Tall trees are not a good source of food because their foliage and tender twigs are beyond the reach of elephant's trunk. It is only the fallen fruit and bark of such trees which can be eaten. It is generally difficult to peel off the bark from trees. In a scrub or a grassland, it is easy to feed. The food item may be foliage, tender shoot, entire plant or even the root, all are within their easy reach.

With respect to the area, there are two options for the conservation of the elephants:

- Restrict the elephants in a defined area
- Develop a corridor for long, may be interstate, migration route.

Photograph of Mahua *(Madhuca indica)*

Photograph of Harra *(Terminalia chebula)*

Development of a corridor far beyond the industrial area will be the best choice for the conservation of the species. The corridor, to be developed, must have both the dense forest with tall trees as well as shrubby areas. Now it depends upon the condition of the area to decide that the shrubby areas should be forming outer fringe to the tall tree area or should be in the middle or should be in patches in between the tall trees. The corridor belt should be of sufficient width and should be planned either away from the village settlements or the isolated houses near to their path should be shifted. Elephants require 150-200kg of food per head, per day. Habitat planning should include provisions to yield sufficient food. It is important now to decide about the plant species. The food plants should be of more liking type to the elephants. To keep the food plants within easy reach of the elephants, regular planting of new plants or pruning to stimulate coppicing, should be made. Some of the food plant species suggested to be planted in the area are :

- *Dendrocalamus strictus* (Bans)
- *Bambusa arundinacea* (Bans)
- *Ficus religiosa* (peepal)
- *Ficus rumphii* (Jangali Bargad)
- *Artocarpus heterophyllus* (Kathal)
- *Plerocarpus marsupium* (Bija)
- *Phoenix acaulis* (Buta chhind)
- *Feronia elephantum* (Kaith)
- *Thysanolaena agrostis* (Hathi ghas)
- *Themeda quadrivalvis* (Ghas)
- *Bothriochloa per/usa* (Ghas)
- *D. Rhedhii* (Bans)
- *Ficus benghalensis* (Bargad)
- *Ficus gloinerata* (Gular)
- *Ficus infectoria* (Pakar)
- *Miliusa velutina* (Bhilwa)
- *Phoenix sylvestris* (Chhind)
- *Buchanania lanzan* (Char)
- *Goruga pinnata* (Kekad)
- *Cymbopogon flexuosus* (Ghas)
- *Iseilema laxum* (Ghas)
- *Api uda mulica* (Ghas) etc.

Bamboos (*Dendrocalamus strictus, Bambusa arundinacea*) are one group of fast growing plants which can form a good proportion of diet to the elephants. Another bamboo species *Dendrocalamus rhedii* will be an exotic species to the area but is common in Western Ghats. It has a thin stem. Elephants have special liking for the bamboo plant and it is easy to grow the plant in sufficient quantity in short time. However, it is not a species which can create any problem. The villagers in buffer area have informed that the elephants have special liking for *Buchanania lanzan*. The saplings of the plant are uprooted and the root thrashed clean and eaten. With the vegetation, it is essential to develop perennial sources of water with some salt ponds, within the conservation area.

With the above following more steps should be taken for the conservation of this flagship species:

(i) Forest officers should be trained in Wildlife management.

(ii) Frequent use of fireworks should be avoided. This may lead to develop immunity in elephants against the fireworks.

(iii) Conflict with human is a major conservation problem, hence, should be reduced to the lowest possible level.

(iv) Anti-poaching efforts should be strengthened.

(v) Awareness programs should be run frequently.

(vi) Interstate committee of Chhattisgarh, Jharkhand and Orissa Govts. should be constituted for elephants.

**Mitigation of Human-Elephant Conflicts:**

Loss of crop, properties, injuries and lives should be compensated as early as possible.

Compensation should be made immediately and should be replenished from the Govt. fund, received for the purpose. Vehicles equipped with syron, elephant torch and mobile oil should be provided to the area.

**Some suggestions to escape elephant damage:**

**Methods adopted to escape elephant damage may be categorized as i) Active and ii) Passive methods :**

**I. Active methods**

a) Noise-making like shouting, drum beating, bursting fire crackers, firing gun shots into the air (by forest officials only)

b) Using elephant torch light

c) Pelting stones and lighted fuel-woods.
d) Loudspeaker broadcasting of tiger roaring sound

However, the major drawback of using all these methods is that these may provoke the raiding elephants increasing the possibility of more damage to the crops and other properties as well as higher risk to the farmer's life. Further, If the active methods fail to be effective, singly, then combined effort should be made.

**ii. Passive methods**

a) Change in cropping pattern by introducing some elephant repellent alternative cash crops (e.g. Patchouli, *Helianthus annus, Capsicum annum* and *Citrus*).
b) Digging trenches around village area.
c) Planting sisal (*Agave americana*) around village boundary.
d) Solar fencing.
e) Improvement of water sources.
f) Raise/improve fodder resources.
g) Bee Keeping.

Fencing houses with GI wires. Elephants avoid shining objects. GI wires are cheapest, shining objects to distract the elephants. Barbed wire fencing is gradually proving ineffective in preventing the movement of elephants. In the buffer zone of the industrial area also the elephant has broken a barbed wire fencing and entered a nursery.

Crops of elephant liking should be avoided, as far as possible. Some of the crops, listed above, should be used to replace the more traditional crops like the sugarcane and rice. In Karnataka elephant proof trenches are being dig around the village area, but I have observed in Sarguja district in Chhattisgarh state that the elephants can move down and up in trenches of good depth. Sisal has been found to be good to prevent the elephants to cross the sisal planted area. The plant yields a good quality fiber. Electric/Solar fencing has also been suggested as one of the methods but in Assam it has been found to be a failure as the elephant have discovered techniques to break such fences, safely. In areas like Kamakshya Nagar in Dhenkanal division in Orissa improvement of fodder resources in the forest has shown promising result of restricting the elephants more in the forest area.

Passive methods are always better to avoid man-elephant conflicts. More important are the selection of plants as alternative crop as well as plants to check the entry of elephants in to the settlement areas.

**Following steps are taken in Africa to escape elephant damage -**

- Elephant area is fenced with ropes. Fencing ropes are smeared with a mixture of chili + tobacco powder in engine oil. Disagreeable smell of the mixture helps to some extent, to ward off the elephants.
- Honey bee combs are promoted on the elephant corridor boundary. Honey bees ward off the elephants.
- Electronic tracking devices are attached to the elephants to track their movements. This helps in timely information to the villagers.

**(iii) Long Termed Measure -**

(a) Constitution of a "Task-force" at divisional level which should include local representatives, journalists, honorary wildlife wardens and at least one or two members from elephant affected village. It will be presided by local MLA and in his absence by another local representative. Divisional Forest Officer will be the member secretary. The recommendations or suggestions of the Task Force will be sent to Chief Wildlife Warden for necessary action.

(b) Identification and listing of elephant affected areas.

(c) Establishment of "Elephant Control Room" at divisional level, “Elephant Protection Team" at range level and “Elephant Friend Group (Hathi Mitra Samooh) at concerned village level.

(d) Creating "Public Awareness" with adequate “Propaganda" and to ensure 'People's participation'.

(e) Ensure at district level, speedy electrification of elephant affected villages, and provision of at least two vapor lights in the electrified villages.

(f) At departmental level ensure

- Digging of elephant proof trench around villages.
- Raising plantation of non-palatable species like Ratanjot, Mehandi, Sisal, Eucalyptus, Karanj etc. between forests and village.
- Propagate through agriculture department change in crop cycle and encourage villages to grow crops like sun flowers, chili til, citrus etc which are elephant repellant.

(g) Recommend and ensure the villagers –

- To construct under ground permanent storage (Kothi) for paddy- (provide subsidy for it).
- Not to brew liquor in or near about the village or to keep it in houses.
- To stall feed the cattle
- To have doors on both front and back sides.
- Not to leave paddy in barn after thrashing and to store it in permanent kothi- (which should not be adjoining the outer wall)-, as soon as possible.

**(iv) Emergency Measures**

(a) Store in villages that are susceptible to elephant menace.

- 100 old tyres
- For "Mashal" burnt old mobile oil, kerosene, torn gunny bags, binding wire etc.
- Two high beam torches

(b) When elephant group is in vicinity of 15 km's, alert the villagers.

(c) Ensure the Range Elephant Protection Force reaches the village and forms group of villagers for night patrolling.

(d) Elephant Protection Force to keep watch on morning and evening movement of the elephant herd and alert villagers likely to be visited by the herd.

(e) Ask and ensure the villagers -

- To maintain distance from elephants and not to harass them or irritate them while resting.
- if herd moves towards the village or houses to create dense smoke of chili keeping in view the wind direction and to create sharp and loud sounds with drums, dhol, tin etc so as to scare away the herd. Crackers can also be used.
- It available roaring sound of the tiger to be relayed.
- To keep elders, children and ladies in safe places.
- Not to sleep in barns alone and if staying in group, to keep fire burning throughout the night.
- To create buffer belt around paddy fields Depending or choice and marketability, following spp. can be raised in 100-meter-wide buffer belt around paddy fields and other crops to douse the smell and the view-Sunflower, ginger, turmeric, arrowroot, amorpholus, onion, garlic, chilly, ridge gourd, bitter gourd, snake gourd, arhar, tobacco, tapioca, calocacia, marigold, roses, tube roses, kalmegh, ashwagandha.

A good number of researches and suggestions on the conservation and reducing its conflicts with human being is going on, resulting in suggestions coming frequently on these aspects. Thus the presently prepared report is not the final. With the above, some more, methods are being suggested for buffer zone industrial area.

- **Two doors in a house :** Most of the houses in villages have only one door or exit. In case the elephant enters the house through the door, the occupants can escape through another door.
- **Timely information :** Timely information to the helping person about the approach of elephants can reduce the conflicts as well as loss of human life. For this a network should be formed with the villages and the forest officers.
- **Elephant torch :** The elephant torch should be provided to each of the vulnerable villages. Presently the torch is only with the forest officer, one torch for several villages.

## *5. Python molursus* (Indian Python)

### Depiction of the Species

The Indian Python *(Python molurus)* are large, heavy-bodied non-venomous snakes that kill their prey by constriction. The species is widely distributed throughout the Indian Subcontinent and east to the Malay Peninsula and western Indonesia. Normally Python is a jungle dweller reptile, occurring in dense as well as in open forests, with rocky outcrops. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, and dense water reeds.

### Reason for Conservation

*Python molurus* (Indian Python) is protected under Schedule- I {Part- II (14-A)} of the Indian Wildlife Protection Act, 1972. This species does not fall in any category of IUCN Red List.

Classification of the Species

| | |
|---|---|
| Kingdom | Animalia |
| Phylum | Chordata |
| Class | Reptelia |
| Order | Squamata |
| Sub- order | Serpentes |
| Family | Pythoniade |
| Genus | Python |
| Species | Python molurus |

### Methodology

Survey of the site, Secondary data collection and identification of the place of habitation, were the first few steps followed.

**The survey was carried out in the three steps :**

i. Collection of available area specific secondary information by perusal of literature.
ii. Mapping of land cover/forest and other related parameters.
iii. The entire Core and buffer was surveyed, both by rapid and intensive protocols.

Indian Python habitation area survey was carried out using well accepted scientific method like plots, point count, area search, field perambulation, opportunistic survey in addition to line, belt and vehicle transect.

**Equipment used :** A Sony Telephoto Shooting Camera of 50x optical zoom for Tele- photography, Binocular for safe distance sighting, measuring tape for size measurement, Stick for safe catching, Rope/Adhesive tape for mouth sealing, GPS for Coordinates, Compass for direction measurement, Field guide etc.

**Observations**

Normally Python is a jungle dweller reptile, occurring in dense as well as in open forests, with rocky outcrops. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, and dense water reeds. During survey, the movement of python was confirmed from locals in forest area and around water bodies in buffer area.

**Breeding**

Matting occurs during the cold season in December, January and February, when python is in hibernation, and eggs varying in number from 8 to 100 are laid 3 to 4 months later in the hot weather months from March to June. Eggs measure 12 - 86 cm and are soft, white in color and equally domed at both poles. The female broods the eggs by coiling around them. The mother takes no further interest in her brood after hatching, which occurs 58 days after laying. Females living alone in captivity often lay sterile eggs. Python are long lived, and have lived in captivity for over 22 years. Growth is a continuing process through at a slow rate.

**Feeding Habit**

Feed on mammals, birds and reptiles indiscriminately, but seems to prefer mammals. Python which lie up in Dam and other waterlogged areas have little difficulty in capturing prey. Largely water birds and animals which are live near water or come to drink. They also lie in wait near jungle trails. Heronries, nesting colonies and large birds' roosts usually have attendant python which take their toll at night. Python preying on roosting flying foxes has been reported.

**Threats**

i. Python is tertiary consumer which depends on primary & consumers and therefore it occupies fourth trophic level of ecological pyramid.
ii. Any changes in habitat of python in the forest area are likely to affect this species.
iii. Habitat destruction due to conversion of forest land into agriculture field, human interference in forest areas, over grazing by domestic cattle, cutting of trees for fodder, wood and fuel.
iv. Pollution due to Industrial and agriculture activities has a direct influence on the survival of Python in its habitation in terms of environment pollution, inorganic pesticide & fertilizers usages in cultivation.
v. Illegal hunting and poaching of Python for traditional medicine and to a lesser extent for their skins contributes to the loss of animals in the reproductive size class.
vi. Human- Python Conflict- The people generally kill the python when it is entered the habitation of people due to lack of awareness in local people about python. The illiterate people do not know that this is nonpoisonous snake.
vii. Although these threats are believed to be causing an alarming decline in population, the magnitude and pattern of the effects in the study area is yet to be quantified.

**Conservation Measures for Python**

i. Probable habitat boundaries need to determine for all areas that are likely to possess viable populations so that protection measures can be initiated.

ii. All appropriate landowners within these protection boundaries will be identified. Each will be contacted in the manner that will ensure cooperation. Land owners will be made aware of the sensitivity of the endangered python and of the value of maintain natural habitat. They will be made aware of the available conservation options.

iii. Development of Den, Burrows and planting where required for habitat improvement.

iv. Soil and Water conservation practices is being done.

v. A programme of regular, systematic monitoring of known Python population is essential. Nesting and basking sites will be identified, mapped and census technique needs to be refined and standardized so that they are scientifically credible. Initially this will be carried out in forest areas.

vi. All Forest Areas that Python require protection from illegal activities that threaten Python in particular-especially netting, disturbance at nesting and basking spots and killing of prey species. Adequate protection will be afforded to Python burrows especially from livestock.

vii. A conservation awareness program that involves local people in the conservation of python is vital to ensure long-term success of any management plan. Plans will be included educational materials, signs, organizing plays, poster display and instill pride amongst the locals as caretakers of the last populations of python in their habitation. There is an equally compelling need for a concerted human/python conflict mitigation program.

viii. Public awareness is an important priority within the scope of overall management plans for the species. Public awareness often yields new locality information and could reduce the frequency with which python are killed.

ix. Fencing will be made around python nesting and burrows area to ensure any interference.

x. Poaching and hunting of Python will be continuous monitor and take action against it according to Wildlife Protection Act, 1972. Aware local people and built effective information system against hunting and poaching activities.

xi. GPS system will be used with cooperation of forest department for monitoring of python movement in 10 km radius study area that will be benefited for census record updating.

xii. Habitation of python will be developed and maintained in ecological manners such as sufficient availability of prey for python.

xiii. Effective communication network will be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with python, hunting and poaching activities.

xiv. Training programme will be conducted to conservation expert team and local people for safe handling of python.

Photographs of Indian Python

## *6. Panthera tigris tigris* (Bengal tiger)

The Bengal tiger is a population of the *Panthera tigris* subspecies. It ranks among the biggest wild cats alive today. It is considered to belong to the world's charismatic megafauna.

The tiger is estimated to have been present in the Indian subcontinent since the Late Pleistocene, for about 12,000 to 16,500 years. Today, it is threatened by poaching, loss and fragmentation of habitat, and was estimated at comprising fewer than 2,500 wild individuals by 2011. None of the Tiger Conservation Landscapes within its range is considered large enough to support an effective population of more than 250 adult individuals.

### Characteristics

The Bengal tiger's coat is yellow to light orange, with stripes ranging from dark brown to black; the belly and the interior parts of the limbs are white, and the tail is orange with black rings. The white tiger is a recessive mutant, which is reported in the wild from time to time in Assam, Bengal, Bihar, and especially in the former State of Rewa. However, it is not an occurrence of albinism. In fact, there is only one fully authenticated case of a true albino tiger, and none of black tigers, with the possible exception of one dead specimen examined in Chittagong in 1846. Fourteen Bengal tiger skins in the collection of the Natural History Museum, London have 21–29 stripes.

### Body weight and size

Males and female Bengal tigers in Panna Tiger Reserve reach a head-to-body length of 183-211 cm and 164-193 cm respectively, including a tail of 85-110 cm long. Total length ranges from 283 to 311 cm for male tigers and 255-285 cm for female tigers. They typically range 90–110 cm in height at the shoulders. Subadult males weigh between 130 and 170 kg and reach 200 to 260 kg when adult; subadult females weigh 80 to 100 kg and reach between 110 and 180 kg when adult.

### Distribution and habitat

In the 20th century, Indian censuses of wild tigers relied on the individual identification of footprints known as pug marks – a method that has been criticised as deficient and inaccurate. Camera traps are now being used in many sites. Good tiger habitats in subtropical and temperate forests include the Tiger Conservation Units (TCUs) Manas-Namdapha. TCUs in tropical dry forest include Hazaribag Wildlife Sanctuary, Nagarjunsagar-Srisailam Tiger Reserve, Kanha-Indravati corridor, Orissa dry forests, Panna National Park, Melghat Tiger Reserve and Ratapani Tiger Reserve. The TCUs in tropical moist deciduous forest are probably some of the most productive habitats for tigers and their prey, and include Kaziranga-Meghalaya, Kanha-Pench, Simlipal and Indravati Tiger Reserves. The TCUs in tropical moist evergreen forests

represent the less common tiger habitats, being largely limited to the upland areas and wetter parts of the Western Ghats, and include the tiger reserves of Periyar, Kalakad-Mundathurai, Bandipur and Parambikulam Wildlife Sanctuary. During a tiger census in 2008, camera trap and sign surveys using GIS were employed to estimate site-specific densities of tiger, co-predators and prey. Based on the result of these surveys, the total tiger population was estimated at 1,411 individuals ranging from 1,165 to 1,657 adult and sub-adult tigers of more than 1.5 years of age. As of 2014, the Indian tiger population was estimated to range over an area of 89,164 km2 (34,426 sq mi) and number 2,226 adult and subadult tigers older than one year. About 585 tigers were present in the Western Ghats, where Radhanagari and Sahyadri Tiger Reserves were newly established. The largest population resided in Corbett Tiger Reserve with about 215 tigers. The Central Indian tiger population is fragmented and depends on wildlife corridors that facilitate connectivity between protected areas. By 2018, the population had increased to an estimated 2,603–3,346 individuals. The tigers in the Sundarbans in India and Bangladesh are the only ones in the world inhabiting mangrove forests. The population in the Indian Sundarbans was estimated as 86–90 individuals in 2018.

**Ecology and behaviour**

The basic social unit of the tiger is composed of a female and her offspring. Adult animals congregate only temporarily when special conditions permit, such as plentiful supplies of food. Otherwise, they lead solitary lives, hunting individually for the forest and grassland animals upon which they prey. Resident adults of either sex maintain home ranges, confining their movements to definite habitats within which they satisfy their needs and those of their cubs, which include prey, water and shelter. In this site, they also maintain contact with other tigers, especially those of the opposite sex. Those sharing the same ground are well aware of each other's movements and activities. The home ranges occupied by adult male residents tend to be mutually exclusive, even though one of these residents may tolerate a transient or sub-adult male at least for a time. A male tiger keeps a large territory in order to include the home ranges of several females within its bounds, so that he may maintain mating rights with them. Spacing among females is less complete. Typically there is partial overlap with neighbouring female residents. They tend to have core areas, which are more exclusive, at least for most of the time. Home ranges of both males and females are not stable. The shift or alteration of a home range by one animal is correlated with a shift of another. Shifts from less suitable habitat to better ones are made by animals that are already resident. New animals become residents only as vacancies occur when a former resident moves out or dies. There are more places for resident females than for resident males.

**Hunting and diet**

The tiger is a carnivore and prefers hunting large ungulates such as gaur, sambar, chital, barasingha, water buffalo, nilgai, serow and takin. Medium-sized prey includes wild boar, Indian hog deer, Indian muntjac and northern plains gray langur. Small prey such as porcupine, hare and peafowl form a small part of its diet. Because of the encroachment of humans into tiger habitat, it also preys on domestic livestock.

Bengal tigers occasionally hunt and kill predators such as Indian leopard, mugger crocodile, Asian black bear, sloth bear and dhole. They generally do not attack adult Indian elephant and Indian rhinoceros, but such extraordinarily rare events have been recorded. In Kaziranga National Park, tigers killed 20 rhinoceros in 2007. In 2011 and 2014, two instances of Bengal tigers killing adult elephants were recorded; in Jim Corbett National Park on a 20-year-old elephant cow, and another on a 28-year-old sick elephant in Kaziranga National Park; the latter was eaten by several tigers at once. In the Sundarbans, a king cobra (Ophiophagus hannah) and an Indian cobra (Naja naja) were found in the stomachs of tigers. In most cases, tigers approach their victim from the side or behind from as close a distance as possible and grasp the prey's throat to kill it. Then they drag the carcass into cover, occasionally over several hundred metres, to consume it. The nature of the tiger's hunting method and prey availability results in a "feast or famine" feeding style: they often consume 18–40 kg (40–88 lb) of meat at one time. If injured, old or weak, or when its regular prey species become scarce, tigers often attack humans and become man-eaters.

**Reproduction and lifecycle**

The tiger in India has no definite mating and birth seasons. Most young are born in December and April. Young have also been found in March, May, October and November. In the 1960s, certain aspects of tiger behaviour at Kanha National Park indicated that the peak of sexual activity was from November to about February, with some mating probably occurring throughout the year. Males reach maturity at 4–5 years of age, and females at 3–4 years. A Bengal comes into heat at intervals of about 3–9 weeks, and is receptive for 3–6 days. After a gestation period of 104–106 days, 1–4 cubs are born in a shelter situated in tall grass, thick bush or in caves. Newborn cubs weigh 780 to 1,600 g (1.72 to 3.53 lb) and they have a thick woolly fur that is shed after 3.5–5 months. Their eyes and ears are closed. Their milk teeth start to erupt at about 2–3 weeks after birth, and are slowly replaced by permanent dentition from 8.5 to 9.5 weeks of age onwards. They suckle for 3–6 months, and begin to eat small amounts of solid food at about 2 months of age. At this time, they follow their mother on her hunting expeditions and begin to take part in hunting at 5–6 months of age. At the age of 2–3 years, they slowly start to separate from the family group and become transient, looking out for an area, where they can establish their own home range. Young males move farther away from their native home range than young females. Once the family group has split, the mother comes into heat again.

## Threats

None of the Tiger Conservation Landscapes within the Bengal tiger range is large enough to support an effective population size of 250 individuals. Habitat losses and the extremely large-scale incidences of poaching are serious threats to the species' survival. The Forest Rights Act passed by the Indian government in 2006 grants some of India's most impoverished communities the right to own and live in the forests, which likely brings them into conflict with wildlife and under-resourced, under-trained, ill-equipped forest department staff. In the past, evidence showed that humans and tigers cannot co-exist.

## Poaching

The most significant immediate threat to the existence of wild tiger populations is the illegal wildlife trade in poached skins and body parts between India, Nepal and China. The governments of these countries have failed to implement adequate enforcement response, and wildlife crime remained a low priority in terms of political commitment and investment for years. There are well-organised gangs of professional poachers, who move from place to place and set up camp in vulnerable areas. Skins are rough-cured in the field and handed over to dealers, who send them for further treatment to Indian tanning centres. Buyers choose the skins from dealers or tanneries and smuggle them through a complex interlinking network to markets outside India, mainly in China. Other factors contributing to their loss are urbanisation and revenge killing. Farmers blame tigers for killing cattle and shoot them. Their skins and body parts may however become a part of the illegal trade.

The illicit demand for bones and body parts from wild tigers for use in Traditional Chinese medicine is the reason for the unrelenting poaching pressure on tigers on the Indian subcontinent. For at least a thousand years, tiger bones have been an ingredient in traditional medicines that are prescribed as a muscle strengthener and treatment for rheumatism and body pain.

## Human–tiger conflict

The Indian subcontinent has served as a stage for intense confrontations between tigers and people. At the beginning of the 19th century tigers were so numerous, that the killing of tigers was officially rewarded in many localities. The Terai region supported large numbers of tigers that were pushed into marginal habitat after the 1950s, when the conversion of natural habitat for paddy fields increased. Marauding tigers began to take a toll of human life in areas bordering cultivation. They are thought to have followed domestic livestock that wintered in the plains when they returned to the hills in the spring, and then being left without prey when the herds dispersed back to their respective villages. These tigers were the old, the young and the disabled. All suffered from some disability, mainly caused either by gunshot wounds or porcupine quills.

In the Sundarbans, 10 out of 13-man-eaters recorded in the 1970s were males, and they accounted for 86% of the victims. These man-eaters have been grouped into the confirmed or dedicated ones who go hunting especially for human prey; and the opportunistic ones, who do not search for humans but will, if they encounter a man, attack, kill and devour him. In areas where opportunistic man-eaters were found, the killing of humans was correlated with their availability, most victims being claimed during the honey-gathering season. Tigers in the Sunderbans presumably attacked humans who entered their territories in search of wood, honey or fish, thus causing them to defend their territories. The number of tiger attacks on humans may be higher outside suitable areas for tigers, where numerous people are present, but with little wild prey for tigers. In December 2012, a tiger was shot by the Kerala Forest Department on a coffee plantation on the fringes of the Wayanad Wildlife Sanctuary. Chief Wildlife Warden of Kerala ordered the hunt for the animal after mass protests erupted as the tiger had been carrying away livestock. The Forest Department had constituted a special task force to capture the animal with the assistance of a 10-member Special Tiger Protection Force and two trained Indian elephants.

**Conservation efforts**

An area of special interest lies in the "Terai Arc Landscape" in the Himalayan foothills of northern India, where 11 protected areas composed of dry forest foothills and tall-grass savannas harbour tigers in a 49,000 square kilometres landscape. The goals are to manage tigers as a single metapopulation, the dispersal of which between core refuges can help maintain genetic, demographic, and ecological integrity, and to ensure that species and habitat conservation becomes mainstreamed into the rural development agenda. WWF partnered with Leonardo DiCaprio to form a global campaign, "Save Tigers Now", with the ambitious goal of building political, financial and public support to double the wild tiger population by 2022. Save Tigers Now started its campaign in 12 different WWF Tiger priority landscapes, since May 2010. This population of tigers has been assessed at the local level in several countries. It is listed as Endangered in India, list it as Critically Endangered. In 1973, Project Tiger was launched aiming at ensuring a viable tiger population in the country and preserving areas of biological importance as a natural heritage for the people. The project's task force visualised these tiger reserves as breeding nuclei, from which surplus animals would disperse to adjacent forests. The selection of areas for the reserves represented as close as possible the diversity of ecosystems across the tiger's distribution in the country. Funds and commitment were mustered to support the intensive program of habitat protection and rehabilitation under the project. By the late 1980s, the initial nine reserves covering an area of 9,115 square kilometres had been increased to 15 reserves covering an area of 24,700 square kilometres. More than 1100 tigers were estimated to inhabit the reserves by 1984.

Through this initiative the population decline was reversed initially, but has resumed in recent years; India's tiger population decreased from 3,642 in the 1990s to just over 1,400 from 2002 to 2008. The Indian Wildlife Protection Act of 1972 enables government agencies to take strict measures so as to ensure the conservation of the Bengal tigers. The Wildlife Institute of India estimates showed that tiger numbers had fallen in Madhya Pradesh by 61%, Maharashtra by 57%, and Rajasthan by 40%. The government's first tiger census, conducted under the Project Tiger initiative begun in 1973, counted 1,827 tigers in the country that year. Using that methodology, the government observed a steady population increase, reaching 3,700 tigers in 2002. However, the use of more reliable and independent censusing technology including camera traps for the 2007–2008 all-India census has shown that the numbers were in fact less than half than originally claimed by the Forest Department. Following the revelation that only 1,411 Bengal tigers existed in the wild in India, down from 3,600 in 2003, the Indian government set up eight new tiger reserves. Because of dwindling tiger numbers, the Indian government has pledged US$153 million to further fund the Project Tiger initiative, set up a Tiger Protection Force to combat poachers, and fund the relocation of up to 200,000 villagers to minimise human-tiger interaction. Indian tiger scientists have called for use of technology in the conservation efforts. In 2022, Ranipur Wildlife Sanctuary was declared as the 54th tiger reserve. In January 2008, the Government of India launched a dedicated anti-poaching force composed of experts from Indian police, forest officials and various other environmental agencies. Ranthambore National Park is often cited as a major success by Indian officials against poaching.

## *7. Tetracerus quadricornis* (Chousingha)

The four-horned antelope (*Tetracerus quadricornis*), or chousingha, is a small antelope found in India and Nepal. Its four horns distinguish it from most other bovids, which have two horns (with a few exceptions, such as the Jacob sheep). The sole member of the genus Tetracerus, the species was first described by French zoologist Henri Marie Ducrotay de Blainville in 1816. Three subspecies are recognised. Four-horned antelopes tend to inhabit areas with significant grass cover or heavy undergrowth, and avoid human settlements. Earlier common throughout deciduous forests in India, the antelope now occurs in widely disjunct, small populations. Most of the populations are in India. The four-horned antelope is threatened by the loss of its natural habitat due to agricultural expansion. Moreover, the unusual four-horned skull and the horns have been a popular target for trophy hunters. The four-horned antelope is classified as Vulnerable by the International Union for the Conservation of Nature and Natural Resources (IUCN).

**Description**

The four-horned antelope is one of the smallest Asian bovids. The number of its horns distinguishes it from most of the other bovids, that have two horns. The four-horned antelope stands 55-64 centimetres at the shoulder and weighs 17-22 kilograms the head-and-body length is typically between 80 and 110 centimetres. Sexual dimorphism is not very notable, though only males possess horns. Slender with thin legs and a short tail, the four-horned antelope has a yellowish brown to reddish coat. The underparts and the insides of the legs are white. Facial features include black markings on the muzzle and behind the ears. A black stripe marks the outer surface of each leg. Females have four teats far back on the abdomen. The hair feels coarse, more like that of a deer than the glossy hair typical of antelopes. The fetlocks are marked with white patches. One pair of horns is located between the ears, and the other on the forehead. The posterior horns are always longer than the anterior horns, which might be mere fur-covered studs. While the posterior horns each measures 8-12 centimetres, the anterior ones measure 2-5 centimetres. Horns emerge at 10 to 14 months. According to Groves, anterior horns show the poorest development in the subspecies. The four-horned antelope differs greatly from the nilgai in colour, is much smaller and has an extra pair of horns. The nilgai is nearly nine times heavier and two times taller than the four-horned antelope. Two deer species, the Indian muntjac and the Indian hog deer, can be confused with this antelope. The four-horned antelope, however, lacks their antlers.

**Ecology and behaviour**

The four-horned antelope is diurnal (active mainly during the day), though it mainly rests or ruminates in dense undergrowth at noon. Though solitary by nature, the four-horned antelope may form loose groups of three to five. Groups consist of one or more adults, sometimes accompanied by juveniles. Males and females hardly interact, except in the mating season. The antelope is shy and elusive. When alarmed, it stands motionless and may nervously leap away from the danger or even sprint. It often conceals itself in tall grasses to escape predators. The use of alarm calls to alert others is not common because the antelope tries to avoid the attention of predators. However, in extreme cases, these calls may be used to warn predators that they have been identified. Adults mark vegetation in their territories with a colourless secretion of preorbital glands, that soon condenses to form a white film. They maintain multiple latrine sites where piles of their pellet droppings are formed by regular use. Latrine sites can be confused with those of the barking deer but the pellets are longer and larger in four-horned antelopes. Submissive display consists of shrinking the body, lowering the head and pulling the ears back. Predators of four-horned antelopes include tigers, leopards, and dholes.

**Diet**

The four-horned antelope feeds on grasses, herbs, shrubs, foliage, flowers and fruits. A study in Mudumalai National Park (Tamil Nadu, India) showed that the antelope prefers grass species of the family Cyperaceae; genera Axonopus, Cynodon, Digitaria, Echinochloa, Panicum, Sehima and Sporobolus; and the species Imperata cylindrica, Ottochloa nodosa, Pseudanthistria umbellata and Themeda cymbaria. The shrub Grewia hirsuta is frequently eaten. Preferred herbs include Helichrysum, Indigofera and Tinospora species and Leucas aspera. The four-horned antelope feeds on the leaves of trees such as Cordia wallichii, Emblica officinalis, Randia dumetorum and Zizyphus xylopyrus. Grasses comprise nearly 29 percent of the diet, followed by foliage from trees (nearly nine percent). Grass and browse were consumed in nearly equal proportions. A study in the Panna National Park (Madhya Pradesh, India) showed preference for Zizyphus mauritiana, Acacia nilotica, A. leucophloea and A. catechu. Babool flowers were frequently eaten. The antelope often associates with langurs under fruiting trees, just as chital frequently do. Interaction with chital, a sympatric species, was infrequent. The antelope is wary when feeding, often raising its head and looking about its vicinity. The four-horned antelope needs to drink water frequently; as such it stays in places near water sources.

**Reproduction**

Breeding behaviour of the four-horned antelope has not been well studied. The age at which sexual maturity is gained is doubted; two captive females had their first parturition at less than two years. The breeding season in Panna National Park probably lasts from May to July, and from June to August in Mudumalai National Park. The male approaches the female in a relaxed gait, giving out low coughs. The two may kneel and push against each other with the necks intertwined. The male makes a few short mounting attempts; the female may be foraging all the while without any reaction. Gestation lasts about eight months, followed by the birth of one or two calves. The newborn has a head-and-body length of 42 to 46 centimetres (17 to 18 in), and weighs 0.7 to 1.1 kg (1.5 to 2.4 lb). Juveniles are kept concealed for the first few weeks of birth. Births in Mudumalai National Park peak from February to April. Juveniles remain with their mothers for about a year.

Distribution and habitat

The four-horned antelope is confined to the Indian subcontinent, occurring widely in disjunct and small populations. The range in India covers a vast expanse, from the foothills of the Himalayas in the north to the Deccan Plateau in the south. Most of the existing populations live in India. The four-horned antelope inhabits open, dry, deciduous forests in hilly terrain. It prefers areas close to water bodies that are covered with grasses or heavy undergrowth. It generally keeps away from settlements. It was earlier common throughout deciduous forests in India, but the population declined to an estimated at slightly above 10,000 mature individuals in 2001, with a decreasing trend. Numbers in Gir National Park were estimated at 256 individuals in 1974; later estimates at waterholes in the same location put them a little above 1,000. Densities of above 0.7 individuals per km2 have been considered as being healthy.

**Threats and conservation**

The four-horned antelope is threatened by the loss of its natural habitat due to agricultural expansion. Moreover, the unusual four-horned skull and the horns have been a popular target for trophy hunters.

The four-horned antelope is classified as Vulnerable on the IUCN Red List. It is protected under Schedule I of the Indian Wildlife Protection Act of 1972; the population in Nepal is listed in CITES Appendix III.

## 8. Gaur (*Bos gaurus*)

The **gaur(Bos gaurus)**, also called **Indian bison,** is the largest extant bovine, native to the Indian Subcontinent and Southeast Asia. It has been listed as Vulnerable on the IUCN Red List since 1986. Population decline in parts of its range is likely to be more than 70% during the last three generations. However, population trends are stable in well-protected areas, and are rebuilding in a few areas which previously had been neglected. The gaur is the tallest of wild cattle species.

Photographs of Gaur

### CHARACTERISTICS

The gaur is a strong and massively built species with a high convex ridge on the forehead between the horns, which protrudes anteriorly, causing a deep hollow in the profile of the upper part of the head. There is a prominent ridge on the back. The ears are very large; the tail only just reaches the hocks, and in old bulls the hair becomes very thin on the back. In colour, the adult male gaur is dark brown, approaching black in very old individuals; the upper part of the head, from above the eyes to the nape of the neck, is, however, ashy grey, or occasionally dirty white; the muzzle is pale coloured, and the lower part of the legs are pure white or tan. The cows and young bulls are paler, and in some instances, have a rufous tinge, which is most marked in groups inhabiting dry and open districts. The tail is shorter than

in the typical oxen, reaching only to the hocks. They have a distinct ridge running from the shoulders to the middle of the back; the shoulders may be as much as 12 cm (4.7 in) higher than the rump. This ridge is caused by the great length of the spinous processes of the vertebrae of the fore-part of the trunk as compared with those of the loins. The hair is short, fine and glossy; the hooves are narrow and pointed.

The gaur has a head-and-body length of 250 to 330 cm (8 ft 2 in to 10 ft 10 in) with a 70 to 105 cm (28 to 41 in) long tail, and is 142 to 220 cm (4 ft 8 in to 7 ft 3 in) high at the shoulder, averaging about 168 cm (5 ft 6 in) in females and 188 cm (6 ft 2 in) in males. At the top of its muscular hump just behind its shoulder, an average adult male is just under 200 cm (6 ft 7 in) tall and the male's girth at its midsection (behind its shoulders) averages about 277 cm (9 ft 1 in). Males are about one-fourth larger and heavier than females. Body mass can range widely from 440 to 1,000 kg (970 to 2,200 lb) in adult females and 588 to 1,500 kg (1,296 to 3,307 lb) in adult males.

Gaurs do not have a distinct dewlap on the throat and chest. Both sexes carry horns, which grow from the sides of the head, curving upwards. Between the horns is a high convex ridge on the forehead. At their bases, they present an elliptical cross-section, a characteristic that is more strongly marked in bulls than in cows. The horns are decidedly flattened at the base and regularly curved throughout their length, and are bent inward and slightly backward at their tips. The colour of the horns is some shade of pale green or yellow throughout the greater part of their length, but the tips are black. The horns, of medium size by large bovid standards, grow to a length of 60 to 115 cm (24 to 45 in).

The cow is considerably lighter in make and in colour than the bull. The horns are slenderer and upright, with more inward curvature, and the frontal ridge is scarcely perceptible. In young animals, the horns are smooth and polished. In old bulls, they are rugged and dented at the base.

Gaurs are among the largest living land animals. Only elephants, rhinos, the hippopotamus (Hippopotamus amphibius) and the giraffe (Giraffa camelopardalis) consistently grow heavier. Two species that naturally co-exist with the gaur are heavier: the Asian elephant (Elephas maximus) and Indian rhinoceros (Rhinoceros unicornis). By most standards of measurements, gaur is the largest wild bovid alive today. However, the shorter-legged, bulkier wild water buffalo (Bubalus arnee) is similar in average body mass, if not maximum weight.

Photographs of Gaur

**DISTRIBUTION AND HABITAT**

In India, the population was estimated to be 12,000–22,000 in the mid-1990s. The Western Ghats and their outflanking hills in southern India constitute one of the most extensive extant strongholds of gaur, in particular in the Wayanad – Nagarhole – Mudumalai – Bandipur complex. Major populations of about 2,000 individuals have been reported in both Nagarahole and Bandipur National Parks, over 1,000 individuals in Tadoba Andhari Tiger Project, 500–1000 individuals in both Periyar Tiger Reserve and Silent Valley and adjoining forest complexes, and over 800 individuals in Bhadra Wildlife Sanctuary.

**FEEDING ECOLOGY**

Wild gaur graze and browse on a wider variety of plants than any other ungulate species of India, with a preference for the upper portions of plants, such as leaf blades, stems, seeds and flowers of grass species, including *kadam*

**THREATS**

Gaurs are highly threatened by poaching for trade to supply international markets, but also by opportunistic hunting, and specific hunting for home consumption. In the 1990s, they were particularly sought by poachers for their commercial value. Gaurs are highly threatened by poaching for commercial trade in meat and trophies.

**CONSERVATION**

*Bos gaurus* is listed in CITES Appendix I, and is legally protected in all range states. Cryoconservation of animal genetic resources have been put into place in order to help reinforce the Gaur population.

### 9. Common Leopard (*Panthera pardus*)

Indian leopard (*Panthera pardus fusca*) is a leopard subspecies widely distributed on the Indian subcontinent. The species *Panthera pardus* is listed as Vulnerable on the IUCN Red List because populations have declined following habitat loss and fragmentation, poaching for the illegal trade of skins and body parts, and persecution due to conflict situations.

The Indian leopard is one of the big cats found on the Indian subcontinent, apart from the Asiatic lion, Bengal tiger, snow leopard and clouded leopard.

**CHARACTERISTICS**

In 1794, Friedrich Albrecht Anton Meyer wrote the first description of Felis fusca, in which he gave account of a panther-like cat from Bengal of about 85.5 cm (33.7 in), with strong legs and a long well-formed tail, head as big as a panther's, broad muzzle, short ears and small, yellowish grey eyes, light grey ocular bulbs; black at first sight, but on closer examination dark brown with circular darker coloured spots, tinged pale red underneath. Male Indian leopards grow to between 4 ft 2 in (127 cm) and 4 ft 8 in (142 cm) in body size with a 2 ft 6 in (76 cm) to 3 ft (91 cm) long tail and weigh between 110 and 170 lb (50 and 77 kg). Females are smaller, growing to between 3 ft 5 in (104 cm)

and 3 ft 10 in (117 cm) in body size with a 2 ft 6 in (76 cm) to 2 ft 10.5 in (87.6 cm) long tail, and weigh between 64 and 75 lb (29 and 34 kg). Sexually dimorphic, males are larger and heavier than females.

The coat is spotted and rosetted on pale yellow to yellowish brown or golden background, except for the melanistic forms; spots fade toward the white underbelly and the insides and lower parts of the legs. Rosettes are most prominent on the back, flanks and hindquarters. The pattern of the rosettes is unique to each individual. Juveniles have woolly fur, and appear dark due to the densely arranged spots. The white-tipped tail is 60–100 centimetres (24–39 in) long, white underneath, and displays rosettes except toward the end, where the spots form incomplete bands. The rosettes are larger in Asian populations and their yellow coat tends to be paler and cream coloured in desert populations, more gray in colder climates, and of a darker golden hue in rainforest habitats.

**DISTRIBUTION AND HABITAT**

On the Indian subcontinent, topographical barriers to the dispersal of this subspecies are the Indus River in the west, and the Himalayas in the north. In the east, the Ganges Delta and the lower course of the Brahmaputra River form natural barriers to the range of the Indochinese leopard. Indian leopard is distributed all over India.

The Indian leopard inhabits tropical rain forests, dry deciduous forests, temperate forests and northern coniferous forests but does not occur in the mangrove forests of the Sundarbans.

**ECOLOGY AND BEHAVIOUR**

Leopards are elusive, solitary, and largely nocturnal. They are known for their ability in climbing, and have been observed resting on tree branches during the day, dragging their kills up trees and hanging them there, and descending from trees headfirst. They are powerful swimmers, although are not as disposed to swimming as some other big cats, such as the tiger. They are very agile, and can run at

over 58 kilometres per hour (36 mph), leap over 6 m (20 ft) horizontally, and jump up to 3 m (9.8 ft) vertically. They produce a number of vocalizations, including grunts, roars, growls, meows, and purrs.

Leopards are versatile, opportunistic hunters, and have a very broad diet. The diet of Indian leopards include spotted deer, sambar deer, nilgai, wild pig, common langur, hare and peafowl.

Although they are smaller than most other members of the genus *Panthera*, they are able to take large prey due to their massive skulls and powerful jaw muscles.

Depending on the region, leopards may mate all year round. The estrous cycle lasts about 46 days and the female usually is in heat for 6–7 days. Gestation lasts for 90 to 105 days. Cubs are usually born in a litter of 2–4 cubs. Mortality of cubs is estimated at 41–50% during the first year. Females give birth in a cave, crevice among boulders, hollow tree, or thicket to make a den. Cubs are born with closed eyes, which open four to nine days after birth. The fur of the young tends to be longer and thicker than that of adults. Their pelage is also grayer in colour with less defined spots. Around three months of age, the young begin to follow the mother on hunts. At one year of age, leopard young can probably fend for themselves, but remain with the mother for 18–24 months. The average typical life span of a leopard is between 12 and 17 years.

**THREATS**

Hunting of Indian leopards for the illegal wildlife trade is the biggest threat to their survival. They are also threatened by loss of habitat and fragmentation of formerly connected populations, and various levels of human leopard conflict in human–dominated landscapes.

**POACHING**

A significant immediate threat to wild leopard populations is the illegal trade in poached skins and body parts between India, Nepal and China. The governments of these countries have failed to implement adequate enforcement response, and wildlife crime remained a low priority in terms of political commitment and investment for years. There are well-organised gangs of professional poachers, who

move from place to place and set up camp in vulnerable areas. Skins are rough-cured in the field and handed over to dealers, who send them for further treatment to Indian tanning centres. Buyers choose the skins from dealers or tanneries and smuggle them through a complex interlinking network to markets outside India, mainly in China. Seized skins in Kathmandu confirm the city's role as a key staging point for illegal skins smuggled from India bound for Tibet and China.

It is likely that seizures represent a tiny fraction of the total illegal trade, with the majority of smuggled skins reaching their intended end market. Seizures revealed:

- In India: more than 2845 poached leopards between 1994 and October 2010.

In May 2010, the Wildlife Protection Society of India estimated that in India at least 3,189 leopards were killed since 1994. For every tiger skin, there are at least seven leopard skins in the haul.

**HUMAN–LEOPARD CONFLICT**

Expansion of agriculturally used land, encroachment of humans and their livestock into protected areas are main factors contributing to habitat loss and decrease of wild prey. As a result, leopards approach human settlements, where they are tempted to prey on dogs, pigs and goats — domestic livestock, which constitutes an important part of their diet, if they live on the periphery of human habitations. Human–leopard conflict situations ensue, and have increased in recent years. In retaliation for attacks on livestock, leopards are shot, poisoned and trapped in snares. The leopards are considered to be unwanted trespassers by villagers. Conservationists criticize these actions, claiming that people are encroaching on the leopard's native habitat. India's Forest Department is entitled to set up traps only in cases of a leopard having attacked humans. If only the presence of a crowd of people prevents the leopard from escaping, then the crowd has to be dispersed and the animal allowed to escape.

As urban areas expanded, the natural habitats of leopards shrunk resulting in leopards venturing into urbanized areas due to easy access of domestic food sources.

## CONSERVATION

Panthera pardus is listed in CITES Appendix I. Despite India being contracting party to CITES, national legislation of our country does not incorporate and address the spirit and concerns of CITES. Trained human resources, basic facilities and effective networks for control of poaching and trade in wildlife are lacking. Frederick Walter Champion was one of the first in India who after World War I advocated for the conservation of leopards, condemned sport hunting and recognised their key role in the ecosystem.

A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/ leopard conflict mitigation program.

Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with leopard, hunting and poaching activities.

Training programme would be conducted to conservation expert team and local people for safe handling of this mammal.

Small holes containing water should be constructed in habitation zone of leopard and its water quality should be maintained.

It is critical that urgent efforts are made to understand the habitat and population status of the species through field based research and in situ conservation projects.

Photographs of Indian Leopard.

Photographs of Indian Leopard.

# CHAPTER - VI

## Other Ecological Components

### THREATS TO WILDLIFE IN INDIA

Disintegration as well as destruction of habitat have been the two most significant factors that threaten wildlife in India. The threats to the corridors of protected areas, industrial demands on ecologically sensitive areas for mining and quarrying have resulted in extensive damage to the sensitive habitats that host wildlife. The network of protected area I.e. national parks and sanctuaries have been established as representative samples of ecosystems, linked by 'corridors' to facilitate genetic continuity. Unfortunately, these corridors are not legally protected and are subject to maximum exploitation.

Various government actions have proved to be harmful for wild life and their habitat, which were taken purportedly for the good of both human society and wildlife.

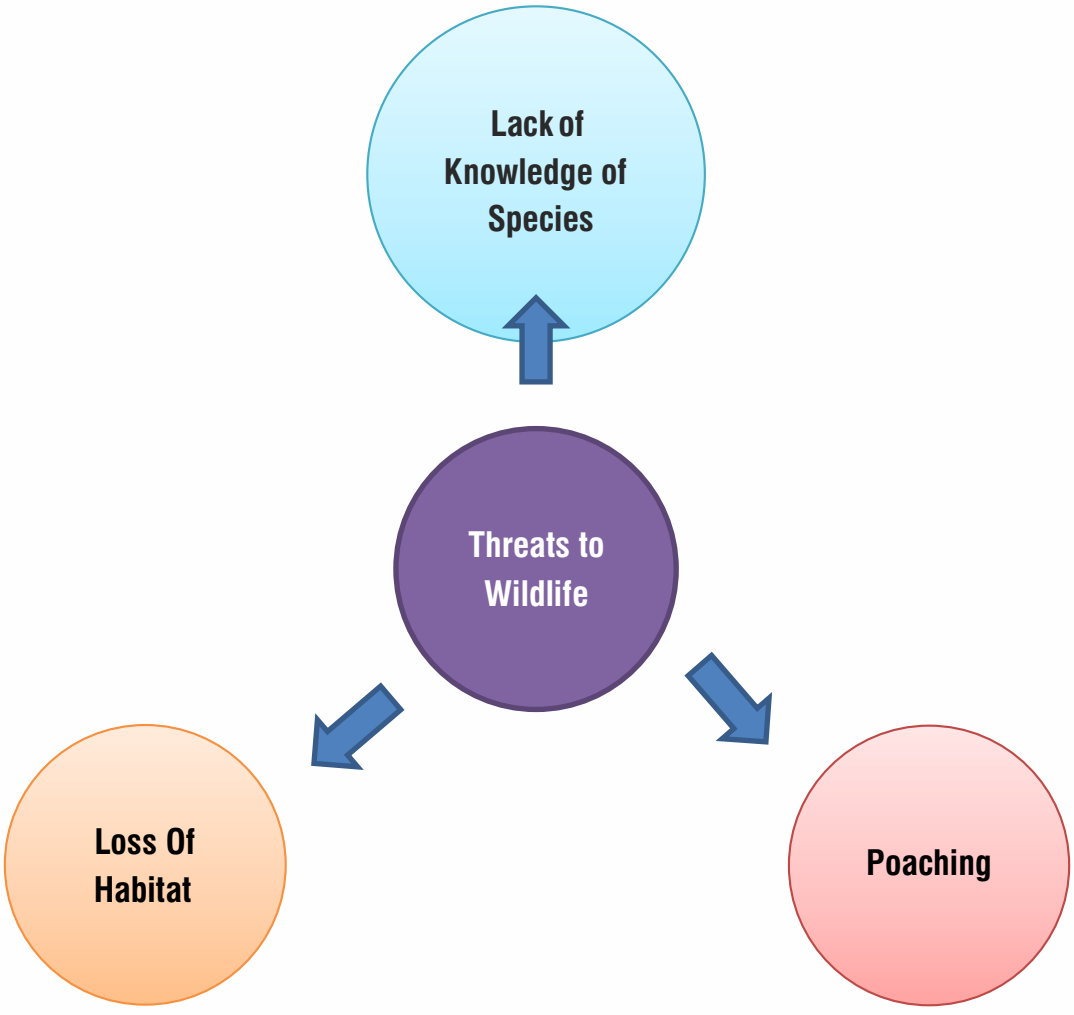
Another growing concern relates to global extinction of flora and fauna in the case of loss of habitat and excessive illegal hunting. Numerous international instruments have been signed to address this issue, e.g. the **International Convention for the Regulation of Whaling, Washington, 1946 the Convention on International Trade in Endangered Species of Wild Flora and Fauna, 1976 and the Convention on Conservation of Migratory Species of Wil *d Animals Bonn,1979.***

**The World Conservation Union (IUCN)** Publishes a **Red Data Book**, which compiles in 3 appendices, the various species according to the degree in which they are threatened. In the Indian context, the list of threatened is listed in Schedules appended to the wild life Protection Act. Though this is the general trend that is followed globally, it has been argued by some that this is not the best method. Studies have revealed that out of an estimated 8.7 million species existing on Earth, only about14 percent is known to mankind leaving out innumerable other unknown ones from the purview of threatened species. Some of these species may get extinct even before they can be recorded.

Wildlife trade has emerged as another threat to the preservation of the same. Rampant poaching in wildlife and its products are mainly driven by the demands for these in the international markets. It is

believed that illegal trade in wildlife products is second only to the global trade in narcotics. In the case Ivory Traders Manufacturers Association vs Union of India, the Delhi High Court remarked that '…. business in animal species on the verge of extinction being dangerous and pernicious is, therefore not covered by Article 19(g) of the Constitution.

The trade in tiger parts including bones, claws, skin, snake skin, furs, rhino horns, ivory, bear bile, shahtoosh, sea turtle eggs etc. has resulted in depletion of many species of wildlife. It is also pertinent to note that these trades are not carried out by any forest–dependent community but by others for purely monetary gains.



## Habitat structure

In the Study Area of the **Mukam Bauxite Mines Lease Area (CMDC),** it has been tried to understand the wildlife habitat through and detailed study of floral as well as faunal diversity. Wildlife requires places to hide in order to feel safe from people, predators and inclement weather. Use things like indigenous vegetation, shrubs, thickets and brush piles or even dead trees. The most important features of a wildlife habitat is its canopy cover, availability of fodder, prey, water etc. In general, good habitat conditions for wildlife can be created while managing canopy cover through plantation of indigenous species or other management practices. Information presented here with help in planning for an integrated land management program that optimizes timber growth, plantation of fodder species for herbivores and thus planning to create wildlife habitats and corridors. When considering improvements for wildlife habitat during land management operations, it has been emphasized to be aware of the habitat requirements of wildlife.

**Wildlife have four basic needs:** food, cover, water, and space. The quantity and quality of these components determine the carrying capacity of the land - the maximum number of animals that can be supported in good condition throughout the year. Carrying capacity changes by season and by year as a direct result of changes in farm and forest habitat. With proper planning, forest management can be conducted in such a fashion as to improve habitat conditions for certain species of wildlife. In a truly integrated forest and wildlife management operation, the goal of maximum timber production is compromised in favor of producing quality habitat for wildlife. A reasonable compromise between maximum timber production and quality habitat ensures sustained profits from forest products as well as suitable habitat for wildlife. As forests are altered to grow timber products, wildlife habitats are also changed. Forest management operations that affect habitats include harvesting, site preparation, forest regeneration practices and intermediate stand treatments. Each of these forestry practices will affect habitats by altering certain characteristics of the forest. Some of the habitat characteristics that influence wildlife are edge, habitat diversity, interspersion, and plant succession. Forest stand arrangement also has an effect on the quality of wildlife habitat. Stand arrangement refers to how the forest stands are located in relation to each other. For quality wildlife habitat, forest stands providing habitat components must be available within the home ranges of the wildlife species being managed. Proper arrangement of food, water and cover can often determine the use and value of these habitat components to wildlife.

Poor arrangement of habitat components fails to make the best use of a particular site for wildlife. Size and arrangement of forest stands largely determine the quantity and quality of edge and total forest diversity that is created. A mixture of pastureland, woodland, and non-forested land creates more diversity and edge than does a large block of one timber type.

**Major threats to Biodiversity**

Large scale loss of biodiversity has been mainly caused by anthropogenic activities like habitat loss, degradation, fragmentation, biotic interference, grazing, demand for timber, fuel wood, pollution and introduction of exotic species etc. Some of these factors are discussed below in brief.

**Habitat loss, degradation and fragmentation**

Habitat loss, degradation, and fragmentation are important causes of known species-populations extinctions. The main cause of degradation and depletion of forests and wildlife are the human activity (anthropogenic pressure). Population explosion, over exploitation of forest resources, urbanization, unscientific management, encroachment of forest land, illicit felling, lack of regeneration of forests and outdated laws are major factors responsible for the degradation and depletion of forests in Madhya Pradesh.

Deforestation has led to reduction of rainfall, silting of rivers and dams, increase soil erosion, dryness in the air and increase in temperature, adversely affecting not only forestry but also agriculture and associated activities. In the proposed irrigation project, the threat of habitat disturbance, degradation and fragmentation may not only come from the developmental activities, but also from the population of migrant laborers that will be employed by the project developers from time to time.

**Biotic interference**

The collection of Non-timber Forest Produce (NTFP) in the form of small timber, fuel wood, and fodder by the people living in the surrounding villages in the project area and areas between the village and Reserved Forests are thereby exerting intensive biotic pressures on these resources. There is likelihood

of increase in biotic interference with the influx of labour population during the construction of the project. This floating human population will exert serious pressure on the semi-natural ecosystems around the activity sites. The pressures may be moreseen in terms of fuel-wood collection, rearing of livestock and the grazing pressure on the surrounding forest ecosystems. Plantation of exotic species and invasion of non-native species like *Lantana camara*, *Parthenium sp* and *Eupotorium odoratum* are also forms of biotic interference in this region.

**Timber Requirement**

There is tremendous pressure on the forests for increasing demand for timber and growing rapidly. The demand for timber and other wood produce is very high in the state for various activities like the construction of houses, business centers and other development activates owing to rapid population growth. The situation is similar in present project area also. Therefore, the present situation calls for exploring acceptable alternatives for fuel wood, fodder, grass, timber and other natural resources in the project area would be addressed with creation of other alternative schemes.

**Non Timber Forest Products (NTFP)**

Non Wood Forest Products (NWPF) constitute important source of livelihood for the poor and especially landless. There is abundance of Tendu leaves (*Diospyrus melanoxylon*), Mahua flowers (*Madhuca indica*), Sal leaves and seeds (*Shorea robusta*), different medicinal plants like Harra (*Terminalia achebula*), Bahera (*Terminalia bellerica*), Aonla (*Emblica officinalis)*, wild fruit yielding species like Jamun *(Syzygium cumini)*, Aam (*Mangifera indica*) etc. in the forest patches which are most of the times are over extracted. All species have specific food and habitat needs. The more specific these needs and localized the habitat, the greater the vulnerability of species to loss of habitat to agricultural land, livestock, roads and cities.

**Grazing Pressure**

Livestock play an important role in hilly forest ecosystem. Various livestock species reared in the study area include cattle, buffaloes and goats. The two common livestock-rearing systems are mostly sedentary and to a small extent transhumant. In the sedentary system, animals are kept in the village throughout the year. Cattle and buffaloes are the preferred species and are mostly stall-fed. Some families keep small flocks of sheep and goats. The average number of cattle population per household is estimated to be 3-5 animal heads. The grazing pressure leads to following impacts:

a) Interference of livestock in the wilderness areas required for wildlife.
b) Direct competition for forage availability and degraded quality and reduction in the food availability for herbivores.
c) Transmission of communicable diseases.
d) Reduction in area of wilderness needed for the wildlife to sustain.

**Poaching**

Poaching is one of the major causes for destruction of wildlife. The poaching has to be checked not only by regular patrolling and deployment of anti-poaching squad formed for the purpose and enforcement of the Wildlife but also encouraging people in protection activities.

**Ethno-Botanical Study**

In Study Area of the **Mukam Bauxite Mines Lease Area (CMDC),** the ethno-botanical study that has been carried out reveals the fact that this forest area is closely associated with the life of the villagers within the forest area. The area is inhabited by several tribal groups, including Baiga and Gonds.

In total ten villages were studied for their forest dependence and a weekly market locally known as hat was studied for trade of non-timber forest produces (NTFPs). Sixteen NTFP items were found to be sold in the market which includes vegetables, fruits, various house hold items and even herbal medicines. Within these items there are few which has potential market. The list of medicinal plants found in the buffer area is given in **Table No 2**.

The study therefore shows a close dependence of the villagers cutting across their caste and creed on the forest. A list of ethnomedicinal usage of some plant species is below mentioned. There are two such items mentioned in the **Table No.1**. Most of these items need detailed ethnopharmaceutical studies and therefore the knowledge needs also to be reserved. In most parts of forested areas of Chhattisgarh measures have been taken to make in-situ as well as ex-situ conservation of NTFP species. Species like Asparagus recemosus, Hygrophila salicifalia, Hemidesmus inducus etc. needs special attention. Asparagus sp through not mentioned in the list is an important species of the region and has a trade value.

**Table 1: Species of Ethnobotanical importance**

| Sl. No. | Local name | Scientific name | Part used | Usage |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| 1. | Jamun | *Syzygium cumini* | Bark | The bark decoction is used in dysentery |
| 2. | Nupur | *Desmodium triflorum* | Leaves | Leaves extract with salt are used in dry cough. |
| 3. | Mutha | *Cyperus kyllinga* | Root | Smashed root is used in toothache. |
| 4. | Ramtulsi | *Ocimum sp.* | Leaves | Leaf juice with honey is used in Whooping cough. |
| 5. | Apang | *Achyranthes aspera* | Stem | Stem juice is used in Indigestion and Burning sensation in chest. |
| 6. | Dudhilat | *Icnocarpus fruitcans* | Whole plant | Plant paste with raw milk is used against low pressure and biliary problems |
| 7. | Arjun | *Terminalia orjuna* | Bark | The bark decoction is mixed with the water of sugar candy and taken for 4-5 days in empty stomach in leucorrhoea. |
| 8. | Bara dudhe | *Euphorbia hirta* | Root | The water, in which the roots have been boiled, is used in dysentery. |
| 9. | Muthakani | *Cyperus nutana* | Stem | Stem chewed with *batasa (a nuggest prepared out of sugar)* is useful in gastritis. |
| 10. | Bhui amla | *Phyllanthus amarus* | Whole plant | Plant boiled water is used in jaundice. |
| 11. | Kalmegh | *Andrographis paniculata* | Stem | Stem decoction is useful for enhance liver function and digestion. |
| 12. | Kanta Notey | *Amaranthus spinosus* | Leaf | Leaf paste is useful in bone pain. |
| 13. | Kantikari | *Solanun xanthcarpum* | Root paste | Reliving pain of Pox. |

**Table-2: List of medicinal plants of Buffer zone area**

| Sl. No. | Botanical name | Family | Part used | Usage |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| 1. | *Acacia catechu* | Fabaceae | Leaf | Toothache, Headache, Diarrhoea, Cough, Digestive, Skin disease |
| 2. | *Ahyranthus aspera* | Amaranthaceae | Leaf, Root, Seed | Boils, Wound healing, Antidiabitic, Bleeding control, Scorpion-sting, Diuretic, Antidote, Antidiabetic, Toothache |
| 3. | *Aegle marmelos* | Myrtaceae | Tree | Stomachic, Piles, Cardiotonic, Laxative, Antiinflamatory, Jaundice, Urinary trouble, Diabetes, Dysentery |
| 4. | *Albizia leebek* | Fabaceae | Leaf, Seed | Antidote, Saponin for snake position, Skin disease, Asthma, Piles, Diarrhoea |
| 5. | *Andrographic paniculata* | Acanthaceae | Seed | Diabetes, Jaundice, Fever, Digestion, Blo od purification |
| 6. | *Annona squamosa* | Annonaceae | Fruit, Seed, Root, Leaf | Constipation, Vomiting, Cough, Purgative, Seed powder to kill lice |
| 7. | *Anthocephalous cadamba* | Rubiaceae | Bark, Frout | Inflammation, Antibacterial, Diabetes, Cough, Fever, Asthma |
| 8. | *Asparagus recemosus* | Liliaceae | Root | Weakness, Lactation in women, Diuretic, Tonic, Alterative, Antidiarrhoeal, Galactogenis, Brochitis. |
| 9. | *Azadirachtat indica* | Meliaceae | Brak, Leaves, Flower, Seed, Oil | Skin disease, Tooth ache, Antidote, Fever, Wound, Seed ulcer, Worms, Cough, Diabetes, Inflamation. |
| 10. | *Butea monosperma* | Fabaceae | Bark, Leaves, Flower, Seed, Gum | Uninary disorder, Worms, Diabeters, Inflammation, Skin disease |
| 11. | *Calotropis procera* | Asclepiadaceae | Leaf, Root, Flower, Bark | Ringworm, Emetic, Laxative, Joint and Ear pain, Swelling |
| 12. | *Cassia fistula* | Fabaceae | Lef, Seed | Purgative, Antiviral, Tonic, Boil, Ringworm |

| | | | | |
|---|---|---|---|---|
| 13. | *Cassia tora* | Fabaceae | Root, Seed, Leaves | Dermatiosis, Cough and respiratory disease, Laxative, Carminative, Skin disease |
| 14. | *Cassia occidentalis* | Hypoxidaceae | Rhizome | Bronchitis, Cough, Asthma, Wounds, Antidote, Skin disease, Fever, Allergy |
| 15. | *Curculigo orchioides* | Convolvulaceae | Stem, Seed | Piles, Joint pain, Bronchitis, Jaundice, Asthma, Diarrhoea, Urinary problem |
| 16. | *Cuscuta reflexa* | Poaceae | Leaf | Antihelmintic, Carminative, Purgative |
| 17. | *Cynodon doctlyon* | Fabaceae | Leaf, Stem | Vomiting, Bleeding, Diuretic, Diarrhea, Opthalmic |
| 18. | *Dalbergia sissoo* | Fabaceae | Stem, Root | Skin disease, Gonorrhoea, Dysentry, Itching |
| 19. | *Dendrocalamus strictus* | Poaceae | Leaf | Antifertility agent, Astringent |
| 20. | *Desmodium trifolium* | Fabaceae | Tuber | Antidote, Diuretic, Carminative, Tonic, Diarrhea, Skin disease, Wounds |
| 21. | *Emblica officinalis* | Euphorbiaceae | Bark, Leaf, Root | Laxative, Diuretic, Carminative, Stomatchic, Antidiarrhoeal, Jaundice, Eye problem, Digestive. |
| 22. | *Euphorbia hirta* | Euphorbiaceae | Leaf | Boil, Antiasthematic, Cough, Dysentry |
| 23. | *Ficus bengalensis* | Moraceae | Milky latex | Brain tonic, Antidysentric, Antiasthematic, Bronchitis |
| 24. | *Ficus religeosa* | Moraceae | Milky latex | Asthma, Ulcer, Skin Disease, Leucoderma, Urinary problem |
| 25. | *Ficus glomarata* | Moraceae | Milky latex, Fruit | Antidote, Anti-gonorrhea, Ulcer, Stomachic |
| 26. | *Hibiscus rosasinensis* | Malvaceae | Leaf, Flower | Alopecia, Burn |
| 27. | *Ipomoea aquatic* | Convolvulaceae | Leaf | Antidote, Gonorrhoea, Increase mother milk |
| 28. | *Jatropha curcus* | Euphorbiaceae | Leaf, Seed | Piles, Wound healing, Burn, Leucoderma |
| 29. | *Magnifera indica* | Anacardiaceae | Fruit | Dysentery, Digetaive, Vitamin A, Tonic, Rheumatism |

| | | | | |
|---|---|---|---|---|
| 30. | *Nycthanthus arbortritis* | Nyctaginaceae | Leaf, Seed | Laxative, Diuretic, Bleeding, Piles |
| 31. | *Ocimum canum* | Lamiaceae | Leaf, Flower | Cold, Cough, Bronchitis, Destroying bacteria and isects, Stimulant, Skin disease, Burn, Ringworm |
| 32. | *Phyllanthus niruri* | Euphorbiaceae | Whole plant | Liver disorder, Diabetes, Skin disease, Urinary problem |
| 33. | *Pongamia pinnata* | Fabaceae | Seed | Skin disease, Leucoderma, Carminitative, Parasiticide, Bleeding |
| 34. | *Sida cordifolia* | Malvaceae | Leaf, Root | Opthalmia, Diarrhoea, Leucorrhoea |
| 35. | *Terminalia arjuna* | Combretaceae | Bark, Fruit | Antidysentric, Antiasthematic, Cardiotonic, Diuretic, Ulcer, Leucoderma, Antidote |
| 36. | *Tridax procumbens* | Asteraceae | Leaf | Blood clotting, Boil, Wound treatment |
| 37. | *Typha angustifolia* | Typhaceae | Rhizome | Diuretic, Astringent |
| 38. | *Vitex negundo* | Verbenaceae | Leaf, stem | Tooth ache, Swelling, Digestive, tonic, asthma, stem cutting dysentery, rheumatism, skin disease |
| 39. | *Xanthiumstrumarium* | Asteraceae | Root, frout | Skin disease, bleeding, insect bite, diuretic, urinary problem |
| 40. | *Zizyphus mauritiana* | Rhamnaceae | Leaf, fruit | Diarrhea, cough, bleeding, digestive. |

## Species of Economic importance

The forest has good number of NTFP (Non Timber Forest Product Species) which are of economic importance to the people. During the study eighteen such species (**Table No 3**) could be identified which are economically important to the people within the study area. Some of these species are also important to the Forest Department as they fetch good amount of money as these are nationalized items. These products (Tendu Leaf, Sal seed) are sold to the Govt. recognized agencies only. These species also need to be preserved in in-situ condition.

## Table-3: Non-Timber Forest Produce Yielding Species

| Sl. No. | Species | Local Name | Parts used | Usage | Regeneration status |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) |
| 1. | *Anogeissus latifolia* | Dhaora | Gum | Medicinal | Low |
| 2. | *Azadirachta indica* | Neem | Bark, leaf and fruit | Medicinal | Low |
| 3. | *Boswella serrata* | Salai | Gum | Medicinal | Good |
| 4. | *Diospyros melanoxylon* | Kend | Leaf | Biri making | Good |
| 5. | *Madhuca indica* | Mahua | Flower and fruit | Liquor and vegetable | Low |
| 6. | *Mangifera indica* | Amm | Fruit | Food | Low |
| 7. | *Schleichera oleosa* | Kusum | Seed | Oil extraction | Low |
| 8. | *Shorea robusta* | Sal | Leaf and fruit | Leaf plate and oil | Good |
| 9. | *Terminalia chebula* | Harra | Fruit | Medicinal | Good |
| 10. | *Terminalia bellerica* | Bah$^{era}$ | Fruit | Tanning anf medicinal | Good |
| 11. | *Syxygium cumini* | Jamun | Fruit | Food | Good |
| 12. | *Emblica officinalis* | Aonla | Fruit | Food and medicine | Low |
| 13. | *Vitex negundo* | Nirgundi | Leaves | Medicinal | Low |
| 14. | *Aproragus recemousus* | Satabar | Root | Medicinal | Good |
| 15. | *Hoarrhena antidysenterica* | Dudhi | Whole plant | Medicinal | Good |
| 16. | *Smilax zeylanica* | Ramdatan | Whole plant | Medicinal | Low |

## Species of High Conservation Significance (REET species)

Through this landscape (Both the core and buffer zone) is quite rich in plant species diversity, it exhibits very low degree of endemism. This may be due to contiguity of landmass with adjacent phytogeographic regions. Nevertheless a large number of species in this tract are common between Western Ghats, Central Highlands, Chotanagpur and North-East India which signify the past climatic conditions and corridor for floral migration. One of the prominent species in this region, *Hardwickia binata*, locally known as Anjan, can be considered a typical (broad endemic) of Deccan plateau. This tree species is a medium or large deciduous ornamental tree and is a native of India. The tree can be grown from the seeds. The seeds should be soaked in water for 24 hours. Season of seed sowing in nursery on June to July and germinates within 10-35 days and the nursery beds should be prepared in the shade, covered lightly with hay and burnt. The wood is used as timber. The bark yields a fiber used for well ropes. The leaves are used as fodder and green manure. Oleo-resin extracted from the heart wood is used in manufacture of varnishes. *Mucuna prurita* - Endemic species in present study area.

But it can be emphatically said that none of these species are in the Red Data Bok of BSI or has been included under the list of Rare & Endangered, Threatened Plants .Some plant species which require local conservation efforts are as follows. These species has been identified as locally endangered by Govekar, R .

## Locally Endangered species

*(i) Butiea monosperma*
*(ii) Clerodendron serratum*
*(iii) Curculigo orchioides*
*(iv) Curcuma augustifolia*
*(v) Pteroearpus morsupium.*

According to Madhya Pradesh State Medicinal Plant Board list of endangered species, following species are found in study area :

1. *Diospyros peniculato*
2. *Pterocerpus marsupium*
3. *Terminalia arjuna*
4. *Grewia rothi*
5. *Vilex trifolia - Nirgundi - Critically endangered.*

*(http://www.bsienvis.nic.in/FAMILY.htm).*
*(http://www2.wii.gov.in/envis/threatened_plants/Chapter-22.htm)*

# CHAPTER - VII

## Wildlife Conservation And Management Plan

It is evident from the study that there are few plant species of rare & endangered occurrence in the study area of the **Mukam Bauxite Mines Lease Area (CMDC)**there are few animal species within Scheduled-I of the Wild Life (Protection) Act 1972. These species are likely to be affected by mining activities. The existing natural ecosystems in area constituting a rich bio diversity region need protection and further strengthening of conservation efforts. In order to facilitate state forest and wild life department ongoing conservation efforts, policies and measures and additional mitigation measures have been formulated for the proposed project. Keeping in view the Wild Life (Protection) Act 1972 and the rules made there under, Forest conservation Act (1980) and the rules made there under, Biological Diversity Act 2002 & its rule, the National Forest Policy 1988 and the National Wildlife Action Plan (2002-2016) have also been kept in mind while formulating this Wildlife Conservation Plan (WLCP).

**Conservation Plan For Fauna Requires Knowledge On:**

1. Home range of the animal
2. Territorial requirement of the animal
3. Deciding the number of animals to be conserved and accordingly evaluating the carrying capacity of the habitat
4. Conservation is aimed at single species or multiple species
5. Conservation is proposed in a managed ecosystem or an un-managed, natural ecosystem. However, very little knowledge exists on the above parameters of most of the animals.

**Basis of the Conservation Plan**

The proposed conservation plan has been prepared on the basis of the following:

A. Working Plan of East Mandla, Forest division.
B. Wildlife Management plan of Phen wildlife sanctuary.
C. Some other references:


- Tikader, BK. 1983. *Threatened Animals of India.* Zoological Survey of India.
- Stracey, PD. 1963. *Wild Life in India, its Conservstion and Control,* Ministry of Food Agriculture, C. D. & CO-OP, Department of Agriculture, Govt. of India, New Delhi.
- Nair, SM. 1992. *Endangerd Animals of India and their Conservation,* National Book Trust, India.
- Singh, SK. 2009. Text Book of Wildlife Management, 2nd Ed. International Book Distributing Company, Lucknow.
- Berwick, SH. And Sharma, VB. 1995. The Development of International Principles and Practices of WILDLIFE RESEARCH AND MANAGEMENT, Asian and American Approaches, Oxford University Press, Delhi.
- Prater, HS. 1980. The Book of Indian Animals, Bombay Natural History Society, Bombay.
- Memon, Vivek. 2009. Mammals of India, A Field Guide, Wildlife Trust of India.
- Tiwari, SK. 1998. National Parks of Madhya Pradesh. APH Publishing Corporation, New Delhi.
- Alfred, JRB.; Ramakrishna and Pradhan, MS. 2006. Validation of threatened Mammals of India. Zoological Survey of India, Kolkata.


Several reasons for the decline of wild life and methods for their conservation are proposed. However, the best method for the conservation of wild life is related directly to the maintenance of ecosystems in their natural condition, allowing their natural development and protection to the wildlife and their habitat. Both these phenomena (ecosystem development and habitat protection) are related to anthropogenic factors. Some of the important anthropogenic factors are listed below:

1. Habitat fragmentation and destruction 2. Man-animal conflict 3. Forest fire
4. Poaching 5. Stake holders' dependence on forest resources
6. Creating awareness amongst forest stake holders

To the above-mentioned factors may be added a non-anthropogenic but important factor:

7. Water scarcity

The plan for wild life conservation with respect to above situations is detailed as under:

## Habitat Management

Habitat component is a simple part or a relatively complex entity regarded as a part, of an area or type of environment in which an organism or biological population normally lives or occurs (Thomas, 1979).

For the existence of an Organism basically three factors viz. food, water and shelter are required. Hence, for wild animals also these basic requirements play important roles in their growth and propagation. Since, all these basic components are exclusively related with their habitats, the management or maintenance or manipulation of the habitats is a major component of the wildlife management. This is the prime responsibility of the wildlife manager. It cannot be ignored as wildlife habitats are presently undergoing tremendous changes primarily by the man for his needs, encroachment of forest land for grazing and agricultural purposes due to mushroom growth in human population, constructing roads and cities etc. Therefore, man's manipulation of environment for his needs or greedy needs is the most prevalent factor affecting wildlife habital and as a consequence the wildlife populations. The man's use of these natural resources in his own way unscientifically caused bad impact on the wildlife. Hence, habitat management/improvement/manipulation and its preservation is as important as wildlife conservation. The wildlife mangager must identify those factors which affect the habitat, specially which do not design or implement for wildlife, and understands the interrelationships between the animal and the habitat.

There are many examples for the manipulated environment to be beneficial or detrimental to wildlife. It is the responsibility of wildlife manager to judge how such practices should be modified of wildlife. Thus, habitat-manipulation acts as an important controlling-factor in the field of wildlife management. The modification done in the habitat as per the requirement and benefit of the wildlife especially for food, water and shelter and area is called habitat-manipulation.

Before starting manipulation, it must be judged that whether there is necessity of manipulation in the particular habitat or not. In case of area, it is very difficult at the present age to enhance it and so it will be better to project the available area from its further shrinkage. In this way, the emphasis should be given on the existing area of the habitat. In general, the habitat-management has basically two objectives:-

(i) To maintain quality habitat to be existed in a natural ecosystem .

(ii) To provide quality habitat where it is deteriorated or where limiting factor/factors have developed.

The following principles of habitat-management should be followed:-

(a) The project should be framed after thorough studies and justification in accordance with the needs of wildlife.

(b) The practices must be evaluated for their effect on other natural resources, land-uses etc. Therefore, the proposed practices should not be against the benefits of other species and natural resources along with the target species.

(c) It should be specified clearly the objective such as to maintain as it is, of, to improve, or alter completety the existing habitat.

(d) The improvement practices must simulate natural conditions/ecosystem perpetuating native flore and fauna,

(e) If tree plantation is needed, the topography of the area must be cared for.

(f) Manipulation should be designed following topographical characteristics of the area.

(g) The project should be practical and economical.

(h) The project must be evaluated at intervals to access its effects and results as well as to fulfilled or not. It should not be forgotten that the faulty habitat-manipulation gives harmful and disastrous result in leau of good and beneficial output.

In general, the Plants of any place are the resultant of climate, soil, moisture and biotic factors of that very place. Hence, these factors determine the quality and quantity of food. For the manipulation, the projects should be designed to improve the habital for wildlife; seed mixtures should be used rather than straight browse or grass plantings. Native ranges containing a wide choice of grass, browse etc. usually support the most abundant wildlife-population. Therefore, habitat-management projects should be designed not only to increase the quantity of grass, browse etc. but to provide a well-balanced variety as well. Hence, to access the condition, quality and character of the existing plants and their improvement in a habitat, is primary basic steps of wildlife management. Before the management/manipulation of the habitat, it is important to find out or access the necessities of the all types of plants available in that habitat. For example, some animals eat only fruits and seeds, some depend upon grass, and some take grass and leaves of the bushes. In this way, their requirements are different and, therefore, the condition of the habital or the animals depends upon each other. Judging the situation of the habitats, it is essential to manipulate them as per the needs of the wildlife. For the purpose, control-burning and control-grazing are must through which germination of the seeds and growths of the plants are assured. Likewise, afforestation and introduction of fodder species, wherever needed, are essential taking into consideration the suitability of the wild animals. The above objectives should be brought about following the principles such as:-

(a) Reduction of other competitive plants to allow moisture and soil nutrients for the planted seeds.

(b) Elimination or control of grazing by livestocks.

(c) Terrain and soil should be suitable to support the desired forage species.

(d) Plantation of adopted species and strains.

(e) Plantation of mixture (mixed species) because it supports different species on the site conditions to which they are best suited.

(f) Use of sufficient seeds to ensure a stand.

(g) Proper planting and coverage of seed is essential.

(h) Seeding and plantation should be in proper time.

(i) Control-burning and control-grazing.

Food is the most important basic need of the animal.Hence, 'improvement of food production' is the most frequently used technique to manipulate the habitat of wildlife.

(i) Production of Edible Fruits and Seeds (ii) Control-grazing (iii) Control-Burning

(2) WATER IMPROVEMENT

The requirement of water is one of the basic needs of wild animals, though its consumption varies in accordance with the species concerned. Some species require it daily, some at intervals while some do not. But majority require it daily. Therefore, the availability of water source (waterholes) in the habitat is very essential throughout the year. If it is not found it sufficient quantity, the wild animals will be unable to live in that particular habitat, their number will deplete and even cases of death will occur. Hence, water affects density of the animal's population and, therefore, the management and maintenance of waterholes is an important tool in habitat-improvement in the field of wildlife management. Generally, it has been seen that even after the availability of sufficient food and shelter, there is insufficient number of the species or occurrence of death in the habitat showing the reason of lacking of sufficient waterholes. Such occurrence is apparent in pinchperiod specially in the summer.

To be big in size or quantity of the waterholes is not very essential but its distribution and numbers in the habitat matter a lot. For instance, if there is very less number of waterholes in the habitat; there will be great pressure and gathering of wid animals around it causing hard intra and interspecific competition among them. Near the wate source, there will be crowd of the animals beyond its carrying-capacity. There will be over-utilzation of food and shelter around it, causing its destruction; while the other parts of the habitat will remain untouched or under-utilized. As the resultant, the animals will come under psychological pressure due to over-crowding hampering their productivity. This will also cause diseases due to dirtyness of the waterholes being more and more utilized beyond its capacity and, thus, the whole populations of the area may vanish. Only existence of a population is essential and important. Therefore, management of evenly and properly distributiaon of waterholes in sufficient numbers throughout the year in the habitat is very essential. Keeping this view,

There should be at least one waterhole in each home-range for the animals which require water daily or regularly; for others, it may be at distinct places serving their requirement. The proper management of waterholes in sufficient number increases the Carrying-Capacity of habitat and its, proper utilization as a whole. For the purpose, maintenance of natural waterholes and development of artificial waterholes are must. Following are the methods of improving waterholes for wildlife:-

(a) Maintenance of Natural Waterholes

Natural waterholes can be maintained and improved as follows:-

(j) Natural Waterholes: Natural waterholes are often found in nallas and rocky areas where run-off water is accumulated in depressions. At times, such holes can be improved by deepening the catchments or by trenching run-off water directly to the basin. The arrangement should be done to make it available to the wildlife.

The improvement techniques of the natural water sources should be done under the guidance of experienced and expertized persons, otherwise the result may lead to damaging stage.

(ii) Seeping: Somewhere in natural condition, it is seen that water is coming out drop by drop through a particular space. Such water cannot be utilized by the wildlife. Such water can be collected in a artificially made ditch/tank by applying devices like through hollow bomboo or pipe catching those seeping water, Such collected water will be beneficial and utilzable to the wildlife serving their purpose.

(b) Development of Artificial Waterholes

Artificial waterholes are developed by adopting following measures:-

(i) Reservoirs and Ponds (ii) Water Catchments (iii) Other Water Developments

(c) Soil & Water Conservation

From habitat improvement point of view, it is important to take care simulataneously for soil-conservation and water-conservation. It is essential to maintain eco-balance of the habitat as soil is the prime natural base for the development of vegetation. Soil is one of the factors determining the kinds and growth of the plant of a place as stated earlier for which water is also essential. Hence, their conservation is the

conservation and propagation of forest, plants and all types of vegetations and ultimately to the wild animals. By planting suitable tree, fodder, grass and other species in the habitat; soil and water should be conserved. This will also solve water and food problem of wildlife. In addition, formation of check-dams and other suitable devices are also necessary to prevent soil-erosion and run-off of water.

(d) Wetland Development

**(3) SHELTER IMPROMENT**

Shelter or cover is also a basic fundamental need like food and water for wildlife and acts a limiting-factor for them as described earlier. Shelter varies differently for different kinds of species and, hence, it is species-specific in case of wild animals. Therefore, the management technique should be accessed and applied as per the need of the target species. Moreover, it should be tagged, if possible, with the food improvement technique as the foods plants may be suitable covers also for the animal. Hence, selection of food plants and its improvement should be done carefully and wisefully. The various artificial measures for shelter/cover improvement are as follows:-

(a) Development of Natural Shelter: We know that in nature, there is cycle of plant succession. The phenomenon is continuous and contiguous process in its own way unless and until it is manipulated by the human-beings/as stated earlier in detail, management should be like that particular stage and caon be retarded or retained for longer desired period so that it may be helpful for the target species for its proper growth and propagation. In this way, the desired shelter/cover may be obtained for wildlife.

Hence in general, it can be concluded two cases in natural-cover development such as:-

(i)If the plant succession is in favourable direction for the target species; then it should be enhanced in the habitat by applying measures such as fire-protection, control-grazing, plantation of suitable species, if required and so on.

(ii)If a particular stage of succession itself is beneficial for target species; then measures for manipulation should be applied to retain that particular stage of the succession such as felling, grazing, control-burning, changes in the silvicultural operations etc.

(b)Development of Artificial Shelter:

(i)Plantation of Trees (Afforestation/Reforestation):

(ii) Caves and Rock-cliff Sheltrs:

(iii) Development of Brush-piles:

(iv)Development of Travel-route Cover:

(v)Artificial Nesting:

(vi)Modification in Silvicultural Operations:

The following general facts must be considered in silvicultural practices:-

(a) Felling of shade and fruit trees should be stopped as far as possible.
(b) There should be always mixed-species plantation to meet the various foods-chains of various wild animals.
(c) The felling of coups should be in such a way that they may given maximum core-effects to the wild animals resulting highest interspersion and juxtaposition for them.
(d) After felling and trading operations, the left-out parts of the trees should be arranged in the form or brush-piles to provide shelter for certain small wild animals and birds.
(e) There should not be felling etc. at night to maintain the privacy of wild animals.
(f) As far possible, the interference at the waterholes should be avoided.
(g) There should not be interruption near the riparian zone as well as shelters like caves and rock-cliffs.
(h) The trees having youngones and eggs in the nests should be left untouched, and besides these at least 10 more trees should be left unfelled at certain destances for the purpose of roosting-cover.
(i) At least, five snag trees per hectare should be left for protection and propagation purposes of wild animals.

**Prevention of Forest Fire**

Fire management is an important component of babitat-management. It is the most disastrous in the forest as it results in much harm to the wild flora and fauna. It causes damage to the habital of the wild animals destroying its food and shelter, forest crop, regeneration, productivity of forest and soil. Hence, wildlife is caused excessive loss by the fire by burning their eggs, young ones and the habitat. As a result, the equilibrium of the nature becomes upset. Fire may be intentional or natural. Actually, all forest fires are man-made so as to facilitate grazing, collection of forest produces etc.

Forest fire is caused both naturally as well as by the human beings. Forest fire in late winter and early summer is a major threat to the wildlife. Severity, frequency and expanse of the fire affect the wildlife, ground and shrub flora, small animals, soil erosion and regeneration of the vegetation. Most of the animals hiding in the litter are burntto death, causing great loss to the biodiversity. Burning of the litter exposes the soil surface to the torrential monsoonal rains causing significant erosion of the soil, making it thin and thinnerand exposing the bed rock, which is unable to support a good growth of vegetation. Most common reason of forest fire is setting fire to the litter for the collection of N.T.F.P. like Mahua flower and fruit, sal seed, seeds of achar, kusum, harra, beheda, bhilwa etc. Anthropogenic causes will be minimized through forming a fire line around the forest area. To add tothe prevention of fire local persons will be employed as fire guards, during the fire prone season.The team will be instructed to fight the fire as soon as it is detected. Watch towers will also be constructed to detect forest fire. Awareness program against forest fire will also be run in adjoining villages.

**Management Prescriptions For Fire Protection**

The forest fires along-with unregulated razing have been acknowledged as the main causes of degradations of forest eco-systems and wildlife habitat. It directly affects the fodder availability and also kills the helpless wild animals especially the micro-fauna, reptiles, etc. It also exposes the soil to erosion and, hence, causes habitat degradation in the process. Due to deciduous nature of the forests, the grasses, weeds and falling leaves and twigs forms a thick layer of undergrowth which is highly inflammable in nature. The availability of water also becomes scarce during summers causing further hardships in its timely check and control.

The Fire lines are classified into, the following, categories in order of priority.

i. **A -Class Fire lines:** These Fire lines comprise of the external boundary These are the prominent Fire lines, which should be prescribed for clearing, burning and maintenance every year on priority basis.

ii. **B -Class Fire lines:** These Fire lines includes internal boundaries and roads. These Fire lines should also be prescribed for clearing, burning and maintenance, every year.

iii. **C -Class Fire lines:** It includes the remaining Fire lines including the internal boundaries of compartments and coupe lines.

## Weed Management

*"A weed is a plant growing at place where it is not desired"* -Jethro Tail (1731) was the first person to use the word weed in their sense in literature in his famous writing on house hold husbandry. Some define that weeds are plants growing in a place and at times when we wanted either some other plants to grow or no plants to grow at all. So long as a plant species is growing without interfering with management affairs at a place and time it is not considered as a weed. In other words, while all weeds are unwanted, all unwanted plants may not be the weed.

Alien species are non-native or exotic organisms that occur outside their natural adapted ranges and dispersal potential. Many alien species support our forestry systems in a big way. However, some of the alien species become invasive when they are introduced deliberately or unintentionally outside their natural habitats into new areas where they express the capability to establish, invade and out compete native species.

International Union for Conservation of Nature and natural Resources (IUCN) defines alien Invasive Species as an alien species, which becomes established in natural or semi natural ecosystems or habitat, an agent of change, and threatens native biological diversity. These invasive are widely distributed in all kinds of ecosystems throughout the world and include all categories of living organisms. Nevertheless, plants, mammals and insects comprise the most common types of invasive alien species in terrestrial environments.

The threat to biodiversity due to invasive alien species is considered second only to that of habitat destruction. Invasive species cause loss of biodiversity including species extinctions and change in hydrology and ecosystem function. Differences between native and exotic plant species in their requirements and modes of resource acquisition and consumption may cause a change in soil structure, its profile, decomposition, nutrient content of soil, moisture availability, etc. Invasive species are thus a serious hindrance to conservation and sustainable use of biodiversity, with significant undesirable impacts on the goods and services provided by ecosystems.

Biological invasions now operate on a global scale and will undergo rapid increase in this century due to interaction with other changes such as increasing globalization of markets, rise in global trade, travel and tourism. For effective management of invasive species, knowledge about their ecology, morphology, phenology, reproductive biology, physiology and phytochemistry is essential.

About 40% of the species in the Indian flora are alien, of which 25% of invasive which includes - *Parthenium hysterophorus, Eupatorium adenophorum, Eupatorium odoratum, Mikanio micrantha, Ageratum conyzoides, Galinsoga parviflora, Ipomea species* etc. The weed found in study area are Shrubby weed i.e. Chhind Grass and other herbaceous weed like Parthenium. *Eupatorium, Ageraturn, Cassiatora, Hyptis suaveolens* etc.

**Elimination of Man-Animal Conflicts**

Man-animal conflict is a difficult problem to be eliminated. The conflict is both deliberate as well as inadvertent. Several animals like, wild boar, nilgai and spotted deer cause extensive damage to crops.

There is a considerable loss of agricultural crops by the wild animals such as nilgai, wild boar, chital and other ungulates. No compensation is paid to villagers for the loss of their agricultural crops. These losses to villagers living close to forests and particularly close to forest result in non-participation in conservation efforts.

Non-payment of compensation for the crop damage is a matter of great concern for the farmers. There is a constant demand by the farmers to pay cash compensation for their crop damage.

Crop raiding by the wildlife can be prevented provided the wildlife is contained within the forests. In most cases, wild animals move out of forests in search of water and food. Therefore, forests should have enough water and food resources well distributed within the forest boundary.

Crop damage by wild animals can also be prevented by restricting their movement out of the forest by creating different kind fencing.

**Prevention of Poaching**

Poaching is undoubtedly a serious problem in the conservation of wild life. Poaching is premeditated, an organized crime. Poaching starts from the local people and may end at an international level. Poaching cannot be operated without the help of local people most of which are the tribes, because they only have the knowledge about the location of the animals. Several methods are employed by the poachers, to kill or trap the wild life, of which poisoning and traps of different types are more common. Traps are often homemade eluding the forest officer's detection. Poachers can apply even electrocution by using connection from the power line passing from the area. Poaching links sometimes are extended to international level. A proper vigilance will be maintained to check such menace. Poaching menace will be eliminated seriously neither all the efforts to promote wild life survival in the area will go to waste. This will be achieved through employing, properly equipped like with Walkie-takie, two ex-army jawans to assist the forest officers.

**Reducing Stake Holder's Dependence On Forest Produce**

People from adjoining villages have already exploited the forest to the extent that the forests have become a grazing land or a source of fuel wood. Timber and medicinal species have either disappeared or have become scarce. However, regenerating the forest will again attract the villagers towards the forest. To keep the people away from the forest their economic condition will be improved. This will be achieved through financial and technical help to develop Dairy, Poultry, Vegetable cultivation, Horticulture and Agro-forestry. Promotion of agro-forestry, in particular, will reduce their dependence on forests for timber as well as for fuel wood.

**Creating Awareness Amongst Forest Stake Holders**

Awareness about the environment and wild life will be created amongst the adjoining villages. They will be informed about the importance of a good environment, a healthy ecosystem and more importantly about the wild life. Through slide and film shows they will be convinced about the sustenance of natural ecosystems. They will be convinced that their own survival depends upon the survival of a healthy ecosystem, to which a wide variety of wild life is an essential component. To develop affection of the people towards the wild life some of them will be taken to some zoos and wild life sanctuaries. Awareness programs will be run with the help of Forest Officers and more importantly some national experts will be invited to deliver talks awareness, related to wildlife conservation.

**Restriction of Grazing**

Illegal grazing is a serious problem in the area. There is a large population of cattle of local breed, mostly the cows. These cows of very small size are of little use either in agriculture or milk production. They are all driven to the forests in the morning and gathered back in the evening, these are serious threats to the forests,causing degradation of forests through trampling and browsing away the newly sprouting saplings.

Trampling not only results in killing the saplings but also causes compaction of the soil, reducing water infiltration, increasing surface run off and consequently the erosion of soil. Transmission of diseases from cattle to wildlife can cause depletion of wiping out the wildlife of the area. Waterholes will be constructed outside the plain area for exclusive parties will check and stop the entry and illegal grazing of cattle in the area. Heavy grazing not only reduces the herbaceous cover but brings about compaction of the soil also. It also favours the growth of non-palatable, unwanted weeds like *Chhind Grass, Parthenium, Hyptis suaveolens, Plectranthus incanus, Ageratum conyzoides* and so on. Such weeds will be uprooted and eradicated, preferably before their flowering and fruiting, to promote the growth of fodder grasses.

**Training And Awareness Programme**

This is the most important aspect of wild life conservation. People will be educated regarding the importance of wild life conservation through mass publicity by installing sign-boards, conducting audio visual classes and distributing literature in respective villages in the buffer zone. Experts in the field of wild life conservation will also be invited to deliver talks through slides.

**Creation of conservation awareness**

What if a few species of wildlife become endangered or extinct? How are we concerned if the Indian Cheetah has been lost forever or the Asiatic lion is precariously perched on the verge of extinction? Why should we spend crores of rupees to protect the tiger? The answers to these questions of "what", "how" and why" should form the basis for creating conservation awareness among the public- an understanding of the importance of biological diversity of inter-relationships in nature, of the sustenance and stability of ecosystems and of man's impact on the natural world.

## Sign boards

Wild life protection will be most effective if the young once like the school children are thought and involved in it. To begin with sign boards with images of wild life will be placed near the village schools as well as at places of more occurrence or more conflicts of any particular species of the wildlife.

## Working Plan Prescriptions

The study area falls in the Balodabazar Forest Division. Working plans, prepared now a day, have have more ecologically systemic approach as compared to earlier reports which had more emphasis on exploitation of the forest products for economic gains. Working plans have several circles but one related to wildlife conservation is the "Wildlife and Bio-diversity Conservation Working Circle.
Main objectives of the circle are :

- Conservation and Propagation of Biodiversity
- Increase density of forest crop
- Soil & water conservation
- Improve habitat for wildlife
- Conservation and propagation of endangered species
- Provide special protection to plants of medicinal value
- Involve fringe villagers for active co-operation in Eco development.

However, it is worth mentioning that none of the presently proposed impact areas fall under areas marked by the circle for special biodiversity treatment.

For wildlife conservation, the areas have been divided in to three zones as follows:

- P-I High presence of wildlife
- P-II Medium level presence of wildlife
- P-III Minimum level presence of wildlife

Presently proposed impact areas fall almost entirely under P-III. General objectives of these areas is to develop them in a way so that they can support wildlife in the future.

**Wildlife Conservation Philosophy**

The natural habitats and the Wildlife being supported by them are quite vulnerable now-a-days because of various biotic pressures. It has been an endeavor of the Authors to adopt such a philosophy which would help in attaining the conservation of forests in general and fauna in particular.

Wildlife Conservation Plan, inter-alia, includes Habitat Improvement, Water Management besides the efforts for the Socio-Economic Development of the local populace including creation of awareness for Bio-Diversity Conservation amongst them.

# CHAPTER - VIII

PRESCRIPTION FOR CONVERSATION OF FLORA, FAUNA AND WILDLIFE MANAGEMENT

The program for conservation of flora, fauna and wildlife management are vast ones and there are one of the major activities of the Forest Department. These works are taken up with funds received from State Government, Government of India and various other funding agencies like World Bank, UNDP, CAMPA etc. Here the main consideration is that, due to this expansion of industry the area will be opened up increasing the chances of disturbances and will destroy the calmness of the area causing stress and panic amongst the wildlife. Hence, project proponent should attend to these and should provide necessary funds to mitigate these.

**Habitat Improvement**

For the existence of an organism basically three factors, viz, food, water and shelter are required. Hence for the wild animals also, these basic requirements play important roles in their growth and propagation. Since all these basic components are exclusively related to their habitats, the management and maintenance or manipulation of the habitat is major component of wildlife management.

**Development of Water Sources and Water Holes :**

Water replenishment is essential for all wild animals. Presence of abundant food in a habitat is rendered useless if water is not available in close proximity. A habitat becomes poor from the wildlife point of view if it is devoid of water source. Good wildlife areas should have well distributed water points. Many wild animals love to have bath or swim across large water bodies like river, rivulet and nala during summer or wallow in mud. This is more pronounced in case of Spoted dear, amphibious, wild boors etc. At time failure of rains makes things more difficult for wild animals. Hence, alternative artificial water harvesting structure water holes, tank need to be created.

**Soil Moisture Conservation :**

Though no specific provisions have been made in working plan for soil and water conservation; but however, based on guidelines given by WALMI- Bhopal and as contained in "Technical Manual of Conservation Research" issued by Central Soil and Water Conservation Research and Training Institute, Dehradun, annual scheme can be prepared to treat the selected areas and it will contains provisions for –

i) construction of counter trench and bunds.
ii) creation of ring-heads at mouth of gully easing of the slopes and brush wood.
iii) gully plugging
iv) construction of check dams.
v) seed sowing and planting on treches, bunds.

**Fire Protection**

The damage caused by forest fires is well known and there is urgent need for strict fire protection. The legal provisions for fire protection is reserve forests are given in Fire Protection Rules as notified under Indian Forest Act and for protected forests in Rule 6 of Madhya Pradesh Protected Forest Rules, 1960. The following areas are specially protected areas-

| | | | |
|---|---|---|---|
| i) | Regeneration and treated areas | - | 5 years |
| ii) | Plantations | - | 5 years |
| Iii) | Flowered Bamboo areas | - | 7 years |
| Iv) | Experiment / Preservation plots. | | |

Every year annual fire protections scheme is to be prepared classifying areas as under:-

- Very sensitive areas
- Moderately sensitive areas
- Less sensitive areas.

The scheme is to contain work schedule for -

i) cleaning and maintenance of existing external and internal fire lines.
ii) propose fire lines
iii) fire watchers – number and their work
iv) Requirement of fire fighting equipments
v) Extension and publicity for protection and demonstration for use of equipments.

All the forest fires should be properly attended to and should be extinguished at earliest.

**Measures to reduce Human-Elephant conflict**

In Chhattisgarh more than 305 elephants, in a number of groups, are roaming and residing in the different regions within the State. From last two to three years Kawardha Forest Division is also visited by elephants. The area is new thus human- animal conflicts may arise in the area. They visit the said area by the following route- from Achanakmar Tiger Reserve to Mungeli to Kawardha Range Taregaon and Pandaria to Phen Wildlife Sanctuary to Kanha National Park and return following the same route.

In Human - Elephant conflict, Elephant kills the human and destroy the properties, Crops, houses etc. So, to save their crop from destruction, farmer often use brutal methods like fireworks, poison and electrocuted fences. The death of a pregnant elephant in Kerala in first week of June after biting into a "Snare bomb" - a pineapple filled with crackers -sparked national outrage but it also brought home the ugly realties of human-elephant conflict.

Following measures are suggested to reduce the human-elephant conflicts:

**1. Formation of Haathi Mitra Dal :**

A five member team from NGO, local villagers who shall work like master trainers, skit actors , workshop, seminar in the villages to teach the villagers how to conduct themselves around elephants and to save themselves in case of a conflict with elephants. With help of these programs , they will inculcate the confidence of villagers to live amicably with the elephants. They shall teach the villagers the dos and donts around elephants.

**2. Digging of elephant proof trench with planting of sisal on trench.**

**Prescriptions for Capacity Building of Local Populace**

Participation of local populace is a need of the day for conservation of forests and Wildlife therein. In order to motivate and sensitize the local populace, following activities would be undertaken which would also help in their Socio-Economic development.

1. **Training:**

   Promising local youths would be exposed to training in various trades which would earn bread and butter for them and bring self-sufficiency.

2. **Formation of Self-Help Groups:**

   Self-Help Groups of women would be formed by providing them necessary working capital. Such groups would be registered with the competent authority. This activity would also help in empowerment of women, which is policy of the Central Government.

**Prescriptions for Creation of Awareness for Bio-Diversity Conservation**

Complete apathy towards the conservation of Biodiversity is noticed amongst the local populace. There is no concern about the conservation and protection of forests and wildlife.

As stated earlier, participation of local populace is essential for the conservation of forests and wildlife. To obtain such participation, creation of awareness is essential.

During the WLCP period awareness for Bio - Diversity conservation would be created through distribution of Pamphlets/Handouts /Brochures etc.

# CHAPTER - IX

## FUNDING, IMPLEMENTATION AND MONITORING OF WILDLIFE CONSERVATION PLAN

### Funding of Wildlife Conservation Plan

Financial Forecast of Rs. **55.00** Lakhs for the Plan Period and it would be funded by the Project Proponent.

Funds required for implementation of this WLC Plan would be placed at the disposal of the Implementing Authority, in advance, before the start of the fiscal year.

### Implementation of Wildlife Conservation Plan

Wildlife conservation and habitat protection includes technical and forest management related activities. The Wildlife Conservation Plan is intended to educate communities, mine owners, potentially responsible parties, companies, and other interested groups about how land conservation tools can be used as part of an integrated strategy to remediate and conserve wildlife and forest around mining areas. These sites may pose significant environmental, regulatory, and conflicting development challenges. Forest conservation is the long-term protection and management of well protected as well as under protected land resources, such as open space, wasteland, and forest regeneration land. The Wildlife Conservation Plan includes (1) identify forest land, typology and conservation and discusses how land conservation tools can support the restoration of lands; (2) reviews potential benefits associated with land conservation; and (3) evaluates conditions under which land conservation tools can best facilitate the restoration of lands around the proposed mines. In view, the above task need for professional expertise and regulatory body it is advised that state forest department may be requested to take responsibility to implement the wildlife conservation plan related activity.

The only agency that has this expertise is Forest Department of Madhya Pradesh. Forest department has lot of trained forest officials and field staff who can effectively manage the conservation program. The Forest Department has close link with the Joint Forest Management Committees of the villages in which the management activities will be implemented.

## Wildlife Conservation Monitoring System

Monitoring is the systematic collection, analysis and use of information from projects and program. Based on this information, it can be determined whether any changes need to be made at a project, program or policy level, and if so, what they are, what went well, where is there room for improvement. Since Conservation and habitat analysis is crucial to understand changes in a species' demographics, one competent third-party Monitoring Agency under the guidelines and supervision of "**Chief Wildlife Warden, Government of Madhya Pradesh**" may be engaged to collect periodical data based on criteria and indicator and handle the various data of the proposed conservation and habitat and create visual depictions gives the user the ability to monitor change and discover important relationships. Understanding threatened species is important in preventing their extinction and revitalizing their populations. The Wildlife Conservation Monitoring System will provide the platform for agencies to collect and share information on the trends and patterns of wildlife conservation. Selected information will be shared with the public for bringing awareness about wildlife crime. Monitoring agency will keep a track of any habitat loss, and human disruptions, such as pollution and deforestation which can cause wildlife fragmentation and extinction and threaten the biodiversity of the area.

Management plans are dynamic documents that will be evaluated and updated periodically. Evaluations will be made annually for each compartment so that effective practices can continue to be implemented, while those that produce few or no results can be modified or discarded. Recording impacts of management efforts on compartment sheets is important in helping to evaluate the effectiveness of certain management practices. Keeping a log book of observations and changes that occur in compartments can also provide valuable information for evaluating management efforts. Monitoring will ensure that mitigation plans are working effectively. Monitoring also includes assessment of compliance against regulatory requirements and other agreed performance standards. Monitoring will help to identify areas of non-compliance and suggest for corrective action.

# CHAPTER - X

## BUDGET PROVISION FOR WILDLIFE CONSERVATION AND MANAGEMENT PLAN

### Mukam Bauxite Mines Lease Area

The buffer zone of Mukam Bauxite mines is the 10 kilometer radius area from the periphery of the Mine lease area. Out of total buffer zone area approximately 70% area is situated in territorial forest limit of Chhattisgarh State and rest 30 % area in territorial forest limit of Madhya Pradesh State. The buffer zone of Mukam Bauxite mines area of Madhya Pradesh falls in the area of Phen Wildlife Sanctuary and Kanha Achanakmar Tiger Corridor Area (Area of East Mandla Forest Division Range Mawai). The distance of Phen Wildlife Sanctuary from the boundary of Mukam Bauxite Mine Lease Area is 4.10 kilometers and Kanha Achanakmar Tiger Corridor is approximately 5.89 kilometers.**( Annexure-V)**

According to guidelines of MoEF&CC New Delhi[1] and Standing Committee of National Board For Wildlife (SCNBWL)[2] the budget for impact mitigation and Wildlife Conservation Plan should be 2% of the total project cost. The total project cost of this project is 9.00 Crores. **Thus for impact mitigation and Wildlife Conservation Plan the budget should be 18 Lakhs, however we are proposing Rs 121 Lakhs (Rs 66 Lakhs for Chhattisgarh and Rs 55 Lakhs for MP) 13.5% of the total project cost.**

1. **Budget Provision for Impact mitigation and Wildlife Conservation Plan for Phen Wildlife Sanctuary (Kanha Tiger Reserve Mandla Madhya Pradesh)**

   (Revised Budget provision in compliance of PCCF Wildlife MP Letter No WL/DM /Mines-150/4258 Bhopal Dated 09.05.2023)

   The Phen Wildlife Sanctuary is a “Satellite Mini Core” of the Kanha Tiger Reserve. The total area of this Sanctuary is 110.74 square kilometer. The Phen Wildife Sanctuary, a separate protected area unit, under the administrative control of Kanha Tiger reserve Mandla. In buffer zone area of Mukam Bauxite Mines, following compartments are situated within the area of this Sanctuary:

   Compartment No 18 (Part), 19 (Part), 22, 23, 24, 25, 27, 28, 30, 31, 32, 34 (Part), 35 (Part), 36, 37, 38, 39, 40 and 41.

   Compartment Number 1383, 1384, 1385 and 1386 of Buffer Zone Area of Kanha National Park.

2. **Kanha Achanakmar Tiger Corridor (East Mandla Territorial Forest Division Range Mawai MP) :**

   In buffer zone area of Mukam Bauxite Mines following compartments fall in East Mandla Territorial Forest Division Range Mawai which are parts of Kanha Achanakmar Tiger Corridor Area. The compartments are :

   1341, 1342, 1343, 1344, 1345, 1346, 1347, 1348, 1190, 1191, 1192, 1188, 1189, 1187, 1171, 1172, 1340 (Part), 1174 (Part) and 1176 (Part).

1. GOI MoEF&CC File Number I-20/2014(Wildlife Plan) Dated 20.10.2015 and File Number FC-II/40/2021-FC Dated 07.06.2022
2. 34th NBWL Meeting Minutes.

## 1. Budget Provision for Wildlife Conservation and Management Plan

### M/s Chhattisgarh Mineral Development Corporation Limited (CMDC)

### MUKAM BAUXITE MINE LEASE AREA

Plan Period 10 Years.

(Revised Budget provision in compliance of PCCF Wildlife MP Letter No WL/DM /Mines-150/4258 Bhopal Dated 09.05.2023)

| S. No. | Details of Proposed Works | Work Place | Compt. No. | Quantity | Year Wise Budget Provisions (₹ Lakh) | | | | | | | | | | Total ₹Lakhs | Justification |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | | |
| 1. | Bela to Neempani forest road upgradation (W.B.M.) | Buffer Zone | 178,179 | 1 Km | 15.00 | - | - | - | - | - | - | - | - | - | 15.00 | For forest & wildlife protection & communication to remote area |
| 2. | Bolder Soling work on Bordah to Neempani forest road | Phen Sanctuary | 35,36 | 2 Km | - | 5.00 | - | - | - | - | - | - | - | - | 5.00 | |
| 3. | Bolder Soling work on Karwamatta to Bordah forest road | Phen Sanctuary | 30,32 | 2 Km | - | - | 5.00 | - | - | - | - | - | - | - | 5.00 | |
| 4. | Madmadi / Lantana Eradication at Sajalagan | Phen Sanctuary | 31 | 50 Hect. | - | 2.50 | - | - | - | - | - | - | - | - | 2.50 | For development & management of meadows |
| 5. | Madmadi / Lantana Eradication at Sajalagan (After care First Year) | Phen Sanctuary | 31 | 50 Hect. | - | - | 1.20 | - | - | - | - | - | - | - | 1.20 | |
| 6. | Madmadi / Lantana Eradication at Sajalagan (After care Second Year) | Phen Sanctuary | 31 | 50 Hect. | - | - | - | 1.30 | - | - | - | - | - | - | 1.30 | |
| 7. | Maintance & Minor Reparing of forest road | Phen Sanctuary | - | L/S | - | - | - | 1.00 | 1.00 | 1.00 | 0.50 | 0.50 | 0.50 | 0.50 | 5.00 | Forest, wildlife protection & communication to remote area |
| | | | | Total | 15.00 | 7.50 | 6.20 | 2.30 | 1.00 | 1.00 | 0.50 | 0.50 | 0.50 | 0.50 | 35.00 | |

## 2. Budget Provision for Wildlife Conservation and Management Plan for Kanha Achanakmar Tiger Corridor (East Mandla Territorial Division)

### M/s Chhattisgarh Mineral Development Corporation Limited (CMDC)

### MUKAM BAUXITE MINE LEASE AREA

Plan Period 10 Years.

(Revised Budget provision in compliance of PCCF Wildlife MP Letter No WL/DM /Mines-150/4258 Bhopal Dated 09.05.2023)

| S. No. | Description of the Item of Work | No. / Quantity | Year Wise Budget Provisions (₹ Lakh) | | | | | | | | | | Total ₹Lakhs |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1st | 2nd | 3rd | 4th | 5th | 6th | 7th | 8th | 9th | 10th | |
| 1. | Health/Veterinary Services of Wildlife | L/S | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 2.50 |
| 2. | Improvement of Fodder availability & pasture development one place in each year. | 5 No. | 1.50 | 1.50 | 1.50 | 1.50 | 1.50 | - | - | - | - | - | 7.50 |
| 3. | Fire Protection | L/S | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 0.50 | 5.00 |
| 4. | Prophylactic Inoculation | L/S | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | - | - | - | - | - | 1.25 |
| 5. | Awareness Generation / Capacity building of Local Populace and other expenses | L/S | 0.50 | 0.50 | 0.50 | 0.50 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 3.75 |
| | | **Total** | **3.00** | **3.00** | **3.00** | **3.00** | **3.00** | **1.00** | **1.00** | **1.00** | **1.00** | **1.00** | **20.00** |

Grand Total : Rs. 35.00 Lakh Phen Sanctuary

Rs. 20.00 Lakh Kanha Achanakmar Tiger Corridor

**Total : Rs. 55.00 Lakh**

वनमण्डलाधिकारी
पूर्व सामान्य वन मण्डल, मण्डला

क्षेत्र संचालक,
कान्हा टायगर रिजर्व,
मण्डला

(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

# CHAPTER - XI

## IMPACT ASSESSMENT OF PROPOSED MINING ON FLORA & FAUNA

The biodiversity assessment & conservation plan is sustainable use of natural resources which involves scientific management of natural wealth vis-à-vis developmental activities that are likely to affect the natural resources. The threat to natural ecosystems generally arise due to anthropogenic activities that arise as a result of mining and other associated activities.

Impacts on ecological environment, which directly or indirectly affect the species composition of the area may be as follows:-

1. The entire vegetation will disappear in the mining area, waste dumps, overburden, road construction and infrastructure development.
2. Settleable dust pollution is a major threat to the vegetation in the core as well as buffer zone area.
3. The fauna, though very sparse, in the vicinity of mine may be displaced and will search new habitations.
4. Localized landscape alteration, and topography change may occur to some extent.
5. Drainage system may be affected to some extent.

**Environmental Impact**

It is an irrefutable scientific fact that there cannot be any developmental or industrial and mining activity which is completely devoid of causing any environmental impact. Mining sectors too are no exception to that. However, it is also a fact that environment is a dynamic entity and has a built-in self-renewal process that can level the extrinsic impact within reasonable limits. Moreover, biodiversity is a resilient entity of the environment and can tolerate impacts and recuperate if their renewal mechanisms are unaffected over a long period of time. Therefore focus should be laid on ensuring that the renewal dynamics of various floral and faunal taxa is not impeded by the mining Industry.

A total area of 33% will be developed under greenbelt development/ plantation in and all around the Mine site. The improvement in agricultural production will also increase the vegetal cover. This coupled with Greenbelt development/ plantation is a favourable and eco-friendly measure to reduce the impact of the proposed capacity enhancement of mine on the biodiversity of the area. The species planted so far are *Azadirachta indica* (Neem), *Terminalia tomentosa* (Saja), *Terminalia arjuna* (Arjun), *Cassia fistula* (Amaltas), *Delonix regia* (Gulmohar), *Ficus spp*. (Bargad, hairy fig), *Mangifera indica* (Mango), *Phyllanthus emblica* (Amla), *Psidium guajava* (Amrud) etc. The plant species will be selected as per CPCB guidelines.

Adequate measures are being/ adopted as a part of the Environmental Management Plan (EMP) to prevent entrainment of fugitive dust emissions. Thus, adverse impacts due to fugitive emissions are not expected to be significant.

This requires sensitization of all levels of stakeholders involved in the process of development to realize the importance of biodiversity and the role biodiversity in maintaining an ecological balance. Practically this can be achieved by:

1. Inviting locals for participatory management & conservation of local biodiversity through training programs linking biodiversity to livelihood.
2. Scaling up the Green Belt development in and around the mine lease area.
3. Controlling the fugitive emissions and other airborne pollutants by appropriate technology at point source.
4. Adherence to the strategies outlined in the EMP.
5. Water sprinkler would be used on connecting road for transportation of material in operation phase to control fugitive emission in surrounding environment.
6. Paved road would be use for transportation to minimize fugitive emission.
7. Transported material and place of store of raw material will be well covered.
8. Transport vehicles and machinery would be properly maintained and periodically check pollution level to reduce noise level and gaseous emission in surrounding environment.
9. Emission of particulate matter during operation phase will be controlled at source by using particulate matter control devices as per CPCB guidelines.
10. Create a live hedge of sturdy woody shrubs along the periphery of mine that would restrict the wildlife to enter into mine site.

**Biological Impact**

No significant impact on biodiversity is anticipated from existing mining due to effective management plan. The vegetation is very sparsely and scanty in core zone, but due to presence of Reserve forests in buffer zone, biodiversity of the study area is moderately rich. There is no perennial and seasonal surface water body passing through mine lease area. However, in the buffer zone Manai Nadi, Litari Nadi in North-Western Part and Hanp River in East-Northern region exists in the study area.

Core area of the mine site has low density of plant species. Some trees being cut for the bauxit mining activity. Gaseous emission like SOx, NOx, CO and Particulate matter may affect both flora and fauna in the surrounding environment. These gases may deteriorate the chlorophyll content of plant. Some plant specifies are very sensitive to the concentration of gases in the environment and cannot survive in higher concentration. The Carbon Monoxide is reacting with Hemoglobin of blood of animal and affects carrying capacity of oxygen to organs. These gases are cause of health related issues in animals at particular concentration.

**Pollution Impact**

Noise pollution and ground vibration can affect the behavior of animals and may lead to habitat disintegration. If, Hazardous wastes, solid wastes and waste water are not disposed and treated accordingly, they may lead to fouling of environment resulting negatively on floral and faunal species.

The higher particular concentration of gaseous emissions and particulate matters may cause migration of wild animals and birds. The fugitive emissions, which are expected to be generated during the mining operation, are likely to settle down in the mining lease. There are three perennial water body at sufficient distance from mine lease area; accept this no specific perennial water bodies within the 10 km radius of the lease area, which could possibly be impacted by the fugitive emission in terms of increased turbidity and Total Solid content. However, the terrestrial flora will also be impacted. The settlement of these fine particles on the laminar surface of plants can impede the efficiency of photo-synthesis and thereby affects the productivity of plants. In some of the plants, it may smother the leaf surface thus blocking stomata, resulting in reduced transpiration.

There are low density of wildlife in the buffer area of mine lease area. The area does not fall in any part of National Park or Wildlife sanctuary but the buffer zone area falling in Madhya Pradesh have some area of Phen Wildlife Sanctuary and Kanha-Achanakmar Tiger Corridor Area. During biodiversity assessment in a reserve forest it was revealed that there lies thin wild life habitation. Nine Schedule-1 species were recorded in the buffer zone of project area during the biodiversity assessment, which belongs to schedule-1 species of wild life protection act-1972.

However, speculations on the likely impact of the mining activity on the movement of some resident faunal species need to be examined and addressed. Noise and vibration will be generated because of blasting which may scare the wild fauna of the nearby forests patches and force them to migrate to other areas. After expansion of existing mine, the emission of toxic gases in the environment may badly affect the terrestrial and aquatic animals due to change in composition of the elements. Migratory birds may be affected due to increase pollution level and lighting beam in or around the industrial and mining activities. The migratory route of birds will be affected and habitation of birds will be disturbed from the topographical changes, construction and blasting activities.

From the results of air pollutant dispersion modeling, it was found that the SPM concentration will have negligible effect beyond a distance of 2.1 km from site. As Reserve forests are located within the distance of 0.5km from the mining lease boundary, there will be some effect of emissions on the flora & fauna in the forest area due to mining activities of bauxit mining activity. Whenever the bauxit mine will be in operated with full enhanced production; it will be having little impact on the surrounding biodiversity as proper mitigation measures have been taken up to control the fugitive and other emissions. **Mukam Bauxite Mines Lease Area (CMDC)** are being developing greenbelt to control fugitive and other emissions as well as for controlling noise pollution impact on surrounding environment. Thus the impact on biodiversity due to mining will not be significant. Effective Environment Management Plan and proper mitigation measures will be adopted as per CPCB guidelines to reduce the impacts.

**Ecosystem Impact**

The human influence on biodiversity and ecosystem functioning have largely taken in the form of rapid, large and frequent changes in land and resource use, increased frequency of biotic invasion, reduction in species number, creation of stresses and the potential for changes in climatic systems. Such changes have a direct impact through habitat destruction and over- exploitation of resources such as overgrazing and indirect impact through their impact on the composition of the atmosphere and climate. Increasing anthropogenic pressure on forest over the few decades has led to vast exploitation of natural flora. Anthropogenic disturbances play an important role in change, loss or maintenance of plant biodiversity and more recent phenomenon of climate change will also be responsible for the change in species composition and other ecosystem activities. The anthropogenic disturbances occur in form of grazing, browsing, lopping of tree for fuel wood and fodder, fire, deforestation etc. Both natural and human caused disturbances are considered since vegetation responses do not distinguish between natural and human activities. These biotic pressures play an important role in forest community dynamics and regulate the regeneration ability of a species.

**Impacts on Biodiversity**

There are no direct or indirect evidence of presence of any major wildlife in the core zone. The area does not fall in any part of National Park or Wildlife sanctuary, though there are three reserve forests. However, speculations on the likely impact of the mining activity on the movement of some resident faunal species need be examined and addressed.

Due to operation of existing mine; there seems to be little impact on the surrounding biodiversity as proper mitigation measures are taken up to control fugitive and other emission. Also green belt/ plantation has done in and around the mine lease area. Mitigation measures as per CPCB guidelines will be adopted to reduce impact after expansion of the mining production capacity.

Increasing anthropogenic pressure on forest over the few decades has led to vast exploitation of natural flora. Anthropogenic disturbances play an important role in change, loss or maintenance of plant biodiversity and more recent phenomenon of climate change will also be responsible for the change in species composition and other ecosystem activities. The anthropogenic disturbances occur in form of grazing, browsing, lopping of tree for fuel wood and fodder, fire, deforestation etc. Both natural and human caused disturbances are considered since vegetation responses do not distinguish between natural and human activities. These biotic pressures play an important role in forest community dynamics and regulate the regeneration ability of a species. The human influence on biodiversity and ecosystem functioning have largely taken in the form of rapid, large and frequent changes in land and resource use, increased frequency of biotic invasion, reduction in species number, creation of stresses and the potential for changes in climatic systems. Such changes have a direct impact through habitat destruction and over-exploitation of resources such as overgrazing and indirect impact through their impact on the composition of the atmosphere and climate.

**Proposed steps &strategies to minimize mining effects :**

Biological environment: - The mining bauxit area is located in the private and revenue areas, with almost scanty trees. But even then the mining operation will begin with the extraction of existing vegetation growing over the proposed mining pit area & dumping area. The impact of all these activities may not be respected to its earmarked area of mining, but will also affect the flora and fauna in around and close vicinity. In order to mitigate and minimize the mining effect arising due to mining operation, especially after the removal of existing vegetation, various activities and stetgies will be adopted. To minimize the impacts like air pollution, noise pollution, soil erosion, water loss and dump menace the steps taken will be as follows :-

1) Safety zone development
2) Shelterbelt plantations
3) Greenbelt management
4) Rehabilitation of exhausted mining pits
5) Dump stabilization
6) Habitat improvement in vicinity
7) Awareness programme
8) Water conservation measures.

**Dump management :**

Waste materials will be dumped within the core area of the project the exact location of which has already been mentioned in mining plan. It is suggested to stabilize the dumps by planting the indigenous trees as well as with monocot and leguminous plants, which have fibrous roots and act as good soil binder. It is also proposed that at the toe of each dump two parapet walls will be erected to check the rolling boulders. A trench between two walls is also suggested. It also proposed that proper drainage system will also be developed at the crest of the dumps, and conserving the rain water. Following species are suggested for stabilizing the waste dumps:-

| S.No. | Species | Uses |
|---|---|---|
| 1 | *Dalbergia sisoo* | Timber and fuel |
| 2 | *Terminalia tomentosa* | Timber and fuel |
| 3 | *Syzygium cumini* | Timber and fuel |
| 4 | *Bauhinia varigata* | Fodder and fuel |
| 5 | *Bombax sieba* | Fuel |
| 6 | *Ficus bengalensis* | Timber and fuel |
| 7 | *Ficus religiosa* | Fodder and fuel |
| 8 | *Albizzia lebbek* | Timber and fuel |
| 9 | *Albizzia procera* | Timber and fuel |
| 10 | *Acacia nilotica* | Timber, fuel and Fodder |
| 11 | *Zyzyphus species* | Timber, fuel and Fodder |
| 12 | *Tamarindus indica* | Timber, fuel and Fodder |
| 13 | *Prosopis* | fuel and Fodder |
| 14 | *Grewia* | fuel and Fodder |
| 15 | *Cassia fistula* | fuel and Fodder |
| 16 | *Morus indica* | Timber and fuel |
| 17 | *Neem species* | Timber and fuel |
| 18 | *Moringa* | Fodder and fuel |
| 19 | *Leuceanea leucocephala* | Fodder and fuel |
| 20 | *Eucalyptus* | Fodder and fuel |
| 21 | *Amaltas* | Fuel and ornamental |

**Mitigation planning :**

Though the wild animal's species and floral species are very sparsely distributed in the area but even then suitable water conservation measures needs to be adopted. The following steps are proposed :-

1. All the water bodies in the vicinity will be maintained and improved
2. The reclamation plan will be prepared taking in to account the edaphic, ecological and hydrological considerations.
3. Exhausted mining sites will be developed in such way that these are used for economic benefits of the villagers.
4. It is also proposed that major irritants like high noises, excessive bright light and vibration be kept under strict control.
5. Apart from the above, the issues and strategies are proposed for improving the socio economic status of the people residing with in the buffer zone. Such activities may be infrastructure support programme, economic upliftment programmes and village's empowerment programmes. Some of the activities under this programmes may be as follows:-

   A. Health and family welfare programmes.
   B. Medical camps
   C. Sanitation & disease prevention programmes
   D. Education improvement
   E. Improving water supply etc.
   F. Awareness programme
   G. Cultural development
   H. Villages empowerment

**ANNEXURE - I**

**F. No: IA-J-11015/37/2022-IA-II(NCM)**

Government of India

Ministry of Environment, Forest and Climate Change

(Impact Assessment Division)

***

2nd Floor, Prithvi Wing,
Indira Paryavaran Bhavan,
Jor Bagh Road, Aliganj,
New Delhi - 110 003.

Dated: 28th November, 2022

To,

**M/s Chhattisgarh Mineral Development Corporation Ltd,**
Sector, 24, Block No. 7A,
Third Floor, Naya Raipur,
Atal Nagar, Pin code- 492015,
Chhattisgarh.

**Subject: - Mukam Bauxite mine of M/s Chhattisgarh Mineral Development Corporation Ltd for mining of Bauxite with Total Excavation of 802977.5 TPA [384615.4 TPA (ROM) & OB 418362.1 TPA] in the mine lease area of 110.563 Ha, located at Village: Mukam, Tehsil- Bodla, District- Kabirdham, Chhattisgarh - Terms of Reference (ToR) - regarding.**

Sir,

This has reference to the online proposal no. IA/CG/MIN/402430/2022 for grant of Terms of Reference (ToR) for mining of Bauxite in Mukam Bauxite mine of M/s Chhattisgarh Mineral Development Corporation Ltd with Total Excavation of 802977.5 TPA [384615.4 TPA (ROM) & OB 418362.1 TPA] in the mine lease area of 110.563 Ha, located at Village: Mukam, Tehsil- Bodla, District- Kabirdham, Chhattisgarh.

2. The details of the project as ascertained from the document submitted by the Project Proponent are mentioned below:

i. The mine lease area is located between Latitude 22°22'45.72558"N to 22°23'26.25876"N and Longitude 81°08'49.47502"E to 81°10'16.84813"E. The mine lease area falls under the Survey of India Toposheet No: 64 F/3 and falls in Seismic Zone-II.

ii. The proposed project activity is listed at schedule no. 1(a) Mining of Minerals and falls under Category "A" as the Interstate Boundary of Madhya Pradesh is located at a distance of 4.1 km, W from the mine lease area and appraised at the Central level.

Chhattisgarh Mineral Development Corporation Limited
05 DEC
Receipt No. 1894

iii Details of Mine lease

| S No | Letter of Intent | Date of the grant | Name of the Mineral | Period of Grant | Granted by | Mine lease area in Ha |
|---|---|---|---|---|---|---|
| 1 | Letter of Intent for grant of mining for a period of 50 years vide Lr No F3-3/2021/12, Nava Raipur | 11.04.2022 | Bauxite | 50 years | Government of Chhattisgarh | 110.563 ha |

iv Land use/Land Cover of the Mine Lease Area

| | |
|---|---|
| Private Agriculture land | 67.401 Ha |
| Government land | 43.162 Ha |
| Total Mining lease area (MLA) | 110.563 ha |

v Mining Plan Details

| | | |
|---|---|---|
| Mining Plan along with Progressive Mine Closure Plan approved by Indian Bureau of Mines (IBM) | Letter No | कबिरधाम/बाक्स/खयो-1335/2022-रायपुर |
| | Date | 07.09.2022 |
| | Mineral | Bauxite |
| | Mine lease area | 110.563 Ha |
| | Validity | Five Years |
| Mining Parameters | Quantitative Description | |
| Method of Mining | Opencast mechanized with drilling and blasting | |
| Geological Reserves | 50,26,659.22 Tonnes | |
| Mineable Reserves | 32,13,288.26 Tonnes | |
| Life of mine | 11 years. The life of the mine will likely to be increased after the proposed exploration is completed | |
| Bench Height | 3 m | |
| Bench Width | 3 m | |
| Individual bench slope | 45° | |
| Overall pit slope | 60° | |
| RoM output size | 100-250 mm | |
| Transportation details | By excavator-dumper combination | |
| Dumpers capacity | 18T | |
| | PP reported that about 4,18,362.12 m3 of OB, 22,061.83 m3 of topsoil and 96,153.85 m3 of mineral reject will be generated in the five-year plan period. The recovery of bauxite ore is expected as about 65% from the total excavation from bauxite zone and remaining 35% will be considered as waste. The | |

| | |
|---|---|
| | waste generated every year through mining will be properly kept at a suitable site and this will be backfilled every year at a site of mining after excavating mineral from the site. The backfilling will be carried out in same sequence as it is found in nature, i.e., waste and overburden in bottom, then top soil in the top. After backfilling, the land will be levelled and covered by shrubs and grass so as to improve the fertility of the land. |
| Conceptual Land Use | PP submitted that during the first five years, about 23.014 Ha of area will be covered as mining pit, out of this about 8.14 Ha area will be backfilled by OB and waste. Up to the life of the mine, about 68.01 Ha area will be covered as a pit and 40.716 Ha area will remain as virgin land within the statutory barriers and no-ore zone. Out of the total pit area of 68.01 Ha, almost are will be backfilled and reclaimed. |

vi. Water requirement:

| | | | |
|---|---|---|---|
| Total water requirement (KLD) | 6.5 KLD | Dust suppression | 0.425 KLD |
| | | Greenbelt | 3.750 KLD |
| | | Domestic | 2.325 KLD |
| Source | Tube well for domestic and drinking purpose and for other purposes it will be fulfilled from local supplier. | | |

vii. Nearest village / town/ highway/railway station / water bodies:

| Particulars | Particular's Name | Distance & Directions |
|---|---|---|
| Nearest Village | Mukam | approx. 0.5 km. from project boundary |
| Nearest National Highway | NH- 12 Bodla to Daldali | 42 km. |
| Nearest Railway station | Bilaspur<br>Raipur | 110 km approx<br>135 km approx |
| Nearest Airport | Bilaspur Airport | 106.80 km, SE approx. |
| Nearest water bodies | Manai Nadi<br>Lilari Nadi<br>Hanp River | 3.1km, NWN<br>2.6 km, NW<br>4.4km, ENE |

viii. The Project Proponent reported that there is no forest land involved in the mine lease area. PP reported that there are no National Park, Wildlife Sanctuary, Biosphere Reserves, Tiger/Elephant Reserves within the 10km radius of the study area. Further, PP reported that Reserve Forests such as Daldali RF- 5 km, South Phen RF-2.7 km,

NW, Marpha RF- 7.9 km, N, Dhaba RF-8.5 km, NE and Protected Forests such as Neur PF-3.5km, E, Labda PF-4.2km, SE and Nunsarai PF- 7.5km, NW are found within the 10 km radius of the study area.

ix. The Project Proponent submitted that during the first five-year plan period, an area of about 2.0 Ha will be covered under greenbelt/plantation with proposal of planting 250 no. of trees every year and the expected survival rate is 85%.

x. The Project Proponent reported that some part of the Mukam Village lies inside the lease area. However, a safety zone will be maintained as per the proposal given in the approved mining plan. Hence, will be no land ousted nor any R & R of the Project Affected Persons shall be involved in this project.

xi. The Project Proponent submitted that there is no litigation pending against the project and/or land in which the project is proposed to be set up.

xii. The Project Proponent submitted that the total cost of the project is Rs 9.0 Crores and about 93 persons will get employment.

3. Observation and Recommendation of the Committee:

The EAC noted that the instant proposal is a green field project for grant of Terms of Reference (ToR) for mining of Bauxite in Mukam Bauxite mine with Total Excavation of 802977.5 TPA [384615.4 TPA (ROM) & OB 418362.1 TPA] in the mine lease area of 110.563 Ha. The EAC asked the Project Proponent to being with KML indicating the surface features in the study area. The instant mine lease area falls under Category "A" as the Interstate Boundary of Madhya Pradesh is located at a distance of 4.1 km, W from the mine lease area and appraised at the Central level. The Project Proponent informed that the total mine lease area is 110.563 ha, out of which Private Agriculture land is 67.401 Ha and Govt. land is 43.162 Ha. The EAC asked the Proponent to submit the cost benefit analysis study comparing to the production of agriculture and mineral production. The EAC also asked the Project Proponent to submit the action plan for returning the land back to the farmers along with the timeline. The EAC observed that the vicinity of the mine lease area is occupied by dense vegetation and it seems the mine lease area is surrounded by forest land and hence the EAC asked the Proponent that whether any forest land is involved in the mine lease area. The Project Proponent informed the EAC that there is no forest land involved in the mine lease. Nearest Village is Mukam which is located at a distance of 0.5 km from the mine lease boundary. The EAC was of the view that some part of the Mukam Village area lies in the mine lease area and in North Western part of the mine lease area some habitations are visible. The EAC asked the Project Proponent to carry out a detailed R&R plan with need based study.

The Project Proponent informed the EAC that the material will be transported to the Railway Siding at a distance of 70 km from the mine lease area. The EAC asked the Project Proponent to submit the detailed traffic density study and the carrying capacity of the road. The Project Proponent needs to prepare the transportation plan in such a way that the transportation route shall not pass through any village road. Further, the Project Proponent

informed the EAC that the Reserve Forests such as Daldali RF- 5 km, South Phen RF-2.7 km, NW, Marpha RF- 7.9 km, N, Dhaba RF-8.5 km, NE and Protected Forests such as Neur PF-3.5km, E, Labda PF-4.2km, SE and Nunsarai PF- 7.5km, NW are found within the 10 km radius of the study area. The water bodies such as Manai Nadi: 3.1km, NWN, Lilari Nadi: 2.6km, NW, Hanp River: 4.4km, ENE and Phadej Nala: 10.6 km, SWS direction from mine site. The project site is not falling within any wildlife sanctuary or National Park.

Then, the Project Proponent began the technical presentation and informed the EAC that the Letter of Intent (LoI) was granted by the Government of Chhattisgarh vide letter dated 11.04.2022 and is valid upto 31.03.2023. The mineable reserves of bauxite estimated as 32,13,288.26 Tonnes. The maximum proposed annual production rate during the first five years will be 384615.4 tonnes and the anticipated life of the mine is 11 years and the life of the mine will likely to be increased after the proposed exploration is completed. The maximum depth of working will be 15m. An area of 7.701 ha will be degraded in the first five-year plan. The EAC noted that the upto the life of the mine, an area of about 68.01 Ha will be covered as a pit and an area of 42.553 Ha will remain as virgin land within the statutory barriers and no-ore zone. Out of the total pit area of 68.01 Ha, almost are will be backfilled and reclaimed. The mining operations will be restricted to day time only. Total water requirement will be 6.5 KLD. Requirement of manpower is 93 No.s. The estimated project cost is Rs 9.0 Cr.

In view of the above, the EAC recommended the proposal during the 6th EAC (Non-Coal Mining) meeting held during 9-11 November, 2022 under the provisions of EIA Notification, 2006 for grant of Terms of Reference (ToR) for Mukam Bauxite mine of M/s Chhattisgarh Mineral Development Corporation Ltd for mining of Bauxite with Total Excavation of 802977.5 TPA [384615.4 TPA (ROM) & OB 418362.1 TPA] in the mine lease area of 110.563 Ha. located at Village: Mukam, Tehsil- Bodla, District- Kabirdham, Chhattisgarh for undertaking detailed EIA/EMP study subject to the specific conditions in addition to the standard ToR conditions applicable for non-coal mining projects.

4. The matter was examined in the Ministry in accordance with the Environmental Impact Assessment Notification, 2006 and further amendments thereto and the undersigned is directed to say that the Ministry of Environment Forest & Climate Change after accepting the recommendation of EAC during its meeting held during 9-11 November, 2022 hereby accords Specific and Standard Terms of Reference (ToR) for Mukam Bauxite mine of M/s Chhattisgarh Mineral Development Corporation Ltd for mining of Bauxite with Total Excavation of 802977.5 TPA [384615.4 TPA (ROM) & OB 418362.1 TPA] in the mine lease area of 110.563 Ha. located at Village: Mukam, Tehsil- Bodla, District- Kabirdham, Chhattisgarh for undertaking detailed EIA/EMP study subject to the following specific conditions in addition to the standard ToR conditions applicable for non-coal mining projects.

**A. SPECIFIC TERMS OF REFRERENCE**

i. In view of the agricultural land proposed under the mining lease area, the Project Proponent needs to submit the Cost Benefit analysis comparing the current agricultural production and annual turnover including the cost and the benefits drawn by the local villages vis-a-vis the mineral cost and beneficiaries.

ii. The Project Proponent needs to submit the action plan for returning the land back to the farmers along with the timeline.

iii. The EAC noted that an area of 7.701 ha will be degraded in the first five-year plan. The EAC also noted that the upto the life of the mine, an area of about 68.01 Ha will be covered as a pit and an area of 42.553 Ha will remain as virgin land within the statutory barriers and no-ore zone. Out of the total pit area of 68.01 Ha, almost all area will be backfilled and reclaimed. The EAC not convinced with the reply of the Project Proponent and noted that there is no similarity among the land proposed for degradation, area of backfilling w.r.t life of the mine. The EAC asked the Project Proponent to revisit the same and to properly justify with factual data. The Project Proponent also needs to submit the details of the proposed exploration program.

iv. The Project Proponent needs to monitor the ambient air quality and noise level at the mine lease boundary, nearest village, predominant downwind direction and at other sensitive receptors. Accordingly, Project Proponent shall propose to install Continuous Ambient Air Quality Monitoring Station within certain timeline.

v. The Project Proponent should prepare the EMP considering the scenario of pollution to be generated for normative and peak total excavation for assessing air and noise pollution.

vi. The Project Proponent needs to submit the detailed traffic density study and the carrying capacity of the road. The Project Proponent needs to prepare the transportation plan in such a way that the transportation route shall not pass through any village road.

vii. The Project Proponent needs to submit the map demarcating the mineralized and non-mineralized zone in the mine lease area.

viii. The Project Proponent needs to carry out the Public Hearing as per provisions of EIA Notification, 2006. PP should also submit the time bound action plan on concerns of the public through a separate budget with capital expenditure with a timeline of 3 years.

ix. The EAC observed that the vicinity of the mine lease area is occupied by dense vegetation and it seems the mine lease area is surrounded by forest land. Hence, the

Project Proponent should submit the list of Schedule - I species present in the lease area authenticated by PCCF and the status of Forest land in the mine lease area, National Park/Sanctuary, Biosphere Reserve/Tiger Reserve/Elephant Reserve/any other Reserve, Habitat for migratory birds, Corridor for animals within 10 km of the lease area.

x. The Project Proponent needs to submit the detailed R&R plan covering all the components viz. number of Project Affected Families (PAF)/Project Displaced Families (PDF) and details of the land owned by them, break up of total compensation to be paid including method of calculation including the sources/references adopted and mode of payment etc. PP need to submit the plan for Socio economic development of the neighbourhood habitats based on the need based survey along with the time bound action plan. PP also needs to submit the possession certificate and timeline for acquiring the land at the time of appraisal of EC.

xi. The Project Proponent shall conduct drone survey of the mine lease area and buffer area and submit during the appraisal for EC.

## B. STANDARD TOR FOR MINING PROJECT

### I. Project Details

1) Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994. The production details need to submit since inception of mine duly authenticated by Department of Mines & Geology, State Government.
2) A copy of the document in support of rightful lessee of the mine should be submitted. In case of new mines copy of LoI granted by State Government to be submitted. PP should ensure that LoI is valid at the time of grant of ToR. PP should submit the copy of lease deed/supplementary lease deed/extension letter/transfer deed, from its initial grant to subsequent renewals/ transfer/extension of validity.
3) All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4) PP should submit the District Survey Report (DSR) as per S.O. 3611(E) dated 25.07.2018 in case of minor minerals.
5) Brief of proposal to be submitted which include total excavation of the material required for the production of certain quantity of the minerals, location of the project, mining lease area, latitude longitude, seismic zone etc. In case of expansion project

details of expansion viz. expansion in mining lease area or expansion in production of any particular mineral or expansion in total excavation, latest certified Compliance report (CCR) from IRO of conditions granted in existing EC needs to be submitted.

6) The PP should submit the real-time aerial video footage & video of the mining lease area and of the transportation route.

7) All corner coordinates of the mine lease area, superimposed on a High-Resolution Imagery/toposheet, topographic sheet, geomorphology and geology of the area should be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).

8) Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.

9) The PP should collect the Baseline data (BLD) in respect of initial level of the mining lease. For this permanent bench marks (BM) needs to be established at prominent location preferably close to mining leases in question and should have precisely known relationship to the level datum of the area, typically mean sea level.

10) In case of sand mining, the entire mining lease area should be divided suitably into grids of 25 m x 25 m with the help of sections across the width of river and along the direction of flow of the river. The levels (MSL & RL) of the corner point of each grid needs to be recorded. Each Grid should be suitably numbered for identification. PP should identity grids which will be worked out and grids which will come under no mining zone i.e. safety barriers from the river bank. PP should comply with the sustainable sand mining management guidelines 2016 and enforcement and monitoring guidelines, 2020 etc.

11) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given. The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.

12) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.

13) Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.

14) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.

15) Benefits of the Project if the Project is implemented should be spelt out. The benefits

of the Project shall clearly indicate environmental, social, economic, employment potential, etc.

16) Compliance of the Ministry's Office Memorandum No. F. 3-50/2017-IA.III (Pt.), dated 30.05.2018 on the judgment of Hon'ble Supreme Court, dated the 2nd August, 2017 in Writ Petition (Civil) No. 114 of 2014 in the matter of Common Cause versus Union of India needs to be submitted and included in the EIA/EMP Report.

## II. Forest

17) PP shall submit a certificate from Chief Conservator of Forests regarding involvement of Forest Land in the mining lease area if any. In case forest land is involved i) PP should submit the proof of application made for obtaining forest clearance and ii) a map clearly showing the forest & non-forest area.

18) Status of forestry clearance for the broken-up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.

19) Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.

20) The vegetation in the RF / PF areas in the study area, with necessary details, should be given.

## III. Court Matters

21) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.

## IV. Land Environment

22) PP should submit the details of survey number [viz. survey no, area in hectare, classification of land (government, private, forest, grazing land etc.), villages] duly authenticated by State Government, falling in the mining lease area.

23) The study area will comprise of 10km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc. should be for the life of the mine / lease period.

24) Land use of the study area delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given.

25) Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.

## V. Wildlife

26) A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.

27) A detailed biological study of the study area [core zone and buffer zone] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. PP shall submit list of Schedule-1 species present in core and buffer zone duly authenticated by CWLW. In case of any Scheduled-I fauna found in the study area, the necessary plan along with budgetary provisions for their conservation should be prepared in consultation with State Forest/Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost. Proof of its submission of conservation plan to the CWLW needs to be submitted.

28) PP shall submit a certificate from Chief Wildlife Warden regarding distance of mining lease from the protected area falling within 10 KM of the mining lease. In case project requires clearance under Wildlife (Protection) Act, 1972 then copy of application made for the same needs to be submitted.

## VI. Baseline Environment:

29) One season (non-monsoon) [i.e. March - May (Summer Season); October - December (post monsoon season); December - February (winter season)] primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of PM10, particularly for free silica, should be given.

30) Air quality modelling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input

parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site, location of sensitive receptors, if any, and the habitation. The windrose showing pre-dominant wind direction may also be indicated on the map.

31) The PP should submit the photograph of monitoring stations & sampling locations. The photograph should bear the date, time, latitude & longitude of the monitoring station/sampling location. In addition to this, PP should submit the original test reports and certificates of the labs from which samples were analyzed.

## VII. Water Environment

32) The water requirement for the Project, its availability and source should be furnished. Quantity of surface or ground water to be used for the Project should be indicated. A detailed water balance should also be provided. Submit the year wise target for reduction in consumption of the ground/surface water by developing alternative source of water through rain water harvesting measures. Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided. The capital and recurring expenditure to be incurred needs to be submitted.

33) Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.

## VIII. Hydro Geology

34) Details of any stream, seasonal or otherwise, passing through the lease area and modification / diversion proposed, if any, and the impact of the same on the hydrology should be.

35) Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and BGL. A schematic diagram may also be provided for the same.

36) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working bench will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished. In case of surface water is proposed to be utilized then Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.

## IX. Transportation

37) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.

## X. Land Acquisition and R&R

38) Details about the land proposed for mining activities should be given with information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.

39) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need-based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.

## XI. Socio-Economic Environment

40) Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.

41) Measures of socio-economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.

42) Public Hearing points raised and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.

43) Activity-wise time-bound action plan on the issues raised and commitment made during public hearing to be submitted as part of the final EMP Report in compliance of the Ministry's OM F.No.22-65/2017-IA.III dated 30th September, 2020.

## XII. Environmental Monitoring and Management

44) It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/ violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the proposed safeguard measures in each case should also be provided.

45) Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change of land use, loss of agricultural and grazing land, if any, occupational health impacts besides other impacts specific to the proposed Project.

## XIII. Critically Polluted Areas, Aravali & CRZ

46) Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Dept. Should be secured and furnished to the effect that the proposed mining activities could be considered.

47) Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would also need to obtain approval of the concerned Coastal Zone Management Authority).

## XIV. Risk Assessment & Disaster Management

48) Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.

49) Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.

50) A Disaster Management Plan shall be prepared and included in the EIA/EMP Report.

## XV. Miscellaneous

51) The general points are also to be followed: -

a) All documents to be properly referenced with index and continuous page numbering.
b) Where data are presented in the Report especially in Tables, the period in which the data were collected and the sources should be indicated.
c) Project Proponent shall enclose all the analysis/testing reports of water, air, soil, noise etc. using the MoEF&CC/NABL accredited laboratories. All the original analysis/testing reports should be available during appraisal of the Project.
d) Where the documents provided are in a language other than English, an English translation should be provided.
e) The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
f) While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF vide O.M. No. J-11013/41/2006-IA.II (I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
g) Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of MoEF&CC with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
h) As per the circular no. J-11011/618/2010-IA.II (I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
i) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

5. The prescribed TOR would be valid for a period of four years for submission of the EIA/EMP report, as per the notification S.O 751 (E) dated 17.02.2020. The instant TOR is valid up to four years from the date of issuance of TOR.

6. The Project Proponent should submit the EIA/EMP report as per the generic structure prescribed in Appendix-III of the EIA Notification, 2006 after incorporating the details of public hearing conducted and covering the above-mentioned issues, to take further necessary action for obtaining environmental clearance in accordance with the procedure prescribed under the EIA Notification, 2006.

7. This issues with the approval of the Competent Authority.

Yours faithfully,

(Pankaj Verma)
Scientist 'E'

**Copy to:**

i. **The Secretary,** Ministry of Mines, Government of India, Shastri Bhawan, New Delhi-110 001.
ii. **The Secretary,** Department of Environment, Government of Chhattisgarh.
iii. **The Secretary,** Department of Mines and Geology, Government of Chhattisgarh, Chhattisgarh.
iv. **The Chairman,** Chhattisgarh Environment Conservation Board, Nanak Niwas, Civil Lines, Raipur, Chhattisgarh.
v. **The Inspector General of Forests,** Ministry of Environment, Forest and Climate Change, Integrated Regional Office, Aranya Bhawan, North Block, Sector-19, Naya Raipur, Atal Nagar, Chhattisgarh - 492002.
vi. **The Controller General,** Indian Bureau of Mines, Indira Bhavan, Civil Lines, Nagpur-440 001.
vii. **The Member Secretary,** Central Pollution Control Board, Parivesh Bhawan, CBD-Cum-Office Complex, East Arjun Nagar, New Delhi-110 032.
viii. **The Member Secretary,** Chhattisgarh Environment Conservation Board, Paryavas Bhavan, North Block Sector-19, Atal Nagar Dist- Raipur(C.G.)-492002.
ix. **The Member Secretary,** Central Ground Water Authority, 18/11, Jam Nagar House, Man Singh Road, New Delhi-110011.
x. **The Chief Wildlife Warden,** Govt. of Chattisgarh, Aranya Bhavan, Jail Road, Fafadih Chowk, Raipur - 492001.
xi. **The District Collector,** District Kabirdham, Govt. of Chhattisgarh.
xii. **Guard File.**
xiii. **PARIVESH Portal.**

(Pankaj Verma)
Scientist 'E'

## ANNEXURE - II

### INVENTORY OF FLORAL DIVERSITY IN THE CORE & BUFFER ZONE OF MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

Habit: Tree (T), Shrub (S), Herb (H), Grass (G), and Climber (C)

### (a) Floral Diversity within Core Zone - Trees

| S. No. | Scientific name | Local name | Family | Habit |
|---|---|---|---|---|
| 1. | *Ficus religiosa* | Pipal | Moraceae | T |
| 2. | *Azadiracta indica* | Neem | Maliaceae | T |
| 3. | *Mangifera indica* | Mango | Anacardiaceae | T |
| 4. | *Cassia fistula* | Amaltas | Laguminosae | T |
| 5. | *Albizzia lebeck* | Kala Siris | Fabaceae | T |
| 6. | *Albizzia chinesis* | Kiragi | Laguminosae | T |
| 7. | *Albizzia odoratissima* | Chichwa | Laguminosae | T |
| 8. | *Anona squamosa* | Sitafal | Anonaceae | T |
| 9. | *Albizzia procera* | Safed Siris | Laguminosae | T |
| 10. | *Bauhinia variegata* | Kachnar | Laguminosae | T |
| 11. | *Bauhinia racemosa* | Asta | Laguminosae | T |
| 12. | *Pongamia Pinnata* | Karanj | Laguminosae | T |
| 13. | *Madhuca indica* | Mahua | Sapotaceae | T |
| 14. | *Diospyros monatana* | Bistendu | Ebenaceae | T |
| 15. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 16. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 17. | *Euphorbia nivulia* | Thuar | Euphorbiaceae | T |
| 18. | *Ficus hispida* | Kutumar | Moraceae | T |
| 19. | *Ficus lacor* | Pakar | Moraceae | T |
| 20. | *Flacourtia Indica* | Kakai | Bixaceae | T |
| 21. | *Randia dumetorum* | Mainphal | Rubiaceae | T |
| 22. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 23. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 24. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 25. | *Tectona grandis* | Teak | Verbinaceae | T |
| 26. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| | | **Shrubs** | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |

## (a) Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 5. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 6. | *Azanza lampus* | Banakpas | Malvaceae | S |
| 8. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 9. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 10. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 11. | *Clerodendronserratum* | Barangi | Verbenaceae | S |
| 12. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 13. | *Crotalaria juncea* | Son | Laguminosae | S |
| 14. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 15. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 16. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 17. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 18. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 19. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 20. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 21. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 22. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 23. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 24. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 25. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 26. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 27. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |
| 28. | *Olax scandens* | Harduli | Oleaceae | S |
| 29. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 30. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 31. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 32. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 33. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 34. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 35. | *Uraria labata* | - | Malvaceae | S |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 36. | *Urena siuta* | - | Malvaceae | S |
| 37. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 4. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 5. | *Lanandula burmanni* | - | Labistea | H |
| 6. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 7. | *Micromeria capitellata* | - | Labiateae | H |
| 8. | *Napeta ruderalis* | - | Labiateae | H |
| 9. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 10. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |
| 11. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 12. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 7. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 8. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 9. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 10. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 11. | *Vitis linnei* | Jangli angur | Ampelideae | C |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 12. | *Vitis tomentosa* | Purbel | Ampelideae | C |
| 13. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | **Grasses** | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj0 | - | G |
| 24. | *Sehima nervosum* | Shedo | - | G |

## (b) List of existing floristic composition within Buffer zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 1. | *Acacia catechu* | Khair | Mimosaceae | T |
| 2. | *Acacia arabica* | Babul | Laguminosae | T |
| 3. | *Acacia leucophloea* | Reunja | Mimosaceae | T |
| 4. | *Adinacordifolia* | Haldu | Rubiaceae | T |
| 5. | *Boswellia serrata* | Salayi | Burseraceae | T |
| 6. | *Bridelea retusa* | Kasai | Euphorbiaceae | T |
| 7. | *Buchnania lanzan* | Achar | Anacardiaceae | T |
| 8. | *Butea Monosperma* | Palash | Leguminaceae | T |
| 9. | *Aegle marmelos* | Bel | Rutaceae | T |
| 10. | *Ailanthus excelsa* | Mahaneem | Simaroubaceae | T |
| 11. | *Careya arborea* | Wild Guava/ kumbhi | Palmae | S |
| 12. | *Anogeissus latifolia* | Dhaura | Combretaceae | T |
| 13. | *Casearia graveolens* | Gilehi | Samydaceae | T |
| 14. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 15. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 16. | *Elaeodendron glaucum* | Jamrasi | Celastraceae | T |
| 17. | *Dillenia aurea* | Karmata | Dilleniaceae | T |
| 18. | *Delonix regia* | Gulmohar | Laguminosae | T |
| 19. | *Dillenia pentagyna* | Kalla | Dilleniaceae | T |
| 20. | *Ehretia laevis* | Datranga | Burseraceae | T |
| 21. | *Cordia latifolia* | Bara lasora | Baraginaceae | T |
| 22. | *Cordian macleodli* | Silwat | Baraginaceae | T |
| 23. | *Dalbergia latifolia* | Shisham | Leguminosae | T |
| 24. | *Dalbergia sissoo* | Sissoo | Leguminosae | T |
| 25. | *Euphorbia nivulia, Ham* | Thuar | Euphorbiaceae | T |
| 26. | *Ficus hispida* | Kutumar | Moraceae | T |
| 27. | *Chloroxylon swietenia* | Bhirra | Caesalpiniaceae | T |
| 28. | *Cleistanthus collinus* | Garari | Meliacea | T |
| 29. | *Cochlospermum religiosum* | Galgal | Euphorbiaceae | T |
| 30. | *Eucalyptus spp.* | Nilgiri | Myrtaceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 31. | *Ficus lacor* | Pakar | Moraceae | T |
| 32. | *Bauhinia malabarica* | Amta | Leguminaceae | T |
| 33. | *Casearia elliptica* | Tondri | Samydaceae | T |
| 34. | *Cordia dichotoma* | Lisoda/Gunda | Rubiaceae | T |
| 35. | *Litsea sebifera* | Maida lakri | Lauraceae | T |
| 36. | *Mitragyna parvifolia* | Mundi | Rubiaceae | T |
| 37. | *Pterocarpus marsupium* | Bija | Leguminosae | T |
| 38. | *Randia Dumetorum* | Mainphal | Rubiaceae | T |
| 39. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 40. | *Santalum album* | Chandan | Santalaceae | T |
| 41. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 42. | *Sterculia villosa* | Udal | Anacardiaceae | T |
| 43. | *Stereospermum suaveolens* | Padar | Bignoniaceae | T |
| 44. | *Terminalia belerica* | Bahera | Combretaceae | T |
| 45. | *Psidium guava* | Amrud | Myrtaceae | T |
| 46. | *Dalbergia paniculata* | Dhobin | Fabaceae | T |
| 47. | *Diospyros melanoxylon* | Tendu | Lythraceae | T |
| 48. | *Diospyros monatana* | Bistendu | Lythraceae | T |
| 49. | *Ficus benghalensis* | Bad | Moraceae | T |
| 50. | *Emblica officinalis* | Amla | Euphorbiaceae | T |
| 51. | *Ficus glomerata* | Gular | Moraceae | T |
| 52. | *Ficus hispida* | Hairy fig | Moraceae | T |
| 53. | *Ficus religiosa* | Pipal | Moraceae | T |
| 54. | *Strychnos potatorum* | Nirmali | Laguminosae | T |
| 55. | *Grewia disperma* | Chaturli | Tiliaceae | T |
| 56. | *Grewia tiliaefolia* | Dhaman | Tiliaceae | T |
| 57. | *Holoptelea integrifolia* | Papri/Churel | Asclepiadaceae | T |
| 58. | *Gardenia latifolia* | Papra | Rubiaceae | T |
| 59. | *Gardenia turgida* | Phetra | Rubiaceae | T |
| 60. | *Garuga pennata* | Kekad | Burseraceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 61. | *Gmelina arborea* | Gamari | Verbenaceae | T |
| 62. | *Hymenodictyon excelsum* | Bhonrsal | Rubiaceae | T |
| 63. | *Ixota arborea* | Lokhandi | Rubiaceae | T |
| 64. | *Kydia calycina* | Pula | Malvaceae | T |
| 65. | *Langerstroemia parviflora* | Lendia | Lythraceae | T |
| 66. | *Schrebera switenioides* | Mokha | Oleaceae | T |
| 67. | *Semecarpus anacardium* | Bhilwa | Anacardiaceae | T |
| 68. | *Xylia xylocarpa* | Suria | Mimisaceae | T |
| 69. | *Lannea coramandelica* | Mohin/ Ash tree | Anacardiaceae | T |
| 70. | *Pterocarpus marsupium* | Bija | Leguminoceae | T |
| 71. | *Pongamia pinnata* | Karanj | Fabaceae | T |
| 72. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 73. | *Spondias pinnata* | Amra | Leguminaceae | T |
| 74. | *Sterculia urens* | Kullu | Euphorbiaceae | T |
| 75. | *Stereospermum suaveolens* | Paddar | Bignoniaceae | T |
| 76. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| 77. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 78. | *Hardwikia binata* | Anjan | Leguminoceae | T |
| 79. | *Terminalia tomentosa* | Saja | Combretaceae | T |
| 80. | *Zizyphus mautatiana* | Bar | Rhamnaceae | T |
| 81. | *Tectona grandis* | Teak | Verbinaceae | T |
| 82. | *Terminalia arjuna* | Arjun | Combretaceae | T |
| | | **Shrubs** | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Ageratum conyzoids* | - | Compositae | S |
| 5. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 6. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 7. | *Azanza lampus* | Banakpas | Malvaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 8. | *Barleria cristata* | Koranta | Acanthaceae | S |
| 9. | *Barleria mantana* | Korat | Verbenaceae | S |
| 10. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 11. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 12. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 13. | *Clerodendron serratum* | Barangi | Verbenaceae | S |
| 14. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 15. | *Crotalaria juncea* | Son | Laguminosae | S |
| 16. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 17. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 18. | *Desmodium velutinum* | Chikati | Laguminosae | S |
| 19. | *Dioscorea anguina* | Bansora | Dioscoreaceae | S |
| 20. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 21. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 22. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 23. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 24. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 25. | *Grewia sapida* | Phalsa | Tiliaceae | S |
| 26. | *Helicteres isora* | Marorphali | Sterculiaceae | S |
| 27. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 28. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 29. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 30. | *Justieia betonica* | Kokander | Acanthaceae | S |
| 31. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 32. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 33. | *Maytenus emarginata* | Bahrti | Celastraceae | S |
| 34. | *Malastoma malababathricum* | Palor | Malastomaceae | S |
| 35. | *Maghania nana* | Chepati | Papilionaceae | S |
| 36. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 37. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 38. | *Olax scandens* | Harduli | Oleaceae | S |
| 39. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 40. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 41. | *Sida acuta* | Kareta | Mavaceae | S |
| 42. | *Sida cardifolia* | Mamas | Mavaceae | S |
| 43. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 44. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 45. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 46. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 47. | *Triumfetta bartramia* | Chirpat | Tiliaceae | S |
| 48. | *Triumfetta pilosa* | Chikati | Tiliaceae | S |
| 49. | *Uraria labata* | - | Malvaceae | S |
| 50. | *Urena siuta* | - | Malvaceae | S |
| 51. | *Vitex negundo* | Nirgudi | Verbenaceae | S |
| 52. | *Waltheria indica* | Haduli | Sterculiaceae | S |
| 53. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Chlorophylum tuberosum* | Safed Musali | Liliaceae | H |
| 4. | *Curculigo orachiolides* | Kali musli | Amaryullidaceae | H |
| 5. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 6. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 7. | *Lanandula burmanni* | - | Labistea | H |
| 8. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 9. | *Micromeria capitellata* | - | Labiateae | H |
| 10. | *Napeta ruderalis* | - | Labiateae | H |
| 11. | *Polygala chinesis* | Bijnori | Pigalaceae | H |
| 12. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 13. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 14. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 15. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| 3. | *Visum nepalene* | Bandha | Loranthaceae | - |
| 4. | *Orodanche oegyptica* | Bandha | Prkobancheaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Celastrus paniculata* | Malkangini | Celastraceae | C |
| 7. | *Combretum decandrum* | Piwarbel | Combretaceae | C |
| 8. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 9. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 10. | *Ichnocarpus frutescens* | Dhimarbel | Apocynaceae | C |
| 11. | *Marsdenia hamiltonia* | Dudhibel | Asclepiadaceae | C |
| 12. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 13. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 14. | *Mucuna pruriens* | Kewanch | Leguminosae | C |
| 15. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 16. | *Vitis linnei* | Jangli angur | Ampelideae | C |
| 17. | *Vitis fomentosa* | Purbel | Ampelideae | C |
| 18. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | **Grasses** | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj | - | G |
| 24. | *Imperata Cylidrica* | Chhir | - | G |
| 25. | *Sehima nervosum* | Shedo | - | G |

**Status of RET Species**

During Field Survey, rare, endangered and threatened species of flora recorded under threatened status in the study area are as follows:

1. Endemic- *Hardwikia binnata, Mucuna prurita*
2. Locally Endangered Species

   *A. Butea monosperma B. Clerodendron serratum C. Curculigo orchioides D. Curcuma augustifolia E. Pterocarpus marsupiyum.*
3. According to Madhya Pradesh State Medicinal Plant Board endangered species are:

   *A. Diospyros peniculato B. Pterocarpus marsupiyum C. Terminalia arjuna D. Grewia rothi*

   *E. Vitextrifolia*-Critically endangered.

## ANNEXURE - III

### INVENTORY OF FAUNAL DIVERSITY IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

**a) Core Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Vulpes bengalenss* | Common fox | Sch. II |
| 2. | *Rattus rattus* | Black rat | Sch. V |
| 3. | *Tatera indica* | Indian Gerbil | Sch. V |
| 4. | *Funambulus palmarum* | Indian palm Squirrel | Sch. IV |
| 5. | *Canis aureus* | Jackal | Sch. III |
| 6. | *Boselaphus tragocamelus* | Nilgai | Sch. III |
| 7. | *Axis axis* | Chital | Sch. III |
| 8. | *Sus scrofa* | Wild boar | Sch. III |
| 9. | *Felis chaus* | Jungle cat | Sch. II |
| 10. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 11. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 12. | *Hystris indica* | Porcupine | Sch. IV |
| | | **Reptilian** | |
| 1. | *Ptyas mucosa* | Indian Rat snake | Sch. II |
| 2. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 3. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 4. | *Bungarus candidud* | Common krait | Sch. IV |
| 5. | *Naja naja* | Naag/Kobra | Sch. II |
| 6. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 7. | *Vipera russelli* | Russell's viper | Sch. II |
| 8. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| | | **Amphibian** | |
| 1. | *Rana tigrina* | Common Frog | Sch. IV |
| 2. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 3. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 7. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 8. | *Junonia almana* | Peacock pansy | Sch. IV |
| 9. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 10. | *Leptosia nina* | Psyche | Sch. IV |
| | | **Arthropods and Mollusca** | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Periplaneta amercana* | Cockroach | - |
| 3. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 4. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 5. | *Stegodyphus sp.* | Social Spider | - |
| | | **Avifaunal (Birds)** | |
| 1. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 2. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 3. | *Egretta garzetta* | Little egret | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 6. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 7. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 8. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 9. | *Acridotheres tristis* | Common myna | Sch. IV |
| 10. | *Spilopelia senegalensis* | Laughing dove | Sch. IV |
| 11. | *Ardeola grayii* | Pond heron | Sch. IV |
| 12. | *Aegithina tiphia* | Common iora | Sch. IV |
| 13. | *Anas crecca* | Common teal | Sch. IV |
| 14. | *Passer domesticus* | House sparrow | Sch. IV |

**Birds**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 15. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 16. | *Corvus splendens* | House crow | Sch. V |
| 17. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 18. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 19. | *Milvus migrans* | Black kite | Sch. IV |
| 20. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |
| 21. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 22. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 23. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| 24. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 25. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 26. | *Cuculus micropterus* | Indian Cuckoo | Sch. IV |
| 27. | *Apus affinis* | House swift | Sch. IV |
| 28. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 29. | *Milvus migrans* | Black kite | Sch. IV |
| 30. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 31. | *Tyto alba* | Barn owl | Sch. IV |

## B. Faunal Diversity in Buffer Zone

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Canis aureus* | Jackal | Sch. II |
| 2. | *Hyaena hyaena* | Hyena | Sch. III |
| **3.** | ***Melursus ursinus*** | **Sloth bear** | **Sch. I** |
| 4. | *Vulpes bengalenss* | Common fox | Sch. II |
| 5. | *Rattus rattus* | Black rat | Sch. V |
| **6.** | ***Panthera tigris tigris*** | **Bengal tiger** | **Sch. I** |
| 7. | *Rattus norvegicus* | Field mouse | Sch. V |
| 8. | *Bandicota indica* | Bandicoot | Sch. V |
| 9. | *Tatera indica* | Indian Gerbil | Sch. V |
| 10. | *Funambulus palmarumi* | Indian Palm Squirrel | Sch. IV |
| **11** | ***Tetracerus quadricornis*** | **Chousingha** | **Sch. I** |
| 12. | *Boselaphus tragocamelus* | Nilgai | Sch.III |
| **13.** | ***Elephas maximus*** | **Elephant** | **Sch.I** |
| 14. | *Rhinolophus spp.* | Horseshoe Bat | Sch. V |
| **15.** | ***Bos qaurus*** | **Bison** | **Sch.I** |
| 16. | *Pteropus giganteus* | Indian flying fox | Sch. V |
| 17. | *Cervus unicolor* | Sambar | Sch. III |
| 18. | *Axis axis* | Chital | Sch. III |
| 19. | *Hystris indica* | Porcupine | Sch. II |
| **20.** | ***Panthera Pardus*** | **Common leopard** | **Sch.I** |
| 21. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 22. | *Presbytis entellus* | Common langur | Sch. II |
| 23. | *Macaca mulatta* | Rhesus macaque | Sch. II |
| 24. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 25. | *Sus scrofa* | Wild boar | Sch. III |
| 26. | *Cuon alpinus* | Wild dog | Sch. II |
| | | **Reptilian** | |
| 1. | *Vipera russelli* | Russell's viper | Sch. II |
| **2.** | ***Varanus bengalensis*** | **Monitor lizard** | **Sch. I** |
| 3. | *Ptyas mucosa* | Indian Rat snake | Sch. II |

**Faunal Diversity in Buffer Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 4. | *Lycodon aulicus* | Common wolf snake | Sch. IV |
| 5. | *Bungarus candidus* | Common krait | Sch. IV |
| 6. | *Boiga trigonata* | Cat snake | Sch. IV |
| 7. | *Eryx johnii* | Red sand Boa | Sch. IV |
| 8. | *Naja naja* | Naag/Kobra | Sch. II |
| 9. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 10. | *Melanochelys trijuga* | Indian pond turtle | Sch. IV |
| 11. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 12. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 13. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| **14.** | ***Pythan molurns*** | **Pythan** | **Sch.I** |
| | | **Amphibian** | |
| 1. | *Rana limnocharis* | Indian cricket Frog | Sch. IV |
| 2. | *Hoplobatrachus tigerinus* | Indian bull frog | Sch. IV |
| 3. | *Rana tigrina* | Common Frog | Sch. IV |
| 4. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 5. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |
| 6. | *Hyla goeldii* | Tree frog | Sch. IV |
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Papilio polymnestor* | Blue mormon | |
| 5. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Neptis hylas* | Common sailer | Sch. IV |
| 7. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 8. | *Parantica aglea* | Glassy tiger | Sch. IV |
| 9. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 10. | *Junonia almana* | Peacock pansy | Sch. IV |
| 11. | *Junonia orythia* | Blue pansy | Sch. IV |
| 12. | *Junonia atlites* | Grey pansy | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 13. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 14. | *Leptosia nina* | Psyche | Sch. IV |
| 15. | *Chilades parrhassius* | Small cupid | Sch. IV |
| 16. | *Musca domestica* | Housfly | Sch. IV |
| 17. | *Aedes aegypti* | Dengue mosquito | Sch. IV |
| 18. | *Pieris napi* | Green- veined white butterfly | Sch. IV |
| 19. | *Eurema brigitta* | Small grass yellow | Sch. IV |
| 20. | *Parantica aglea* | Glassy tiger | Sch. IV |
| **Arthropods and Mollusca** | | | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Apis dorsata* | Badi Madhumakkhi | - |
| 3. | *Periplaneta amercana* | Cockroach | - |
| 4. | *Buthus sp.* | Scorpion | - |
| 5. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 6. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 7. | *Stegodyphus sp.* | Social Spider | - |
| **Avifaunal (Birds)** | | | |
| 1. | *Ardeola grayii* | Pond heron | Sch. IV |
| 2. | *Acridotheres tristis* | Common myna | Sch. IV |
| 3. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Egretta garzetta* | Little egret | Sch. IV |
| 6. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 7. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 8. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 9. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 10. | *Milvus migrans* | Black kite | Sch. IV |
| 11. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 12. | *Tockus birostris* | Indian Grey Hornbill | Sch. IV |
| 13. | *Tyto alba* | Barn owl | Sch. IV |
| 14. | *Accipiter badius* | Shikra | Sch. IV |
| 15. | *Bubo bubo* | Eurasian Eagle Owl | Sch. IV |

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| 16. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 17. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 18. | *Corvus splendens* | Common crow | Sch. V |
| 19. | *Passer domesticus* | House sparrow | Sch. IV |
| 20. | *Nectarinia asiatica* | Purple sunbird | Sch. IV |
| 21. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| **22.** | ***Pavo cristatus*** | **Peafowl** | **Sch. I** |
| 23. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 24. | *Turdoides striatus* | Jungle babbler | Sch. IV |
| 25. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 26. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 27. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 28. | *Vanellus indicus* | Red-wattled lapwing | Sch. IV |
| 29. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 30. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 31. | *Apus affinis* | House swift | Sch. IV |
| 32. | *Halcyon smyrnensis* | White throated kingfisher | Sch. IV |
| 33. | *Francolinus pondicerianus* | Grey francolin | Sch. IV |
| 34. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 35. | *Centropus sinensis* | Greater coucal | Sch. IV |
| 36. | *Amaurornis phoenicurus* | White breasted water hen | Sch. IV |
| 37. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |

**Analysis of Fauna**

Schedule-I fauna was recorded in the study area during field survey as per (IWPA) Indian Wildlife Protection Act, 1972.

| | | | |
|---|---|---|---|
| **1.** | **Indian monitor lizard** | ***Varanus benglensis*** | **Sch. I** |
| **2.** | **Indian peafowl** | ***Pavo cristatus*** | **Sch. I** |
| **3.** | **Sloth bear** | ***Melursus ursinus*** | **Sch. I** |
| **4.** | **Elephant** | ***Elephas maximus*** | **Sch. I** |
| **5.** | **Indian rock python** | ***Python molurus*** | **Sch. I** |
| **6.** | **Bengal tiger** | ***Panthera tigris tigris*** | **Sch. I** |
| **7.** | **Chousingha** | ***Tetracerus quadricornis*** | **Sch. I** |
| **8.** | **Bison** | ***Bos qaurus*** | **Sch. I** |
| **9.** | **Common leopard** | ***Panthera Pardus*** | **Sch. I** |

## INVENTORY OF AQUATIC FLORA IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| | **Aquatic diversity of buffer zone** | | |
| 1. | *Harpadon nehereus* | Bombil | - |
| 2. | *Sperata seenghala* | Singara | - |
| 3. | *Penaeus monodon* | Prawn | - |
| 4. | *Labeo rohita* | Rohu | - |
| 5. | *Oreochromis niloticus* | Tilapia | - |
| 6. | *Lamellidens corrianus* | Shells | - |
| 7. | *Rita rita* | Rita | - |
| 8. | *Mastacembelus armatus* | Bam | - |
| 9. | *Alysfus tengara* | Tengara | - |
| 10. | *Cirrhinas mrigala* | Mrigal | - |
| 11. | *Boleophithalmus spp.* | Mudskippers | - |
| 12. | *Catla catla* | Catla | - |
| 13. | *Mugil cephalus* | Mullet | - |

वनमण्डलाधिकारी
पूर्व सामान्य वन मण्डल, मण्डला

क्षेत्र संचालक,
कान्हा टायगर रिजर्व,
मण्डला

(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

PROJECT PROPONENT

# PLAN PERIOD : TEN YEARS
## FOR MUKAM BAUXITE MINES
( FOR 10 KM RADIUS AREA , BUFFER ZONE IN MADHYA PRADESH )


**M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)**
Village-Mukam, Tehsil-Bodla,
District-Kabirdham, Chhattisgarh

enviro greens

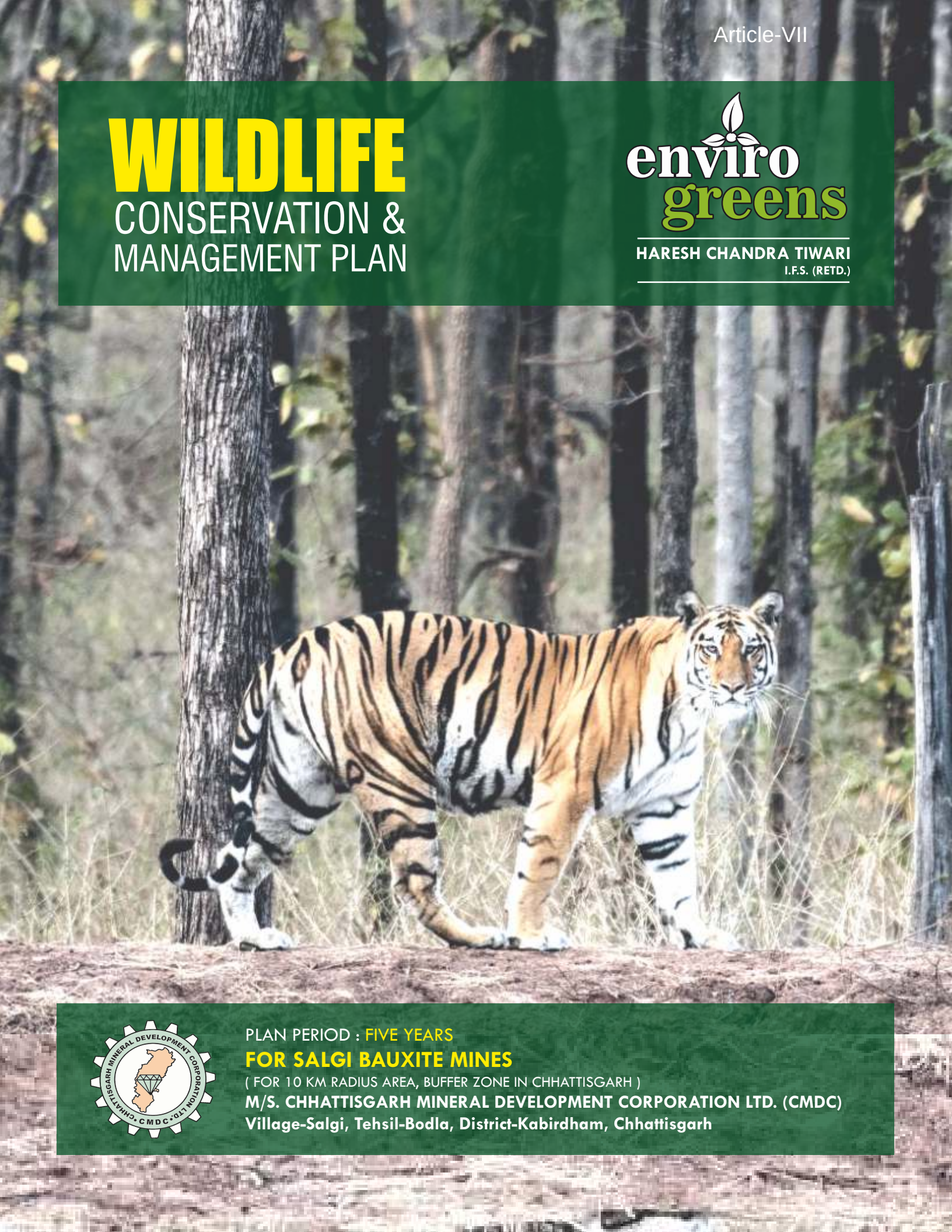
Prepared By:
HARESH CHANDRA TIWARI I.F.S. (RETD.)
ENVIRO GREENS
CENTRE FOR CONSERVATION OF FORESTS WILDLIFE AND ENVIRONMENT
Head Office : 222, Officer's Colony, New Airport Road, Dharampura, Raipur (CG)
Contact : +91 9425226796, Email : hareshctiwari@gmail.com

Article-VII

# WILDLIFE
## CONSERVATION & MANAGEMENT PLAN

enviro greens

HARESH CHANDRA TIWARI
I.F.S. (RETD.)



PLAN PERIOD : FIVE YEARS

**FOR SALGI BAUXITE MINES**

( FOR 10 KM RADIUS AREA, BUFFER ZONE IN CHHATTISGARH )

**M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)**

**Village-Salgi, Tehsil-Bodla, District-Kabirdham, Chhattisgarh**

# WILDLIFE

## CONSERVATION

## & MANAGEMENT

## PLAN

**HARESH CHANDRA TIWARI**
**I.F.S. (RETD.)**

PLAN PERIOD : FIVE YEARS

FOR SALGI BAUXITE MINES

(For 10 km. Radious Area Buffer Zone in CG)

**M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)**

Village-Salgi, Tehsil-Bodla, District-Kabirdham, Chhattisgarh

## ACKNOWLEDGEMENT

I have taken efforts in this Wildlife Conservation And Management Plan. However, it would not have been possible without the kind support and help of many individuals and organizations. I would like to extend my sincere thanks to all of them.

I am highly indebted to **Shri Sudhir Agrawal, I.F.S., Principal Chief Conservator of Forests (Wildlife), CWLW** Government of Chhattisgarh & **Shri B.P Singh I.F.S. Chief Conservator of Forests Durg.** for their guidance and constant personal supervision as well as for providing necessary information regarding the formulation of the Plan & also for his support in completing the project.

I would like to express my gratitude towards **Shri Churamani Singh IFS Divisional Forest Officer, Kawardha** and his subordinate staff for their kind co-operation which helped me in completion of this project.

I would like to express my special gratitude and thanks to the Office of the **M/s. Chhattisgarh Mineral Development Corporation Ltd. (CMDC) Raipur,** for giving me such attention and time.

My thanks and appreciations also go to my colleagues in developing the project and people who have willingly helped me out with their abilities.

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# TABLE OF CONTENTS

# CITATION

State level appraisal committee Government of India, Ministry of Environment and Climate Change Paryavas Bhawan Nava Raipur Atal Nagar, Raipur has put forward the following conditions vide its **Letter number 1099/SEACCG/MINE/1191 Nava Raipur Atal Nagar dated 14.10.2022** while issuing ToR (Terms of Reference) for environmental clearance in favour of **M/s. Chhattisgarh Mineral Development Corporation Limited** for **Salgi Bauxite Mines** Village Salgi, Tehsil-Bodla, District-Kabirdham, Chhattisgarh.

**Standard Terms of Reference for conducting Environmental Impact Assessment study for non coal mining project.**

12) A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees.

15) The vegetation in the RF/PF areas in the study area, with necessary details, should be given.

16) A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly, detailed mitigative measures required, should be worked out with cost implications and submitted.

17) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

18) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished Necessary allocation of funds for implementing the same should be made as part of the project cost.

This Wildlife Conservation and Management Plan is prepared in accordance with the above conditions only.

**Raipur**
**10 Feb. 2023**

**Haresh Chandra Tiwari**
IFS (Retd.)
Managing Partner
Envirogreens

# CHAPTER - I

## Introduction

Wildlife resources constitutes a vital link in the survival of the human species and have been a subject of much fascination, interest, and research all over the world. Today, when wildlife habitats are under severe pressure and a large number of species of wild fauna have become endangered, the effective conservation of wild animals is of great significance. Because every one of us depends on plant and animals for all vital components of our welfare, it is more than a matter of convenience that they continue to exist, it is a matter of life and death. Being living units of ecosystem plants and animals contribute of human welfare by providing:

- Material benefit to human life.
- Knowledge about genetic resources and their preservation; and
- Significant contributions to the enjoyment of life (e.g. recreation).

Human society depends on resources for virtually all of its food; nearly half of its medicines, much of its clothing in some regions, all of its fuel and building materials; and part of its mental and spiritual welfare.

Considering the way, we are galloping ahead, oblivious of what legacy we plan to leave for future generations, the future does not seem too bright. Statisticians have projected that by 2030, the human population will have increased by more than half, and the arable fertile land and tropical forest will be less than half of what they are today. Genetic resources are treated as inexhaustible mineral resources, but we need to care about them. It is here that the concept of management and conservation of wildlife comes into play, because anything that is not human of undomesticated is 'wildlife'.

Presence or absence of an animal or plant in a region is determined by ecological and historical factors. Animals and plants are living indicators of the characteristics of their environment: their ranges mark the places where environmental condition is the same or similar.

One of the key underlying assumptions about wildlife management is that native species and ecological process have to be maintained in their native state. To maintain and strengthen the fragile ecosystem, the present wildlife management recommendations are primarily aimed at managed forests. The recommendations are designed to promote long term stand level maintenance and recruitment of important structural attributes such as wildlife diversity of species, spatial or unique habitats for floral and faunal wealth, riparian areas and wetland, coarse woody debris, horizontal and vertical diversity.

Wildlife management is interdisciplinary that deals with protecting endangered and threatened species and subspecies and their habitats, as well as the non-threatened agricultural animals and game species. The Wildlife Management program emphasizes both applied and basic research in wildlife ecology, management, education and extension.

Wildlife management takes into consideration the ecological principles such as carrying capacity of the habitat, preservation and control of habitat, reforestation, predator control, re-introduction of extinct species, capture and reallocation of abundant species and management of “desirable” or “undesirable” species.

There are two general types of wildlife management:

**Manipulative management** involves regulating numbers of animals directly by harvesting or by influencing numbers by altering food supply, habitat, density of predators etc.

**Custodial management** is preventive or protective and minimized external influences on the population and its habitat. It is done by setting up national parks where ecological conditions are protected and threatened species are conserved by law.

The Wildlife Management program focuses on the following:

- Predator-prey relationship
- Migratory wildlife species
- Urban and suburban wildlife
- Wildlife-human interaction
- International wildlife

**Elements of Wildlife Management**

Management of wildlife depends on certain elements such as public support and awareness to protect wildlife and their habitats.

**Public Participation :** It is necessary to make local people realize and accept the idea and importance of wildlife protection. Public interaction can help in making local people responsible and cooperate in enforcement of wildlife management laws and regulations. Their feedback should also be taken for effective functioning of wildlife management.

**Public Awareness :** People should understand the concept of conservation of natural resources. The wildlife managers and other responsible persons should held public discussions, shown, and talks and should held public discussions, shown, and talks and should also take help of other media like newspapers, magazines, radio and television to make people aware about the basic concepts behind wildlife management. This can stop people from exploiting natural resources, which is the major threat to wildlife and their habitats.

**Education :** The role of education in public awareness programs is very important. There should be environmental subjects based on wildlife conservation in school and college curricula. The well-educated and trained specialists on environmental and forest issued should participate in public training and interaction with people and solve their queries to make them more responsible towards their wildlife management duties.

**Nature Interpretation Centers :** Nature interpretation centers may include setting up to educational camps or exhibition in nearby regions of protected areas such as zoological gardens, parks and wildlife sanctuaries. It is usually taken up by the concerned forest departments. The interpretation centers should be handled by qualified and trained staff in order to explain and motivate the concepts of wildlife management to the tourists and people of the nearby-protected areas.

**Coordination :** Wildlife management is operated at four basic levels – local, state, national and international Government agencies plan the policies of protecting, conserving and managing wildlife. All the management levels participate in passing wildlife management tools and many a time, conflicts arise.

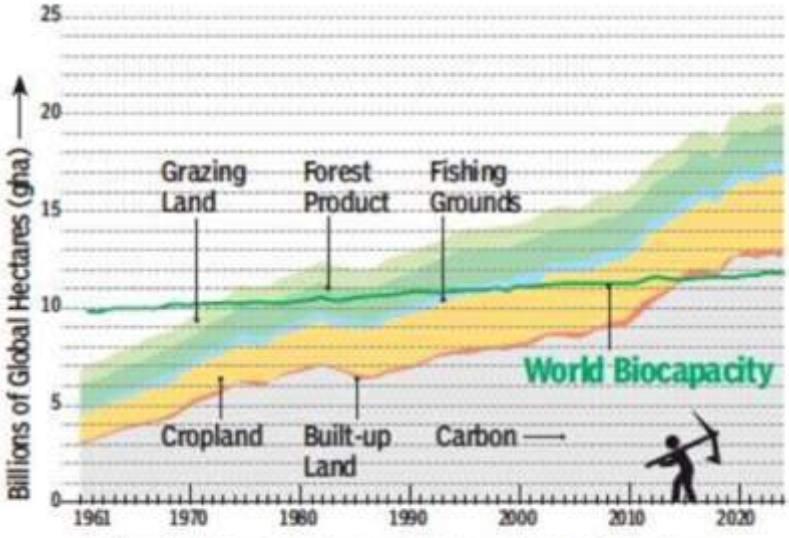
National parks, sanctuaries and conservation reserves are notified under the Wildlife Protection Act 1972 as Protected Areas which are rich in and represent the unique biodiversity of that place. Such protected areas are considered very important for conservation of biodiversity, and for ensuring the healthy population of its floral and faunal components for sustenance of the present and the future generations alike. However, the rising human population and its growing demands for socio-economic development puts an ever-increasing stress on forests including protected areas both directly and indirectly. This calls for a balance that has to be struck between development and conservation implying that any activity involving use or diversion of any part of notified protected area shall be considered only under most exceptional circumstances, after taking fully into consideration its implementing impact on the biodiversity of the area, and the consequent effect on the management of the protected areas. A critical part of this balanced approach is to spell out the feasibility of mitigation to address the impacts without compromising the management activities of the protected area. The activities to be taken up in the identified wildlife habitats also needs to comply with the orders of the Hon'ble Supreme Court in addition to the statutory mandate as provided in the Wildlife Protection Act 1972.

The extraordinary richness of life that surrounds us in the form of diverse arrays of organisms, ecologic al communities and natural landscapes are called biodiversity. Bio- means life and diversity- means variety. Biodiversity is the term used to describe the variety of life on earth from genus to species to broader scales of ecosystem. It includes every plant and animal as well as all microorganisms.

Conservation of Bio-Diversity has become the most important requirement of the present-day world. This is because survival of the man depends upon the bio-diversity. Bio-diversity consists of two components: rich ness, or taxonomic diversity, and evenness, or the distribution of individuals among taxa

The incredible growth in population, the global economy and consumption - what scientists call the Great Acceleration - has in just the last five decades fundamentally altered the Earth's intrinsic systems. Despite positives like increasing lifespans and the rise of the middle classes, this leap has come at a huge cost, especially in terms of loss of biodiversity. That is cause for some alarm since biodiversity is key to life on Earth. Humans are stretching nature to a thin, jeopardizing capacity.

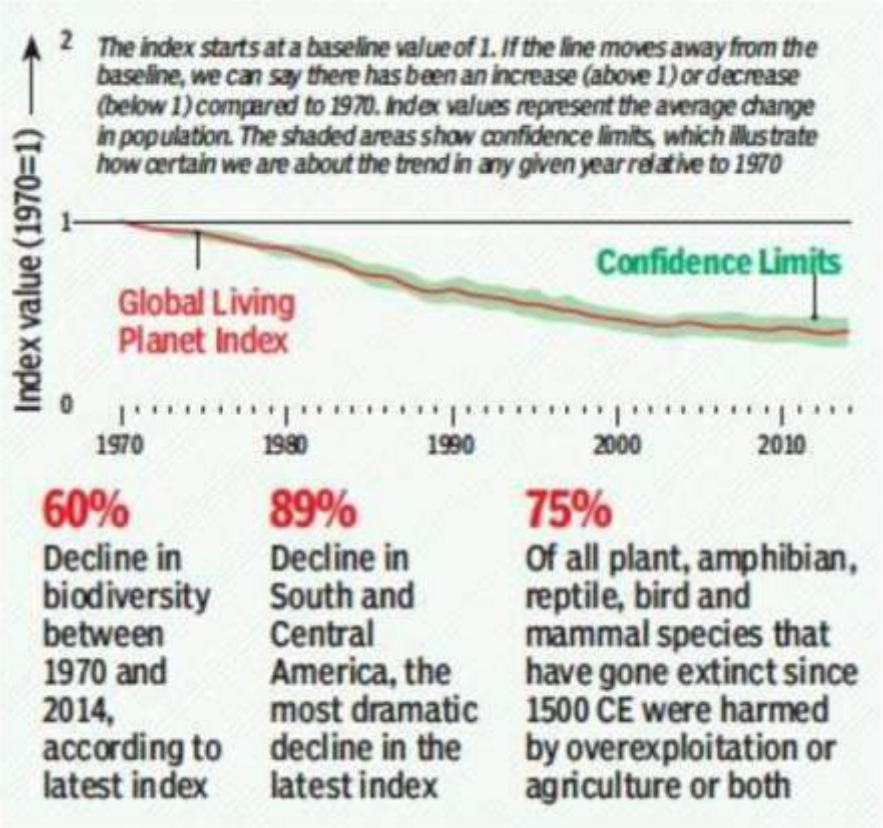
**Bio-capacity,** measured in global hectares (gha), is the ability of an ecosystem to renew itself and **ecological footprint** is a measure of our consumption of natural resources. Together biocapacity and ecological footprint allow us to compute whether humanity is living within the means of the planet. Biocapacity has increased by 27% in the past 50 years with new technology and food management practices. But so has our ecological foot print has grown at 190% in the last 50 years nearly 10 times of the growth rate of biocapacity.



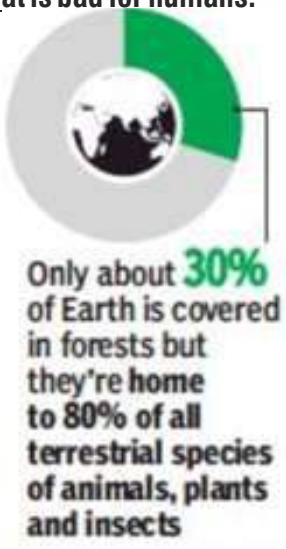

*World ecological footprint of consumption by area type in global hectares, 1961-2024. The largest contribution to the ecological footprint is carbon emissions from fossil fuel burning (60%)*

**Since 1970 biodiversity has only been headed one way- Down**

The living planet index tracks the state of global biodiversity and the planet's health, considering the populations of thousands of mammal, bird, fish, reptile and amphibian species. It recognizes five types of threats: Habitat loss is the most commonly recorded threat, followed by overexploitation which combined accounts for two-thirds of all threats.




**There is huge pressure on earth, and that is bad for humans.**



Large-scale farming has destroyed 40% of forests between 2000 to 2010 in tropical and sub-tropical countries. Since 1971, global production of wheat and rice have grown by 116% and 133% respectively, to meet rising food demand and a growing population, expected to hit 9.8 billion in 2050.

**THE 'SIXTH MASS EXTINCTION'**

Species are becoming extinct 100 times faster than they would without human impacts. Populations of wild animals have more than halved since 1970, while the human population has doubled. Only five times before in our planet's history have so many species and so much biodiversity been lost so quickly. The fifth was when the dinosaurs were wiped out. That is why scientists and conservationists call what is happening now the 'sixth mass extinction'. Some have even described the loss of biodiversity today as 'biological annihilation' causing rapid decrease in the biodiversity of the Earth. Such an event is identified by a sharp change in the diversity and abundance of multicellular organisms. It occurs when the rate of extinction increases with respect to the rate of speciation.

Chhattisgarh State has almost tropical humid climate, a climate good to support a good bio-diversity. The State has *teak*, *sal* and mixed forests as climax communities. Further, more than fourty one percentage of its land area is covered with forests. However, only a fragmentary knowledge of bio-diversity of the State is there. In the animal kingdom, richness component of almost all the mammals is known. Listing of some *amphibia* and fishes are also available, but for other groups of animals, very little or almost no record is available. Similarly, among plants, Botanical Survey of India has published flora for some of the districts of the state. There are several publications on the medicinal plants and some publications on the edible mushrooms of the State, but for other group of plants, although some research work has been done in the universities but there are no published records of their wealth.

**Postulates for special consideration of Bio-Diversity Conservation are:**

1. Conservation of an area should be to the extent that it develops into an ecosystem, which is climatic climax of the area. Ultimate aim of conservation is sustainable ecosystem.

2. Emphasis should not be given to the conservation of a single species. This may require altered maintenance of an ecosystem, which may lead, ultimately to the destruction of the ecosystem.

3. With the shrinking of the habitat, development and maintenance of extensive corridor is essential for the conservation of the species, which requires a large home range. This is essential because a single, reduced habitat may not be able to sustain species, requiring a large home range, for a longer period.

4. Conservation of forests is never anti-thesis to the exploitation, utilization or extraction. Most important is to know the productivity of the eco-system. Exploitation of eco-system up to or below the level of its productivity will maintain it at **sustainable** level. Exploitation equal to its productivity is also called the **carrying capacity** of the system. Exploitation of the system, more than its productivity will lead to the reorganization of the system. It is necessary also to know the resilience ability of the system so that in case of any large **natural perturbation** its ability to return to its normal condition may be evaluated.

5. However basic too many conservation plans used to know the status and required optimum biodiversity of the area. Serious efforts must be made to evaluate these two parameters: the status and required optimum biodiversity of the area, planned for conservation.

6. It is now the role of the policy makers to frame policy and to allocate appropriate funds to evaluate the status and required optimum biodiversity of the area, marked for conservation.

## Need For Wildlife Conservation Plan

This Wildlife Conservation and Management Plan has been prepared as per the mandate by **State level appraisal committee Government of India, Ministry of Environment and Climate Change Paryavas Bhawan Nava Raipur Atal Nagar, Raipur its letter number 1099/SEACCG/MINE/1191 Nava Raipur Atal Nagar dated 14.10.2022 (Annexure - I).**

Wildlife has paid maximum to accommodate the development. It is but natural that land for expansion, mainly for agriculture is available only with the forests. Horizontal expansion of agriculture is continuously encroaching up on the forest land. This is resulting in fragmentation and reduction of the available habitat to the wildlife. This with poaching is causing heavy loss on the density and variety and evenness component of the biodiversity. Industry is essential for development; however, a compromise step has to be taken to industrialized as well as to preserve the nature with its biodiversity.

## Objectives of The Study

1. Listing the existi ng flora and fauna of the study area that is 10 km radius of the **Salgi Bauxite Mine Lease Area (CMDC),** Village-Salgi, Tehsil- Bodla, District-Kabirdham (CG)
2. To explore whether the study area forms a part of an ecologically sensitive area or migratory corridor ofany endangered fauna.
3. To prepare a comprehensive conservation plan for endangered, endemic and economically important plant and animal species.

**Based on the above studies objectives of conservation plan will be fixed as follows:**

1. Improve the habitat in the buffer zone to provide better living conditions to the wildlife.
2. To augment amenities in the buffer zone resulting in better settlement of the wildlife displaced from the Study Area.
3. Prescribe corridors for safe movement of wildlife from one habitat to another habitat.
4. Suggestions to reduce man animal conflicts.
5. Suggestions to reduce dependence of local people on forest which intern will reduce local people forest employee conflicts.

## SCOPE OF THE WORK

The Scope of the work includes Biodiversity Survey and preparation of Wildlife Conservation and Management Plan for **Salgi Bauxite Mine Lease Area (CMDC),** Village-Salgi, Tehsil- Bodla, District-Kabirdham (CG)

The study area includes the area under 10 km radius of the **Salgi Bauxite Mine Lease Area (CMDC),** for preparation of Wildlife Conservation Plan.

No conservation plan can mitigate all the impacts of the developmental activities. Similarly, a conservation plan is prepared keeping in view the present conditions. Basic requirement of a conservation plan is to maintain an ecosystem as natural as possible. Hence, the present plan has been prepared as better as can be, under the present conditions.

# CHAPTER - II

## Location, Accessibility And Details Of The Study Area

Salgi bauxite mine is located at Village Salgi, Tehsil – Bodla, District – Kabirdham Chhattisgarh. Mine lease area is 42.646 Hectares. The mining of bauxite in Salgi Bauxite mines is total excavation of 1,99,875 TPA and OB 1,07,625 TPA]. The instant mine lease area falls under the category "B1" as the inter-state boundary of Madhya Pradhesh and Chhattisgarh is located at a distance of 5 kilometer west from the mine lease area and appraised at central level.

Salgi bauxite mine is situated in Bodai-Daldali Plateau which is about 68 kilometers from the district headquarters of Kabirdham and about 135 kilometers from Amarkantak. It forms the central part of Maikal Range and falls in seismic zone-II.

**Location Coordinates :** The mine lease area is located between

| S.No. | BP No. | Latitude | Longitude |
|---|---|---|---|
| 1 | BP1 | 22" 23' 57.344" N | 81°10' 19.034" E |
| 2 | BP2 | 22° 23' 57.874" N | 81°10' 17.526" E |
| 3 | BP3 | 22° 23' 59.146" N | 81°10' 17.910" E |
| 4 | BP4 | 22° 24' 5.790" N | 81°10' 17.526" E |
| 5 | BP5 | 22° 24' 6.906" N | 81°10' 21.185" E |
| 6 | BP6 | 22° 24' 25.825" N | 81°10' 21.078" E |
| 7 | BP7 | 22° 24' 25.845" N | 81°10' 22.133" E |
| 8 | BP8 | 22° 24' 29.090" N | 81°10' 22.113" E |
| 9 | BP9 | 22° 24' 29.103" N | 81°10' 20.364" E |
| 10 | BP10 | 22° 24' 32.380" N | 81°10' 17.138" E |
| 11 | BP11 | 22° 24' 34.348" N | 81°10' 17.134" E |
| 12 | BP12 | 22° 24' 34.400" N | 81°10' 14.405" E |
| 13 | BP13 | 22° 24' 36.298" N | 81°10' 14.392" E |
| 14 | BP14 | 22° 24' 38.291" N | 81°10' 16.462" E |
| 15 | BP15 | 22° 24' 38.236" N | 81°10' 29.951" E |
| 16 | BP16 | 22° 24' 36.610" N | 81°10' 29.933" E |
| 17 | BP17 | 22° 24' 35.333" N | 81°10' 29.035" E |
| 18 | BP18 | 22° 24' 33.254" N | 81°10' 28.700" E |
| 19 | BP19 | 22° 24' 31.187" N | 81°10' 29.906" E |
| 20 | BP20 | 22° 24' 23.247" N | 81°10' 29.903" E |

| S.No. | BP No. | Latitude | Longitude |
|---|---|---|---|
| 21 | BP21 | 22° 24' 23.253" N | 81°10' 24.921" E |
| 22 | BP22 | 22° 24' 15.415" N | 81°10' 24.917" E |
| 23 | BP23 | 22° 24' 13.216" N | 81°10' 29.842" E |
| 24 | BP24 | 22° 24' 13.194" N | 81°10' 35.120" E |
| 25 | BP25 | 22° 24' 12.463" N | 81°10' 35.137" E |
| 26 | BP26 | 22° 24' 11.928" N | 81°10' 36.284" E |
| 27 | BP27 | 22° 24' 12.470" N | 81°10' 36.516" E |
| 28 | BP28 | 22° 24' 12.512" N | 81°10' 37.645" E |
| 29 | BP29 | 22° 24' 13.205" N | 81°10' 38.100" E |
| 30 | BP30 | 22° 24' 12.683" N | 81°10' 38.802" E |
| 31 | BP31 | 22° 24' 12.863" N | 81°10' 39.006" E |
| 32 | BP32 | 22° 24' 11.659" N | 81°10' 42.725" E |
| 33 | BP33 | 22° 24' 4.663" N | 81°10' 35.744" E |
| 34 | BP34 | 22° 24' 5.022" N | 81°10' 33.663" E |
| 35 | BP35 | 22° 24' 4.289" N | 81°10' 33.456" E |
| 36 | BP36 | 22° 24' 4.295" N | 81°10' 32.674" E |
| 37 | BP37 | 22° 23' 59.533" N | 81°10' 28.831" E |
| 38 | BP38 | 22° 24' 0.481" N | 81°10' 26.544" E |
| 39 | BP39 | 22° 23' 56.945" N | 81°10' 25.230" E |
| 40 | BP40 | 22° 23' 59.868" N | 81°10' 20.314" E |

Survey of India Toposheet Number 64F/3

**Land Use and Land Cover of Mine Lease Area :**

| | |
|---|---|
| Private Agriculture Land | 32.898 Hectares |
| Government Waste Land | 9.748 Hectares |
| **Total Mine Lease Area (MLA)** | **42.646 Hectares** |

Nearest village/town/highway/railway station/water bodies:

| Particulars | Particular's Name | Distance & Directions |
|---|---|---|
| Nearest Village | Salgi | Approx 0.1 km form project boundary |
| Nearest National highway | NH-12 Bodla to Daldali | 44 km |
| Nearest Railway Station | Hathband | 140 Km approx. |
| | Raipur | 145 km approx |
| Nearest Waterbodies | Hanp River | 2.3 km ENE |

**Climate**

During peak summer the temperature rises to 42°C, while winter temperature falls down to 03°C (average 15°C). The precipitation is confined to the rainy season from July to September and annual rainfall average is 1200 mm.

**Topography**

The plateau of Salgi forms the central part of Maikal range. The average elevation of the area is 940 MSL. The plateau trending N-S has irregular margin and bounded by steep escarpments. It is about 12 km long N-S linear plateau with width varying from 0.5 to 2.0 km.

**Regional Geology**

The area constitutes central part of the extensive laterite-capped plateau of the Maikal Range hills. In plains to the north-western part of the area around Mawai and Kathaitola, gneissose and schistose rocks form the core of the range, whereas around Kukrapani and Taregaon in the south-east, phyllite, slates and quartzites belonging to Chilphi Group are exposed. In the lower part of the plateau, narrow patches of Lametas, represented by calcareous gritty sandstones and pink & white clays are seen in the Kanai river section at Kukri. These are overlain by horizontally disposed basaltic lawa flows of Deccan Trap. Good exposures of Deccan Trap are noticed along the Kukrapani Daldali ghat section. The traps are capped by about 25 m thick laterite. Bauxite is normally found within upper part of the laterite capping.

**The geological sequence of the area is as under :**

**Geological Sequence**

| | | |
|---|---|---|
| Upper Tertiary | High level laterite & bauxite | Clay, laterite & bauxite |
| Lower Eocene to upper Cretaceous | Deccan Trap | Basaltic rocks and intertrappeans |
| Cretaceous (Turonian) | Lameta | Calcareous & gritty sandstone and clay |

**UNCONFORMITY**

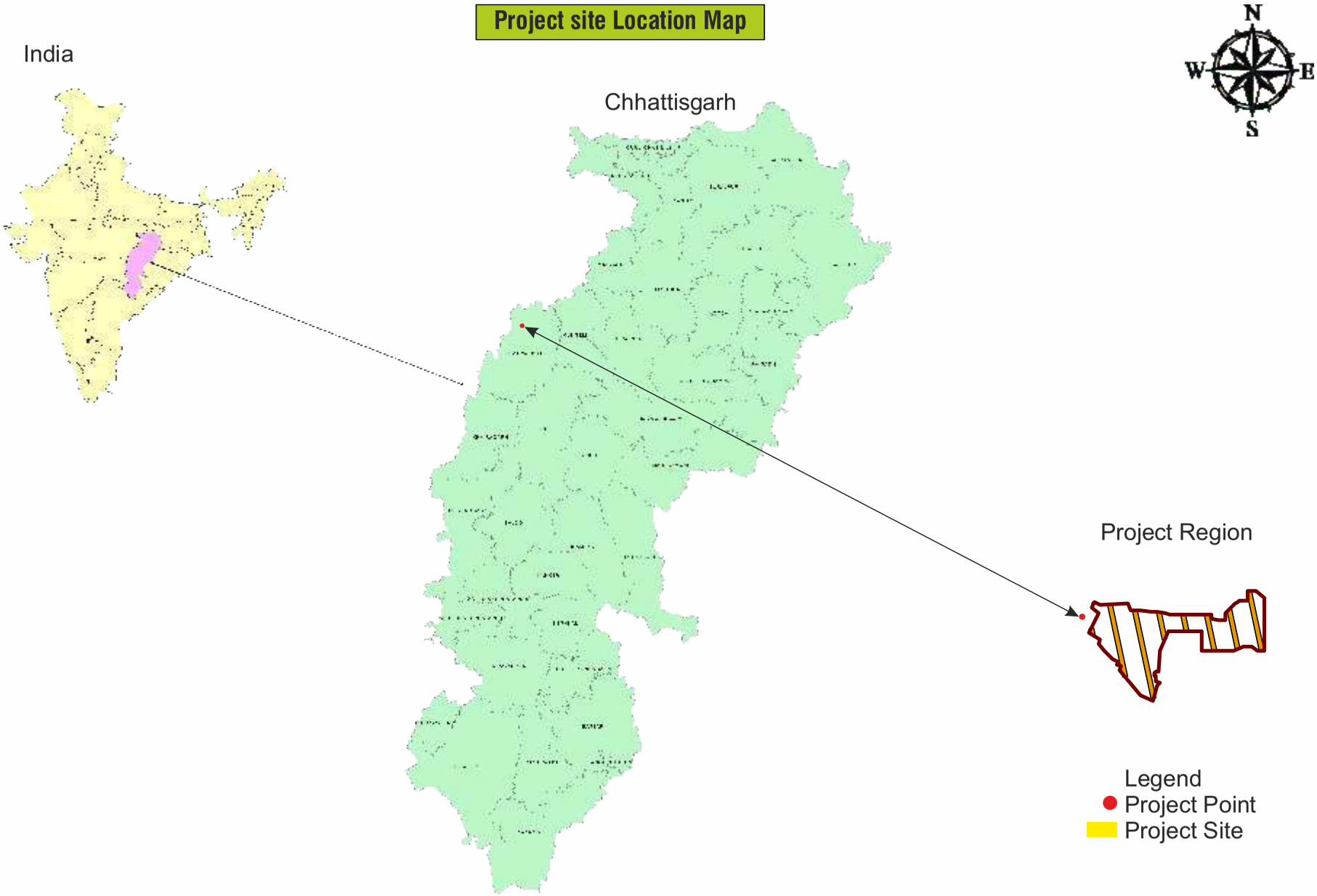
| | | |
|---|---|---|
| Precambrian | Chilphi Group Archaean basement complex | Phyllite, slates & quartzites Gneisses and schists |

**A typical profile of the leased out area is summarized as under:**

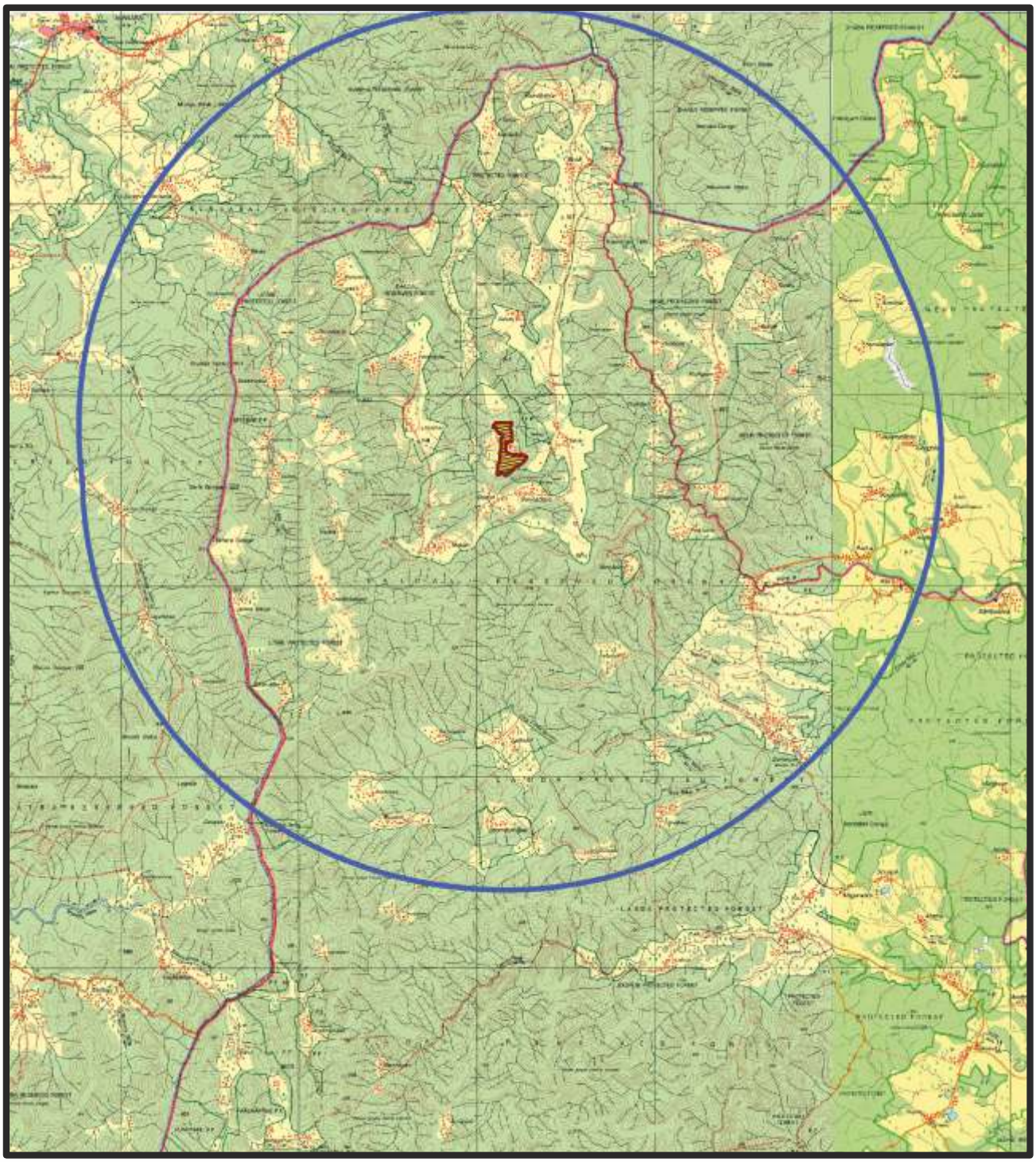
| Lithology | Thickness | Description |
|---|---|---|
| Top soil | 0.00 -2.00 m | Dark gray grading downwards into laterite soil |
| Upper laterite | 0.00 - 1.00 m | Pisolitic, loose or undulated, scoraceous contains pebbles and boulders of the bauxite and shows undulating but sharp contact with the underlying bauxite |
| Bauxite | 0.00 - 3.30 m | Massive, sometimes pisolitic, hard and compact, denser than the laterite vesicular and pitted; displays shades of light gray and pink colour |
| Lower laterite | 0.00 - 3.30 m | Massive locally oolitic and pisolitic, moderately hard to soft vermicular and scoraceous, porous and shows darker shades of red, yellow and brown colour |
| Litho merge | 0.00 -15.3 m | Light gray, yellow & red clay, laminated; laminae impersistent; highly porous |
| Trap | + 30 m | Weathered, at the contact with the Lithomerge, followed downwards by fresh unaltered trap |

## ENVIRONMENTAL SENSITIVITY

| S.No | Particulars | Details |
|---|---|---|
| 1 | Elevation above MSL | 920 M |
| 2 | Climate Conditions (IMD Raipur) | Annual max Temp- 41.9°C<br>Annual Min Temp- 12.7°C<br>Annual Total Rainfall- 1252.7 mm |
| 3 | Land use of Mine Site | Barren Land and Partly Agricultural land |
| 4 | Nearest Highway | NH-12 Bodla to Daldali 44km. |
| 5 | Nearest Railway station | Hathband 140 Km |
| 6 | Nearest Town/ city, District Headquarters along with distance In km | Kawardha, 60.0 km, S |
| 7 | Hills/Valley | Maikal range |
| 8 | Ecologically Sensitive Area | Within 5 Km range Eco senstive area of phen wildlife santury |
| 9 | Protected area as per wild life protection Act 1972 | Within 5 Km range pehn wildlife santury |
| 10 | R&R Factors | No additional R&R required |
| 11 | Densely populated or built-up area | Nil |
| 12 | Areas which are important or sensitive of ecological reasons-wetlands, water courses or other water bodies, coastal zone, biospheres, mountains, forests (within 10 Km radius) | **(i) Forest** Daldali R.F (2 km)<br>Phen Wildlife Sanctuary lies within the 10 km<br>**(ii) Water body**<br>Hanp River 2.3 Km ENE |
| 13 | Water Source | Hanp River 2.3 Km ENE |
| 14 | Defence installations | Nil within 15 Km range |
| 15 | Major Industries | Nil within 15 Km range |
| 16 | Seismic Zone | Zone – II (as per IS-1893, Part I :2002) |


Project site Location Map
India
Chhattisgarh
N
W
E
S
Project Region
Legend
Project Point
Project Site

## SALGI LEASE BOUNDARY AREA SUPERIMPOSE ON SOI TOPOSHEET



**Legend**

Salgi Lease Area BOUNDARY

10 KM Radius from Mining Lease Boundary

**SOI TOPOSHEET MAP NO. : 64F/7**

**RGB**

Red: Layer_1

Green: Layer_2

Blue: Layer_3

**SOI TOPOSHEET MAP NO. : 64F/3**

**RGB**

Red: Layer_1

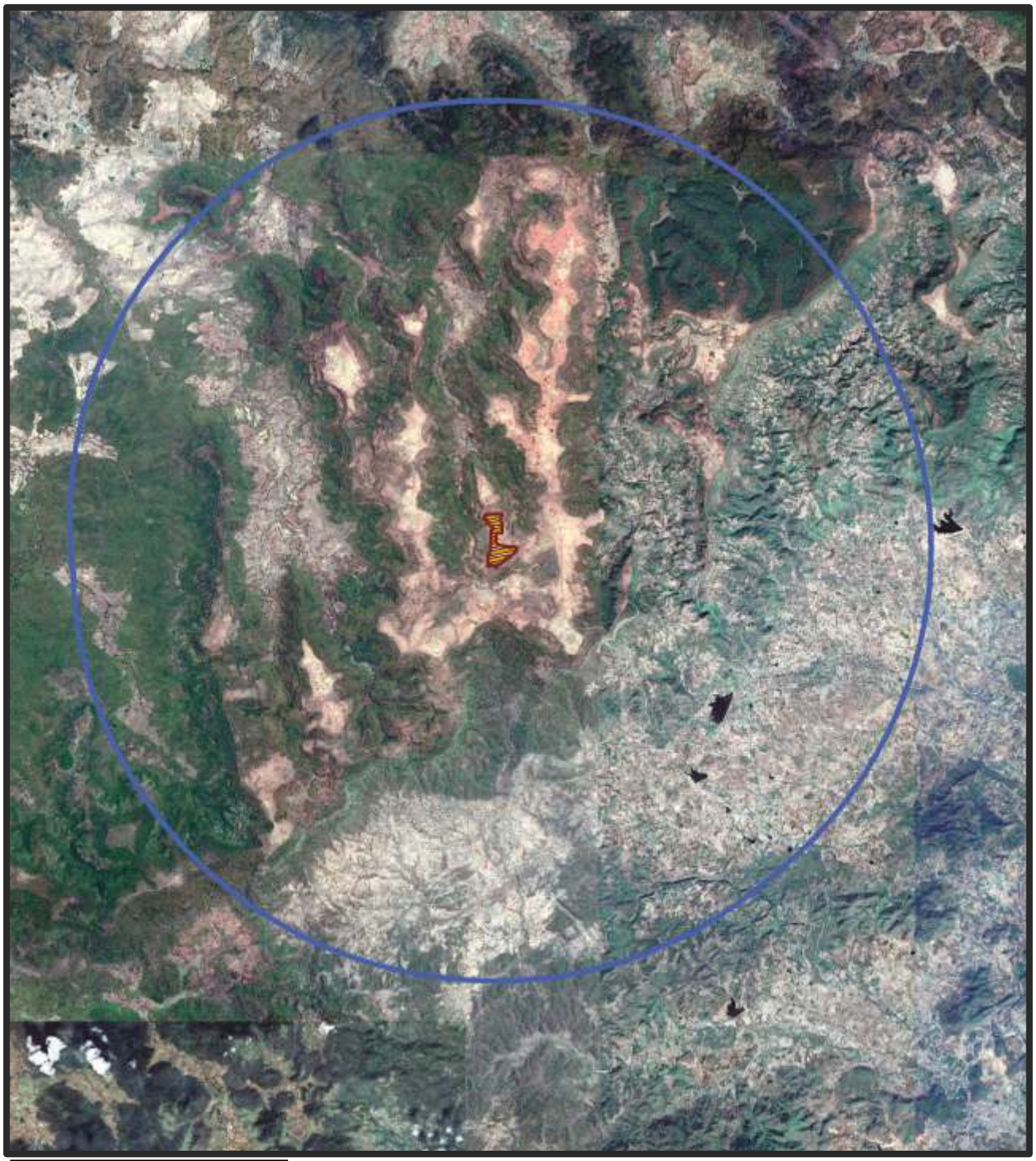
Green: Layer_2

Blue: Layer_3

Scale
1:121,000
1 centimeter = 1,210 meters

0 2,500 5,000 10,000 Meters

## SALGI LEASE BOUNDARY AREA SUPERIMPOSE ON GOOGLE IMAGE



**Study Area :**

Study Area is divided into two parts ,i.e., Core Zone and Buffer Zone.

**Core Zone :**

The mine lease area comprises of agricultural land with partly rocky and barren government wasteland. The total mine lease area is 42.646 Hectares which is situated in Salgi Village. There is no forest land including ***"Chhote aur Bade Jhad ke Jungle"*** in the core zone area.

**LAND BREAKUP**

| Govt. Waste Land (Ha.) | Private Agriculture Land (Ha.) | Total (Ha.) |
|---|---|---|
| 9.748 | 32.898 | 42.646 |

**Buffer Zone :**

The buffer zone area is the 10-kilometer radius from the periphery of the mine lease area. Out of the total Buffer zone area, 65% area of buffer zone falls in the territorial limits of the state of Chhattisgarh and the rest 35% of the buffer is within the territorial limits of the neighboring state of Madhya Pradesh.

**A. Details of the Buffer Zone Area of Chhattisgarh**

It is situated in two forest ranges of Kawardha Forest Division and some area of Chhattisgarh Forest Development Corporation Kawardha.

**Buffer zone area of Chhattisgarh falls in two range ie Taregao and Pandaria west of Kawardha Forest Division.**

Range wise details of forest compartment in buffer zone are as follows:

**DIVISION KAWARDHA**

**RANGE TAREGAON**

Reserve / Protected Forest Compartment Numbers:

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 |
| 26 | 27 | 28 | 30 Part | 392 | 399 | 401 | 402 | 403 | 404 | 405 | 406 | 407 | | |

**RANGE PANDARIYA WEST**

**Area under Protected forest - Compartment nos. :**

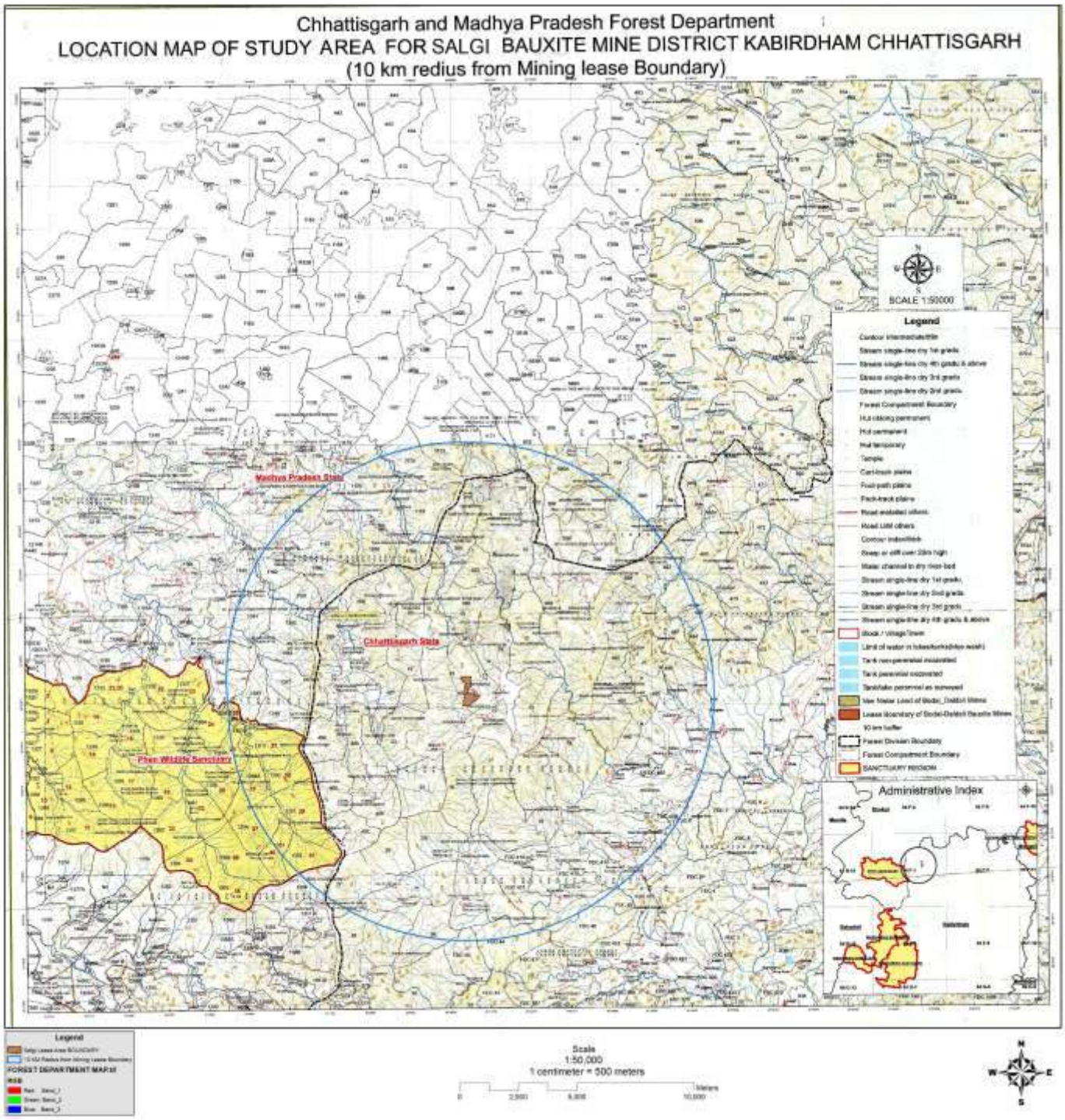
• 482 Part • 483 Part • 486 • 487 • 488 • 489 • 490 • 491 • 492

**Area under C.G. Forest Development Corporation**

Kawardha Division compartment no. - 408, 409, 412, 413, 414, and 415.

**B. Details of the Buffer Zone Area of Madhya Pradesh**

1. Some area of Mawai Range of East Mandla Forest Division & Bajag Range of Dindori Forest Division.
2. Some area of Phen Wildlife Sanctuary.


Chhattisgarh and Madhya Pradesh Forest Department
LOCATION MAP OF STUDY AREA FOR SALGI BAUXITE MINE DISTRICT KABIRDHAM CHHATTISGARH
(10 km redius from Mining lease Boundary)
SCALE 1:50000
Legend
Madhya Pradesh State
Chhattisgarh State
Phen Wildlife Sanctuary
Administrative Index
Scale
1:50,000
1 centimeter = 500 meters

# CHAPTER - III

## Methodology Followed

### Rapid ecological study

This ecosystem is a dynamic one with both rich floral and faunal biodiversity with respect to its diversity of species composition and visible succession stages. An ecosystem can be studied from different angles. This report has endeavored to explore the various aspects of the study area to understand mostly the structural aspects of this forest ecosystem and associated ones. For this study sampling technique was followed as provided below.

### Faunal Study

An ecological survey of the study area for understanding the fauna of the study area was conducted, particularly with reference to listing of species and assessment of the existing baseline ecological conditions in the study area in the following manner.

- Direct Count Method
- Transect Method
- Photographic-survey Based
- Dropping/scat
- Collection of dissociable body parts
- Interviewing Local Villagers
- Geo-reference:
- Equipments: Nikon D5000, Tamron VR-II 150-600 mm Lens, Olympus 10x42, Leica 10x42 ED, Garmin Oregon 550 and Garmin -12, Voice Recorder.

The studies were conducted in the study area, i.e., 10 km radius area of **Salgi Bauxite Mines Lease Area (CMDC),** The study was conducted during study period daily before sunrise to late night (5:30am to 11.30pm). The adults of Odonata, Lepidoptera and Hymenoptera were collected in the field with aspirator, manually and aerial sweeping nets. The collected insects were killed by using benzene and preserved in insect collection boxes for further examination in the laboratory.

The common Odonata, Lepidoptera and Hymenoptera species were identified in the field and only very limited unidentified species representatives were collected. Mollusca, Amphibians and Reptiles were collected with the help of forceps manually and Fishes with the help of Aquatic net and all the materials preserved in 70% Alcohol. The random collection and field observation were also made on different groups of the fauna of the study area. The Reptiles, Aves and Mammals were identified by using Binocular (10mmx25mm) and field guides of concerned faunal group and their presence also recorded by taking photographs.

The presence of some Mammals species is also ascertained on the basis of pugmarks, interview with wildlife and forest officials, and villagers residing in study area. Discussion with forest staff posted in study area was also helpful in surveying.

**Estimation Of Carrying Capacity**

The number of individuals of a population (species) which an area/habitat can carry or support during the pinch-period is known as carrying-capacity of that habitat for that particular species. All numbers produced in excess of the carrying-capacity are obviously subject to loss.

There is tendency in every species to grow in numbers beyond the carrying-capacity but the decimating-factors/environmental-factors seize such tendency cheking species-abundance from exceeding the optimum number and density of the species in that particular habitat. Since reproduction adds many new individuals through breeding-potential and productivity of the species, we can ensure their maximum survival if we keep the total population below the carrying-capacity or balancing the herd with available range. Thus, carrying-capacity is a concept which relates a specific area to a particular species. To understand carrying-capacity very well, we can suppose a particular habitat as a ball in which certain population (number of individuals) of a species is growing. This ball may also be suitable and favourable in resect of food, water and shelter for a fixed number, due to productivity etc. there will be increase in number in the population of that species and thus crowd inside the ball will arise.

To minimize this crowed, there will be intraspecific-competition as wall as as adverse effects posed by decimating-factor/environmental-factors and ultimately excess numbers will die or migrate. Therefore, just before reaching such stage, the surplus numbers of the individuals of a population are to be harvested, the situation will be normal and the species will again grow upto that stage. In this way, harvesting will be useful for getting revenue and saving the individuals from dying uselessly.

The carrying-capacity is variable as per the season or time. When the season is of marked adverse conditions (adverse climatic/factors such as cold, hot etc.) the carrying-capacity will drop accordingly during unfavourable season; and when the favourable season is reached, the carrying-capacity will rise. In this way, fluctuations in population take place. Generally wild animals are accustomed to this annual-fluctuation of carrying-capacity bringing their young to the beginning of season of high carrying-capacity (favourable condition). If the habitat-ball grows means increases its capacity, the population also expands accordingly through reproduction, productivity and growth to keep it in full.

Though, the carrying-capacity is the attributes of a species habitat, it is being increased with the seasons and may also be increased by proper management or manipulation of the habitat to suit the increasing number of density of the species brought about by its productivity whenever, it is not possible or done artificially, there is no chance to survive the excess number of individuals which are beyond the carrying capacity. In this way; carrying-capacity controls the population-density, etc. are altogether linked to each-other. The consideration of all these factors is needed primarly and positively on priority basis during applying management/improvement/manipulation techniques in the field of wildlife.

Method of Estimation of Carrying-Capacity

The carrying-capacity of a babitat is carried out in the following steps:-

(a) First of all the total area of the habitat and the area of vegetation found within the habitat are estimated.

(b) After this, the amount of the vegetation found in the pinch-period of the habitat is calculated by transect or sampling or any other suitable method and, in this way, the total amount of the vegetation in one year is found out. Hence, the total amount of vegetation in one year is found out. Hence, the total amount of vegetation available in a year on the basis of pinch-period is calculated.

(c) Afterwards; on the basis of food consumed in one day by one individual of the species, the total quantity of food consumed by individual animal required for one year is calculated.

(d) On the basis of amount of food in one year for one individual and the total amount of food (vegetation) available in one year (as calculated); the number of individuals are calculated to be sustained in a year in that habitat and, thus, carrying-capacity is estimated.

It is estimated in the term of biomass of the herbivorous animals of the habitat (biomass is the total weight of the population in unit area of the habitat). It means that the total weight of all the herbivores available in the area (habitat) is found out and then biomass per kilometer is calculated, as an average in unit area. This method is used specially in comparing with the other habitats.

**Study of Forest Type**

In the whole study area, random samples were taken to study intensively various ecological parameters so as to understand largely the ecological structure of the study area and get some sample idea of the ecological functions. In some places where anthropogenic activities are low species available are recorded as per the findings of transverse walk.

In most cases random sampling was done with the help of Satellite Imagery and topo-sheet of the area. Samples were studied within the buffer area i.e. 10Km radius of the **Salgi Bauxite Mine Lease Area (CMDC)**. Studies were done for understanding the phytosociology, inventorization of faunal species as well as their habitat and ethno botanical study within the villages surround within the buffer area.

**Quadrate sampling**

Quadrate sampling was done in the study area, where there are both forest areas and non-forest areas. At the outset a species area curve was prepared in eastern side of the hill to find out the minimum size of the quadrate required for the study of three layers (considered as separate communities) such as tree, shrub and herb. It was inferred that for tree layer the minimum size of the quadrate required for study was 100 sqmtrs (10mtrs x 10mtrs) for trees, (5mtrs x 5mtrs) 25 sqmtrs for shrubs and (1mtr x 1mtr) 1 sqmtrs for herbs. In each of the sample sites a quadrate of 100 sqmtrs (10mtrs x 10mtrs) was laid in the north-south direction to study the tree community for the parameters like Importance Value Index

(IVI), Diversity Index, Canopy cover statistics and later on the data generated was used to calculate similarity index of the three layers of the study area. In each of the tree quadrate, four shrub quadrates were laid on alternate sides and similarly five herb quadrates were for study of herb layer. Each quadrate was given a code and marked by GPS reading. For GPS reading GARMIN-12 handset is used and all the readings are recorded.

**Taxonomic identification of plant species**

Plant species will be identified following standard flora by Hooker (1872-1897)[1], Verma et al. (1985)[2] and Kumar et al (2005)[3]. Names of the plant species were verified using Bennet (1987)[4]. The help of scientists of Botanical survey of India (BSI), Allahabad was taken.

**Calculation of Importance Value Index (IVI)[5] of Trees**

This index utilizes 3 characteristics such as Relative frequency, Relative Density and Relative dominance.

A. Relative dominance = (Total basal area of $i^{th}$ species/Total basal area of the species) x 100
B. Relative density = (Number of individual of $i^{th}$ species/Number of individuals of all species) x 100
C. Relative abundance = Number of occurrence of $i^{th}$ species/ Number of occurrences of all species) x 100 The above three values are added to get Importance Value Index (IVI).

**Important Value Index (IVI) = Relative dominances + Relative Density + Relative Abundant.**

**Canopy Statistics**

Canopy cover is an important indicator of the forest habitat condition. The movements and behavioral patterns of large mammalian herbivores as well as birds and several groups of insects are dictated to a large extent, by the status of canopy cover. The overall forest cover may easily be estimated from the satellite imagery. The satellite maps of the study area shows that the overall canopy cover in the forested areas is well above 40%. However, within the forest area, different patches of the forest understandably

1. Hooker J.D.1872 - 1897. Flora of British Inda, London (Reprinted Edition 1973)
2. Verma D.M. P.C. Pant and M.I. Hanfi. 1985. Flora of Raipur, Durg and Rajnandgaon. Botanical Survey of India, Howrah.
3. Kumar, A., K.K. Khanna, and A.K. Jha. 2005. Floristic Diversity of Chhattisgarh (Angiosperms). Bishen Singh and Mahendra Pal Singh, Dehradun. Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
4. Bennet S.S.R 1987 Name changes of flowering plants of India and adjacent region. Triseas Publishers, Dehradun.
5. Philip, E.A. (1959) Methods of Vegetation study. Henry Holt & Co. Inc.

showed different characteristics, depending on the floral composition, age structure of the stand, and the history and degree of perturbation like fragmentation, felling, etc. Instead of depending on the generalized satellite estimation, a more direct and authentic estimate of canopy cover was undertaken by the study team by physically measuring the canopy spread.

We have adopted a geometric measurement to estimate CC, by directly measuring the crown diameters at right angles, in a specified quadrate. Half of the averages of these two diameters give the mean radius of the canopy, whence the mean canopy area of each tree can be calculated as $\pi r\ i^2$(where ri is the mean canopy radius for the $i^{th}$ individual tree). The total canopy cover area (c) in a sample quadrate equals the sum total of the canopy area of the trees within the quadrate $\Sigma \pi r\ i^2$. Thus, the Canopy Cover Index (CC) is the ratio of C to A, Where A = XY, (X and Y denoting axes of the quadrate being measured). Open canopy is inferred when CC<0.4.

**Life form study**

The life form composition of the community is the manifestation of the adaptations of its component species to the climatic condition, contributes to community architecture (Jamir et al. 2006)[6]. Life form spectrum is the sum of adaptations of plants to the climate. Following the system of Braun-Blanquet's (1951)[7] system the area possesses five major classes like

| | | | | | |
|---|---|---|---|---|---|
| I. | Phanerophytes | II. | Therophytes | III. | Hydrophytes |
| IV. | Hemicryptophytes | V. | Geophytes | | |

**Ethno botanical Study**

This is the study related to use of different plant species by local people mostly for food, medicine, and other traditional uses.

---

*6.Jamir, S.A., Upadhaya, K. and Pandey, H.N. 2006. Life form composition and stratification of montane humid forests in Meghalaya, northeast India. Trop. Ecology 47(2), pp 183-190.*

*7.Braun Blanquet, Josias (1964): Pflanzensoziologie, Grundzuge der Vertationskunde. (3. Auflage). Springer Verlag, Wien, 865 pages)*

**Method of procuring ethnobotanical information**

The procedure of gathering data, in general, was same as mentioned by Jain (1963a[8], 1964a[9] , 1965a[10], and 1967a[11]). It included either interviews of the informants or witness of the uses during the period of work in the field.

Information on plants associated with food, medicine, material culture and worship. The conservation aspects of the community, natural history, ethnology has been done by rapid ethnobotanical appraisal (REA) as suggested by Martin (1995)[12]. REA is a method by which quick assessment of ecological knowledge and resource use can be studied and assessed. This technique is adopted from various disciplines to form a collaborative approach.

Informants were requested to accompany the author in field, to detect the plants. Alternatively a particular plant was picked up and quarries made as to how it was useful for them. The reply was either description of the uses in details in all respects or a reply in negative. When discussion on one plant was over, a second plant was taken up, and so on, where possible both a man and women were engaged, as the women were supposed to know the foods, vegetables, medicine etc. and the men the materials in wood working, housing as well as medicine.

**Information from secondary sources**

Ethnobotanical information has been collected for this study from following sources also. These are (i) Old literatures and (ii) Oral history. Herbarium specimen and field notes on herbarium sheets also proved to be a good source of ethnobotanical information. In many cases the observation on plant are made by previous botanical explorers were noted on herbarium labels. This information were not published and remained unnoticed. Much useful information on plants associated with people of extent past has gone in written accounts of those items. Sometimes this information is scattered and exists in rather obsolete literature, such as, travel accounts, forest department reports, natural history, ethnologist, etc. In the present study all the tools mentioned above have been taken as source of information.

---

*8.Jain, S.K. 1963a. Studies in Indian ethnobotany: Less known fuses of fifty common plants from the tribal areas of Madhya Pradesh. Bull. Bot. Surv. India 5: 223-226.*
*9.Jain, S.K. 1964a. The role of botanist in Folklore research. Folklore 5 (4): 145-150.*
*10.Jain, S.K. 1965a. Medicinal plant and Folklore of the tribal's of Baster. Econ. Bot. 19: 236-250.*
*11.Jain, S.K. 1967a. Ethnobotany: Its scope and study. Indian Mus. Bull. 2(1): 39-43.*
*12.Martin, G.J. 1995. Ethnobotany. Chapman & Hall: London, UK.*

# CHAPTER - IV

## STATUS OF FLORAL DIVERSITY

The climatic, edaphic and biotic factors generally determine the type and distribution of the natural vegetation of this tract. By far the most important factor which influences composition of the forest, in addition to rainfall, is the underlying parent rocks and soils derived from them. Wherever water retentive soils are found, the growth of the vegetation is luxuriant, both in quality and stocking. Soils of poor water holding capacity even under high annual rainfall, support only low-quality vegetation of sparse density.

The topography also plays a great role in determining the composition of the forests. For example, the percentage of Sal in the crop is generally inversely proportional to the degree of the slopes.

Aspect also plays a significant role in determination of composition and stocking of the forests. The northern aspect presents generally the moister and cooler conditions as compared to the southern or south-western aspects.

The vegetation occurring in the study area belong to **SOUTHERN TROPICAL DRY DECIDUOUS FORESTS (CLASS 5 A)** which intermingles with Class - 5B **(NORTHERN TROPICAL DRY DECIDUOUS TYPE)**, according to **Champion and Seth** classification of forests types of India 1968. According to the classification of ***Legris*** and ***Paseal*** (1982), the study area falls under deciduous climax forests and this type of forests does not have the potentiality of secondary moist deciduous forests. The most characteristic type of this type is *Anogeissus latifolia* while *Terminalia tomentosa* is a very typical associate. *Diospyros monatona* is also common. *Boswellia serrata* and *Legerstromia paruflora* are very wide spread and conspicuous in this category of forests. Bamboo is generally of poor quality. Grass is conspicuous till it is grazed or burnt in forest fire. Woody climbers are few like *Bauhinia vahali.* This type of forests, being especially prevalent in the drier locality occurs throughout the study area. Top canopy remains leafless between February-May. The understory is well defined and the forest floor is full of vegetal growth.

According to the revised classification of forests types in India by **CHAMPION AND SETH,** recognizable ecological forest types of the tract are as follows :-

1. **Moist peninsular high level Sal forest 3C/C 2 e (i).**
2. **Southern dry mixed deciduous forest - 5A/C3.**
3. **Northern dry mixed deciduous forest - 5B/C2.**
4. **Boswellia forests - 5/E2.**
5. **Dry bamboo forests - 5/E9 (Bamboo occurs as under storey)**

The above listed forests types are individually described as under:

## Moist Peninsular High Level Sal Forests - 3C/C2 e(i)

Sal forests of the study area lie at the northern frontier of the natural sal zone. Hence vegetative equilibrium gets easily upset by biotic interferences. Here, sal occurs as small to large patches in the main mass of non-sal miscellaneous forests. Sal forest of the tract is basically of III quality and IVa quality.

The elevation of Sal forest varies from 606 meters to 916 metres above mean sea level. It is found very commonly on plateau of Daldalli.

The best sal forests usually occupy the low hills, lower slopes of higher hills and such portion of valley which are well-drained. It degenerates in growth as it ascends the hills and gives way to mixed forests on top of the hills.

Sal crop is mostly from seeding origin, fairly well formed and uneven aged. A distinct understorey formed by the advance growth of sal, saja, tinsa, etc. usually exists. Underwood is moderate and undergrowth is poor, climbers are quite few. Parasites and fungi are rarely seen. Common associates of sal in top canopy are Saja, Dhaura, Mahua, Hadu, Bija etc.
Bamboo is generally absent; sometime bamboo clumps of poor quality and stocking are seen along nalla banks here and there.

### General floristic of Sal forest are given here under

| | | |
|---|---|---|
| Overwood | - | Sal, Saja, Kumbhi, Mahua, Am, Baheda, Kusum, Jamun, Shisham, Salai, Kullu, Dhaora, Semal, Bija, Haldu, Papal, Siris, Mocha, Mundi. |
| Underwood | - | Tinsa, Tendu, Aonla, Char, Amaltas, Loyen, Surya, Kasai, Lendia, Dhaman, Padar, Bhilwa, Baranga, Mainhar, Palas, Thawar. |
| Undergrowth | - | Dhawai, Marorphal, Dudhi, Gilchi, Rasna, Baibirang, Tilwan, Dikamali, Karonda, Kurchi, Surfonk. |
| Herbs | - | Bantulsi, Tikhur, Baichandi, Gokhru, Ziziphus, Spps., Banrahar. |
| Grasses | - | Chir, Bagai, Doob, Khus, Sukla, Gondla, Bhurbhusi, Phoolbahari. |
| Climbers | - | Ramdaton, Keoti, Mahulbel, Nagbel, Palas Bel, Cheelbel. |
| Parasite | - | Bandha species are seen occasionally nuisance is alarming. |

## Southern dry mixed deciduous forest 5A/C3

These forests occupy bulk of the study area. Density varies from 0.2 to 0.7 with a number of small to extensive blanks. Average density is 0.5. Bamboos are usually absent and usually of poor quality. Scattered bamboo clumps are seen along nalla banks and in depressions occasionally. The crop is usually malformed (occasionally fairly well-formed); uneven aged; both from coppice and seedling origin. The Underwood and undergrowth are moderate to poor. Grasses flourish during rainy season and get grazed during the open season. Climbers are fairly common. At places climber nuisance is alarming.

Bulk of the area of this forests type is covered by Boswellia overlapping forests. At places concentration of salai in overwood exceeds 80%. The principal species in the overwood besides salai which forms a large proportion of the crop are Moyan, Dhobin, Dhaora, Saja, Haldu etc. It is felt that a few years back these forests were not having salai concentration in overwood to such a high proportion. Trees of miscellaneous species such as Haldu, Dhaora, Tinsa, Saja, Tendu, Senha etc. were also in existence as remnants which can still be seen in the forests in shape of their bushy coppice growth. The present deplorable condition of these forests can be attributed to the fact that the trees of miscellaneous species have been ruthlessly cut for fuel and timber year after year by the local inhabitants. Salai trees are left untouched as these are having no utility value as fuel or timber to the local population. Scattered Kullu trees are noticed on rocky slopes.

The following is the floristic composition of this forest type:

| | |
|---|---|
| Overwood - | Saja, Salai, Dhaora, Dhobin, Bija, Moyan, Mahua, Haldu, Mundi, Kusum, Semal, Kullu, Harra, Teak, Sal, Bahera, Jamun, Am. |
| Underwood.- | Tinsa, Tendu, Aonla, Achar, Karra, Bhirra, Kakai, Dikamali, Amaltas, Galgal, Ghont, Palas, Bel, Bhilwa, Shisham, Neem, Senha, Bamboo, Thawar, Keolari, Padar, Dhaman. |
| Undergrowth.- | Dhawai, Anarphal, Keronda, Lantana, Dudhi, Chhind, Ber. |
| Herbs. - | Charota, Chirchira, Gokhru. |
| Grasses.- | Bhurbhusi, Bagal, Sukla. |
| Climbers.- | Cheelbel, Palasbel, Mahulbel, Keoti, Malkangni, Ramdaton, Satawar. |
| Parasite.- | Amarbel, Bandha Spps. |

Bulk of the area of this forests type is covered by Boswellia overlapping forests. At places concentration of salai in overwood exceeds 80%. The principal species in the overwood besides salai which forms a large proportion of the crop are Moyan, Dhobin, Dhaora, Saja, Haldu etc. It is felt that a few years back these forests were not having salai concentration in overwood to such a high proportion. Trees of miscellaneous species such as Haldu, Dhaora, Tinsa, Saja, Tendu, Senha etc. were also in existence as remnants which can still be seen in the forests in shape of their bushy coppice growth. The present deplorable condition of these forests can be attributed to the fact that the trees of miscellaneous species have been ruthlessly cut for fuel and timber year after year by the local inhabitants. Salai trees are left untouched as these are having no utility value as fuel or timber to the local population. Scattered Kullu trees are noticed on rocky slopes.

### The following is the floristic composition of this forest type

| | | |
|---|---|---|
| Overwood | - | Saja, Salai, Dhaora, Dhobin, Bija, Moyan, Mahua, Haldu, Mundi, Kusum, Semal, Kullu, Harra, Teak, Sal, Bahera, Jamun, Am. |
| Underwood | - | Tinsa, Tendu, Aonla, Achar, Karra, Bhirra, Kakai, Dikamali, Amaltas, Galgal, Ghont, Palas, Bel, Bhilwa, Shisham, Neem, Senha, Bamboo, Thawar, Keolari, Padar, Dhaman. |
| Undergrowth | - | Dhawai, Anarphal, Keronda, Lantana, Dudhi, Chhind, Ber. |
| Herbs | - | Charota, Chirchira, Gokhru. |
| Grasses | - | Bhurbhusi, Bagal, Sukla. |
| Climbers | - | Cheelbel, Palasbel, Mahulbel, Keoti, Malkangni, Ramdaton, Satawar. |
| Parasite | - | Amarbel, Bandha Spps. |

### Northern dry mixed deciduous forest 5B/C2

The quality varies from M.P. IVb to III but the average quality is IVa. Density varies from 0.2 to 0.8 with number of small and extensive blanks. Average density is 0.5. It is mostly middle aged both from coppice and seedling origin, fairly well-formed and occasionally mal-formed. The under wood (which is mostly of bamboo) is moderate. The undergrowth is poor.

## Following is the floristic composition of the forests

| | | |
|---|---|---|
| Overwood | - | Saja, Dhaora, Salai, Dhobin, Moyan, Haldu, Bija, Mahua, Mundi, Kullu, Harra, Jamun, Kahua, Papal. |
| Underwood | - | Tinsa, Tendu, Aonla, Achar, Amaltas, Dikamali, Galgal, Ghont, Palas, Dhaman, Bhilwa, Senha, Thawal, Siris, Baranga, Keolari, Bamboo. |
| Undergrowth | - | Marorphal, Dhwai, Lantana, Karonda, Dudhi, Chhind, Ber. |
| Herbs | - | Charonta, Gokhru, Baichandi. |
| Grasses | - | Sukla, Bhurbhusi, Doob, Munj, Kunda, Phoolbahari, Chhir, Gandri. |
| Climbers | - | Cheelbel, Keoti, Mahulbel, Nagbel, Palas Bel, Ramdaton. |
| Parasite | - | Bandha (Spps) Rarely. |

## Boswellia (Salai) Forests - 5/E2

Boswellia (salai) forests are overlapping the mixed forests of the tract. Bulk of salai forest is of Madhya Pradesh IVa quality. Salai generally tends to occupy the high elevations on plateau and ridges, particularly on southern and western aspects where boundary, shallow and drier soils are in existence. The type occurs on shallow, greyish to reddish, gritty sandyloam derived from granites, qartzite, laterite, etc. Salai crop is middle aged to mature.

It is mostly of seedling origin. Density varies from 0.2 to 0.6. The crop is mostly malformed. The clear boles of salai trees are generally short as the branching is profuse.

Underwood and undergrowth are scantly to moderate. Reproduction of Salai is most inadequate; some seedlings of Salai are noticed in the interior parts of mixed forest but there also its reproduction can-not be said to be adequate. It is patchy. Fires are common in these forests and the incidence of grazing and illicit fallings for fuelwood and small timber is heavy particularly on the lower slopes. Notable feature of these forests is the presence of a number of drought hardly species, the most conspicuous of which in underwood is Tendu which produces root-suckers in groups scattered all over these forests. The other conspicuous drought hardy species of these forests in the undergrowth are Harsingar, Mainphar, Kakai and Dudhi. Harsingar occurs on dry hill slopes and rocky region. Most common drought hardy shrubby species of these forests is Marorphal.

## The floristic features of the type are as under

| | | |
|---|---|---|
| Overwood | - | Salai, Dhaora, Dhobin, Moyan, Bija, Mahua, Haldu, Siris, Mundi, Semal, Harra, Kullu, Teak, Bar, Papal. |
| Underwood | - | Tendu, Karra Lendia, Char, Anola, Kakai, Dikamali, Kasai, Galgal, Dhaman, Mainphal, Amaltas, Keolari, Palas, Bel, Tinsa, Bhilwa, Gilchi, Bamboo. |
| Undergrowth- | | Marorphal, Dhawai, Gursukli, Dikamali, Dudhi, Harsingar, Kakai, Baibirang, Chhind, Ber, Chirota, Rasana. |
| Herbs | - | Charota, Bantulsi. |
| Grasses | - | Bhurbhusi, Sukla. |
| Climbers | - | Cheelbel, Palasbel, Keoti, Ramdaton. |
| Parasite | - | Loranthus On Mahua And Saja. |

## Dry bamboo forests - 5/E 9

Bamboos do not form pure forests but occur as understorey in varying proportion in mixed and sal forests. Dendrocalamus strictus is the only species occurring in the tract. These forests are mostly met with in Taregaon range. These forests are usually located on hill slopes, undulated ground, and sheltered valleys and along water courses.

Gregarious flowering of bamboo is not reported in the past. Due to constant irregular hacking by local population, condition of bamboo is poor in the plain portion and on lower slopes. The clumps in these portions lack vigour and culms are thin. Bamboo clumps are generally unhealthy due to unsystematic working and over-exploitation. Fires are also quite common in these forests. Illicit fellings, over-exploitation in the past and regular recrudescence of annual fires have caused grant damage to these forests. It has very adversely affected the development of clumps and recruitment of Karlas. In isolated blocks clumps have been hacked so badly that there is no chance of their survival. Floral diversity in core and buffer zone of study area are given in **ANNEXURE - II.**

# CHAPTER - V

## STATUS OF FAUNAL DIVERSITY

Thestate of Chhattisgarh falls under the Deccan Bio-Geographical zone of Rodger et al (2002)[13] of its forest, 11% are under the protected area network. The occurrence of wild animals and composition of its species depends directly upon the plant and vegetative composition of its species, depends directly upon the plant and vegetative composition of that area. Therefore, we can say that occurrence of animals are directly related to the vegetation types and climate along the geomorphology of earth in that part. The study area with it's extensive area and remoteness once had the reputation for abundance of wildlife. Now there is a remarkable depletion of wild animals. The reasons for the disappearance of the wild animals are attributed to indiscriminate shooting and destruction of forest for extension of agriculture and other developmental activities. The important factor which is mainly responsible for the disappearance of the wild animals is the hunting by local tribals & sarguja state. They hunt by bows and arrows and also by laying traps. The natural calamities such as animal diseases have also contributed to the depletion of Wildlife.

## STATUS OF MAMMALS REPTILES, AVIFAUNA, SPIDERS AND BUTTERFLIES

### MAMMALS

The study area is mostly reserve forest and is subjected to severe pressure from the villagers. The grazing pressures are immense and livestock grazing is prevalent in all the areas of the project site. Though the habitat reveals that it should be supportive of mammalian fauna but owing to the pressures the population status of mammal is very low in the project area. Large herds of cattle and livestock can be seen virtually daily in the entire project area. The Rocky and boulder areas in the project site appeared suitable for sloth bears which are quite common in the Project areas as well as in the entire forested tract in buffer zone and surrounding area.

Forested areas in the vicinity of the human settlements are good habitats for Jackals.

[13] *Rodgers, W.A. and Panwar, H.S. 1988. Planning a Wildlife Protected Area Network in India. A report prepared for the Ministry of Environment and Forests & Wildlife, Government of India, Volumes 1 and 2.*

## REPTILES

Among reptiles there were direct sighting of Rat Snakes, Cobra, Common Krait in the study area. Few mounds of a Rat snake (*Ptyas mucosus*) were also found in the study area. House Gecko (*Hemidiactylus flaviridis*) was commonly seen in the entire study area. Common Skink (*Mabuya carinata*) and Garden Lizards were also commonly seen in project area. Discussions with local people did confirm the presence of Krait (*Bungarus careuleus*), Saw's scaled viper (*Echis carintus*). Russell's viper (*Vipera russelii*) in the report. As per the reports of local people the sightings were not very common and not many people had seen snakes in the proposed project area. The reptilian species seen in the study area are given in **Annexure-III** based on the direct sightings, indirect evidence and discussions held with the local people during the survey. Rat snakes were fairly common in the forest area close to the human settlements as the people store paddy in their houses which attracts rats and bandicoots and in turn attract rat snakes.

Of all the species of reptiles seen and reported from the area are monitor lizard & Indian Rock Python is protected under Schedule 1 of WPA 1972. No conclusive data could be collected with respect to the total population estimate of Python. Interviews with villagers only confirmed the presence of the species. No one however reported sighting python in last five years in the project area. In the last ten years people do not recollect any incidence of snake bite case also in the project area. The sightings that people had in past were mostly in the vicinity of village areas close to water bodies.

## AVIFAUNA

A total of 37 species of birds were recorded in the study area during the survey. The project area is quite rich in avian diversity, but mostly only generalist species are seen in area. One species belonging to Schedule I of the Wildlife Protection Act (1972), namely Indian Peafowl is found in the buffer zone. This is naturally protected by local people as it is pilgrimage site. Few individuals of India Peafowl were seen in this area. Apart from this no species belonging to Schedule I of the WPA 1972 is reported to be found in the study area.

## BUTTERFLIES

A total of 20 species of butterflies were recorded from the study area during the survey. The butterfly richness was higher in the areas that appeared to be disturbed by human and livestock interference. In the disturbed areas openings are created and these openings act as good habitat for butterflies by letting enough sunlight reach the ground. Butterflies need open sunlight and prepare habitats which will provide food plants and sunlight. All such openings in the forest area provide excellent feeding and breeding habitat the butterflies.

Natural Small openings in forest also provide excellent habitat for basking and flowering plants to come up in these forests. The moist patches in riverine areas also attract butterflies. Possibly these moist patches act as source of minerals for butterflies as many of them can be seen sitting over such patches. Areas is vicinity of natural drains close to the village provide excellent habitats for butterflies.

**OVERALL HABITAT STATUS**

Overall habitat condition in the study area is not good, owning to tremendous amount of grazing pressure all over the area. There is also tremendous hunting pressure in the area. Tribals move with bow and arrow and almost everyone encountered in the forest narrated some or the other story of hunting. Local people now feel that it is not so easy to get wild animals as they have moved out to the denser and deeper areas. The disturbance signs are prevalent and can be seen in the entire stretch of the project area. There is also immense lopping pressure in the area. Charcoal making is also one of the activities being carried out by some villagers in the area.

The study area of Kawardha territorial forest division is not good in wild animal diversity. The status of any wild animal over a given area can be obtained through its population estimation and status survey. In survey of 10 km radius area of **Salgi Bauxite Mines Lease Area (CMDC).** The wildlife recorded and listed in different schedule of Indian Wildlife is provided in **ANNEXURE-III.**

**IUCN RED LIST CATEGORIES**

IUCN, now known as the world Conservation Union, with Headquarters at Gland, Switzerland, is the premier coordinating body for International Conservation efforts. It produces directories of specialist who are knowledgeable about captive breeding programs and other aspects of conservation. To highlight the legal status of rare species for the purpose of conservation, the International Union for Conservation of Nature & Natural Resources (IUCN) recognized earlier in 1963, 1984 and 1988, the following five main conservation categories.

1. **Extinct** species that are no longer known to exist in the wild. Searches of localities where they were once found and of other possible sites have failed to detect the species.
2. **Endangered** species that have a high likelihood of going extinct in the near future.
3. **Vulnerable** species that may become endangered in the near future because populations of the species are decreasing in size throughout its range.
4. **Rare** species that have small total numbers of individuals often due to limited geographical ranges or low population densities.
5. **Insufficiently known** species that probably belong to one of the conservation categories but are not sufficiently well known to be assigned to a specific category.

IUCN later (2012) recognized nine Red list categories of species.

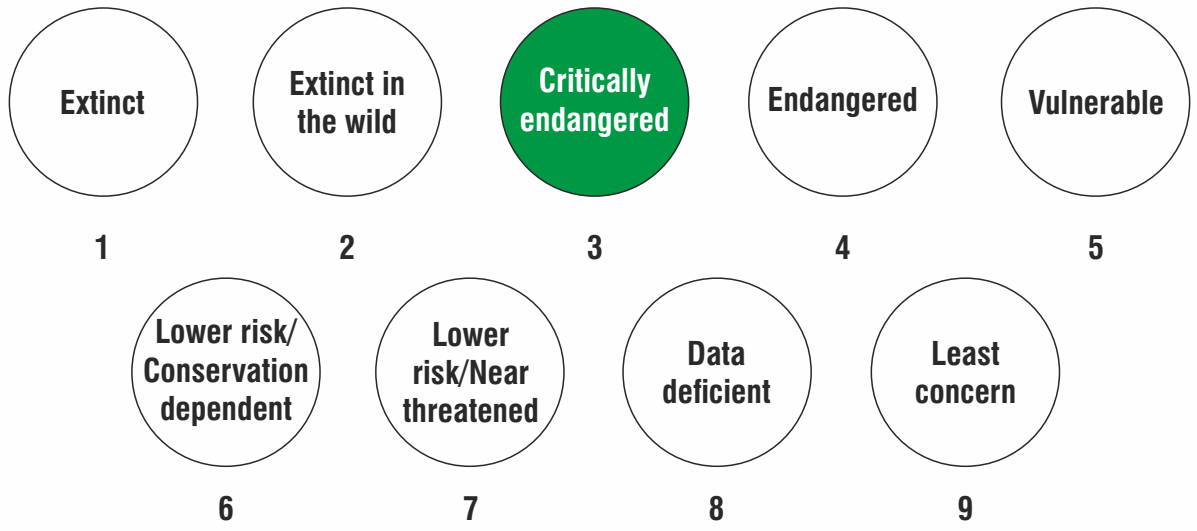



Figure: Nine risk categories of species (IUCN 2012).

**Critically endangered :** is the highest risk category assigned bythe IUCN RED LIST to wild species. There are five quantitative criteria to determine whether a taxon is threatened. A taxon is critically endangered when the best available evidence indicates that it meets any of the following criteria;

1. Populations have declined or will decrease, by greater that80% over the last 10 years or three generations.
2. Has a restricted geographical range.
3. Small population size of less that 250 individuals and continuing decline at 25% in three years or one generation.
4. Very small or restricted population of fewer than 50 mature individuals.

In buffer zone following scheduled - I animals are found :

**1. Indian monitor lizard *(Varanus benglensis)***
**2. Indian peafowl *(Pavo cristatus)***
**3. Sloth bear *(Melursus ursinus)***
**4. Elephant *(Elephas maximus)***
**5. Indian Rock Python *(Python molurus)***
**6. Common Leopard *(Panthera Pardus)***

## CONSERVATION PLAN FOR WILDLIFE BELONGING TO SCHEDULE-I

### 1. Indian Monitor Lizard *(Varanus bengalensis)*

The Bengal monitor lizard (*Varanus bengalensis*) or bis-cobra is known by various names in the local dialects, viz., Godha in Sanskrit, Goh in Hindi and Punjabi, guishaap or goshaap in Bengal, goyra in Rajasthan, ghorpad in Maharashtra, belonging to Varanidae family, is sliding fast towards extinction, due to consistent persecution for its precious skin, yummy meat, and various body parts for folk remedies, besides freak accidents on road, while the farmers in some parts of India are engaged in the conservation of this species, due to agro-friendly characteristics, like feeding on insects and common pests, inimical to crops.

Photograph of Indian Monitor Lizard (Varanus bengalensis)

This large lizard is mainly terrestrial and grows to about 175 cm from the tip of the snout to the end of the tail. Young monitors may be more arboreal but adults mainly hunt on the ground preying mainly on arthropods but also taking small terrestrial vertebrates, ground birds, eggs and fish. It is basically omnivorous and often engaged in scavenging, hence playing a key role in cleaning the environment.

**Reason for Conservation**

The Varanus bengalensis (Indian Monitor Lizard) is least concern species in the IUCN Red list of the species within the country, the species is protected under Schedule-I of the Wildlife Protection Act (1972) of India.

**Ecology and Behavior**

Monitor lizards are usually solitary and usually found on the ground, although the young are often seen on trees. *V. b. nebulosus* has a greater propensity for tree climbing. Bengal monitors shelter in burrows, they dig or crevices in rocks and buildings, whilst clouded monitors prefer tree hollows. Both races will make use of abandoned termite mounds. Bengal monitors, like other varanids, show true sleep at night and are diurnal, becoming active around 6 AM and bask in the morning sun. During winter, in the colder parts of their distribution range, they may take shelter and go through a period of reduced metabolic activity. They are not territorial, and may change their range seasonally in response to food availability.

They are usually shy and avoid humans. They have keen eyesight and can detect human movement nearly 250 m away. When caught, a few individuals may bite, but rarely do so. Captives have been known to live for nearly 22 years. Predators of adults include pythons, mammalian predators and birds.

**Food & Feeding habit**

This is a carnivorous animal. It eats any animals it can overcome. Young monitors may be more arboreal, but adults mainly hunt on the ground, preying mainly on arthropods, but also taking small terrestrial vertebrates, ground birds, eggs and fish, small turtle and snakes also. It probably seeks its prey both by smell & sight.

**Breeding Pattern**

The main breeding season is June to September. Eggs are laid from mid-April to October. Females may be able to retain sperm, and held in confinement have been able to lay fertile eggs. Males, however, begin to show combat behavior in April. Females dig a nest hole in level ground or a vertical bank and lay

the eggs inside, filling it up and using their snouts to compact the soil. The females often dig false nests nearby and shovel soil around the area. They sometimes make use of a termite mound to nest. A single clutch of about 20 eggs are laid. The eggs hatch in 168 to nearly as long as 254 days. About 40 to 80% of the eggs may hatch. The larger females, as among other reptiles, lay more eggs. Incubation period is 8 to 9 months. The newly hatched young's are common at the beginning of the monsoon.

**Threats**

Monitor lizards are hunted for skin and their body fat. Its eggs are considered a delicacy and the entire animal is also eaten.

- Unani, the Greco-Arabian system of medicine, recommends the use of various body parts of monitors to cure numerous ailments.
- The population of the Common Indian Monitor, Varanus bengalensis has alarmingly dwindled throughout the Indian sub-continent mainly due to excessive exploitation of the adults for their commercially valuable skins, as food and in traditional medicines.
- Habitat loss due to large-scale deforestation, urbanization, industrial activities and other biotic factors are also responsible for the population decline of the species.
- The population of the species of monitor lizards has drastically declined throughout their range due to illegal and extensive exploitations and adults for their commercially valuable skin, food purposes by local fisherman community and traditional medicinal values.

**Conservation and Management Plan for Indian Monitor Lizard**

- A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/monitor lizard conflict mitigation program.
- Public awareness is an important priority within the scope of overall management plans for the species. Public awareness often yields new locality information and could reduce the frequency with which this species are killed.
- Poaching should be restricted and poachers should be punished.
- Poaching and hunting of this reptile would continuous monitor and take action against it according to Wildlife Protection Act-1972. Aware local people and built effective information system against hunting and poaching activities.

- Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with monitor lizard, hunting and poaching activities.
- There is no scarcity of food or habitat to the animal. Preventing poaching will be the single most important factor in the conservation of the species, for which awareness programs should be run frequently.

**Conservation Status :** Status: Not Listed (IUCN 2000); Endangered (ESA). Schedule I Indian Wildlife (Conservation) Act, 1972.

### 2. Indian Peafowl *(Pavo cristatus)*

Peafowl is the largest gallinaceous birds. Peafowl is common word for male and female. The male is known as Peacock while female is known as Peahen and the immature offspring are sometimes called peachicks. The male bird is having a beautiful crest consisting of a row of small feathers on the crown, the color of the crown feathers is bright blue known as Peacock blue, the same color also appears on the head, neck and breast, a white patch under the eyes is a distinctive characteristic of this bird, the upper parts found barred. Lower breast, abdomen and flanks were found black and green, wings brownish black with blue tinge. Legs are dust-grey or blackish with a spur in the male. Train formed by the upper tail coverts, color of the tail feathers is metallic green with bronze and purple, sub terminal ocellus formed by a blue patch surrounded by green and purple color. It is known as eye spot. Fish tail feather is the longest feather of the train; the end is bifurcated like the tail of fish. Female and sub-adult youngs are more or less alike, the crest lore's, and upper neck brownish, each feather bordered bronze green, sides of bead and throat are white; lower neck, upper breast and upper back are metallic green; abdomen pale buff; wing blackish brown with spots.

The term 'Mayura' means a killer. It is a killer of the killer-the Snakes. The term bhujangabhuk and Bhujangabhogin means Snake-eater, peafowl has habit of eating the Snake. The name 'Neelakantha' means blue-necked, it suggests that the Peafowl is habitual eating venomous serpents hence its neck became blue by virtue of the terrible poison like Lord Shivam. The Kekin is believed to be in the Sadja, the first of the seven primary musical notes. The term 'Meghananda' means happy to see clouds. The word Sikhin and Sikhavala means possessing the crest on head. The crest considerably adds to the beauty of the bird and suggests its dignity. The term 'Candrakin' means possessing the eyes in the tail. It points to

the significance of the brilliant variegated circular spots in the feathers. The terms Barhina and Barhin suggest the most charming feather of Peacock- the pretty feathers. The name 'Silapanga' means having whiteouter- corners of the eyes, which is a sign of purity. The term 'Sikhandin' is used for having a long beautiful tail. The term 'Kalapin' means many tail covering feathers found with tail. Chitrapicchaka term indicate that the tail which is the most attractive part of the Peacock's body having variegated nature in feathers.

The Indian Peafowl (Pavo cristatus) has been an integral part of Indians and their culture, religion and mythology for centuries. In addition to this, the Indian Peafowl is well recognized for its ecological and aesthetical values, and hence aptly declared as the 'National Bird' of India in the year 1963.

Since the early 1990's, there have been reports of increasing illegal trade in Peafowl feathers, large-scale mortalities due to increased use of insecticides/pesticides in agricultural lands, poaching, and retaliatory killings by people due to alleged crop depredation by Peafowl. Several Peafowl stronghold areas in the country are now concerned about the current declining status.

The Common Indian Peafowl or the Blue Indian Peafowl belongs to the family Phasianidae and order Galliformes. There are three species of Peafowl found in the world, out of them two species belong to genus Pavo of sub-family Pavoninae.

I. The Indian Peafowl *(Pavo cristatus)* is short-legged with a marked sexual-dimorphism.
II. The Green Peafowl *(Pavo muticus)* has a longer and slimmer neck and longer legs, sexualdimorphism is slight.
III. The Congo Peacock *(Atropavo Congensis)* is the third species of Peafowl.
It belongs to Genus Aflopavo to sub-family, Afropavoninae. They are distinguished by not having typical stripes and ocellate spots in their plumage. The Peacock is probably the oldest ornamental bird, in the course of time man has raised various Peacock breeds like White Peacock, Mottled Peacock and Black Winged Peacock (Grzimeck, 1984).

Photographs of Indian Peafowl.

### Characteristics

- Both the male and the female have a fan-shaped set, known as the crest, of spatula tipped wire like feathers on top of their head. Their eyes are a dark, hazel brown. The facial skin is white. The beak and legs are brown.
- The female is mottled brown and dull looking, has a white belly, and lacks a train. She has green neck feathers.
- The male has a radiant blue neck and breast. They also have a metallic bronze green train, spotted with purplish-black markings also known as eyespots or ocelli. The train on the male is used for display to entice the female to mate with him.
- Lifespan: In the Wild 20-24 years; In Captivity same.

## Reason for Conservation

- This bird recognized under Schedule- I (Section- III) species of Indian Wild Life Protection Act, 1972.
- The survival and multiplication of this species is important to our ecosystem.
- The Indian Peafowl is listed as Least Concern species in the Red List of International Union for Conservation of Nature (Bird Life International 2008), probably owing to its widespread distribution, occurrence of locally abundant semi -feral populations, and protection from people on religious grounds.
- Although the train feathers of the Indian Peafowl are traded for various reasons, it is not included on any Appendix of the Conversation on International Trade of Endangered Species perhaps on the claim that these feathers are naturally fallen ones during annual molt of the species, and also that the scale of trade across international border is still to be understood.

## Ecology and Behavior

- The bird is found in scrub-jungles and forest edges; it shows affinity to moist and dry deciduous and semi-arid biomes. It is also found in agriculture fields, along streams with good vegetation. It generally prefers a habitat mosaic of scrub and open areas, with adequate sites for dust bathing and lekking. The Peafowl was spotted in an agricultural farm, close to the proposed project site.
- Indian peafowl stay in small flocks (harems) of 1 peacock (male) and 3-5 peahens (females).
- Peafowl run more than they fly. The only time they fly is when they have to cross a river or ravine, when trying to escape predators, and to roost up in trees.
- They forage in the early morning and shortly before sunset. In the morning they will bask on rock heaps or haystacks. They retreat to the shade and security of the forest for the hottest part of the day.
- Peafowl physically interact with each other usually during territorial disputes. They will attack each other with their beaks and claws, chasing and pecking at each other.
- Peafowl warn each other when danger approaches with loud, shrieking cries and honks. They also call during mating season.
- They usually roost in the same tree every night. They fly to the top branches of dead trees just a little after sunset and leave just before sunrise.

## Reproduction

- Peafowl reach sexual maturity at approximately 2-3 years of age.
- Indian peafowl males pair with 2 or more females. Courtship displays happen in leks, which are breeding territories in close proximity to others. Females wander through several territories before choosing a male.

- During courtship, the male displays his train by fully fanning and lifting it above his head and performing various body movements. After mating, the male has no other involvement with the female or the chicks.
- Nests are a shallow depression dug in the ground concealed in scrub vegetation.
- Females lay a clutch size of 3-6 eggs. Incubation lasts 28-30 days.
- About 2 hours after hatching, the chicks are able to move around and follow the mother. They stay with her for about 9 months.

**Threats**

- No direct impact on the Peafowl due to the mining activity because of no movement found in the mine site area; it is only found in buffer area in an agriculture field.
- The Indian Peafowl is under threat from various quarters that include the demand for feathers and wild meat, conflict with farmers during cropping season, increased use of chemical fertilizers and pesticides, and habitat degradation.
- Habitat degradation and loss: more significantly from conversion of their habitat to agriculture, habitation and industrial growth, poisoning to counter crop damage, consumption of eggs and fat extracts for alleged medicinal values, and killing for wild meat.

**Conservation Measures**

- Fruit and shade plants should be grown near to the Peafowl habitation like Mango, Amla, Guava, Imli, Banyan, Neem, Pipal, Jack fruit etc.
- Small grooves should be constructed on wasteland in Peafowl habitation area. Grooves are small patches of vegetation that are protected by traditional manner. The grooves should have a fencing of about 7-10 ft high, & provided with one hole for water & food for the bird.
- There is no scarcity of food or habitat to the animal. Preventing poaching will be the single most important factor in the conservation of the species, for which awareness programs should be run frequently.
- A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/ Indian Peafowl conflict mitigation program.

- Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with Indian Pea fowl, hunting and poaching activities.
- Small holes containing water should be constructed in habitation zone of Peafowl and its water quality should be maintained.
- Encourage local farmer to use bio-pesticide, bio-fertilizer and vermi-composting in agriculture practices.
- They are generally protected by religious sentiment and will forage around villages for scraps. The people living in the surrounding area should be rewarded for timely information about disturbing and/or poaching of the bird. The bird has wide range of food items, hence, improvement of and protection of the bird in the buffer zone will provide sufficient food to the animal.

Conservation Status: IUCN Red List, Least concern species. Schedule I Indian Wildlife (Conservation) Act, 1972.

### 3. Sloth bear *(Melursus ursinus)*

The sloth bear *(Melursus ursinus)*, also known as the labiated bear, is a nocturnal insectivorous bear species native to the Indian subcontinent. The Sloth Bear also has a variety of "common" names in the different countries:

- North India and Nepal: Bhalu
- India: Rincch, Reachi, Richwa, Asval, Karadi, Jouni Karadi, Chigu Bunti.

The sloth bear *(Melursus ursinus)* mainly are found in India, Nepal, Bangladesh and Shri Lanka.

Photographs of Sloth Bear

**Common Characteristics**

- The sloth bear has thick shaggy fur that is black to brown colored. Its ears are lined with long fur and it has a long snout, a long tongue, round eyes, and a large nose. Its head resembles a domesticated dog. The area around it's muzzle and eyes are cream colored. The sloth bear has a distinct 'V' or 'U'-shaped pattern displayed on its chest that is white or gold colored.
- At one time this curious species was classified as a sloth. It does have long claws, it is an excellent tree climber, and it moves slowly. However, it is definitely a member of the bear family Ursidae. Its classification is *Melursus ursinus.*
- Common habitats include grasslands, forests, and dense brush lands. They are found in India, Bangladesh, Sri Lanka, Bhutan, and Nepal.

- Their favorite food is termites, other insects, and grubs. In their habitat these are abundant and available all year long. They will also eat leafy plants, fruits, nuts, root vegetables, honey, and rodents.
- Specialized adaptations help them find their food. They have a long muzzle and nostrils that can close at will. Combined with their long tongue and lips they can penetrate termite holes and operate like a powerful vacuum cleaner to suck up the tasty insects.
- They also have long curved claws. They use their claws to detach and uncover vegetation to locate insects and prey. Their claws are larger than most bear species. Long claws are especially useful when looking for insects. They aid in prying off bark, penetrating termite and bee nests, and turning over logs and stones.
- Sloth bears do not hibernate due to their warmer climates and the availability of food sources throughout the year.
- Life span is estimated to be 20 to 30 years in the wild. Precise figures are unknown. Estimates are partially based on those in captivity, which can live to be up to 35 to 40 years old. In the wild many sloth bears succumb to survival hardships and conflicts with mankind.
- Breeding season is dependent on region. In most areas mating takes place during the summer and cubs are born in the spring.
- Litter size is usually 1 to 3. Although there have been rare sightings of up to four cubs being nurtured by a single mother, this is extremely uncommon and an extra challenge for her.
- Cubs stay with their mother for 2 to 3 years and like to hitch a ride on her back.
- Sloth bears like to escape from the heat of the day and forage for food at night. They will start to become active as the sun starts to set. This is also the time when many insects such as termites are more active.
- The sloth bear will use its excellent sense of smell to locate food. It will return to well-known feeding areas and work its way around to find insects, fruits, and other favorite foods. Often a fresh supply of bugs will replenish the ones that were sucked up during a previous raid. The sloth bear will return the next day or so to check for “second helpings”.

**Reason for Conservation**

- IUCN estimates that less than 20,000 sloth bears survive in the wilds of the Indian subcontinent and Sri Lanka. The sloth bear is listed in Schedule I of the Indian Wildlife Protection Act, 1972, which provides for their legal protection.
- The survival and multiplication of this species is important to our ecosystem.

## Ecology and Behavior

- Sloth bears do have predators, notably wild dogs, leopards, tigers and humans, while elephants and rhinos also command respect. When threatened, Sloth bears may flee or make a "bluff" charge, stopping at the last minute and rising up on their hind legs to threaten. The charge rarely ends in a full-on confrontation.
- Like all bears, the Sloth bear prefers to avoid conflict with its own species, with other bear species and with other animals. It will avoid situations where it is likely to put itself in danger, but will fight if it has to, especially if the bear is a female with cubs.
- Although the Sloth bear is an agile climber, in threat situations it is likely to avoid trees as a means of escape, since predators may be lying in wait. Leopards, in particular, pose a danger, since they are also agile climbers.
- On the whole, Sloth bears are non-aggressive towards other bears and any marking behavior would appear to be linked to social spacing rather than acting as a serious warning to other bears.
- A "huffing" sound is used as a warning and a "chuffing" sound is used as a non-aggressive "voice" when the bear is distressed. High intensity threats include roars, squeals and screams.
- Cubs yelp when distressed and a female with cubs uses a grunting "whickering" sound to communicate with them. This can be an alarm contact sound, although it may also be a reassuring communication.
- Sloth bear mothers carry cubs up to 9 months old on their backs instead of sending their cubs up trees as the primary defense against attacks by predators, such as tigers, leopards, and other bears.
- They are capable of climbing on smooth surfaces and hanging upside down like sloths. They are good swimmers, and primarily enter water to play. To mark their territories, sloth bears scrape trees with their forepaws, and rub against them with their flanks.

## Habit & Habitat

- Common sloth bears are found in forests, scrub areas and, during the dry season, grasslands. Sloth bears are mainly found in tropical forests, scrub areas and in grasslands during the dry season. They prefer areas which are remote from human beings.

## Food & Feeding habit

- The Sloth Bear is microphagous, that is to say that it eats ants and termites. Sloth bears are expert hunters of termites, which they locate by smell. On arriving at a mound, they scrape at the structure with their claws till they reach the large combs at the bottom of the galleries, and disperse the soil with violent puffs.

- The termites are then sucked up through the muzzle, producing a sucking sound which can be heard 180 m away. Their sense of smell is strong enough to detect grubs 3 ft below ground. Unlike other bears, they do not congregate in feeding groups.
- They rarely prey on other mammals.
- Sloth bears may supplement their diets with fruit and plant matter; in March and April, they eat the fallen petals of mowha trees and are partial to mangoes, sugar cane, jackfruit, and the pods of the golden shower tree.
- Sloth bears are extremely fond of honey. When feeding their cubs, sows are reported to regurgitate a mixture of half-digested jack fruit, wood apples, and pieces of honeycomb. This sticky substance hardens into a dark yellow, circular, bread-like mass which is fed to the cubs. This "bear's bread" is considered a delicacy by some of India's natives.
- The short hair on the muzzle is thought to be an adaptation to help the bear deal with the unpleasant excretions made by the termites. Long hair or fur on the muzzle would make this difficult. The bear's ability to close its nostrils protects the animal from inhaling dust, dirt and angry termites.
- The missing incisor teeth, together with the mobile lips and long tongue, make the ingestion process easy. The bear's strong claws not only smash open termite mounds, but are useful in tearing logs apart and act as digging tools when the bear is looking for food.
- The Sloth Bear may travel distances of around 10–15km every night in search of food. The bears usually feed at night, though may also be seen foraging during daylight hours.
- A female with cubs will eat during the day to avoid night-time predators such as the leopard.
- Although specially adapted to fee on ants, termites and other insects, the Sloth Bear needs a more varied diet.

**Reproduction**

- The breeding season for sloth bears varies according to location: in India, they mate in April, May, and June, and give birth in December and early January. Sows gestate for 210 days, and typically give birth in caves or in shelters under boulders. Litters usually consist of one or two cubs, or rarely three.
- Courtship is brief and is marked by play-fighting and hugging, while mating is a noisy affair.
- During the breeding season, groups of three or four males may be found near receptive females and all may breed, apparently in rank order. Females begin to breed when they reach four years of age. After a pregnancy of 5 – 7 months, the cubs are born in a den.
- Cubs are born blind, and open their eyes after four weeks. Sloth bear cubs develop quickly compared to most other bear species: they start walking a month after birth, become independent at 24-36 months and become sexually mature at the age of three years.

- Young cubs ride on their mother's back when she walks, runs, or climbs trees until they reach a third of her size. Individual riding positions are maintained by cubs through fighting. Intervals between litters can last two to three years.
- The mother bear suckles her young and may not leave them to get food for herself in the early days after the birth. When she does leave them, she stays near to the den and is only absent for very brief periods.
- The cubs vary in how quickly they achieve independence, but generally stay with their mother for at least two years and more often for two and a half years, learning from her the skills they need to survive.
- As a result, the mother bear can only reproduce every two to three years. The female raises her cubs by herself, as the male leaves after mating.

**Threats**

- Threats against the sloth bear include loss of habitat, destroyed termite and ant nests due to various development projects, widespread poaching, and persecution from crop farmers.
- Sloth bear cubs are often snatched from the wild and become unwilling victims as dancing bears.
- Sloth Bears are completely protected under Schedule 1 of the Indian Wildlife Protection Act of 1972, amended in 1986.
- The bears cannot be hunted, but can be killed in self-defense or in special circumstances where they have caused damage.

**Conservation Measures**

- All appropriate landowners within these protection boundaries should be identified. Each should be contacted in the manner that will ensure co-operation. Land owners should be made aware of the sensitivity of this species and of the value of maintain natural habitat. They should be made aware of the available conservation options.
- A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/ sloth bear conflict mitigation program.
- Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with sloth bear, hunting and poaching activities.

- Training program would be conducted to conservation expert team and local people for safe handling of this mammal.
- Small holes containing water should be constructed in habitation zone of sloth bear and its water quality should be maintained.
- It is critical that urgent efforts are made to understand the habitat and population status of the species through field based research and in situ consecration projects.

**Conservation Status**

**CITES APPENDIX :** I: Indian Wildlife (Conservation) Act, 1972 (As amended up to 2002): Scheduled I; Part I; Indian Red Data Book (IUCN 1994): Not Listed; IUCN (1998) (Proposed; Vulnerable (National) and Data Deficient (Global); IUCN (2002) (Proposed): Vulnerable (Global) based on Version 2.3 1994 (IUCN, 2003). According to Alfred et al Considering the nature and degree of threats and treads reported, it is strongly recommended to include sloth bear in one of the endangered categories of IUCN. They are particularly vulnerable to loss of habitat because of their reliance on lowland areas, which tend to be the places most readily used by people. Poaching and trade in sloth bears or their parts is also common in many parts of their range.

## 4. Elephant *(Elephas maximus)*

**Presence/Movement of Elephant in the area**

The forest of the Central province inhabited elephants in olden times. During Mughal times, the Jungles of Surguja District were the main source for supply of elephants to Mughal army. Latter accounts of the presence of elephants in Chhattisgarh are described in a travelogue "Highlands of central India" Written by Captain Forsyth. He has described the movements of elephants from Amarkantak plateau up to Udaipur forest areas. He himself has seen herds of elephants in the jungles of Pendra, Belgahaha, Ratanpur, Matin, Lafagarh, Korba and Tara forests. We do not find any evidence of the presence of elephants in Chhattisgarh from the start of twentieth century.

Actually during 1980's, due to construction of Betla dam in Jharkhand, the elephants living there, were disturbed and their herd got split into many smaller herds. One of the herd migrated towards Odisha and few of the elephants first entered Jashpur-Nagar Division and by 2000 they had spread over Korba and Surguja Districts. The first elephants in these areas were seen in 2001.

In fact scarcity of water, cover and food is forcing the elephants towards many districts of Chhattisgarh. At present these elephant herds are not following any definite route for habitat exploration but keep on roaming in search of better habitat. As per available reports. In the last two to three years the elephant herds were seen in the Kawardha Forest Division. They visit the said area by the following route- from Achanakmar Tiger Reserve to Mungeli to Kawardha Range Taregaon and Pandaria to Phen Wildlife Sanctuary to Kanha National Park and return following the same route.

## Conservation

Following are some key points in the conservation of elephants:

1. Require 150-250 kg of plant food every day, with preference for grasses..
2. Evolved to a large size, with black colour. The black colour absorbs more heat.
3. Lack sweat gland to dissipate the body heat, hence, require a shade in sunny days, or require frequent cooling through wallowing or spreading water over the body.
4. Have very poor visibility particularly during night. Their eyes do not shine in the night, because of reduced number of cones, unlike the canines like tiger, leopard and even bovid like the cow.
5. A good source of water is required also for drinking.
6. Frequent dusting of the body or mud cover over the body is required to protect the body from the biting insects.
7. Change in cropping pattern by introducing crops disliked by elephant or the plants which act as elephant repellent (e.g. Patchouli, (Pachouli) *Helignthus annus* (Sunflower) *Capsicum annum* (Chilli) *Sesamum indicum* (Til) and *Citrus* should be promoted.

## Habitat

Elephants are generalists, but use mainly scrub forest. They can be found in the jungle, but generally on the edge where open, grassy areas are accessible. They prefer areas that combine grass, low woody plants, and forest. Elephants rarely forage in one area for more than a few days in a row. In general, food, water and shade are the three basic resources that can be expected to influence the movement of the elephant (Sukumar et al, 2003). Their Home range ranges from 30-600 km.

## Elephant a part of the ecosystem

### Keystone Species

Elephants are described by ecologist as a “keystone” species. Keystone species are those animal species which are used to indicate the general condition of the habitat.

The elephant being a huge animal, not only requires large quantities of food, but also good and nutritious food. If elephants are living in a particular habitat, it would indicate the availability of a diverse and nutritious range of plant species. This would be a suitable condition for many smaller herbivores also. A large herbivore population would support a healthy carnivore population also. And show the elephant is a good indicator of the health of the habitat. A habitat that is good for elephants is considered good for many other herbivores and also carnivores such as tigers.

## Food

Elephants eat a wide variety of species of vegetation. They are herbivore, folivore and lignivore. More than 100-130 different species of plants may be eaten They prefer grasses, but they also consume bark, roots, leaves, wood, stems and leaves of trees, vines, shrubs, tubers, bamboo and barn, An average day's intake is 150-200 kg of wet vegetation. The proportions of the different plant types in their diet vary depending upon the habitat and season. Annual diet has been found to be dominated by grass. Maximum straying distance covered by the raiding elephant has been recorded up to 5.5 km.

## An appetite for salt

Elephants have a strong liking for salts and minerals. To fulfill their needs elephants, sample all sorts of substances. And in this process, if they come across something that satisfies their need, they eat it, and remember its location to return to it in future. Elephants also consume soil which is rich in minerals. As rain forests soil and plants are particularly deficient in minerals such as sodium that the elephants need, elephants in these regions are found to return to these “salt licks”. Salt licks are salt rich rocks or small patches of earth which are rich in minerals. Although elephants visit salt licks quite often, they cannot lick salt like other animals do, as their tongues are not long enough to reach around their trunks and tusks. So, elephants dig up the soil or rock with their trunks and then pick it up with their trunk tips. After this they use their molar to grind the salt and then finally swallow it. Elephants can eat such clods of salt at the rate of 23 Kg in an hour.

## Time-activity budget of elephants

Generally, they are active almost throughout the day during rainy and winter months, but during summer months they are active only in the morning and evening hours. They become active well before dawn and start their morning activities in the vicinity of the area where they spent night.

Evening hour is the time for drinking and bathing especially during summers. In summer season percentage of movement is more due to lack of fodder species and shrinkage of natural water sources.

## Food plants

Following is a list of plants reported as food by different workers. However, only the names of plants, local to the area, have been taken and the local names have been changed. Part of the plant eaten may be different for the different species.

| S.No. | Botanical Name | Local Name | S.No. | Botanical Name | Local Name |
|---|---|---|---|---|---|
| 1 | *Acacia catechu* | Khair | 33 | *Helicteresisora* | Ainthi |
| 2 | *Acacia nilotica* | Babool | 34 | *Holarrhena antidysenterica* | Korea |
| 3 | *Aegle marmelos* | Bel | 35 | *Ipomoea spp.* | Karmata |
| 4 | *Albizzia lebbek* | Kalasiris | 36 | *Imperata arundinacea* | Ulu |
| 5 | *Bambusa arundinacea* | Bans | 37 | *Kydia calycina* | BarangalPula |
| 6 | *Albizzia procera* | Safed sins | 38 | *Lagerstroemia parvflora* | SenhalS idha |
| 7 | *Bauhinia variegata* | Kachnar | 39 | *Limonia acidissima* | Kaith |
| 8 | *Bauhinia vahlii* | Mahul | 40 | *Mallow philippinensis* | Sinduri/Rohini |
| 9 | *Bauhinia malabarica* | Khatua | 41 | *Mimosa pudica* | Lajwanti |
| 10 | *Bombax ceiba* | Semal | 42 | *Mitragyna parvfolia* | Mudhi |
| 11 | *Brachiaria sp.* | Ghas | 43 | *Musa paradisiaca* | Banana |
| 12 | *Bridelia retusa* | Kasai | 44 | *Neyraudia arundinacea* | Bichhloo |
| 13 | *Careya arborea* | Kumhi | 45 | *Oryzasativa* | Dhan |
| 14 | *Cordia myxa* | Lassora | 46 | *Ougeinia oojeinensis* | Tinsa |
| 15 | *Cymbopogon fiexuosus* | Ghas | 47 | *Phoenix humilis* | Buta Chhind |
| 16 | *Cynodon dactylon* | Doob Grass | 48 | *Pithecellobium dulce* | Jangal Jalebi |
| 17 | *Dalbergia sissoo* | Shisham | 49 | *Randia dumetorium* | Mainphal |
| 18 | *Dendrocalamus strictus* | Bans I Bamboo | 50 | *Saccharum munja* | Kandi-khar |
| 19 | *Desmossachya bipinnata* | Urai/Khus | 51 | *Saccharum officinarum* | Ganna |
| 20 | *Eleusine s.* | Ghas | 52 | *Saccharum spontaneum* | Kans |
| 21 | *Emblica officinalis* | Amla | 53 | *Sansevieria sp.* | Sisal |
| 22 | *Eucalyptus spp* | Nilgiri | 54 | *Schleichera oleosa* | Kosam/Kusum |
| 23 | *Eulaliopsis binata* | Bagai Ghas | 55 | *Shorea robusta* | Sarai/Sal |
| 24 | *Feronia elephantum* | Kaith | 56 | *Syzygium cumini* | Jamun |
| 25 | *Ficus bengalensis* | Bargad/Bar | 57 | *Tamarindus indica* | Amli / Imli |
| 26 | *Ficus giomerata* | Dumar/Gular | 58 | *Terminalia tomentosa* | Saja |
| 27 | *Ficus religiosa* | Pipal | 59 | *Tectona grandis* | Sagaun/Teak |
| 28 | *Ficus rumphii* | Dufanga-hesa | 60 | *Tinospora cordfolia* | Giloe/Gurch |
| 29 | *Ficus infectoria* | Pakar | 61 | *Thysanolaena agrostis* | Hathi ghas / Pirlu |
| 30 | *Flacourtja indica* | Kanda | 62 | *Zizyphus mauritiana* | Bhander |
| 31 | *Garuga pinnata* | Kekad | 63 | *Zizyphus xylopyra* | Ghont |
| 32 | *Grewia elastica* | Dhaman | | | |

*Saccharum spontaneum, Thysanolaena maxima* and fruit parts of *Dillenia indica*, are some of the other species recorded to be preferred by elephants. Some other food plants have been reported by the villagers of elephant moving areas of Chhattisgarh state. The list includes

1. *Saccharurn officinarurn*
2. *Musa paradisica* (Kela)
3. *Oyza saliva* (Rice)
4. *Dendrocalamus strictus* (Bamboo)
5. *Ficus benghalensis* (Bargad)
6. *Ficus religiosa* (Peepal)
7. *Artocarpus heterophyllus* (Kathal)
8. *Miliusa velutina* (Bhilwa)
9. *Pterocarpus marsupium* (Bija)
10. *Zea mays* (Maka)
11. *Phoenix sylvestris* (Chhind)
12. *Phoenix acaulis* (Buta chhind)
13. *Buchanania lanzan* (Char)
14. *Goruga pinnata* (Kekad)
15. *Carica papya* (Papita)

Some of the elephants develop fascination for country made alcoholic drinks called Handia.

## Threats

The pre-eminent threats to the Asian elephant today are habitat loss, degradation, agriculture and farming, grazing, mining, human interference, trade, pollution, hunting for ivory-insurgency, corridor loss, anthropogenic pressures on the habitat, man-elephant conflict, forest fires, illegal captures of live animals etc. Poisoning and disease are some other threats to the animal.

## Causes of Human-Elephant Conflict

No single factor is responsible for conflict between human and elephants. The main factors leading to conflicts are :

1. **Reduction and fragmentation of habitat:**
   The elephant's habitat has been replaced by agricultural fields, monoculture plantations, roads, rail-tracks, mines, factories and irrigation projects that come up in these areas and across elephant migration roots. This has thus fragmented the elephant habitat and also shrunk its size. So elephants in these areas come more frequently in contact with fields and humans, thereby resulting in conflicts.

2. **Grazing**

   Cattle grazing in forest has also emerged as a major threat. This not only deprives the elephant and other wild herbivores of graze, but also spread various diseases. It also creates a scarcity of fodder, results in elephants spending less time in the forests than they usually would, inclined them to more towards fields.

3. **Lure of Crops**

   Elephants eat large quantity of food. Agricultural crops provide substantial quantity of nutritious fodder with minimal effort. This has often lured elephants to more to crop fields. Even though there might be enough fodder in the forest.

4. **Disturbances**

   There are some activities by human beings and other animals that disturb elephants. Grazing by animals and firewood cutting, leading to loss of fodder might create adverse conditions for elephants. Also, at times buffaloes urinate and wallow in elephant pools and make them unfit for elephants to drink from. These disturbances at times makes elephants, particularly groups, avoid an area.

5. **Competition for Water**

   In many parts of the country, it is seen that at night elephants' drinks water from village ponds and irrigation reservoirs and during the periods of water scarcity they turn to water from agricultural land.

6. **Poaching**

   Poaching of elephants has been a wide spread phenomenon in many Asian countries. In India, poaching has always been a factor affecting the survival of the elephants, although historically it has been either sporadic or of low intensity in most parts of the country. However, poaching is today a serious concern, especially in many reserves of South-India.

7. **The Lure of Ivory**

   Among Asian elephants, only male elephants (and not all of them) have tusks, and hence the males are selectively targeted by poachers. This selective poaching of male elephants for their tusks has led to many males being killed, which in turn has led to skewed sex ratio in the population and loss of most big males with tusks.

## Conservation status

CITES APPENDIX: 1; Indian Wildlife (Protection) Act (1972) (As amended up to 2009); Scheduled- 1; Part-I; Indian Red Data Book (IUCN, 1994); Vulnerable; (IUCN 1998) (Proposed); Vulnerable (National) and data deficient (Global); IUCN (2002) (Proposed); Endangered (Global) based on version 2.3 1994 (IUCN, 2003).

## Conservation of the elephants in the buffer zone of Salgi Bauxite Mines Lease Area (CMDC)

Habitat destruction by man has threatened the survival of the Asian Elephant Therefore, maintenance of the habitat is the first requirement in the conservation of the elephants. If proper habitat is absent or is below the desirable standard, then it may be developed. Elephants require, simultaneously, two types of habitats:

a. Dense forest with tall trees and
b. Scrub jungle and grasslands

Dense forest is required as refuge and protection from intense sun rays. While scrub and grasslands are required as a better feeding area. Tall trees are not a good source of food because their foliage and tender twigs are beyond the reach of elephant's trunk. It is only the fallen fruit and bark of such trees which can be eaten. It is generally difficult to peel off the bark from trees. In a scrub or a grassland, it is easy to feed. The food item may be foliage, tender shoot, entire plant or even the root, all are within their easy reach.

With respect to the area, there are two options for the conservation of the elephants:

- Restrict the elephants in a defined area
- Develop a corridor for long, may be interstate, migration route.

Photograph of Mahua *(Madhuca indica)*

Photograph of Harra *(Terminalia chebula)*

Development of a corridor far beyond the industrial area will be the best choice for the conservation of the species. The corridor, to be developed, must have both the dense forest with tall trees as well as shrubby areas. Now it depends upon the condition of the area to decide that the shrubby areas should be forming outer fringe to the tall tree area or should be in the middle or should be in patches in between the tall trees. The corridor belt should be of sufficient width and should be planned either away from the village settlements or the isolated houses near to their path should be shifted. Elephants require 150-200kg of food per head, per day. Habitat planning should include provisions to yield sufficient food. It is important now to decide about the plant species. The food plants should be of more liking type to the elephants. To keep the food plants within easy reach of the elephants, regular planting of new plants or pruning to stimulate coppicing, should be made. Some of the food plant species suggested to be planted in the area are :

- *Dendrocalamus strictus* (Bans)
- *Bambusa arundinacea* (Bans)
- *Ficus religiosa* (peepal)
- *Ficus rumphii* (Jangali Bargad)
- *Artocarpus heterophyllus* (Kathal)
- *Plerocarpus marsupium* (Bija)
- *Phoenix acaulis* (Buta chhind)
- *Feronia elephantum* (Kaith)
- *Thysanolaena agrostis* (Hathi ghas)
- *Themeda quadrivalvis* (Ghas)
- *Bothriochloa per/usa* (Ghas)
- *D. Rhedhii* (Bans)
- *Ficus benghalensis* (Bargad)
- *Ficus gloinerata* (Gular)
- *Ficus infectoria* (Pakar)
- *Miliusa velutina* (Bhilwa)
- *Phoenix sylvestris* (Chhind)
- *Buchanania lanzan* (Char)
- *Goruga pinnata* (Kekad)
- *Cymbopogon flexuosus* (Ghas)
- *Iseilema laxum* (Ghas)
- *Api uda mulica* (Ghas) etc.

Bamboos (*Dendrocalamus strictus, Bambusa arundinacea*) are one group of fast growing plants which can form a good proportion of diet to the elephants. Another bamboo species *Dendrocalamus rhedii* will be an exotic species to the area but is common in Western Ghats. It has a thin stem. Elephants have special liking for the bamboo plant and it is easy to grow the plant in sufficient quantity in short time. However, it is not a species which can create any problem. The villagers in buffer area have informed that the elephants have special liking for *Buchanania lanzan*. The saplings of the plant are uprooted and the root thrashed clean and eaten. With the vegetation, it is essential to develop perennial sources of water with some salt ponds, within the conservation area.

With the above following more steps should be taken for the conservation of this flagship species:

(i) Forest officers should be trained in Wildlife management.

(ii) Frequent use of fireworks should be avoided. This may lead to develop immunity in elephants against the fireworks.

(iii) Conflict with human is a major conservation problem, hence, should be reduced to the lowest possible level.

(iv) Anti-poaching efforts should be strengthened.

(v) Awareness programs should be run frequently.

(vi) Interstate committee of Chhattisgarh, Jharkhand and Orissa Govts. should be constituted for elephants.

**Mitigation of Human-Elephant Conflicts:**

Loss of crop, properties, injuries and lives should be compensated as early as possible.

Compensation should be made immediately and should be replenished from the Govt. fund, received for the purpose. Vehicles equipped with syron, elephant torch and mobile oil should be provided to the area.

**Some suggestions to escape elephant damage:**

**Methods adopted to escape elephant damage may be categorized as i) Active and ii) Passive methods :**

**I. Active methods**

a) Noise-making like shouting, drum beating, bursting fire crackers, firing gun shots into the air (by forest officials only)

b) Using elephant torch light

c) Pelting stones and lighted fuel-woods.
d) Loudspeaker broadcasting of tiger roaring sound

However, the major drawback of using all these methods is that these may provoke the raiding elephants increasing the possibility of more damage to the crops and other properties as well as higher risk to the farmer's life. Further, If the active methods fail to be effective, singly, then combined effort should be made.

**ii. Passive methods**

a) Change in cropping pattern by introducing some elephant repellent alternative cash crops (e.g. Patchouli, *Helianthus annus, Capsicum annum* and *Citrus*).
b) Digging trenches around village area.
c) Planting sisal (*Agave americana*) around village boundary.
d) Solar fencing.
e) Improvement of water sources.
f) Raise/improve fodder resources.
g) Bee Keeping.

Fencing houses with GI wires. Elephants avoid shining objects. GI wires are cheapest, shining objects to distract the elephants. Barbed wire fencing is gradually proving ineffective in preventing the movement of elephants. In the buffer zone of the industrial area also the elephant has broken a barbed wire fencing and entered a nursery.

Crops of elephant liking should be avoided, as far as possible. Some of the crops, listed above, should be used to replace the more traditional crops like the sugarcane and rice. In Karnataka elephant proof trenches are being dig around the village area, but I have observed in Sarguja district in Chhattisgarh state that the elephants can move down and up in trenches of good depth. Sisal has been found to be good to prevent the elephants to cross the sisal planted area. The plant yields a good quality fiber. Electric/Solar fencing has also been suggested as one of the methods but in Assam it has been found to be a failure as the elephant have discovered techniques to break such fences, safely. In areas like Kamakshya Nagar in Dhenkanal division in Orissa improvement of fodder resources in the forest has shown promising result of restricting the elephants more in the forest area.

Passive methods are always better to avoid man-elephant conflicts. More important are the selection of plants as alternative crop as well as plants to check the entry of elephants in to the settlement areas.

**Following steps are taken in Africa to escape elephant damage -**

- Elephant area is fenced with ropes. Fencing ropes are smeared with a mixture of chili + tobacco powder in engine oil. Disagreeable smell of the mixture helps to some extent, to ward off the elephants.
- Honey bee combs are promoted on the elephant corridor boundary. Honey bees ward off the elephants.
- Electronic tracking devices are attached to the elephants to track their movements. This helps in timely information to the villagers.

**(iii) Long Termed Measure -**

(a) Constitution of a "Task-force" at divisional level which should include local representatives, journalists, honorary wildlife wardens and at least one or two members from elephant affected village. It will be presided by local MLA and in his absence by another local representative. Divisional Forest Officer will be the member secretary. The recommendations or suggestions of the Task Force will be sent to Chief Wildlife Warden for necessary action.

(b) Identification and listing of elephant affected areas.

(c) Establishment of "Elephant Control Room" at divisional level, “Elephant Protection Team" at range level and “Elephant Friend Group (Hathi Mitra Samooh) at concerned village level.

(d) Creating "Public Awareness" with adequate “Propaganda" and to ensure 'People's participation'.

(e) Ensure at district level, speedy electrification of elephant affected villages, and provision of at least two vapor lights in the electrified villages.

(f) At departmental level ensure

- Digging of elephant proof trench around villages.
- Raising plantation of non-palatable species like Ratanjot, Mehandi, Sisal, Eucalyptus, Karanj etc. between forests and village.
- Propagate through agriculture department change in crop cycle and encourage villages to grow crops like sun flowers, chili til, citrus etc which are elephant repellant.

(g) Recommend and ensure the villagers –

- To construct under ground permanent storage (Kothi) for paddy- (provide subsidy for it).
- Not to brew liquor in or near about the village or to keep it in houses.
- To stall feed the cattle
- To have doors on both front and back sides.
- Not to leave paddy in barn after thrashing and to store it in permanent kothi- (which should not be adjoining the outer wall)-, as soon as possible.

**(iv) Emergency Measures**

(a) Store in villages that are susceptible to elephant menace.

- 100 old tyres
- For "Mashal" burnt old mobile oil, kerosene, torn gunny bags, binding wire etc.
- Two high beam torches

(b) When elephant group is in vicinity of 15 km's, alert the villagers.

(c) Ensure the Range Elephant Protection Force reaches the village and forms group of villagers for night patrolling.

(d) Elephant Protection Force to keep watch on morning and evening movement of the elephant herd and alert villagers likely to be visited by the herd.

(e) Ask and ensure the villagers -

- To maintain distance from elephants and not to harass them or irritate them while resting.
- if herd moves towards the village or houses to create dense smoke of chili keeping in view the wind direction and to create sharp and loud sounds with drums, dhol, tin etc so as to scare away the herd. Crackers can also be used.
- It available roaring sound of the tiger to be relayed.
- To keep elders, children and ladies in safe places.
- Not to sleep in barns alone and if staying in group, to keep fire burning throughout the night.
- To create buffer belt around paddy fields Depending or choice and marketability, following spp. can be raised in 100-meter-wide buffer belt around paddy fields and other crops to douse the smell and the view-Sunflower, ginger, turmeric, arrowroot, amorpholus, onion, garlic, chilly, ridge gourd, bitter gourd, snake gourd, arhar, tobacco, tapioca, calocacia, marigold, roses, tube roses, kalmegh, ashwagandha.

A good number of researches and suggestions on the conservation and reducing its conflicts with human being is going on, resulting in suggestions coming frequently on these aspects. Thus the presently prepared report is not the final. With the above, some more, methods are being suggested for buffer zone industrial area.

- **Two doors in a house :** Most of the houses in villages have only one door or exit. In case the elephant enters the house through the door, the occupants can escape through another door.
- **Timely information :** Timely information to the helping person about the approach of elephants can reduce the conflicts as well as loss of human life. For this a network should be formed with the villages and the forest officers.
- **Elephant torch :** The elephant torch should be provided to each of the vulnerable villages. Presently the torch is only with the forest officer, one torch for several villages.

## *5. Python molursus* (Indian Python)

### Depiction of the Species

The Indian Python *(Python molurus)* are large, heavy-bodied non-venomous snakes that kill their prey by constriction. The species is widely distributed throughout the Indian Subcontinent and east to the Malay Peninsula and western Indonesia. Normally Python is a jungle dweller reptile, occurring in dense as well as in open forests, with rocky outcrops. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, and dense water reeds.

### Reason for Conservation

*Python molurus* (Indian Python) is protected under Schedule- I {Part- II (14-A)} of the Indian Wildlife Protection Act, 1972. This species does not fall in any category of IUCN Red List.

Classification of the Species

| | |
|---|---|
| Kingdom | Animalia |
| Phylum | Chordata |
| Class | Reptelia |
| Order | Squamata |
| Sub- order | Serpentes |
| Family | Pythoniade |
| Genus | Python |
| Species | Python molurus |

### Methodology

Survey of the site, Secondary data collection and identification of the place of habitation, were the first few steps followed.

**The survey was carried out in the three steps :**

i. Collection of available area specific secondary information by perusal of literature.
ii. Mapping of land cover/forest and other related parameters.
iii. The entire Core and buffer was surveyed, both by rapid and intensive protocols.

Indian Python habitation area survey was carried out using well accepted scientific method like plots, point count, area search, field perambulation, opportunistic survey in addition to line, belt and vehicle transect.

**Equipment used :** A Sony Telephoto Shooting Camera of 50x optical zoom for Tele- photography, Binocular for safe distance sighting, measuring tape for size measurement, Stick for safe catching, Rope/Adhesive tape for mouth sealing, GPS for Coordinates, Compass for direction measurement, Field guide etc.

**Observations**

Normally Python is a jungle dweller reptile, occurring in dense as well as in open forests, with rocky outcrops. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, and dense water reeds. During survey, the movement of python was confirmed from locals in forest area and around water bodies in buffer area.

**Breeding**

Matting occurs during the cold season in December, January and February, when python is in hibernation, and eggs varying in number from 8 to 100 are laid 3 to 4 months later in the hot weather months from March to June. Eggs measure 12 - 86 cm and are soft, white in color and equally domed at both poles. The female broods the eggs by coiling around them. The mother takes no further interest in her brood after hatching, which occurs 58 days after laying. Females living alone in captivity often lay sterile eggs. Python are long lived, and have lived in captivity for over 22 years. Growth is a continuing process through at a slow rate.

**Feeding Habit**

Feed on mammals, birds and reptiles indiscriminately, but seems to prefer mammals. Python which lie up in Dam and other waterlogged areas have little difficulty in capturing prey. Largely water birds and animals which are live near water or come to drink. They also lie in wait near jungle trails. Heronries, nesting colonies and large birds' roosts usually have attendant python which take their toll at night. Python preying on roosting flying foxes has been reported.

**Threats**

i. Python is tertiary consumer which depends on primary & consumers and therefore it occupies fourth trophic level of ecological pyramid.
ii. Any changes in habitat of python in the forest area are likely to affect this species.
iii. Habitat destruction due to conversion of forest land into agriculture field, human interference in forest areas, over grazing by domestic cattle, cutting of trees for fodder, wood and fuel.
iv. Pollution due to Industrial and agriculture activities has a direct influence on the survival of Python in its habitation in terms of environment pollution, inorganic pesticide & fertilizers usages in cultivation.
v. Illegal hunting and poaching of Python for traditional medicine and to a lesser extent for their skins contributes to the loss of animals in the reproductive size class.
vi. Human- Python Conflict- The people generally kill the python when it is entered the habitation of people due to lack of awareness in local people about python. The illiterate people do not know that this is nonpoisonous snake.
vii. Although these threats are believed to be causing an alarming decline in population, the magnitude and pattern of the effects in the study area is yet to be quantified.

**Conservation Measures for Python**

i. Probable habitat boundaries need to determine for all areas that are likely to possess viable populations so that protection measures can be initiated.

ii. All appropriate landowners within these protection boundaries will be identified. Each will be contacted in the manner that will ensure cooperation. Land owners will be made aware of the sensitivity of the endangered python and of the value of maintain natural habitat. They will be made aware of the available conservation options.

iii. Development of Den, Burrows and planting where required for habitat improvement.

iv. Soil and Water conservation practices is being done.

v. A programme of regular, systematic monitoring of known Python population is essential. Nesting and basking sites will be identified, mapped and census technique needs to be refined and standardized so that they are scientifically credible. Initially this will be carried out in forest areas.

vi. All Forest Areas that Python require protection from illegal activities that threaten Python in particular-especially netting, disturbance at nesting and basking spots and killing of prey species. Adequate protection will be afforded to Python burrows especially from livestock.

vii. A conservation awareness program that involves local people in the conservation of python is vital to ensure long-term success of any management plan. Plans will be included educational materials, signs, organizing plays, poster display and instill pride amongst the locals as caretakers of the last populations of python in their habitation. There is an equally compelling need for a concerted human/python conflict mitigation program.

viii. Public awareness is an important priority within the scope of overall management plans for the species. Public awareness often yields new locality information and could reduce the frequency with which python are killed.

ix. Fencing will be made around python nesting and burrows area to ensure any interference.

x. Poaching and hunting of Python will be continuous monitor and take action against it according to Wildlife Protection Act, 1972. Aware local people and built effective information system against hunting and poaching activities.

xi. GPS system will be used with cooperation of forest department for monitoring of python movement in 10 km radius study area that will be benefited for census record updating.

xii. Habitation of python will be developed and maintained in ecological manners such as sufficient availability of prey for python.

xiii. Effective communication network will be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with python, hunting and poaching activities.

xiv. Training programme will be conducted to conservation expert team and local people for safe handling of python.

Photographs of Indian Python

## 6. Common Leopard (*Panthera pardus*)

Indian leopard (*Panthera pardus fusca*) is a leopard subspecies widely distributed on the Indian subcontinent. The species *Panthera pardus* is listed as Vulnerable on the IUCN Red List because populations have declined following habitat loss and fragmentation, poaching for the illegal trade of skins and body parts, and persecution due to conflict situations.

The Indian leopard is one of the big cats found on the Indian subcontinent, apart from the Asiatic lion, Bengal tiger, snow leopard and clouded leopard.

### CHARACTERISTICS

In 1794, Friedrich Albrecht Anton Meyer wrote the first description of Felis fusca, in which he gave account of a panther-like cat from Bengal of about 85.5 cm (33.7 in), with strong legs and a long well-formed tail, head as big as a panther's, broad muzzle, short ears and small, yellowish grey eyes, light grey ocular bulbs; black at first sight, but on closer examination dark brown with circular darker coloured spots, tinged pale red underneath. Male Indian leopards grow to between 4 ft 2 in (127 cm) and 4 ft 8 in (142 cm) in body size with a 2 ft 6 in (76 cm) to 3 ft (91 cm) long tail and weigh between 110 and 170 lb (50 and 77 kg). Females are smaller, growing to between 3 ft 5 in (104 cm)

and 3 ft 10 in (117 cm) in body size with a 2 ft 6 in (76 cm) to 2 ft 10.5 in (87.6 cm) long tail, and weigh between 64 and 75 lb (29 and 34 kg). Sexually dimorphic, males are larger and heavier than females.

The coat is spotted and rosetted on pale yellow to yellowish brown or golden background, except for the melanistic forms; spots fade toward the white underbelly and the insides and lower parts of the legs. Rosettes are most prominent on the back, flanks and hindquarters. The pattern of the rosettes is unique to each individual. Juveniles have woolly fur, and appear dark due to the densely arranged spots. The white-tipped tail is 60–100 centimetres (24–39 in) long, white underneath, and displays rosettes except toward the end, where the spots form incomplete bands. The rosettes are larger in Asian populations and their yellow coat tends to be paler and cream coloured in desert populations, more gray in colder climates, and of a darker golden hue in rainforest habitats.

**DISTRIBUTION AND HABITAT**

On the Indian subcontinent, topographical barriers to the dispersal of this subspecies are the Indus River in the west, and the Himalayas in the north. In the east, the Ganges Delta and the lower course of the Brahmaputra River form natural barriers to the range of the Indochinese leopard. Indian leopard is distributed all over India.

The Indian leopard inhabits tropical rain forests, dry deciduous forests, temperate forests and northern coniferous forests but does not occur in the mangrove forests of the Sundarbans.

**ECOLOGY AND BEHAVIOUR**

Leopards are elusive, solitary, and largely nocturnal. They are known for their ability in climbing, and have been observed resting on tree branches during the day, dragging their kills up trees and hanging them there, and descending from trees headfirst. They are powerful swimmers, although are not as disposed to swimming as some other big cats, such as the tiger. They are very agile, and can run at

over 58 kilometres per hour (36 mph), leap over 6 m (20 ft) horizontally, and jump up to 3 m (9.8 ft) vertically. They produce a number of vocalizations, including grunts, roars, growls, meows, and purrs.

Leopards are versatile, opportunistic hunters, and have a very broad diet. The diet of Indian leopards include spotted deer, sambar deer, nilgai, wild pig, common langur, hare and peafowl.

Although they are smaller than most other members of the genus *Panthera*, they are able to take large prey due to their massive skulls and powerful jaw muscles.

Depending on the region, leopards may mate all year round. The estrous cycle lasts about 46 days and the female usually is in heat for 6–7 days. Gestation lasts for 90 to 105 days. Cubs are usually born in a litter of 2–4 cubs. Mortality of cubs is estimated at 41–50% during the first year. Females give birth in a cave, crevice among boulders, hollow tree, or thicket to make a den. Cubs are born with closed eyes, which open four to nine days after birth. The fur of the young tends to be longer and thicker than that of adults. Their pelage is also grayer in colour with less defined spots. Around three months of age, the young begin to follow the mother on hunts. At one year of age, leopard young can probably fend for themselves, but remain with the mother for 18–24 months. The average typical life span of a leopard is between 12 and 17 years.

**THREATS**

Hunting of Indian leopards for the illegal wildlife trade is the biggest threat to their survival. They are also threatened by loss of habitat and fragmentation of formerly connected populations, and various levels of human leopard conflict in human–dominated landscapes.

**POACHING**

A significant immediate threat to wild leopard populations is the illegal trade in poached skins and body parts between India, Nepal and China. The governments of these countries have failed to implement adequate enforcement response, and wildlife crime remained a low priority in terms of political commitment and investment for years. There are well-organised gangs of professional poachers, who

move from place to place and set up camp in vulnerable areas. Skins are rough-cured in the field and handed over to dealers, who send them for further treatment to Indian tanning centres. Buyers choose the skins from dealers or tanneries and smuggle them through a complex interlinking network to markets outside India, mainly in China. Seized skins in Kathmandu confirm the city's role as a key staging point for illegal skins smuggled from India bound for Tibet and China.

It is likely that seizures represent a tiny fraction of the total illegal trade, with the majority of smuggled skins reaching their intended end market. Seizures revealed:

- In India: more than 2845 poached leopards between 1994 and October 2010.

In May 2010, the Wildlife Protection Society of India estimated that in India at least 3,189 leopards were killed since 1994. For every tiger skin, there are at least seven leopard skins in the haul.

**HUMAN–LEOPARD CONFLICT**

Expansion of agriculturally used land, encroachment of humans and their livestock into protected areas are main factors contributing to habitat loss and decrease of wild prey. As a result, leopards approach human settlements, where they are tempted to prey on dogs, pigs and goats — domestic livestock, which constitutes an important part of their diet, if they live on the periphery of human habitations. Human–leopard conflict situations ensue, and have increased in recent years. In retaliation for attacks on livestock, leopards are shot, poisoned and trapped in snares. The leopards are considered to be unwanted trespassers by villagers. Conservationists criticize these actions, claiming that people are encroaching on the leopard's native habitat. India's Forest Department is entitled to set up traps only in cases of a leopard having attacked humans. If only the presence of a crowd of people prevents the leopard from escaping, then the crowd has to be dispersed and the animal allowed to escape.

As urban areas expanded, the natural habitats of leopards shrunk resulting in leopards venturing into urbanized areas due to easy access of domestic food sources.

## CONSERVATION

Panthera pardus is listed in CITES Appendix I. Despite India being contracting party to CITES, national legislation of our country does not incorporate and address the spirit and concerns of CITES. Trained human resources, basic facilities and effective networks for control of poaching and trade in wildlife are lacking. Frederick Walter Champion was one of the first in India who after World War I advocated for the conservation of leopards, condemned sport hunting and recognised their key role in the ecosystem.

A conservation awareness program that involves local people in the conservation of this species is vital to ensure long-term success of any management plan. Plans should include educational materials, signs, and instill pride amongst the locals as caretakers of the last populations of this species in their habitation. There is an equally compelling need for a concerted human/ leopard conflict mitigation program.

Effective communication network would be developed between local people, forest officers and conservation experts to reduce the risk of the human conflict with leopard, hunting and poaching activities.

Training programme would be conducted to conservation expert team and local people for safe handling of this mammal.

Small holes containing water should be constructed in habitation zone of leopard and its water quality should be maintained.

It is critical that urgent efforts are made to understand the habitat and population status of the species through field based research and in situ conservation projects.

# CHAPTER - VI

## Other Ecological Components

### THREATS TO WILDLIFE IN INDIA

Disintegration as well as destruction of habitat have been the two most significant factors that threaten wildlife in India. The threats to the corridors of protected areas, industrial demands on ecologically sensitive areas for mining and quarrying have resulted in extensive damage to the sensitive habitats that host wildlife. The network of protected area I.e. national parks and sanctuaries have been established as representative samples of ecosystems, linked by 'corridors' to facilitate genetic continuity. Unfortunately, these corridors are not legally protected and are subject to maximum exploitation.

Various government actions have proved to be harmful for wild life and their habitat, which were taken purportedly for the good of both human society and wildlife.

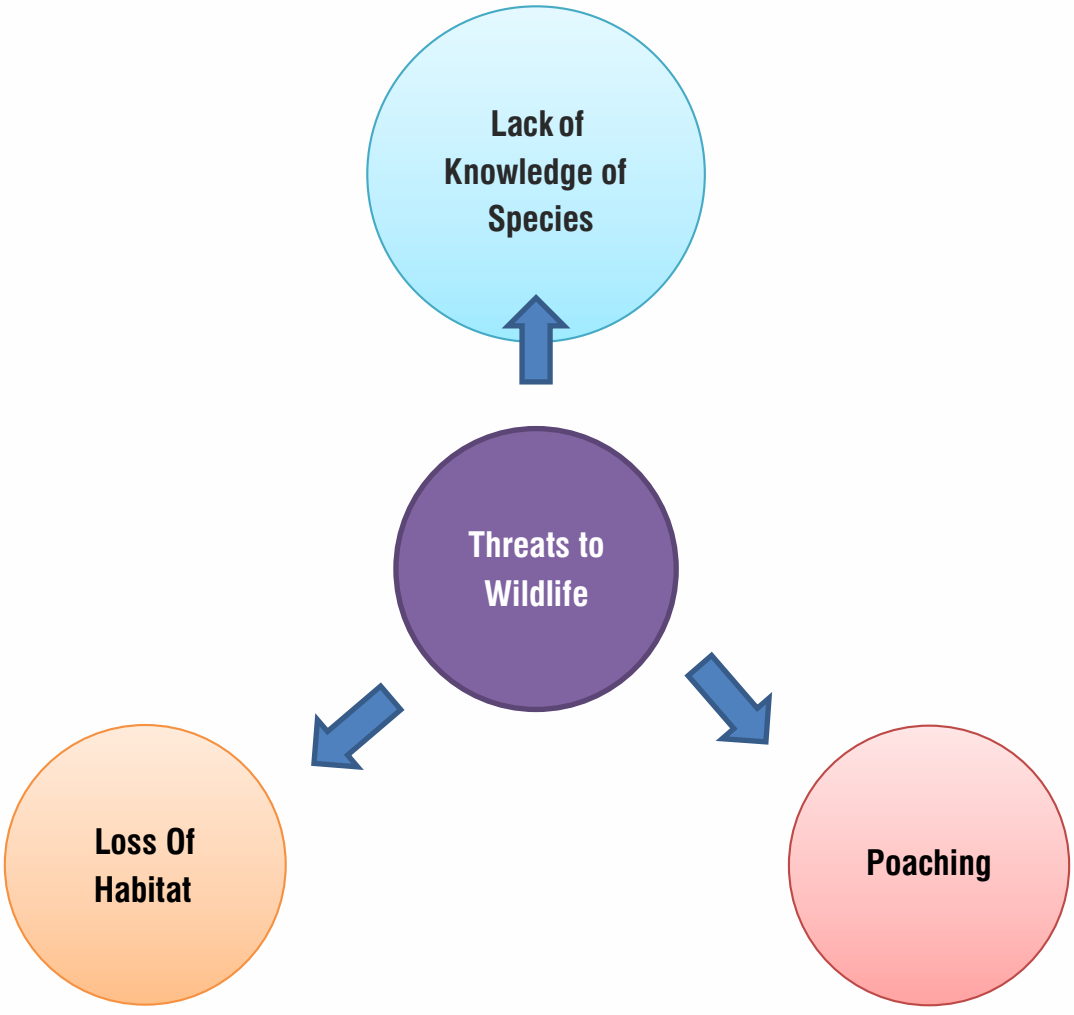
Another growing concern relates to global extinction of flora and fauna in the case of loss of habitat and excessive illegal hunting. Numerous international instruments have been signed to address this issue, e.g. the **International Convention for the Regulation of Whaling, Washington, 1946 the Convention on International Trade in Endangered Species of Wild Flora and Fauna, 1976 and the Convention on Conservation of Migratory Species of Wil *d Animals Bonn,1979.***

**The World Conservation Union (IUCN)** Publishes a **Red Data Book**, which compiles in 3 appendices, the various species according to the degree in which they are threatened. In the Indian context, the list of threatened is listed in Schedules appended to the wild life Protection Act. Though this is the general trend that is followed globally, it has been argued by some that this is not the best method. Studies have revealed that out of an estimated 8.7 million species existing on Earth, only about14 percent is known to mankind leaving out innumerable other unknown ones from the purview of threatened species. Some of these species may get extinct even before they can be recorded.

Wildlife trade has emerged as another threat to the preservation of the same. Rampant poaching in wildlife and its products are mainly driven by the demands for these in the international markets. It is

believed that illegal trade in wildlife products is second only to the global trade in narcotics. In the case Ivory Traders Manufacturers Association vs Union of India, the Delhi High Court remarked that '…. business in animal species on the verge of extinction being dangerous and pernicious is, therefore not covered by Article 19(g) of the Constitution.

The trade in tiger parts including bones, claws, skin, snake skin, furs, rhino horns, ivory, bear bile, shahtoosh, sea turtle eggs etc. has resulted in depletion of many species of wildlife. It is also pertinent to note that these trades are not carried out by any forest–dependent community but by others for purely monetary gains.



## Habitat structure

In the Study Area of the **Salgi Bauxite Mines Lease Area (CMDC),** it has been tried to understand the wildlife habitat through and detailed study of floral as well as faunal diversity. Wildlife requires places to hide in order to feel safe from people, predators and inclement weather. Use things like indigenous vegetatio n, shrubs, thickets and brush piles or even dead trees. The most important features of a wildlife habitat is its canopy cover, availability of fodder, prey, water etc. In general, good habitat conditions for wildlife can be created while managing canopy cover through plantation of indigenous species or other management practices. Information presented here with help in planning for an integrated land management program that optimizes timber growth, plantation of fodder species for herbivores and thus planning to create wildlife habitats and corridors. When considering improvements for wildlife habitat during land management operations, it has been emphasized to be aware of the habitat requirements of wildlife.

**Wildlife have four basic needs:** food, cover, water, and space. The quantity and quality of these components determine the carrying capacity of the land - the maximum number of animals that can be supported in good condition throughout the year. Carrying capacity changes by season and by year as a direct result of changes in farm and forest habitat. With proper planning, forest management can be conducted in such a fashion as to improve habitat conditions for certain species of wildlife. In a truly integrated forest and wildlife management operation, the goal of maximum timber production is compromised in favor of producing quality habitat for wildlife. A reasonable compromise between maximum timber production and quality habitat ensures sustained profits from forest products as well as suitable habitat for wildlife. As forests are altered to grow timber products, wildlife habitats are also changed. Forest management operations that affect habitats include harvesting, site preparation, forest regeneration practices and intermediate stand treatments. Each of these forestry practices will affect habitats by altering certain characteristics of the forest. Some of the habitat characteristics that influence wildlife are edge, habitat diversity, interspersion, and plant succession. Forest stand arrangement also has an effect on the quality of wildlife habitat. Stand arrangement refers to how the forest stands are located in relation to each other. For quality wildlife habitat, forest stands providing habitat components must be available within the home ranges of the wildlife species being managed. Proper arrangement of food, water and cover can often determine the use and value of these habitat components to wildlife.

Poor arrangement of habitat components fails to make the best use of a particular site for wildlife. Size and arrangement of forest stands largely determine the quantity and quality of edge and total forest diversity that is created. A mixture of pastureland, woodland, and non-forested land creates more diversity and edge than does a large block of one timber type.

**Major threats to Biodiversity**

Large scale loss of biodiversity has been mainly caused by anthropogenic activities like habitat loss, degradation, fragmentation, biotic interference, grazing, demand for timber, fuel wood, pollution and introduction of exotic species etc. Some of these factors are discussed below in brief.

**Habitat loss, degradation and fragmentation**

Habitat loss, degradation, and fragmentation are important causes of known species-populations extinctions. The main cause of degradation and depletion of forests and wildlife are the human activity (anthropogenic pressure). Population explosion, over exploitation of forest resources, urbanization, unscientific management, encroachment of forest land, illicit felling, lack of regeneration of forests and outdated laws are major factors responsible for the degradation and depletion of forests in Chhattisgarh.

Deforestation has led to reduction of rainfall, silting of rivers and dams, increase soil erosion, dryness in the air and increase in temperature, adversely affecting not only forestry but also agriculture and associated activities. In the proposed irrigation project, the threat of habitat disturbance, degradation and fragmentation may not only come from the developmental activities, but also from the population of migrant laborers that will be employed by the project developers from time to time.

**Biotic interference**

The collection of Non-timber Forest Produce (NTFP) in the form of small timber, fuel wood, and fodder by the people living in the surrounding villages in the project area and areas between the village and Reserved Forests are thereby exerting intensive biotic pressures on these resources. There is likelihood

of increase in biotic interference with the influx of labour population during the construction of the project. This floating human population will exert serious pressure on the semi-natural ecosystems around the activity sites. The pressures may be moreseen in terms of fuel-wood collection, rearing of livestock and the grazing pressure on the surrounding forest ecosystems. Plantation of exotic species and invasion of non-native species like *Lantana camara*, *Parthenium sp* and *Eupotorium odoratum* are also forms of biotic interference in this region.

**Timber Requirement**

There is tremendous pressure on the forests for increasing demand for timber and growing rapidly. The demand for timber and other wood produce is very high in the state for various activities like the construction of houses, business centers and other development activates owing to rapid population growth. The situation is similar in present project area also. Therefore, the present situation calls for exploring acceptable alternatives for fuel wood, fodder, grass, timber and other natural resources in the project area would be addressed with creation of other alternative schemes.

**Non Timber Forest Products (NTFP)**

Non Wood Forest Products (NWPF) constitute important source of livelihood for the poor and especially landless. There is abundance of Tendu leaves (*Diospyrus melanoxylon*), Mahua flowers (*Madhuca indica*), Sal leaves and seeds (*Shorea robusta*), different medicinal plants like Harra (*Terminalia achebula*), Bahera (*Terminalia bellerica*), Aonla (*Emblica officinalis)*, wild fruit yielding species like Jamun *(Syzygium cumini)*, Aam (*Mangifera indica*) etc. in the forest patches which are most of the times are over extracted. All species have specific food and habitat needs. The more specific these needs and localized the habitat, the greater the vulnerability of species to loss of habitat to agricultural land, livestock, roads and cities.

### Grazing Pressure

Livestock play an important role in hilly forest ecosystem. Various livestock species reared in the study area include cattle, buffaloes and goats. The two common livestock-rearing systems are mostly sedentary and to a small extent transhumant. In the sedentary system, animals are kept in the village throughout the year. Cattle and buffaloes are the preferred species and are mostly stall-fed. Some families keep small flocks of sheep and goats. The average number of cattle population per household is estimated to be 3-5 animal heads. The grazing pressure leads to following impacts:

a) Interference of livestock in the wilderness areas required for wildlife.
b) Direct competition for forage availability and degraded quality and reduction in the food availability for herbivores.
c) Transmission of communicable diseases.
d) Reduction in area of wilderness needed for the wildlife to sustain.

### Poaching

Poaching is one of the major causes for destruction of wildlife. The poaching has to be checked not only by regular patrolling and deployment of anti-poaching squad formed for the purpose and enforcement of the Wildlife but also encouraging people in protection activities.

### Ethno-Botanical Study

In Study Area of the **Salgi Bauxite Mines Lease Area (CMDC),** the ethno-botanical study that has been carried out reveals the fact that this forest area is closely associated with the life of the villagers within the forest area. The area is inhabited by several tribal groups, including Baiga and Gonds.

In total ten villages were studied for their forest dependence and a weekly market locally known as hat was studied for trade of non-timber forest produces (NTFPs). Sixteen NTFP items were found to be sold in the market which includes vegetables, fruits, various house hold items and even herbal medicines. Within these items there are few which has potential market. The list of medicinal plants found in the buffer area is given in **Table No 2**.

The study therefore shows a close dependence of the villagers cutting across their caste and creed on the forest. A list of ethnomedicinal usage of some plant species is below mentioned. There are two such items mentioned in the **Table No.1**. Most of these items need detailed ethnopharmaceutical studies and therefore the knowledge needs also to be reserved. In most parts of forested areas of Chhattisgarh measures have been taken to make in-situ as well as ex-situ conservation of NTFP species. Species like Asparagus recemosus, Hygrophila salicifalia, Hemidesmus inducus etc. needs special attention. Asparagus sp through not mentioned in the list is an important species of the region and has a trade value.

**Table 1: Species of Ethnobotanical importance**

| Sl. No. | Local name | Scientific name | Part used | Usage |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| 1. | Jamun | *Syzygium cumini* | Bark | The bark decoction is used in dysentery |
| 2. | Nupur | *Desmodium triflorum* | Leaves | Leaves extract with salt are used in dry cough. |
| 3. | Mutha | *Cyperus kyllinga* | Root | Smashed root is used in toothache. |
| 4. | Ramtulsi | *Ocimum sp.* | Leaves | Leaf juice with honey is used in Whooping cough. |
| 5. | Apang | *Achyranthes aspera* | Stem | Stem juice is used in Indigestion and Burning sensation in chest. |
| 6. | Dudhilat | *Icnocarpus fruitcans* | Whole plant | Plant paste with raw milk is used against low pressure and biliary problems |
| 7. | Arjun | *Terminalia orjuna* | Bark | The bark decoction is mixed with the water of sugar candy and taken for 4-5 days in empty stomach in leucorrhoea. |
| 8. | Bara dudhe | *Euphorbia hirta* | Root | The water, in which the roots have been boiled, is used in dysentery. |
| 9. | Muthakani | *Cyperus nutana* | Stem | Stem chewed with *batasa (a nuggest prepared out of sugar)* is useful in gastritis. |
| 10. | Bhui amla | *Phyllanthus amarus* | Whole plant | Plant boiled water is used in jaundice. |
| 11. | Kalmegh | *Andrographis paniculata* | Stem | Stem decoction is useful for enhance liver function and digestion. |
| 12. | Kanta Notey | *Amaranthus spinosus* | Leaf | Leaf paste is useful in bone pain. |
| 13. | Kantikari | *Solanun xanthcarpum* | Root paste | Reliving pain of Pox. |

**Table-2: List of medicinal plants of Buffer zone area**

| Sl. No. | Botanical name | Family | Part used | Usage |
|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) |
| 1. | *Acacia catechu* | Fabaceae | Leaf | Toothache, Headache, Diarrhoea, Cough, Digestive, Skin disease |
| 2. | *Ahyranthus aspera* | Amaranthaceae | Leaf, Root, Seed | Boils, Wound healing, Antidiabitic, Bleeding control, Scorpion-sting, Diuretic, Antidote, Antidiabetic, Toothache |
| 3. | *Aegle marmelos* | Myrtaceae | Tree | Stomachic, Piles, Cardiotonic, Laxative, Antiinflamatory, Jaundice, Urinary trouble, Diabetes, Dysentery |
| 4. | *Albizia leebek* | Fabaceae | Leaf, Seed | Antidote, Saponin for snake position, Skin disease, Asthma, Piles, Diarrhoea |
| 5. | *Andrographic paniculata* | Acanthaceae | Seed | Diabetes, Jaundice, Fever, Digestion, Blo od purification |
| 6. | *Annona squamosa* | Annonaceae | Fruit, Seed, Root, Leaf | Constipation, Vomiting, Cough, Purgative, Seed powder to kill lice |
| 7. | *Anthocephalous cadamba* | Rubiaceae | Bark, Frout | Inflammation, Antibacterial, Diabetes, Cough, Fever, Asthma |
| 8. | *Asparagus recemosus* | Liliaceae | Root | Weakness, Lactation in women, Diuretic, Tonic, Alterative, Antidiarrhoeal, Galactogenis, Brochitis. |
| 9. | *Azadirachtat indica* | Meliaceae | Brak, Leaves, Flower, Seed, Oil | Skin disease, Tooth ache, Antidote, Fever, Wound, Seed ulcer, Worms, Cough, Diabetes, Inflamation. |
| 10. | *Butea monosperma* | Fabaceae | Bark, Leaves, Flower, Seed, Gum | Uninary disorder, Worms, Diabeters, Inflammation, Skin disease |
| 11. | *Calotropis procera* | Asclepiadaceae | Leaf, Root, Flower, Bark | Ringworm, Emetic, Laxative, Joint and Ear pain, Swelling |
| 12. | *Cassia fistula* | Fabaceae | Lef, Seed | Purgative, Antiviral, Tonic, Boil, Ringworm |

| | | | | |
|---|---|---|---|---|
| 13. | *Cassia tora* | Fabaceae | Root, Seed, Leaves | Dermatiosis, Cough and respiratory disease, Laxative, Carminative, Skin disease |
| 14. | *Cassia occidentalis* | Hypoxidaceae | Rhizome | Bronchitis, Cough, Asthma, Wounds, Antidote, Skin disease, Fever, Allergy |
| 15. | *Curculigo orchioides* | Convolvulaceae | Stem, Seed | Piles, Joint pain, Bronchitis, Jaundice, Asthma, Diarrhoea, Urinary problem |
| 16. | *Cuscuta reflexa* | Poaceae | Leaf | Antihelmintic, Carminative, Purgative |
| 17. | *Cynodon doctlyon* | Fabaceae | Leaf, Stem | Vomiting, Bleeding, Diuretic, Diarrhea, Opthalmic |
| 18. | *Dalbergia sissoo* | Fabaceae | Stem, Root | Skin disease, Gonorrhoea, Dysentry, Itching |
| 19. | *Dendrocalamus strictus* | Poaceae | Leaf | Antifertility agent, Astringent |
| 20. | *Desmodium trifolium* | Fabaceae | Tuber | Antidote, Diuretic, Carminative, Tonic, Diarrhea, Skin disease, Wounds |
| 21. | *Emblica officinalis* | Euphorbiaceae | Bark, Leaf, Root | Laxative, Diuretic, Carminative, Stomatchic, Antidiarrhoeal, Jaundice, Eye problem, Digestive. |
| 22. | *Euphorbia hirta* | Euphorbiaceae | Leaf | Boil, Antiasthematic, Cough, Dysentry |
| 23. | *Ficus bengalensis* | Moraceae | Milky latex | Brain tonic, Antidysentric, Antiasthematic, Bronchitis |
| 24. | *Ficus religeosa* | Moraceae | Milky latex | Asthma, Ulcer, Skin Disease, Leucoderma, Urinary problem |
| 25. | *Ficus glomarata* | Moraceae | Milky latex, Fruit | Antidote, Anti-gonorrhea, Ulcer, Stomachic |
| 26. | *Hibiscus rosasinensis* | Malvaceae | Leaf, Flower | Alopecia, Burn |
| 27. | *Ipomoea aquatic* | Convolvulaceae | Leaf | Antidote, Gonorrhoea, Increase mother milk |
| 28. | *Jatropha curcus* | Euphorbiaceae | Leaf, Seed | Piles, Wound healing, Burn, Leucoderma |
| 29. | *Magnifera indica* | Anacardiaceae | Fruit | Dysentery, Digetaive, Vitamin A, Tonic, Rheumatism |

| | | | | |
|---|---|---|---|---|
| 30. | *Nycthanthus arbortritis* | Nyctaginaceae | Leaf, Seed | Laxative, Diuretic, Bleeding, Piles |
| 31. | *Ocimum canum* | Lamiaceae | Leaf, Flower | Cold, Cough, Bronchitis, Destroying bacteria and isects, Stimulant, Skin disease, Burn, Ringworm |
| 32. | *Phyllanthus niruri* | Euphorbiaceae | Whole plant | Liver disorder, Diabetes, Skin disease, Urinary problem |
| 33. | *Pongamia pinnata* | Fabaceae | Seed | Skin disease, Leucoderma, Carminitative, Parasiticide, Bleeding |
| 34. | *Sida cordifolia* | Malvaceae | Leaf, Root | Opthalmia, Diarrhoea, Leucorrhoea |
| 35. | *Terminalia arjuna* | Combretaceae | Bark, Fruit | Antidysentric, Antiasthematic, Cardiotonic, Diuretic, Ulcer, Leucoderma, Antidote |
| 36. | *Tridax procumbens* | Asteraceae | Leaf | Blood clotting, Boil, Wound treatment |
| 37. | *Typha angustifolia* | Typhaceae | Rhizome | Diuretic, Astringent |
| 38. | *Vitex negundo* | Verbenaceae | Leaf, stem | Tooth ache, Swelling, Digestive, tonic, asthma, stem cutting dysentery, rheumatism, skin disease |
| 39. | *Xanthiumstrumarium* | Asteraceae | Root, frout | Skin disease, bleeding, insect bite, diuretic, urinary problem |
| 40. | *Zizyphus mauritiana* | Rhamnaceae | Leaf, fruit | Diarrhea, cough, bleeding, digestive. |

## Species of Economic importance

The forest has good number of NTFP (Non Timber Forest Product Species) which are of economic importance to the people. During the study eighteen such species (**Table No 3**) could be identified which are economically important to the people within the study area. Some of these species are also important to the Forest Department as they fetch good amount of money as these are nationalized items. These products (Tendu Leaf, Sal seed) are sold to the Govt. recognized agencies only. These species also need to be preserved in in-situ condition.

## Table-3: Non-Timber Forest Produce Yielding Species

| Sl. No. | Species | Local Name | Parts used | Usage | Regeneration status |
|---|---|---|---|---|---|
| (1) | (2) | (3) | (4) | (5) | (6) |
| 1. | *Anogeissus latifolia* | Dhaora | Gum | Medicinal | Low |
| 2. | *Azadirachta indica* | Neem | Bark, leaf and fruit | Medicinal | Low |
| 3. | *Boswella serrata* | Salai | Gum | Medicinal | Good |
| 4. | *Diospyros melanoxylon* | Kend | Leaf | Biri making | Good |
| 5. | *Madhuca indica* | Mahua | Flower and fruit | Liquor and vegetable | Low |
| 6. | *Mangifera indica* | Amm | Fruit | Food | Low |
| 7. | *Schleichera oleosa* | Kusum | Seed | Oil extraction | Low |
| 8. | *Shorea robusta* | Sal | Leaf and fruit | Leaf plate and oil | Good |
| 9. | *Terminalia chebula* | Harra | Fruit | Medicinal | Good |
| 10. | *Terminalia bellerica* | Bah$^{era}$ | Fruit | Tanning anf medicinal | Good |
| 11. | *Syxygium cumini* | Jamun | Fruit | Food | Good |
| 12. | *Emblica officinalis* | Aonla | Fruit | Food and medicine | Low |
| 13. | *Vitex negundo* | Nirgundi | Leaves | Medicinal | Low |
| 14. | *Aproragus recemousus* | Satabar | Root | Medicinal | Good |
| 15. | *Hoarrhena antidysenterica* | Dudhi | Whole plant | Medicinal | Good |
| 16. | *Smilax zeylanica* | Ramdatan | Whole plant | Medicinal | Low |

## Species of High Conservation Significance (REET species)

Through this landscape (Both the core and buffer zone) is quite rich in plant species diversity, it exhibits very low degree of endemism. This may be due to contiguity of landmass with adjacent phytogeographic regions. Nevertheless a large number of species in this tract are common between Western Ghats, Central Highlands, Chotanagpur and North-East India which signify the past climatic conditions and corridor for floral migration. One of the prominent species in this region, *Hardwickia binata*, locally known as Anjan, can be considered a typical (broad endemic) of Deccan plateau. This tree species is a medium or large deciduous ornamental tree and is a native of India. The tree can be grown from the seeds. The seeds should be soaked in water for 24 hours. Season of seed sowing in nursery on June to July and germinates within 10-35 days and the nursery beds should be prepared in the shade, covered lightly with hay and burnt. The wood is used as timber. The bark yields a fiber used for well ropes. The leaves are used as fodder and green manure. Oleo-resin extracted from the heart wood is used in manufacture of varnishes. *Mucuna prurita* - Endemic species in present study area.

But it can be emphatically said that none of these species are in the Red Data Bok of BSI or has been included under the list of Rare & Endangered, Threatened Plants .Some plant species which require local conservation efforts are as follows. These species has been identified as locally endangered by Govekar, R .

## Locally Endangered species

*(i) Butiea monosperma*
*(ii) Clerodendron serratum*
*(iii) Curculigo orchioides*
*(iv) Curcuma augustifolia*
*(v) Pteroearpus morsupium.*

According to State of Chhattisgarh, C.G. State Medicinal Plant Board list of endangered species, following species are found in study area:

1. *Diospyros peniculato*
2. *Pterocerpus marsupium*
3. *Terminalia arjuna*
4. *Grewia rothi*
5. *Vilex trifolia - Nirgundi - Critically endangered.*

*(http://www.bsienvis.nic.in/FAMILY.htm).*
*(http://www2.wii.gov.in/envis/threatened_plants/Chapter-22.htm)*

# CHAPTER - VII

## Wildlife Conservation And Management Plan

It is evident from the study that there are few plant species of rare & endangered occurrence in the study area of the **Salgi Bauxite Mines Lease Area (CMDC)** there are few animal species within Scheduled-I of the Wild Life (Protection) Act 1972. These species are likely to be affected by mining activities. The existing natural ecosystems in area constituting a rich bio diversity region need protection and further strengthening of conservation efforts. In order to facilitate state forest and wild life department ongoing conservation efforts, policies and measures and additional mitigation measures have been formulated for the proposed project. Keeping in view the Wild Life (Protection) Act 1972 and the rules made there under, Forest conservation Act (1980) and the rules made there under, Biological Diversity Act 2002 & its rule, the National Forest Policy 1988 and the National Wildlife Action Plan (2002-2016) have also been kept in mind while formulating this Wildlife Conservation Plan (WLCP).

**Conservation Plan For Fauna Requires Knowledge On:**

1. Home range of the animal
2. Territorial requirement of the animal
3. Deciding the number of animals to be conserved and accordingly evaluating the carrying capacity of the habitat
4. Conservation is aimed at single species or multiple species
5. Conservation is proposed in a managed ecosystem or an un-managed, natural ecosystem. However, very little knowledge exists on the above parameters of most of the animals.

**Basis of the Conservation Plan**

The proposed conservation plan has been prepared on the basis of the following:

A. Working Plan of Kabirdham,Forest division.

B. Some other references:


- Tikader, BK. 1983. *Threatened Animals of India.* Zoological Survey of India.
- Stracey, PD. 1963. *Wild Life in India, its Conservstion and Control,* Ministry of Food Agriculture, C. D. & CO-OP, Department of Agriculture, Govt. of India, New Delhi.
- Nair, SM. 1992. *Endangerd Animals of India and their Conservation,* National Book Trust, India.
- Singh, SK. 2009. Text Book of Wildlife Management, 2nd Ed. International Book Distributing Company, Lucknow.
- Berwick, SH. And Sharma, VB. 1995. The Development of International Principles and Practices of WILDLIFE RESEARCH AND MANAGEMENT, Asian and American Approaches, Oxford University Press, Delhi.
- Prater, HS. 1980. The Book of Indian Animals, Bombay Natural History Society, Bombay.
- Memon, Vivek. 2009. Mammals of India, A Field Guide, Wildlife Trust of India.
- Tiwari, SK. 1998. National Parks of Madhya Pradesh. APH Publishing Corporation, New Delhi.
- Alfred, JRB.; Ramakrishna and Pradhan, MS. 2006. Validation of threatened Mammals of India. Zoological Survey of India, Kolkata.


Several reasons for the decline of wild life and methods for their conservation are proposed. However, the best method for the conservation of wild life is related directly to the maintenance of ecosystems in their natural condition, allowing their natural development and protection to the wildlife and their habitat. Both these phenomena (ecosystem development and habitat protection) are related to anthropogenic factors. Some of the important anthropogenic factors are listed below:

1. Habitat fragmentation and destruction 2. Man-animal conflict 3. Forest fire
4. Poaching 5. Stake holders' dependence on forest resources
6. Creating awareness amongst forest stake holders

To the above-mentioned factors may be added a non-anthropogenic but important factor:

7. Water scarcity

The plan for wild life conservation with respect to above situations is detailed as under:

## Habitat Management

Habitat component is a simple part or a relatively complex entity regarded as a part, of an area or type of environment in which an organism or biological population normally lives or occurs (Thomas, 1979).

For the existence of an Organism basically three factors viz. food, water and shelter are required. Hence, for wild animals also these basic requirements play important roles in their growth and propagation. Since, all these basic components are exclusively related with their habitats, the management or maintenance or manipulation of the habitats is a major component of the wildlife management. This is the prime responsibility of the wildlife manager. It cannot be ignored as wildlife habitats are presently undergoing tremendous changes primarily by the man for his needs, encroachment of forest land for grazing and agricultural purposes due to mushroom growth in human population, constructing roads and cities etc. Therefore, man's manipulation of environment for his needs or greedy needs is the most prevalent factor affecting wildlife habital and as a consequence the wildlife populations. The man's use of these natural resources in his own way unscientifically caused bad impact on the wildlife. Hence, habitat management/improvement/manipulation and its preservation is as important as wildlife conservation. The wildlife mangager must identify those factors which affect the habitat, specially which do not design or implement for wildlife, and understands the interrelationships between the animal and the habitat.

There are many examples for the manipulated environment to be beneficial or detrimental to wildlife. It is the responsibility of wildlife manager to judge how such practices should be modified of wildlife. Thus, habitat-manipulation acts as an important controlling-factor in the field of wildlife management. The modification done in the habitat as per the requirement and benefit of the wildlife especially for food, water and shelter and area is called habitat-manipulation.

Before starting manipulation, it must be judged that whether there is necessity of manipulation in the particular habitat or not. In case of area, it is very difficult at the present age to enhance it and so it will be better to project the available area from its further shrinkage. In this way, the emphasis should be given on the existing area of the habitat. In general, the habitat-management has basically two objectives:-

(i) To maintain quality habitat to be existed in a natural ecosystem .

(ii) To provide quality habitat where it is deteriorated or where limiting factor/factors have developed.

The following principles of habitat-management should be followed:-

(a) The project should be framed after thorough studies and justification in accordance with the needs of wildlife.

(b) The practices must be evaluated for their effect on other natural resources, land-uses etc. Therefore, the proposed practices should not be against the benefits of other species and natural resources along with the target species.

(c) It should be specified clearly the objective such as to maintain as it is, of, to improve, or alter completety the existing habitat.

(d) The improvement practices must simulate natural conditions/ecosystem perpetuating native flore and fauna,

(e) If tree plantation is needed, the topography of the area must be cared for.

(f) Manipulation should be designed following topographical characteristics of the area.

(g) The project should be practical and economical.

(h) The project must be evaluated at intervals to access its effects and results as well as to fulfilled or not. It should not be forgotten that the faulty habitat-manipulation gives harmful and disastrous result in leau of good and beneficial output.

In general, the Plants of any place are the resultant of climate, soil, moisture and biotic factors of that very place. Hence, these factors determine the quality and quantity of food. For the manipulation, the projects should be designed to improve the habital for wildlife; seed mixtures should be used rather than straight browse or grass plantings. Native ranges containing a wide choice of grass, browse etc. usually support the most abundant wildlife-population. Therefore, habitat-management projects should be designed not only to increase the quantity of grass, browse etc. but to provide a well-balanced variety as well. Hence, to access the condition, quality and character of the existing plants and their improvement in a habitat, is primary basic steps of wildlife management. Before the management/manipulation of the habitat, it is important to find out or access the necessities of the all types of plants available in that habitat. For example, some animals eat only fruits and seeds, some depend upon grass, and some take grass and leaves of the bushes. In this way, their requirements are different and, therefore, the condition of the habital or the animals depends upon each other. Judging the situation of the habitats, it is essential to manipulate them as per the needs of the wildlife. For the purpose, control-burning and control-grazing are must through which germination of the seeds and growths of the plants are assured. Likewise, afforestation and introduction of fodder species, wherever needed, are essential taking into consideration the suitability of the wild animals. The above objectives should be brought about following the principles such as:-

(a) Reduction of other competitive plants to allow moisture and soil nutrients for the planted seeds.

(b) Elimination or control of grazing by livestocks.

(c) Terrain and soil should be suitable to support the desired forage species.

(d) Plantation of adopted species and strains.

(e) Plantation of mixture (mixed species) because it supports different species on the site conditions to which they are best suited.

(f) Use of sufficient seeds to ensure a stand.

(g) Proper planting and coverage of seed is essential.

(h) Seeding and plantation should be in proper time.

(i) Control-burning and control-grazing.

Food is the most important basic need of the animal.Hence, 'improvement of food production' is the most frequently used technique to manipulate the habitat of wildlife.

(i) Production of Edible Fruits and Seeds (ii) Control-grazing (iii) Control-Burning

(2) WATER IMPROVEMENT

The requirement of water is one of the basic needs of wild animals, though its consumption varies in accordance with the species concerned. Some species require it daily, some at intervals while some do not. But majority require it daily. Therefore, the availability of water source (waterholes) in the habitat is very essential throughout the year. If it is not found it sufficient quantity, the wild animals will be unable to live in that particular habitat, their number will deplete and even cases of death will occur. Hence, water affects density of the animal's population and, therefore, the management and maintenance of waterholes is an important tool in habitat-improvement in the field of wildlife management. Generally, it has been seen that even after the availability of sufficient food and shelter, there is insufficient number of the species or occurrence of death in the habitat showing the reason of lacking of sufficient waterholes. Such occurrence is apparent in pinchperiod specially in the summer.

To be big in size or quantity of the waterholes is not very essential but its distribution and numbers in the habitat matter a lot. For instance, if there is very less number of waterholes in the habitat; there will be great pressure and gathering of wid animals around it causing hard intra and interspecific competition among them. Near the wate source, there will be crowd of the animals beyond its carrying-capacity. There will be over-utilzation of food and shelter around it, causing its destruction; while the other parts of the habitat will remain untouched or under-utilized. As the resultant, the animals will come under psychological pressure due to over-crowding hampering their productivity. This will also cause diseases due to dirtyness of the waterholes being more and more utilized beyond its capacity and, thus, the whole populations of the area may vanish. Only existence of a population is essential and important. Therefore, management of evenly and properly distributiaon of waterholes in sufficient numbers throughout the year in the habitat is very essential. Keeping this view,

There should be at least one waterhole in each home-range for the animals which require water daily or regularly; for others, it may be at distinct places serving their requirement. The proper management of waterholes in sufficient number increases the Carrying-Capacity of habitat and its, proper utilization as a whole. For the purpose, maintenance of natural waterholes and development of artificial waterholes are must. Following are the methods of improving waterholes for wildlife:-

(a) Maintenance of Natural Waterholes

Natural waterholes can be maintained and improved as follows:-

(j) Natural Waterholes: Natural waterholes are often found in nallas and rocky areas where run-off water is accumulated in depressions. At times, such holes can be improved by deepening the catchments or by trenching run-off water directly to the basin. The arrangement should be done to make it available to the wildlife.

The improvement techniques of the natural water sources should be done under the guidance of experienced and expertized persons, otherwise the result may lead to damaging stage.

(ii) Seeping: Somewhere in natural condition, it is seen that water is coming out drop by drop through a particular space. Such water cannot be utilized by the wildlife. Such water can be collected in a artificially made ditch/tank by applying devices like through hollow bomboo or pipe catching those seeping water, Such collected water will be beneficial and utilzable to the wildlife serving their purpose.

(b) Development of Artificial Waterholes

Artificial waterholes are developed by adopting following measures:-

(i) Reservoirs and Ponds (ii) Water Catchments (iii) Other Water Developments

(c) Soil & Water Conservation

From habitat improvement point of view, it is important to take care simulataneously for soil-conservation and water-conservation. It is essential to maintain eco-balance of the habitat as soil is the prime natural base for the development of vegetation. Soil is one of the factors determining the kinds and growth of the plant of a place as stated earlier for which water is also essential. Hence, their conservation is the

conservation and propagation of forest, plants and all types of vegetations and ultimately to the wild animals. By planting suitable tree, fodder, grass and other species in the habitat; soil and water should be conserved. This will also solve water and food problem of wildlife. In addition, formation of check-dams and other suitable devices are also necessary to prevent soil-erosion and run-off of water.

(d) Wetland Development

**(3) SHELTER IMPROMENT**

Shelter or cover is also a basic fundamental need like food and water for wildlife and acts a limiting-factor for them as described earlier. Shelter varies differently for different kinds of species and, hence, it is species-specific in case of wild animals. Therefore, the management technique should be accessed and applied as per the need of the target species. Moreover, it should be tagged, if possible, with the food improvement technique as the foods plants may be suitable covers also for the animal. Hence, selection of food plants and its improvement should be done carefully and wisefully. The various artificial measures for shelter/cover improvement are as follows:-

(a) Development of Natural Shelter: We know that in nature, there is cycle of plant succession. The phenomenon is continuous and contiguous process in its own way unless and until it is manipulated by the human-beings/as stated earlier in detail, management should be like that particular stage and caon be retarded or retained for longer desired period so that it may be helpful for the target species for its proper growth and propagation. In this way, the desired shelter/cover may be obtained for wildlife.

Hence in general, it can be concluded two cases in natural-cover development such as:-

(i)If the plant succession is in favourable direction for the target species; then it should be enhanced in the habitat by applying measures such as fire-protection, control-grazing, plantation of suitable species, if required and so on.

(ii)If a particular stage of succession itself is beneficial for target species; then measures for manipulation should be applied to retain that particular stage of the succession such as felling, grazing, control-burning, changes in the silvicultural operations etc.

(b)Development of Artificial Shelter:

(i)Plantation of Trees (Afforestation/Reforestation):

(ii) Caves and Rock-cliff Sheltrs:

(iii) Development of Brush-piles:

(iv)Development of Travel-route Cover:

(v)Artificial Nesting:

(vi)Modification in Silvicultural Operations:

The following general facts must be considered in silvicultural practices:-

(a) Felling of shade and fruit trees should be stopped as far as possible.
(b) There should be always mixed-species plantation to meet the various foods-chains of various wild animals.
(c) The felling of coups should be in such a way that they may given maximum core-effects to the wild animals resulting highest interspersion and juxtaposition for them.
(d) After felling and trading operations, the left-out parts of the trees should be arranged in the form or brush-piles to provide shelter for certain small wild animals and birds.
(e) There should not be felling etc. at night to maintain the privacy of wild animals.
(f) As far possible, the interference at the waterholes should be avoided.
(g) There should not be interruption near the riparian zone as well as shelters like caves and rock-cliffs.
(h) The trees having youngones and eggs in the nests should be left untouched, and besides these at least 10 more trees should be left unfelled at certain destances for the purpose of roosting-cover.
(i) At least, five snag trees per hectare should be left for protection and propagation purposes of wild animals.

**Prevention of Forest Fire**

Fire management is an important component of babitat-management. It is the most disastrous in the forest as it results in much harm to the wild flora and fauna. It causes damage to the habital of the wild animals destroying its food and shelter, forest crop, regeneration, productivity of forest and soil. Hence, wildlife is caused excessive loss by the fire by burning their eggs, young ones and the habitat. As a result, the equilibrium of the nature becomes upset. Fire may be intentional or natural. Actually, all forest fires are man-made so as to facilitate grazing, collection of forest produces etc.

Forest fire is caused both naturally as well as by the human beings. Forest fire in late winter and early summer is a major threat to the wildlife. Severity, frequency and expanse of the fire affect the wildlife, ground and shrub flora, small animals, soil erosion and regeneration of the vegetation. Most of the animals hiding in the litter are burntto death, causing great loss to the biodiversity. Burning of the litter exposes the soil surface to the torrential monsoonal rains causing significant erosion of the soil, making it thin and thinnerand exposing the bed rock, which is unable to support a good growth of vegetation. Most common reason of forest fire is setting fire to the litter for the collection of N.T.F.P. like Mahua flower and fruit, sal seed, seeds of achar, kusum, harra, beheda, bhilwa etc. Anthropogenic causes will be minimized through forming a fire line around the forest area. To add tothe prevention of fire local persons will be employed as fire guards, during the fire prone season.The team will be instructed to fight the fire as soon as it is detected. Watch towers will also be constructed to detect forest fire. Awareness program against forest fire will also be run in adjoining villages.

**Management Prescriptions For Fire Protection**

The forest fires along-with unregulated razing have been acknowledged as the main causes of degradations of forest eco-systems and wildlife habitat. It directly affects the fodder availability and also kills the helpless wild animals especially the micro-fauna, reptiles, etc. It also exposes the soil to erosion and, hence, causes habitat degradation in the process. Due to deciduous nature of the forests, the grasses, weeds and falling leaves and twigs forms a thick layer of undergrowth which is highly inflammable in nature. The availability of water also becomes scarce during summers causing further hardships in its timely check and control.

The Fire lines are classified into, the following, categories in order of priority.

i. **A -Class Fire lines:** These Fire lines comprise of the external boundary These are the prominent Fire lines, which should be prescribed for clearing, burning and maintenance every year on priority basis.

ii. **B -Class Fire lines:** These Fire lines includes internal boundaries and roads. These Fire lines should also be prescribed for clearing, burning and maintenance, every year.

iii. **C -Class Fire lines:** It includes the remaining Fire lines including the internal boundaries of compartments and coupe lines.

**Weed Management**

*"A weed is a plant growing at place where it is not desired"* -Jethro Tail (1731) was the first person to use the word weed in their sense in literature in his famous writing on house hold husbandry. Some define that weeds are plants growing in a place and at times when we wanted either some other plants to grow or no plants to grow at all. So long as a plant species is growing without interfering with management affairs at a place and time it is not considered as a weed. In other words, while all weeds are unwanted, all unwanted plants may not be the weed.

Alien species are non-native or exotic organisms that occur outside their natural adapted ranges and dispersal potential. Many alien species support our forestry systems in a big way. However, some of the alien species become invasive when they are introduced deliberately or unintentionally outside their natural habitats into new areas where they express the capability to establish, invade and out compete native species.

International Union for Conservation of Nature and natural Resources (IUCN) defines alien Invasive Species as an alien species, which becomes established in natural or semi natural ecosystems or habitat, an agent of change, and threatens native biological diversity. These invasive are widely distributed in all kinds of ecosystems throughout the world and include all categories of living organisms. Nevertheless, plants, mammals and insects comprise the most common types of invasive alien species in terrestrial environments.

The threat to biodiversity due to invasive alien species is considered second only to that of habitat destruction. Invasive species cause loss of biodiversity including species extinctions and change in hydrology and ecosystem function. Differences between native and exotic plant species in their requirements and modes of resource acquisition and consumption may cause a change in soil structure, its profile, decomposition, nutrient content of soil, moisture availability, etc. Invasive species are thus a serious hindrance to conservation and sustainable use of biodiversity, with significant undesirable impacts on the goods and services provided by ecosystems.

Biological invasions now operate on a global scale and will undergo rapid increase in this century due to interaction with other changes such as increasing globalization of markets, rise in global trade, travel and tourism. For effective management of invasive species, knowledge about their ecology, morphology, phenology, reproductive biology, physiology and phytochemistry is essential.

About 40% of the species in the Indian flora are alien, of which 25% of invasive which includes - *Parthenium hysterophorus, Eupatorium adenophorum, Eupatorium odoratum, Mikanio micrantha, Ageratum conyzoides, Galinsoga parviflora, Ipomea species* etc. The weed found in study area are Shrubby weed i.e. Chhind Grass and other herbaceous weed like Parthenium. *Eupatorium, Ageraturn, Cassiatora, Hyptis suaveolens* etc.

**Elimination of Man-Animal Conflicts**

Man-animal conflict is a difficult problem to be eliminated. The conflict is both deliberate as well as inadvertent. Several animals like, wild boar, nilgai and spotted deer cause extensive damage to crops.

There is a considerable loss of agricultural crops by the wild animals such as nilgai, wild boar, chital and other ungulates. No compensation is paid to villagers for the loss of their agricultural crops. These losses to villagers living close to forests and particularly close to forest result in non-participation in conservation efforts.

Non-payment of compensation for the crop damage is a matter of great concern for the farmers. There is a constant demand by the farmers to pay cash compensation for their crop damage.

Crop raiding by the wildlife can be prevented provided the wildlife is contained within the forests. In most cases, wild animals move out of forests in search of water and food. Therefore, forests should have enough water and food resources well distributed within the forest boundary.

Crop damage by wild animals can also be prevented by restricting their movement out of the forest by creating different kind fencing.

**Prevention of Poaching**

Poaching is undoubtedly a serious problem in the conservation of wild life. Poaching is premeditated, an organized crime. Poaching starts from the local people and may end at an international level. Poaching cannot be operated without the help of local people most of which are the tribes, because they only have the knowledge about the location of the animals. Several methods are employed by the poachers, to kill or trap the wild life, of which poisoning and traps of different types are more common. Traps are often homemade eluding the forest officer's detection. Poachers can apply even electrocution by using connection from the power line passing from the area. Poaching links sometimes are extended to international level. A proper vigilance will be maintained to check such menace. Poaching menace will be eliminated seriously neither all the efforts to promote wild life survival in the area will go to waste. This will be achieved through employing, properly equipped like with Walkie-takie, two ex-army jawans to assist the forest officers.

**Reducing Stake Holder's Dependence On Forest Produce**

People from adjoining villages have already exploited the forest to the extent that the forests have become a grazing land or a source of fuel wood. Timber and medicinal species have either disappeared or have become scarce. However, regenerating the forest will again attract the villagers towards the forest. To keep the people away from the forest their economic condition will be improved. This will be achieved through financial and technical help to develop Dairy, Poultry, Vegetable cultivation, Horticulture and Agro-forestry. Promotion of agro-forestry, in particular, will reduce their dependence on forests for timber as well as for fuel wood.

**Creating Awareness Amongst Forest Stake Holders**

Awareness about the environment and wild life will be created amongst the adjoining villages. They will be informed about the importance of a good environment, a healthy ecosystem and more importantly about the wild life. Through slide and film shows they will be convinced about the sustenance of natural ecosystems. They will be convinced that their own survival depends upon the survival of a healthy ecosystem, to which a wide variety of wild life is an essential component. To develop affection of the people towards the wild life some of them will be taken to some zoos and wild life sanctuaries. Awareness programs will be run with the help of Forest Officers and more importantly some national experts will be invited to deliver talks awareness, related to wildlife conservation.

**Restriction of Grazing**

Illegal grazing is a serious problem in the area. There is a large population of cattle of local breed, mostly the cows. These cows of very small size are of little use either in agriculture or milk production. They are all driven to the forests in the morning and gathered back in the evening, these are serious threats to the forests,causing degradation of forests through trampling and browsing away the newly sprouting saplings.

Trampling not only results in killing the saplings but also causes compaction of the soil, reducing water infiltration, increasing surface run off and consequently the erosion of soil. Transmission of diseases from cattle to wildlife can cause depletion of wiping out the wildlife of the area. Waterholes will be constructed outside the plain area for exclusive parties will check and stop the entry and illegal grazing of cattle in the area. Heavy grazing not only reduces the herbaceous cover but brings about compaction of the soil also. It also favours the growth of non-palatable, unwanted weeds like *Chhind Grass, Parthenium, Hyptis suaveolens, Plectranthus incanus, Ageratum conyzoides* and so on. Such weeds will be uprooted and eradicated, preferably before their flowering and fruiting, to promote the growth of fodder grasses.

**Training And Awareness Programme**

This is the most important aspect of wild life conservation. People will be educated regarding the importance of wild life conservation through mass publicity by installing sign-boards, conducting audio visual classes and distributing literature in respective villages in the buffer zone. Experts in the field of wild life conservation will also be invited to deliver talks through slides.

**Creation of conservation awareness**

What if a few species of wildlife become endangered or extinct? How are we concerned if the Indian Cheetah has been lost forever or the Asiatic lion is precariously perched on the verge of extinction? Why should we spend crores of rupees to protect the tiger? The answers to these questions of "what", "how" and why" should form the basis for creating conservation awareness among the public- an understanding of the importance of biological diversity of inter-relationships in nature, of the sustenance and stability of ecosystems and of man's impact on the natural world.

## Sign boards

Wild life protection will be most effective if the young once like the school children are thought and involved in it. To begin with sign boards with images of wild life will be placed near the village schools as well as at places of more occurrence or more conflicts of any particular species of the wildlife.

## Working Plan Prescriptions

The study area falls in the Kawardha Forest Division. Working plans, prepared now a day, have have more ecologically systemic approach as compared to earlier reports which had more emphasis on exploitation of the forest products for economic gains. Working plans have several circles but one related to wildlife conservation is the "Wildlife and Bio-diversity Conservation Working Circle.
Main objectives of the circle are :

- Conservation and Propagation of Biodiversity
- Increase density of forest crop
- Soil & water conservation
- Improve habitat for wildlife
- Conservation and propagation of endangered species
- Provide special protection to plants of medicinal value
- Involve fringe villagers for active co-operation in Eco development.

However, it is worth mentioning that none of the presently proposed impact areas fall under areas marked by the circle for special biodiversity treatment.

For wildlife conservation, the areas have been divided in to three zones as follows:

- P-I High presence of wildlife
- P-II Medium level presence of wildlife
- P-III Minimum level presence of wildlife

Presently proposed impact areas fall almost entirely under P-III. General objectives of these areas is to develop them in a way so that they can support wildlife in the future.

**Wildlife Conservation Philosophy**

The natural habitats and the Wildlife being supported by them are quite vulnerable now-a-days because of various biotic pressures. It has been an endeavor of the Authors to adopt such a philosophy which would help in attaining the conservation of forests in general and fauna in particular.

Wildlife Conservation Plan, inter-alia, includes Habitat Improvement, Water Management besides the efforts for the Socio-Economic Development of the local populace including creation of awareness for Bio-Diversity Conservation amongst them.

# CHAPTER - VIII

PRESCRIPTION FOR CONVERSATION OF FLORA, FAUNA AND WILDLIFE MANAGEMENT

The program for conservation of flora, fauna and wildlife management are vast ones and there are one of the major activities of the Forest Department. These works are taken up with funds received from State Government, Government of India and various other funding agencies like World Bank, UNDP, CAMPA etc. Here the main consideration is that, due to this expansion of industry the area will be opened up increasing the chances of disturbances and will destroy the calmness of the area causing stress and panic amongst the wildlife. Hence, project proponent should attend to these and should provide necessary funds to mitigate these.

Because of the fact that the buffer zone area is visited by elephants, the area has become extra sensitive. Here the mitigation measure should not only consider the threats to flora and in particular to fauna but should also tackle the problem to elephant menace. The buffer zone area is new to elephant thus man-animal conflicts may arise in this area. Keeping the above facts in view, the mitigation measures can be considered in two parts. First part will be about the threat to the wildlife and how to overcome it. The second part will be about how to tackle and to minimize the elephant menace. For protection, conservation and management of wildlife including elephant, the initiatives as here-in after suggested appear necessary.

**Habitat Improvement**

For the existence of an organism basically three factors, viz, food, water and shelter are required. Hence for the wild animals also, these basic requirements play important roles in their growth and propagation. Since all these basic components are exclusively related to their habitats, the management and maintenance or manipulation of the habitat is major component of wildlife management.

Elephants are described by ecologist as a **"keystone" species.** Keystone species are those animal species which are used to indicate the general condition of the habitat. The elephant being a huge animal, not only requires large quantities of food, but also good and nutritious food. If elephants are living in a particular habitat, it would indicate the availability of a diverse and nutritious range of plant species. This would be a suitable condition for many smaller herbivores also. A large herbivore population would support a healthy carnivore population also. And show the elephant is a good indicator of the health of the habitat. A habitat that is good for elephants is considered good for many other herbivores and also carnivores such as panther.

In Chhattisgarh the increasing number of elephants and their residing, roaming and breeding in the forest area demonstrates that the habitat in this area are excellent. So in the present plan there is no requirement for further improvement of habitat and therefore no need for any budgetary allocation specifically for habitat improvement.

Moreover, for the development of water facilities, soil moisture conservation, afforestation of fruit bearing trees and fodder development, sufficient budgets are available in forest department under different heads as sanctioned by the State Government. Chhattisgarh Government has floated the innovative and prestigious scheme of Narua Garwa for improvement of water facilities and soil conservation.

**Development of Water Sources and Water Holes :**

Water replenishment is essential for all wild animals. Presence of abundant food in a habitat is rendered useless if water is not available in close proximity. A habitat becomes poor from the wildlife point of view if it is devoid of water source. Good wildlife areas should have well distributed water points. Many wild animals love to have bath or swim across large water bodies like river, rivulet and nala during summer or wallow in mud. This is more pronounced in case of Spoted dear, amphibious, wild boors etc. At time failure of rains makes things more difficult for wild animals. Hence, alternative artificial water harvesting structure water holes, tank need to be created.

**Fire Protection**

The damage caused by forest fires is well known and there is urgent need for strict fire protection. The legal provisions for fire protection is reserve forests are given in Fire Protection Rules as notified under Indian Forest Act and for protected forests in Rule 6 of Chhattisgarh Protected Forest Rules, 1960. The following areas are specially protected areas-

| | | | |
|---|---|---|---|
| i) | Regeneration and treated areas | - | 5 years |
| ii) | Plantations | - | 5 years |
| Iii) | Flowered Bamboo areas | - | 7 years |
| Iv) | Experiment / Preservation plots. | | |

Every year annual fire protections scheme is to be prepared classifying areas as under:-

- Very sensitive areas
- Moderately sensitive areas
- Less sensitive areas.

The scheme is to contain work schedule for -

i) cleaning and maintenance of existing external and internal fire lines.
ii) propose fire lines
iii) fire watchers – number and their work
iv) Requirement of fire fighting equipments
v) Extension and publicity for protection and demonstration for use of equipments.

All the forest fires should be properly attended to and should be extinguished at earliest.

**Measures to reduce Human-Elephant conflict**

In Chhattisgarh more than 305 elephants, in a number of groups, are roaming and residing in the different regions within the State. From last two years Kawardha Forest Division is also visited by elephants. The area is new thus human- animal conflicts may arise in the area.

In Human - Elephant conflict, Elephant kills the human and destroy the properties, Crops, houses etc. So, to save their crop from destruction, farmer often use brutal methods like fireworks, poison and electrocuted fences. The death of a pregnant elephant in Kerala in first week of June after biting into a "Snare bomb" - a pineapple filled with crackers -sparked national outrage but it also brought home the ugly realties of human-elephant conflict.

Following measures are suggested to reduce the human-elephant conflicts:

1. For strengthening of network establishment of control room with one extra room for temporary camp of haanthi mitra dal. Payment of one person- computer operator.
2. Purchase of protective gear, body shield/ armour, boot, dress to handle crisis situation relating to wildlife.
3. Purchase of rescue gear and transportation cages.
4. Awareness creation measures and capacity building of local populace.

# CHAPTER - IX

## FUNDING, IMPLEMENTATION AND MONITORING OF WILDLIFE CONSERVATION PLAN

### Funding of Wildlife Conservation Plan

Financial Forecast of Rs. 45.00 Lakhs for the Plan Period and it would be funded by the Project Proponent.

Funds required for implementation of this WLC Plan would be placed at the disposal of the Implementing Authority, in advance, before the start of the fiscal year.

### Implementation of Wildlife Conservation Plan

Wildlife conservation and habitat protection includes technical and forest management related activities. The Wildlife Conservation Plan is intended to educate communities, mine owners, potentially responsible parties, companies, and other interested groups about how land conservation tools can be used as part of an integrated strategy to remediate and conserve wildlife and forest around mining areas. These sites may pose significant environmental, regulatory, and conflicting development challenges. Forest conservation is the long-term protection and management of well protected as well as under protected land resources, such as open space, wasteland, and forest regeneration land. The Wildlife Conservation Plan includes (1) identify forest land, typology and conservation and discusses how land conservation tools can support the restoration of lands; (2) reviews potential benefits associated with land conservation; and (3) evaluates conditions under which land conservation tools can best facilitate the restoration of lands around the proposed mines. In view, the above task need for professional expertise and regulatory body it is advised that state forest department may be requested to take responsibility to implement the wildlife conservation plan related activity.

The only agency that has this expertise is Forest Department of Chhattisgarh. Forest department has lot of trained forest officials and field staff who can effectively manage the conservation program. The Forest Department has close link with the Joint Forest Management Committees of the villages in which the management activities will be implemented.

## Wildlife Conservation Monitoring System

Monitoring is the systematic collection, analysis and use of information from projects and program. Based on this information, it can be determined whether any changes need to be made at a project, program or policy level, and if so, what they are, what went well, where is there room for improvement. Since Conservation and habitat analysis is crucial to understand changes in a species' demographics, one competent third-party Monitoring Agency under the guidelines and supervision of "**Chief Wildlife Warden, Government of Chhattisgarh**" may be engaged to collect periodical data based on criteria and indicator and handle the various data of the proposed conservation and habitat and create visual depictions gives the user the ability to monitor change and discover important relationships. Understanding threatened species is important in preventing their extinction and revitalizing their populations. The Wildlife Conservation Monitoring System will provide the platform for agencies to collect and share information on the trends and patterns of wildlife conservation. Selected information will be shared with the public for bringing awareness about wildlife crime. Monitoring agency will keep a track of any habitat loss, and human disruptions, such as pollution and deforestation which can cause wildlife fragmentation and extinction and threaten the biodiversity of the area.

Management plans are dynamic documents that will be evaluated and updated periodically. Evaluations will be made annually for each compartment so that effective practices can continue to be implemented, while those that produce few or no results can be modified or discarded. Recording impacts of management efforts on compartment sheets is important in helping to evaluate the effectiveness of certain management practices. Keeping a log book of observations and changes that occur in compartments can also provide valuable information for evaluating management efforts. Monitoring will ensure that mitigation plans are working effectively. Monitoring also includes assessment of compliance against regulatory requirements and other agreed performance standards. Monitoring will help to identify areas of non-compliance and suggest for corrective action.

# CHAPTER - X

## BUDGET PROVISION FOR WILDLIFE CONSERVATION AND MANAGEMENT PLAN

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

### Salgi Bauxite Mines Lease Area

### Plan Period - Five Years

| S. No. | Description of the Item of Work | Year Wise Budget Provisions (₹ Lakh) | | | | | Total ₹Lakhs |
|---|---|---|---|---|---|---|---|
| | | 1st | 2nd | 3rd | 4th | 5th | |
| 1. | Construction of new water tank if catchment is there or deepening or renovation of old tank. | 10.00 | - | - | - | - | 10.00 |
| 2. | Fire protection | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 5.00 |
| 3. | For strengthening of network establishment of control room with one extra room for temporary camp of haanthi mitra dal. Payment of one person- computer operator. | 4.00 | 1.50 | 1.50 | 1.50 | 1.50 | 10.00 |
| 4. | Purchase of protective gear, body shield/armour, boot, dress to handle crisis situation relating to wildlife. | 6.00 | 4.00 | - | - | - | 10.00 |
| 5. | Purchase of rescue gear and transportation cages. | 5.00 | - | - | - | - | 5.00 |
| 6. | Awareness creation measures and capacity building of local populace. | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 5.00 |
| | **Total** | **27.00** | **7.50** | **3.50** | **3.50** | **3.50** | **45.00** |

Sub Divisional Officer
Kawardha

Divisional Forest Officer
Kawardha Division

Chief Conservator of Forest (T)
Durg Circle, Durg (C.G.)

# CHAPTER - XI

## IMPACT ASSESSMENT OF PROPOSED MINING ON FLORA & FAUNA

The biodiversity assessment & conservation plan is sustainable use of natural resources which involves scientific management of natural wealth vis-à-vis developmental activities that are likely to affect the natural resources. The threat to natural ecosystems generally arise due to anthropogenic activities that arise as a result of mining and other associated activities.

Impacts on ecological environment, which directly or indirectly affect the species composition of the area may be as follows:-

1. The entire vegetation will disappear in the mining area, waste dumps, overburden, road construction and infrastructure development.
2. Settleable dust pollution is a major threat to the vegetation in the core as well as buffer zone area.
3. The fauna, though very sparse, in the vicinity of mine may be displaced and will search new habitations.
4. Localized landscape alteration, and topography change may occur to some extent.
5. Drainage system may be affected to some extent.

**Environmental Impact**

It is an irrefutable scientific fact that there cannot be any developmental or industrial and mining activity which is completely devoid of causing any environmental impact. Mining sectors too are no exception to that. However, it is also a fact that environment is a dynamic entity and has a built-in self-renewal process that can level the extrinsic impact within reasonable limits. Moreover, biodiversity is a resilient entity of the environment and can tolerate impacts and recuperate if their renewal mechanisms are unaffected over a long period of time. Therefore focus should be laid on ensuring that the renewal dynamics of various floral and faunal taxa is not impeded by the mining Industry.

A total area of 33% will be developed under greenbelt development/ plantation in and all around the Mine site. The improvement in agricultural production will also increase the vegetal cover. This coupled with Greenbelt development/ plantation is a favourable and eco-friendly measure to reduce the impact of the proposed capacity enhancement of mine on the biodiversity of the area. The species planted so far are *Azadirachta indica* (Neem), *Terminalia tomentosa* (Saja), *Terminalia arjuna* (Arjun), *Cassia fistula* (Amaltas), *Delonix regia* (Gulmohar), *Ficus spp*. (Bargad, hairy fig), *Mangifera indica* (Mango), *Phyllanthus emblica* (Amla), *Psidium guajava* (Amrud) etc. The plant species will be selected as per CPCB guidelines.

Adequate measures are being/ adopted as a part of the Environmental Management Plan (EMP) to prevent entrainment of fugitive dust emissions. Thus, adverse impacts due to fugitive emissions are not expected to be significant.

This requires sensitization of all levels of stakeholders involved in the process of development to realize the importance of biodiversity and the role biodiversity in maintaining an ecological balance. Practically this can be achieved by:

1. Inviting locals for participatory management & conservation of local biodiversity through training programs linking biodiversity to livelihood.
2. Scaling up the Green Belt development in and around the mine lease area.
3. Controlling the fugitive emissions and other airborne pollutants by appropriate technology at point source.
4. Adherence to the strategies outlined in the EMP.
5. Water sprinkler would be used on connecting road for transportation of material in operation phase to control fugitive emission in surrounding environment.
6. Paved road would be use for transportation to minimize fugitive emission.
7. Transported material and place of store of raw material will be well covered.
8. Transport vehicles and machinery would be properly maintained and periodically check pollution level to reduce noise level and gaseous emission in surrounding environment.
9. Emission of particulate matter during operation phase will be controlled at source by using particulate matter control devices as per CPCB guidelines.
10. Create a live hedge of sturdy woody shrubs along the periphery of mine that would restrict the wildlife to enter into mine site.

**Biological Impact**

No significant impact on biodiversity is anticipated from existing mining due to effective management plan. The vegetation is very sparsely and scanty in core zone, but due to presence of Reserve forests in buffer zone, biodiversity of the study area is moderately rich. There is no perennial and seasonal surface water body passing through mine lease area. However, in the buffer zone Manai Nadi, Litari Nadi in North-Western Part and Hanp River in East-Northern region exists in the study area.

Core area of the mine site has low density of plant species. Some trees being cut for the bauxit mining activity. Gaseous emission like SOx, NOx, CO and Particulate matter may affect both flora and fauna in the surrounding environment. These gases may deteriorate the chlorophyll content of plant. Some plant specifies are very sensitive to the concentration of gases in the environment and cannot survive in higher concentration. The Carbon Monoxide is reacting with Hemoglobin of blood of animal and affects carrying capacity of oxygen to organs. These gases are cause of health related issues in animals at particular concentration.

**Pollution Impact**

Noise pollution and ground vibration can affect the behavior of animals and may lead to habitat disintegration. If, Hazardous wastes, solid wastes and waste water are not disposed and treated accordingly, they may lead to fouling of environment resulting negatively on floral and faunal species.

The higher particular concentration of gaseous emissions and particulate matters may cause migration of wild animals and birds. The fugitive emissions, which are expected to be generated during the mining operation, are likely to settle down in the mining lease. There are three perennial water body at sufficient distance from mine lease area; accept this no specific perennial water bodies within the 10 km radius of the lease area, which could possibly be impacted by the fugitive emission in terms of increased turbidity and Total Solid content. However, the terrestrial flora will also be impacted. The settlement of these fine particles on the laminar surface of plants can impede the efficiency of photo-synthesis and thereby affects the productivity of plants. In some of the plants, it may smother the leaf surface thus blocking stomata, resulting in reduced transpiration.

There are low density of wildlife in the buffer area of mine lease area. The area does not fall in any part of National Park or Wildlife sanctuary but the buffer zone area falling in Madhya Pradesh have some area of Phen Wildlife Sanctuary and Kanha-Achanakmar Tiger Corridor Area. During biodiversity assessment in a reserve forest it was revealed that there lies thin wild life habitation. Six Schedule-1 species were recorded in the buffer zone of project area during the biodiversity assessment, which belongs to schedule-1 species of wild life protection act-1972.

However, speculations on the likely impact of the mining activity on the movement of some resident faunal species need to be examined and addressed. Noise and vibration will be generated because of blasting which may scare the wild fauna of the nearby forests patches and force them to migrate to other areas. After expansion of existing mine, the emission of toxic gases in the environment may badly affect the terrestrial and aquatic animals due to change in composition of the elements. Migratory birds may be affected due to increase pollution level and lighting beam in or around the industrial and mining activities. The migratory route of birds will be affected and habitation of birds will be disturbed from the topographical changes, construction and blasting activities.

From the results of air pollutant dispersion modeling, it was found that the SPM concentration will have negligible effect beyond a distance of 2.1 km from site. As Reserve forests are located within the distance of 0.5km from the mining lease boundary, there will be some effect of emissions on the flora & fauna in the forest area due to mining activities of bauxit mining activity. Whenever the bauxit mine will be in operated with full enhanced production; it will be having little impact on the surrounding biodiversity as proper mitigation measures have been taken up to control the fugitive and other emissions. **Salgi Bauxite Mines Lease Area (CMDC)** are being developing greenbelt to control fugitive and other emissions as well as for controlling noise pollution impact on surrounding environment. Thus the impact on biodiversity due to mining will not be significant. Effective Environment Management Plan and proper mitigation measures will be adopted as per CPCB guidelines to reduce the impacts.

**Ecosystem Impact**

The human influence on biodiversity and ecosystem functioning have largely taken in the form of rapid, large and frequent changes in land and resource use, increased frequency of biotic invasion, reduction in species number, creation of stresses and the potential for changes in climatic systems. Such changes have a direct impact through habitat destruction and over- exploitation of resources such as overgrazing and indirect impact through their impact on the composition of the atmosphere and climate. Increasing anthropogenic pressure on forest over the few decades has led to vast exploitation of natural flora. Anthropogenic disturbances play an important role in change, loss or maintenance of plant biodiversity and more recent phenomenon of climate change will also be responsible for the change in species composition and other ecosystem activities. The anthropogenic disturbances occur in form of grazing, browsing, lopping of tree for fuel wood and fodder, fire, deforestation etc. Both natural and human caused disturbances are considered since vegetation responses do not distinguish between natural and human activities. These biotic pressures play an important role in forest community dynamics and regulate the regeneration ability of a species.

**Impacts on Biodiversity**

There are no direct or indirect evidence of presence of any major wildlife in the core zone. The area does not fall in any part of National Park or Wildlife sanctuary, though there are three reserve forests. However, speculations on the likely impact of the mining activity on the movement of some resident faunal species need be examined and addressed.

Due to operation of existing mine; there seems to be little impact on the surrounding biodiversity as proper mitigation measures are taken up to control fugitive and other emission. Also green belt/ plantation has done in and around the mine lease area. Mitigation measures as per CPCB guidelines will be adopted to reduce impact after expansion of the mining production capacity.

Increasing anthropogenic pressure on forest over the few decades has led to vast exploitation of natural flora. Anthropogenic disturbances play an important role in change, loss or maintenance of plant biodiversity and more recent phenomenon of climate change will also be responsible for the change in species composition and other ecosystem activities. The anthropogenic disturbances occur in form of grazing, browsing, lopping of tree for fuel wood and fodder, fire, deforestation etc. Both natural and human caused disturbances are considered since vegetation responses do not distinguish between natural and human activities. These biotic pressures play an important role in forest community dynamics and regulate the regeneration ability of a species. The human influence on biodiversity and ecosystem functioning have largely taken in the form of rapid, large and frequent changes in land and resource use, increased frequency of biotic invasion, reduction in species number, creation of stresses and the potential for changes in climatic systems. Such changes have a direct impact through habitat destruction and over-exploitation of resources such as overgrazing and indirect impact through their impact on the composition of the atmosphere and climate.

**Proposed steps & strategies to minimize mining effects :**

Biological environment: - The mining bauxit area is located in the private and revenue areas, with almost scanty trees. But even then the mining operation will begin with the extraction of existing vegetation growing over the proposed mining pit area & dumping area. The impact of all these activities may not be respected to its earmarked area of mining, but will also affect the flora and fauna in around and close vicinity. In order to mitigate and minimize the mining effect arising due to mining operation, especially after the removal of existing vegetation, various activities and stetgies will be adopted. To minimize the impacts like air pollution, noise pollution, soil erosion, water loss and dump menace the steps taken will be as follows :-

1) Safety zone development
2) Shelterbelt plantations
3) Greenbelt management
4) Rehabilitation of exhausted mining pits
5) Dump stabilization
6) Habitat improvement in vicinity
7) Awareness programme
8) Water conservation measures.

**Dump management :**

Waste materials will be dumped within the core area of the project the exact location of which has already been mentioned in mining plan. It is suggested to stabilize the dumps by planting the indigenous trees as well as with monocot and leguminous plants, which have fibrous roots and act as good soil binder. It is also proposed that at the toe of each dump two parapet walls will be erected to check the rolling boulders. A trench between two walls is also suggested. It also proposed that proper drainage system will also be developed at the crest of the dumps, and conserving the rain water. Following species are suggested for stabilizing the waste dumps:-

| S.No. | Species | Uses |
|---|---|---|
| 1 | *Dalbergia sisoo* | Timber and fuel |
| 2 | *Terminalia tomentosa* | Timber and fuel |
| 3 | *Syzygium cumini* | Timber and fuel |
| 4 | *Bauhinia varigata* | Fodder and fuel |
| 5 | *Bombax sieba* | Fuel |
| 6 | *Ficus bengalensis* | Timber and fuel |
| 7 | *Ficus religiosa* | Fodder and fuel |
| 8 | *Albizzia lebbek* | Timber and fuel |
| 9 | *Albizzia procera* | Timber and fuel |
| 10 | *Acacia nilotica* | Timber, fuel and Fodder |
| 11 | *Zyzyphus species* | Timber, fuel and Fodder |
| 12 | *Tamarindus indica* | Timber, fuel and Fodder |
| 13 | *Prosopis* | fuel and Fodder |
| 14 | *Grewia* | fuel and Fodder |
| 15 | *Cassia fistula* | fuel and Fodder |
| 16 | *Morus indica* | Timber and fuel |
| 17 | *Neem species* | Timber and fuel |
| 18 | *Moringa* | Fodder and fuel |
| 19 | *Leuceanea leucocephala* | Fodder and fuel |
| 20 | *Eucalyptus* | Fodder and fuel |
| 21 | *Amaltas* | Fuel and ornamental |

**Mitigation planning :**

Though the wild animal's species and floral species are very sparsely distributed in the area but even then suitable water conservation measures needs to be adopted. The following steps are proposed :-

1. All the water bodies in the vicinity will be maintained and improved
2. The reclamation plan will be prepared taking in to account the edaphic, ecological and hydrological considerations.
3. Exhausted mining sites will be developed in such way that these are used for economic benefits of the villagers.
4. It is also proposed that major irritants like high noises, excessive bright light and vibration be kept under strict control.
5. Apart from the above, the issues and strategies are proposed for improving the socio economic status of the people residing with in the buffer zone. Such activities may be infrastructure support programme, economic upliftment programmes and village's empowerment programmes. Some of the activities under this programmes may be as follows:-

   A. Health and family welfare programmes.
   B. Medical camps
   C. Sanitation & disease prevention programmes
   D. Education improvement
   E. Improving water supply etc.
   F. Awareness programme
   G. Cultural development
   H. Villages empowerment

**ANNEXURE - I**

# राज्य स्तरीय विशेषज्ञ मूल्यांकन समिति, छत्तीसगढ़

## भारत सरकार

## पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय

पर्यावास भवन, सेक्टर– 19,
नवा रायपुर अटल नगर, जिला– रायपुर (छ.ग.) 492002
E-mail:seaccg@gmail.com

क. 1099 / एस.ई.ए.सी., छ.ग. / माईन / 1991 नवा रायपुर अटल नगर, दिनाक 11/10/2022

प्रति,

मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड,
(सलगी बाक्साईट माईन),
सेक्टर–24, तृतीय तल, ब्लॉक नं0–7ए,
नवा रायपुर अटल नगर,
जिला–रायपुर (छ.ग.)

विषय :– ग्राम–सलगी, तहसील–बोडला, जिला–कबीरधाम स्थित खसरा क्रमांक – 43 / 2, 61 एवं 51 अन्य, कुल क्षेत्रफल–42.646 हेक्टेयर (निजी भूमि–32.898 हेक्टेयर एवं शासकीय भूमि – 9.748 हेक्टेयर) में प्रस्तावित बॉक्साईट (मुख्य खनिज) खदान उत्खनन क्षमता – 1,99,875 टन प्रतिवर्ष, अपशिष्ट क्षमता – 1,07,625 टन प्रतिवर्ष हेतु टर्म्स ऑफ रेफरेन्स (टीओआर) जारी करने के संबंध मे।

संदर्भ – आपका ऑनलाईन आवेदन प्रपोजल नम्बर – एसआईए / सीजी / एमआईएन / 75075 / 2022, दिनांक 13 / 04 / 2022 एवं अनुवर्ती पत्रवार पत्र दिनांक 25 / 07 / 2022.

---:: 00 ::---

उपरोक्त विषयांतर्गत कृपया आपके संदर्भित पत्र दिनांक 13 / 04 / 2022 एवं 25 / 07 / 2022 का अवलोकन हो.

**ऑनलाईन आवेदन** – प्रपोजल नम्बर – एसआईए / सीजी / एमआईएन / 75075 / 2022, दिनांक 13 / 04 / 2022 द्वारा टी.ओ.आर. हेतु आवेदन किया गया है। परियोजना प्रस्तावक द्वारा प्रस्तुत ऑनलाईन आवेदन मे कमियाँ होने से ज्ञापन दिनांक 20 / 04 / 2022 द्वारा जानकारी प्रस्तुत करने हेतु निर्देशित किया गया। परियोजना प्रस्तावक द्वारा वांछित जानकारी दिनांक 26 / 05 / 2022 को ऑनलाईन प्रस्तुत की गई।

**प्रस्ताव का विवरण** – यह प्रस्तावित बॉक्साईट (मुख्य खनिज) खदान है। खदान ग्राम सलगी, तहसील बोडला, जिला–कबीरधाम स्थित खसरा क्रमांक – 43 / 2, 61 एवं 51 अन्य, कुल क्षेत्रफल–42.646 हेक्टेयर (निजी भूमि – 32.898 हेक्टेयर एवं शासकीय भूमि – 9.748 हेक्टेयर) में प्रस्तावित है। खदान की आवेदित उत्खनन क्षमता – 1,99,875 टन प्रतिवर्ष, अपशिष्ट क्षमता – 1,07,625 टन प्रतिवर्ष है। परियोजना की कुल प्रस्तावित लागत 2.78 करोड़ होगी।

छत्तीसगढ़ मिनरल डेवलपमेंट कार्पोरेशन लिमिटेड के ज्ञापन दिनांक 31/05/2022 एवं 10/06/2022 द्वारा पर्यावरणीय स्वीकृति प्राप्त करने हेतु टी.ओ.आर के लिए आवेदित प्रकरण को बैठक में सम्मिलित करने बाबत् पत्र एस.ई.आई.ए.ए. छत्तीसगढ़ को प्रेषित किया गया है। पत्र में उल्लेखित तथ्य निम्नानुसार है:-

छत्तीसगढ़ मिनरल डेवलपमेंट कार्पोरेशन लिमिटेड (सी.एम.डी.सी.) राज्य शासन का एक उपक्रम है। सी.एम.डी.सी. द्वारा निम्न बॉक्साईड क्षेत्रों के पर्यावरणीय स्वीकृति प्राप्त करने हेतु टी.ओ.आर के लिए निम्न आवेदन किया गया है:-

| क्र. | बॉक्साईट खदान का नाम | तहसील/जिला | रकबा (हेक्टेयर) | प्रपोजल नम्बर |
|---|---|---|---|---|
| 1. | जमीरापाट | बलरामपुर/ बलरामपुर-रामानुजगंज | 114.009 | 76931 |
| 2. | सरमंजा | मैनपाट/सरगुजा | 207.870 | 77027 |
| 3. | सलगी | बोडला/कबीरधाम | 42.646 | 75075 |
| 4. | डांडकेसरा | मैनपाट/सरगुजा | 44.718 | 78162 |

सी.एम.डी.सी. को उक्त क्षेत्र आरक्षण के आधार पर मिला है तथा मार्च 2023 के पूर्व खनिपट्टा स्वीकृत कराने अनिवार्य है अन्यथा क्षेत्र व्यपगत की श्रेणी में आ जाएगा।

मेसर्स मां कुदरगढ़ी एल्युमिना रिफायनरी प्राईवेट लिमिटेड द्वारा ग्राम चिरंगा, जिला-सरगुजा में एल्युमिना संयंत्र की स्थापना हेतु राज्य शासन के साथ दिनांक 28/02/2020 को एम.ओ.यू. हस्ताक्षरित किया गया है। उक्त संयंत्र हेतु प्रतिवर्ष 2.5 मिलियन टन बॉक्साईट की मांग की गई है। उपरोक्त के अनुक्रम में सी.एम.डी.सी. के माध्यम से उपरोक्त संयंत्र को सी.एम.डी.सी. द्वारा उत्पादित बॉक्साईट खनिज का 70 प्रतिशत खनिज बाक्साईट प्रदाय करने हेतु लांग टर्म लिंकेज पॉलिसी का मंत्री परिषद द्वारा दिनांक 20/07/2021 को अनुमोदन किया गया है। उक्त संयंत्र के सुचारू रूप से संचालन होने पर राज्य शासन को राजस्व की प्राप्ति होगी साथ ही क्षेत्र के लोगों को रोजगार के अवसर उपलब्ध होगें एवं क्षेत्र का विकास होगा।

उपरोक्त तथ्यों को ध्यान में रखते हुए उक्त प्रकरणों को एस.ई.आई.ए.ए. छत्तीसगढ़ द्वारा माह जून 2022 में आयोजित होने वाले बैठक मे उपरोक्त सभी क्षेत्रों को सम्मिलित करने एवं टी.ओ.आर दिये जाने हेतु अनुरोध किया गया है। जिससे समयावधि में कार्य को निष्पादित किया जा सकें।

**प्राधिकरण द्वारा बैठक में विचार** – उपरोक्त प्रकरण पर प्राधिकरण की दिनांक 20/06/2022 को संपन्न 124वीं बैठक में विचार किया गया। प्राधिकरण द्वारा पत्र का अवलोकन किया गया। अतः **प्राधिकरण द्वारा विचार विमर्श उपरांत सर्वसम्मति से** उक्त प्रकरण को एस.ई.ए.सी., छत्तीसगढ़ की नियमानुसार आयोजित बैठक में नियमानुसार रखे जाने हेतु एस.ई.ए.सी., छत्तीसगढ़ को लेख किये जाने का निर्णय लिया गया।

**बैठकों का विवरण –**

**(अ) समिति की 415वीं बैठक दिनांक 14/07/2022:**

समिति द्वारा नस्ती, प्रस्तुत जानकारी का अवलोकन एवं परीक्षण कर, **विचार विमर्श उपरांत सर्वसम्मति से निर्णय लिया गया** कि परियोजना प्रस्तावक को समस्त सुसंगत जानकारी / दस्तावेज सहित आगामी आयोजित बैठक में प्रस्तुतीकरण दिये जाने हेतु निर्देशित किया जाए।

तदानुसार परियोजना प्रस्तावक को एस.ई.ए.सी., छत्तीसगढ़ के ज्ञापन दिनांक 21/07/2022 द्वारा प्रस्तुतीकरण हेतु सूचित किया गया।

**(ब) समिति की 417वीं बैठक दिनांक 25/07/2022:**

प्रस्तुतीकरण हेतु श्री उपेन्द्र कुमार, डिप्टी जनरल मैनेजर एवं श्री सुशील कुमार चन्द्राकर, एसीसटेंट जनरल मैनेजर तथा पर्यावरण सलाहकार के रूप में गेरार्स श्रुस्ती सेवा प्राईवेट लिमिटेड की ओर से श्री उमाकांत एकनाथजी रोडे उपस्थित हुए। समिति द्वारा नस्ती, प्रस्तुत जानकारी का अवलोकन एवं परीक्षण करने पर निम्न स्थिति पाई गई:–

1. **पूर्व में जारी पर्यावरणीय स्वीकृति संबंधी विवरण:–** इस खदान को पूर्व में पर्यावरणीय स्वीकृति जारी नहीं की गई है।
2. **ग्राम पंचायत का अनापत्ति प्रमाण पत्र** – उत्खनन के संबंध में ग्राम पंचायत का अनापत्ति प्रमाण पत्र प्रस्तुत किया जाना आवश्यक है।
3. **उत्खनन योजना** – माईनिंग प्लान प्रस्तुत किया गया है, जो क्षेत्रीय खान नियंत्रक, भारतीय खान ब्यूरो, रायपुर के ज्ञापन क्रमांक सं. कबीरधाम/बॉक्स/खयो–1317/2021 रायपुर, दिनांक 01/04/2022 द्वारा अनुमोदित है।
4. **500 मीटर की परिधि में स्थित खदान** – कार्यालय कलेक्टर (खनिज शाखा), जिला–कबीरधान के ज्ञापन क्रमांक 902/ख.लि./खनिज/2022 कबीरधाम, दिनांक 21/07/2022 के अनुसार आवेदित खदान से 500 मीटर के भीतर अवस्थित अन्य खदानों की संख्या निरंक है।
5. **200 मीटर की परिधि में स्थित सार्वजनिक क्षेत्र/संरचनाए** – कार्यालय कलेक्टर (खनिज शाखा), जिला–कबीरधाम के ज्ञापन क्रमांक 902/ख.लि./खनिज/2022 कबीरधाम, दिनांक 21/07/2022 द्वारा जारी प्रमाण पत्र अनुसार उक्त खदान से 200 मीटर की परिधि में ग्राम–सलगी बराहट जिसके अंतर्गत 17 परिवार निवासरत हैं एवं गौठान, आंगनबाड़ी गरघट, कच्ची सड़क स्थित है। इसके अतिरिक्त कोई भी सार्वजनिक क्षेत्र जैसे नदी, तालाब, पुलिया, बांध, मंदिर, मस्जिद, रेल लाईन, राष्ट्रीय राजमार्ग, राज्यमार्ग एवं अस्पताल आदि प्रतिबंधित क्षेत्र निर्मित नहीं है। इस संबंध में प्रस्तुतीकरण के दौरान परियोजना प्रस्तावक द्वारा बताया गया कि उक्त खदान से 200 मीटर की परिधि में आने वाले क्षेत्रों को गैर माईनिंग क्षेत्र रखते हुये उत्खनन कार्य किया जाएगा, जिसका उल्लेख माईनिंग प्लान में किया गया है।
6. **एल.ओ.आई. संबंधी विवरण** – एल.ओ.आई. छत्तीसगढ़ शासन, खनिज साधन विभाग, महानदी भवन, नवा रायपुर अटल नगर के ज्ञापन क्रमांक एफ

3–16/2021/12 नवा रायपुर, दिनांक 20/12/2021 द्वारा एल.ओ.आई. जारी की गई है, जो 1 वर्ष की अवधि हेतु वैध है।

7. **भू–स्वामित्व** – भूमि स्वामित्व संबंधी जानकारी/दस्तावेज प्रस्तुत नहीं किया गया है। इस संबंध मे परियोजना प्रस्तावक द्वारा समिति के समक्ष अनुरोध किया गया कि उक्त क्षेत्र का खसरा, बी–1, पी–2 आदि फाईनल ई.आई.ए. रिपोर्ट के साथ प्रस्तुत किया जाएगा। खसरा नक्शा पर सम्पूर्ण निजी भूमि को स्पष्ट रूप से अंकित कर उपलब्ध कराया जाएगा। प्रस्तुतीकरण के दौरान परियोजना प्रस्तावक द्वारा बताया गया कि उक्त उत्खनिपट्टा क्षेत्र पर फसल क्षति मुआवजा प्रदान किये जाने की कार्यवाही जिला स्तर पर प्रचलन में है। फसल क्षति मुआवजा का भुगतान निजी भू–स्वामियों को खनिपट्टा अनुबंध होने के उपरांत शासन के नियम/निर्देशानुसार किया जाएगा। फसल क्षति मुआवजा भुगतान होने के पश्चात् ही खनन कार्य प्रारंभ किया जाएगा।

8. **डिस्ट्रीक्ट सर्वे रिपोर्ट** – वर्ष 2019 की डिस्ट्रीक्ट सर्वे रिपोर्ट (District Survey Report) की प्रति प्रस्तुत की गई है।

9. **वन विभाग का अनापत्ति प्रमाण पत्र** – कार्यालय वनमण्डलाधिकारी, कवर्धा वनमंडल, जिला–कवर्धा के ज्ञापन क्रमांक/तक.अधि./8250 कवर्धा, दिनांक 17/09/2021 से जारी अनापत्ति प्रमाण पत्र अनुसार आवेदित क्षेत्र वन क्षेत्र की सीमा से 20–25 मीटर की दूरी पर है। परियोजना प्रस्तावक द्वारा बताया गया कि अपर प्रधान मुख्य वन संरक्षक (भू–प्रबंध), मध्यप्रदेश, भोपाल के ज्ञापन क्रमांक एफ–1/2008/10–11 भोपाल, दिनांक 23/11/2010 द्वारा वन क्षेत्र से तथा वन क्षेत्र की सीमा से 250 मीटर क्षेत्र के अंदर खनि रियायत देने हेतु विचार करने के लिए गठित समिति के समक्ष भेजे जाने वाले प्रस्ताव हेतु पत्र जारी किया गया था। इस संबंध में अपर प्रधान मुख्य वन संरक्षक (संरक्षण), छत्तीसगढ के ज्ञापन क्रमांक सं.–02/151 रायपुर, दिनांक 02/02/2022 द्वारा "उपर्युक्त निर्देश मध्यप्रदेश राज्य से संबंधित से तथा मध्यप्रदेश शासन द्वारा जारी किये गये थे, अतः संदर्भित पत्र द्वारा प्रेषित निर्देशों का संज्ञान में नहीं लिया जाए।" का उल्लेख है। समिति का मत है कि नियमानुसार वन संरक्षण अधिनियम, 1980 तथा इसके अंतर्गत नियमों में प्रावधानित वन क्षेत्र से निर्धारित दूरी छोड़कर खनन संक्रिया करेगा, के संबंध में परियोजना प्रस्तावक द्वारा वचन पत्र प्रस्तुत किया जाना आवश्यक है तथा इसका समावेश फाईनल ई.आई.ए./ ई.एम.पी. रिपोर्ट में किया जाना आवश्यक है। अतः माईनिंग प्लान में उक्त दूरी को गैर माईनिंग क्षेत्र रखते हुये संशोधित एवं सक्षम अधिकारी से अनुमोदित माईनिंग प्लान प्रस्तुत किया जाना आवश्यक है।

10. प्रस्तुतीकरण के दौरान परियोजना प्रस्तावक द्वारा बताया गया कि आवेदित लीज क्षेत्र के खसरा क्रमांक 149 एवं 153, वन भूमि से लगी हुई है।

11. **महत्वपूर्ण संरचनाओं की दूरी** – निकटतम आबादी ग्राम–सलगी लीज क्षेत्र से लगी हुई है एवं रेल्वे स्टेशन हथबंद 140 कि.मी. की दूरी पर स्थित है। राष्ट्रीय राजमार्ग 44 कि.मी. दूर है। हॉफ नदी 2.3 कि.मी. दूर है। दलदली आरक्षित वन 2 कि.मी. दूर है।

12. पारिस्थितिकीय/जैवविविधता **संवेदनशील क्षेत्र** – परियोजना प्रस्तावक द्वारा 10 कि.मी. की परिधि में अंतर्राज्जीय सीमा, राष्ट्रीय उद्यान, अभयारण्य, केन्द्रीय

प्रदूषण नियंत्रण बोर्ड द्वारा घोषित क्रिटिकली पॉल्युटेड एरिया, पारिस्थितिकीय संवेदनशील क्षेत्र या घोषित जैवविविधता क्षेत्र स्थित नहीं होना प्रतिवेदित किया है।

13. **खनन संपदा एवं खनन का विवरण** – अनुमोदित क्वारी प्लान अनुसार जियोलॉजिकल रिजर्व 15,16,678 टन एवं माईनेबल रिजर्व 12,47,129 टन है। ओपन कास्ट सेमी मेक्नेनाईज्ड विधि से उत्खनन किया जाएगा। उत्खनन की प्रस्तावित अधिकतम गहराई 11 मीटर है। बेंच की ऊंचाई 1.5 मीटर एवं चौडाई 1.5 मीटर है। खदान की संभावित आयु 11 वर्ष है। लीज क्षेत्र में क्रशर स्थापित किया जाना प्रस्तावित नहीं है। जैक हैमर से ड्रिलिंग एवं कंट्रोल ब्लास्टिंग किया जाएगा। खदान में वायु प्रदूषण नियंत्रण हेतु जल का छिड़काव किया जाएगा। वर्षवार प्रस्तावित उत्खनन का विवरण निम्नानुसार है:–

| वर्ष | प्रस्तावित उत्खनन (टन) |
|---|---|
| प्रथम | 26,910 |
| द्वितीय | 50,232 |
| तृतीय | 59,202 |
| चर्तुथ | 83,720 |
| पंचम | 89,102 |

प्रस्तुतीकरण के दौरान परियोजना प्रस्तावक द्वारा बताया गया कि वर्तमान माईनिंग प्लान में आगामी 5 वर्षों हेतु वर्षवार उत्खनन योजना प्रस्तुत की गई है। कॉन्सेप्चुअल प्लान के अनुसार आगामी सातवें वर्ष में अधिकतम उत्खनन 1,99,875 टन प्रतिवर्ष किया जाना प्रस्तावित है।

14. **जल आपूर्ति** – परियोजना हेतु आवश्यक जल की मात्रा 3.5 घनमीटर प्रतिदिन होगी। जल की आपूर्ति स्त्रोत एवं अनुमति संबंधी जानकारी/दस्तावेज प्रस्तुत किया जाना आवश्यक है।

15. **वृक्षारोपण कार्य** – लीज क्षेत्र की सीमा में चारों ओर 7.5 मीटर की पट्टी में वृक्षारोपण किया जाएगा।

16. **खदान की 7.5 मीटर की चौड़ी सीमा पट्टी में उत्खनन** – लीज क्षेत्र के चारों ओर 7.5 मीटर की सीमा पट्टी में उत्खनन कार्य नहीं किया गया है।

17. प्रस्तुतीकरण के दौरान परियोजना प्रस्तावक द्वारा बताया गया कि क्लस्टर में आने वाली अन्य खदानों के लिए बेसलाईन डाटा कलेक्शन का कार्य मार्च, 2022 से मई, 2022 तक किया गया है।

18. परियोजना प्रस्तावक द्वारा बताया गया कि यदि लीज क्षेत्र के भीतर वृक्ष, रहवास आदि अवस्थित हो तो वृक्षा की कटाई सक्षम प्राधिकारी के अनुमति उपरांत आवश्यकता पड़ने पर ही उक्त वृक्षों की कटाई की जाएगी। साथ ही रहवास से 50 मीटर छोड़कर उत्खनन का कार्य किया जाएगा। समिति का मत है कि उक्त के संबंध में शपथ पत्र (Affidavit) प्रस्तुत किया जाना आवश्यक है।

19. प्रस्तुतीकरण के दौरान परियोजना प्रस्तावक द्वारा बताया गया कि लीज क्षेत्र के मध्य से पक्की सड़क गुजर रही है। लीज क्षेत्र के दोनों तरफ 50–50 मीटर गैर माईनिंग क्षेत्र छोड़कर उत्खनन कार्य किया जाएगा। उक्त गैर माईनिंग क्षेत्र में वृक्षारोपण कार्य किया जाएगा। जिसका उल्लेख माईनिंग प्लान में किया गया है।

समिति द्वारा विचार विमर्श उपरांत सर्वसम्मति से निम्नानुसार निर्णय लिया गया:-

1. कार्यालय कलेक्टर (खनिज शाखा), जिला-कबीरधाम के ज्ञापन क्रमांक 902/ख.लि./खनिज/2022 कबीरधाम, दिनांक 21/07/2022 के अनुसार आवेदित खदान से 500 मीटर के भीतर अवस्थित अन्य खदानों की संख्या निरंक है। आवेदित खदान (ग्राम- रालगी) का रकबा 42.646 हेक्टेयर है। खदान की सीमा से 500 मीटर की त्रिज्या में स्वीकृत/संचालित खदानों का कुल क्षेत्रफल 5 हेक्टेयर से अधिक का क्लस्टर निर्मित होने के कारण यह खदान 'बी1' श्रेणी की मानी गयी।

2. समिति द्वारा विचार विमर्श उपरांत सर्वसम्मति से प्रकरण 'बी1' केटेगरी का होने के कारण भारत सरकार, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय द्वारा अप्रैल, 2015 में प्रकाशित स्टैण्डर्ड टर्म्स ऑफ रिफरेंस (टीओआर) फॉर ई.आई.ए./ई.एम.पी. रिपोर्ट फॉर प्रोजेक्ट्स/एक्टीविटीज रिक्वायरिंग इन्वायरमेंट क्लीयरेंस अण्डर ई.आई.ए. नोटिफिकेशन, 2006 में वर्णित श्रेणी 1(ए) का स्टैण्डर्ड टीओआर (लोक सुनवाई सहित) नॉन कोल माईनिंग प्रोजेक्ट्स हेतु निम्न अतिरिक्त टीओआर के साथ जारी किये जाने की अनुशंसा की गई:-

i. Project proponent shall submit the Environment Management Plan.

ii. Project proponent shall submit NOC from Gram Panchayat for Mining.

iii. Project proponent shall obtain the permission from DGMS (Explosive License Holder) for controlled blasting & incorporate the permission in the EIA report.

iv. Project proponent shall submit the NOC from DFO, forest department mentioning distance between mine lease boundary to forest boundary. In case any lease area comes under forest area, project proponent shall submit the stage-1 Forest Clearance under FCA, 1980 (Forest Conservation Act) before the submission of final EIA report.

v. Project proponent shall submit the top soil management plan & over burden plan & incorporate the details in the EIA report.

vi. As per submition made the Project proponent intent to mine laterite mineral along with bauxite "Project proponent shall submit the valid lease/LOI and mining plan approved accordingly for the laterite mineral along with quantity and period of mining." the same shall be incorporated in the Final EIA/EMP report.

vii. The final approval of the state government for the mining of laterite mineral to be incorporated in to the mine lease / LOI and same need to be submitted along with the Final EIA/EMP report.

viii. Project proponent shall submit an affidavit for conservation of top soil within the premises and no top soil shall be dumped outside the mining premises. The Project proponent shall submit detail plan for waste Management.

ix. Project proponent shall submit affidavit for completion of Public Hearing Commitments.

x. Project proponent shall submit an affidavit for cutting of trees with prior permission from compenent authority and leaving minimum 50 meter from all around the human habitation.

xi. Project proponent shall undertake noise study and submit noise level report based on modelling (in worst and best case scenario).

xii. Project proponent shall ensure that mining lease area to be demarcated by erection of boundary pillars and the distance between the boundary pillars be 50 meters. Area will have to be fenced.

xiii. EIA study shall be done at minimum 8 no. of stations for data collection considering the pre-dominant wind direction.

xiv. Project proponent shall submit the land documents with consent letter from land owners for uses of land.

xv. Project proponent shall submit the details of 7.5 meter safety barrier zone area and also submit the detail proposal of plantation in 7.5 meter boundary area for 5 years, incorporating the plant cost, fencing cost, fertilizer cost, maintainace cost and irrigation cost etc.

xvi. Project proponent shall submit source of water requirement and its NOC for usage of water from competent authority.

xvii. Project proponent shall submit the detail proposals of garland drain, check dams, drainage and also submit Ground Vibration Study alongwith required mitigation measures.

xviii. Project proponent shall complete the fencing all along the boundary and submit photographs in the EIA report.

xix. Project proponent shall submit CER proposals (Eco-park Development with minimum 5 Ha. area) with details of works alongwith their estimates including land cost.

xx. The project proponent shall submit an undertaking that the project proponent shall as per rule carryout mining after leaving the prescribed distance from the forest boundary as laid down in forest act, forest conservation act 1980 and rule made there under and incorporate the same in EIA/EMP report.

xxi. The project proponent shall submit the revised mining plan duly approved from competent authority.

xxii. The project proponent shall submit an undertaking that there is no court case pending relating to this project before any Court of Law in India.

xxiii. The project proponent shall submit an undertaking in form of affidavit stating that there is no violation of Ministry of Environment, Forest and Climate Change, Notification S.O. 804(E) dated 14/03/2017.

**प्राधिकरण द्वारा बैठक में विचार** – उपरोक्त प्रकरण पर प्राधिकरण की दिनांक 15/09/2022 को संपन्न 128वीं बैठक में विचार किया गया। प्राधिकरण द्वारा नस्ती का अवलोकन किया गया। **प्राधिकरण द्वारा विचार विमर्श उपरांत सर्वसम्मति से** समिति की अनुशंसा को स्वीकार करते हुये उपरोक्तानुसार टर्मस ऑफ रेफरेन्स (टी.ओ.आर.) (लोक सुनवाई सहित) जारी करने का निर्णय लिया गया।

तदानुसार ग्राम–सलगी, तहसील–बोडला, जिला–कबीरधाम स्थित खसरा क्रमांक – 43/2, 61 एवं 51 अन्य, कुल क्षेत्रफल–42.646 हेक्टेयर (निजी भूमि–32.898 हेक्टेयर एवं शासकीय भूमि 9.748 हेक्टेयर) में प्रस्तावित बॉक्साईट (मुख्य खनिज) खदान उत्खनन क्षमता – 1,99,875 टन प्रतिवर्ष, अपशिष्ट क्षमता – 1,07,625 टन प्रतिवर्ष हेतु भारत

सरकार के पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय द्वारा अप्रैल 2015 में प्रकाशित श्रेणी 1(ए) का स्टैण्डर्ड टीओआर (लोक सुनवाई सहित) नॉन कोल माईनिंग प्रोजेक्ट्स हेतु निर्धारित स्टैण्डर्ड टीओआर **संलग्नक–01** (लोक सुनवाई सहित) अनुसार जारी किया जाता है।

निर्धारित स्टैण्डर्ड टीओआर सहपठित अतिरिक्त टीओआर के आधार पर ड्राफ्ट ई.आई.ए. रिपोर्ट (ई.आई.ए. नोटिफिकेशन, 2006 के परिशिष्ट – 3 में निर्धारित जनरिक स्ट्रक्चर के अनुसार) तैयार कर जनसुनवाई हेतु छत्तीसगढ़ पर्यावरण संरक्षण मंडल में प्रस्तुत करें। जनसुनवाई उपरांत ई.आई.ए. अधिसूचना 2006 (यथा संशोधित) के प्रावधानों के अनुसार अंतिम ई.आई.ए. रिपोर्ट तैयार कर एस.ई.आई.ए.ए., छत्तीसगढ़ को निर्धारित समयावधि के अंदर प्रस्तुत करें।

सदस्य सचिव
एसा.ई.ए.सी. छत्तीसगढ़

पृ. क. /एस.ई.ए.सी.,छ.ग./माईन/1991 नवा रायपुर अटल नगर, दिनांक / /2022

प्रतिलिपि :–

1. एकीकृत, क्षेत्रीय कार्यालय, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, रायपुर (छत्तीसगढ़)
2. सदस्य सचिव, छत्तीसगढ़ पर्यावरण संरक्षण मंडल, पर्यावास भवन, सेक्टर – 19, नवा रायपुर अटल नगर, जिला–रायपुर (छ.ग.)

सदस्य सचिव
एसा.ई.ए.सी. छत्तीसगढ़

संलग्नक –01

# TERMS OF REFERENCE
# FOR
# M/S CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LIMITED
# VILLAGE-SALGI, TEHSIL-BODLA, DISTRICT-KABIRDHAM

## 1(a): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR NON-COAL MINING PROJECTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT

## A. STANDARD TERMS OF REFERENCE (TOR)

1) Year-wise production details since 1994 should be given, clearly stating the highest production achieved in any one year prior to 1994. It may also be categorically informed whether there had been any increase in production after the EIA Notification 1994 came into force, w.r.t. the highest production achieved prior to 1994.
2) A copy of the document in support of the fact that the Proponent is the rightful lessee of the mine should be given.
3) All documents including approved mine plan, EIA and Public Hearing should be compatible with one another in terms of the mine lease area, production levels, waste generation and its management, mining technology etc. and should be in the name of the lessee.
4) All corner coordinates of the mine lease area, superimposed on a High Resolution Imagery/ toposheet, topographic sheet, geomorphology and geology of the areashould be provided. Such an Imagery of the proposed area should clearly show the land use and other ecological features of the study area (core and buffer zone).
5) Information should be provided in Survey of India Toposheet in 1:50,000 scale indicating geological map of the area, geomorphology of land forms of the area, existing minerals and mining history of the area, important water bodies, streams and rivers and soil characteristics.
6) Details about the land proposed for mining activities should be givenwith information as to whether mining conforms to the land use policy of the State; land diversion for mining should have approval from State land use board or the concerned authority.
7) It should be clearly stated whether the proponent Company has a well laid down Environment Policy approved by its Board of Directors? If so, it may be spelt out in the EIA Report with description of the prescribed operating process/procedures to bring into focus any infringement/deviation/violation of the environmental or forest norms/ conditions? The hierarchical system or administrative order of the Company to deal with the environmental issues and for ensuring compliance with the EC conditions may also be given. The system of reporting of non-compliances / violations of environmental norms to the Board of Directors of the Company and/or shareholders or stakeholders at large, may also be detailed in the EIA Report.
8) Issues relating to Mine Safety, including subsidence study in case of underground mining and slope study in case of open cast mining, blasting study etc. should be detailed. The proposed safeguard measures in each case should also be provided.

9) The study rea will comprise of 10 km zone around the mine lease from lease periphery and the data contained in the EIA such as waste generation etc should be for the life of the mine / lease period.

10) Land use of the study rea delineating forest area, agricultural land, grazing land, wildlife sanctuary, national park, migratory routes of fauna, water bodies, human settlements and other ecological features should be indicated. Land use plan of the mine lease area should be prepared to encompass preoperational, operational and post operational phases and submitted. Impact, if any, of change of land use should be given

11) Details of the land for any Over Burden Dumps outside the mine lease, such as extent of land area, distance from mine lease, its land use, R&R issues, if any, should be given.

12) A Certificate from the Competent Authority in the State Forest Department should be provided, confirming the involvement of forest land, if any, in the project area. In the event of any contrary claim by the Project Proponent regarding the status of forests, the site may be inspected by the State Forest Department along with the Regional Office of the Ministry to ascertain the status of forests, based on which, the Certificate in this regard as mentioned above be issued. In all such cases, it would be desirable for representative of the State Forest Department to assist the Expert Appraisal Committees

13) Status of forestry clearance for the broken up area and virgin forestland involved in the Project including deposition of net present value (NPV) and compensatory afforestation (CA) should be indicated. A copy of the forestry clearance should also be furnished.

14) Implementation status of recognition of forest rights under the Scheduled Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 should be indicated.

15) The vegetation in the RF / PF areas in the stucy area, with necessary details, should be given.

16) A study shall be got done to ascertain the impact of the Mining Project on wildlife of the study area and details furnished. Impact of the project on the wildlife in the surrounding and any other protected area and accordingly detailed mitigative measures required, should be worked out with cost implications and submitted.

17) Location of National Parks, Sanctuaries, Biosphere Reserves, Wildlife Corridors, Ramsar site Tiger/Elephant Reserves/(existing as well as proposed), if any, within 10 km of the mine lease should be clearly indicated, supported by a location map duly authenticated by Chief Wildlife Warden. Necessary clearance, as may be applicable to such projects due to proximity of the ecologically sensitive areas as mentioned above, should be obtained from the Standing Committee of National Board of Wildlife and copy furnished.

18) A detailed biological study of the study area [core zone and buffer zone (10 km radius of the periphery of the mine lease)] shall be carried out. Details of flora and fauna, endangered, endemic and RET Species duly authenticated, separately for core and buffer zone should be furnished based on such primary field survey, clearly indicating the Schedule of the fauna present. In case of any scheduled-I fauna found in the study area, the necessary plan alongwith budgetary provisions for their conservation should be prepared in consultation with State Forest and Wildlife Department and details furnished. Necessary allocation of funds for implementing the same should be made as part of the project cost.

19) Proximity to Areas declared as 'Critically Polluted' or the Project areas likely to come under the 'Aravali Range', (attracting court restrictions for mining operations), should also be indicated and where so required, clearance certifications from the prescribed Authorities, such as the SPCB or State Mining Department should be secured and furnished to the effect that the proposed mining activities could be considered.

20) Similarly, for coastal Projects, A CRZ map duly authenticated by one of the authorized agencies demarcating LTL, HTL, CRZ area, location of the mine lease w.r.t CRZ, coastal features such as mangroves, if any, should be furnished. (Note: The Mining Projects falling under CRZ would lso need to obtain approval of the concerned Coastal Zone Management Authority).

21) R&R Plan/compensation details for the Project Affected People (PAP) should be furnished. While preparing the R&R Plan, the relevant State/National Rehabilitation & Resettlement Policy should be kept in view. In respect of SCs /STs and other weaker sections of the society in the study area, a need based sample survey, family-wise, should be undertaken to assess their requirements, and action programmes prepared and submitted accordingly, integrating the sectoral programmes of line departments of the State Government. It may be clearly brought out whether the village(s) located in the mine lease area will be shifted or not. The issues relating to shifting of village(s) including their R&R and socio-economic aspects should be discussed in the Report.

22) One season (non-monsoon) [i.e. March-May (Summer Season); October-December (post monsoon season) ; December-February (winter season)]primary baseline data on ambient air quality as per CPCB Notification of 2009, water quality, noise level, soil and flora and fauna shall be collected and the AAQ and other data so compiled presented date-wise in the EIA and EMP Report. Site-specific meteorological data should also be collected. The location of the monitoring stations should be such as to represent whole of the study area and justified keeping in view the pre-dominant downwind direction and location of sensitive receptors. There should be at least one monitoring station within 500 m of the mine lease in the pre-dominant downwind direction. The mineralogical composition of $PM_{10}$, particularly for free silica, should be given.

23) Air quality modeling should be carried out for prediction of impact of the project on the air quality of the area. It should also take into account the impact of movement of vehicles for transportation of mineral. The details of the model used and input parameters used for modelling should be provided. The air quality contours may be shown on a location map clearly indicating the location of the site location of sensitive receptors, if any, and the habitation. The wind roses showing pre-dominant wind direction may also be indicated on the map.

24) The water requirement for the Project, its availability and source should be furnished. A detailed water balance should also be provided. Fresh water requirement for the Project should be indicated.

25) Necessary clearance from the Competent Authority for drawl of requisite quantity of water for the Project should be provided.

26) Description of water conservation measures proposed to be adopted in the Project should be given. Details of rainwater harvesting proposed in the Project, if any, should be provided.

27) Impact of the Project on the water quality, both surface and groundwater, should be assessed and necessary safeguard measures, if any required, should be provided.

28) Based on actual monitored data, it may clearly be shown whether working will intersect groundwater. Necessary data and documentation in this regard may be provided. In case the working will intersect groundwater table, a detailed Hydro Geological Study should be undertaken and Report furnished. The Report inter-alia, shall include details of the aquifers present and impact of mining activities on these aquifers. Necessary permission from Central Ground Water Authority for working below ground water and for pumping of ground water should also be obtained and copy furnished.

29) Details of any stream, seasonal or otherwise, passing through the lease area and modification /diversion proposed, if any, and the impact of the same on the hydrology should be brought out.

30) Information on site elevation, working depth, groundwater table etc. Should be provided both in AMSL and bgl. A schematic diagram may also be provided for the same.

31) A time bound Progressive Greenbelt Development Plan shall be prepared in a tabular form (indicating the linear and quantitative coverage, plant species and time frame) and submitted, keeping in mind, the same will have to be executed up front on commencement of the Project. Phase-wise plan of plantation and compensatory afforestation should be charted clearly indicating the area to be covered under plantation and the species to be planted. The details of plantation already done should be given.The plant species selected for green belt should have greater ecological value and should be of good utility value to the local population with emphasis on local and native species and the species which are tolerant to pollution.

32) Impact on local transport infrastructure due to the Project should be indicated. Projected increase in truck traffic as a result of the Project in the present road network (including those outside the Project area) should be worked out, indicating whether it is capable of handling the incremental load. Arrangement for improving the infrastructure, if contemplated (including action to be taken by other agencies such as State Government) should be covered. Project Proponent shall conduct Impact of Transportation study as per Indian Road Congress Guidelines.

33) Details of the onsite shelter and facilities to be provided to the mine workers should be included in the EIA Report.

34) Conceptual post mining land use and Reclamation and Restoration of mined out areas (with plans and with adequate number of sections) should be given in the EIA report.

35) Occupational Health impacts of the Project should be anticipated and the proposed preventive measures spelt out in detail. Details of pre-placement medical examination and periodical medical examination schedules should be incorporated in the EMP. The project specific occupational health mitigation measures with required facilities proposed in the mining area may be detailed.

36) Public health implications of the Project and related activities for the population in the impact zone should be systematically evaluated and the proposed remedial measures should be detailed along with budgetary allocations.

37) Measures of socio economic significance and influence to the local community proposed to be provided by the Project Proponent should be indicated. As far as possible, quantitative dimensions may be given with time frames for implementation.

38) Detailed environmental management plan (EMP) to mitigate the environmental impacts which, should inter-alia include the impacts of change

of land use, loss of agricultural and grazing land, if any, occupat cnal health impacts besides other impacts specific to the proposed Project.

39) Public Hearing points ra sed and commitment of the Project Proponent on the same along with time bound Action Plan with budgetary provisions to implement the same should be provided and also incorporated in the final EIA/EMP Report of the Project.

40) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.

41) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.

42) A Disaster management Plan shall be prepared and included in the EIA/EMP Report.

43) Benefits of the Project if the Project is implemented should be spelt out. The benefits of the Project shall clearly indicate environmental, social, economic, employment potential, etc.

44) Besides The Above, The Below Mentioned General Points Are Also To Be Followed:-

a. Executive Summary of the EIA/EMP Report.
b. All documents to be properly referenced with index and continuous page numbering.
c. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
d. Project proponent shall enclose all the analysis / testing reports of water, air, soil, noise etc. using the MoEF&CC / NABL accredited laboratories. All the original analysis / testing reports should be available during appraisal of the project.
e. Where the documents provided are in a language other than English, an English translation should be provided.
f. The Questionnaire for environmental appraisal of mining projects as devised earlier by the Ministry shall also be filled and submitted.
g. While preparing the EIA report, the instructions for the Proponents and instructions for the Consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry, should be followed.
h. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of SEIAA and SEAC, Chhattisgarh with reasons for such changes and permission should be sought, as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
i) As per the circular no. J-11011/618/2010-IA.II(I) dated 30.5.2012, certified report of the status of compliance of the conditions stipulated in the environment clearance for the existing operations of the project, should be obtained from the Regional Office of Ministry of Environment, Forest and Climate Change, as may be applicable.
ii) The EIA report should also include (i) surface plan of the area indicating contours of main topographic features, drainage and mining area, (ii) geological maps and sections and (iii) sections of the mine pit and external dumps, if any, clearly showing the land features of the adjoining area.

**B. BESIDES THE ABOVE, THE BELOW MENTIONED GENERAL POINTS ARE ALSO TO BE FOLLOWED:-**

A. Project proponent shall submit detail action plan regarding plantation including list of plant of local species to be planted.
B. Executive Summary of the EIA/EMP Report.
C. All documents to be properly referenced with index and continuous page numbering.
D. Period / date of data collection shall be clearly indicated. Where data are presented in the report especially in tables, the period in which the data were collected and the sources should be indicated.
E. Project proponent shall enclose all the analysis / testing reports of water, air, soil, noise etc. using the MoEF&CC / NABL accredited laboratories. All the original analysis / testing reports should be available during appraisal of the project.
F. Where the documents provided are in a language other than English, an English translation should be provided.
G. While preparing the EIA report, the instructions for the proponents and instructions for the consultants issued by MoEF&CC vide O.M. No. J-11013/41/2006-IA.II(I) dated 4th August, 2009, which are available on the website of this Ministry of Environment, Forests and Climate Change, Government of India should also be followed.
H. Changes, if any made in the basic scope and project parameters (as submitted in Form-I and the PFR for securing the TOR) should be brought to the attention of SEIAA and SEAC, Chhattisgarh with reasons for such changes and permission should be sought as the TOR may also have to be altered. Post Public Hearing changes in structure and content of the draft EIA/EMP (other than modifications arising out of the P.H. process) will entail conducting the PH again with the revised documentation.
I. The copy of the letter received from SEAC, Chhattisgarh on the TOR prescribed for the project should be attached as an annexure to the final EIA-EMP report. The compliance statement of TOR prescribed should also be incorporated.
J. The consultants involved in the preparation of EIA-EMP report after accreditation with Quality Council of India (QCI) / National Accreditation Board of Education and Training (NABET) would need to include a certificate in this regard in the EIA-EMP reports prepared by them and data provided by other organization / Laboratories including their status of approvals etc. Name of the Consultant and the Accreditation details shall be posted on the EIA-EMP Report as well as on the cover of the Hard Copy of the Presentation material for EC presentation.
K. The TORs are valid for a period of three years from the date issue of this letter. However, this period could be further extended by a maximum period of one year provided an application is made by the project proponent at least three months before the expiry of the validity period, together with updated Form – I based on proper justification.

**C. ADDITIONAL TERMS AND REFERENCE:-**

i. Project proponent shall submit the Environment Management Plan.
ii. Project proponent shall submit NOC from Gram Panchayat for Mining.
iii. Project proponent shall obtain the permission from DGMS (Explosive License Holder) for controlled blasting & incorporate the permission in the EIA report.

iv. Project proponent shall submit the NOC from DFO, forest department mentioning distance between mine lease boundary to forest boundary. In case any lease area comes under forest area, project proponent shall submit the stage-1 Forest Clearance under FCA, 1980 (Forest Conservation Act) before the submission of final EIA report.

v. Project proponent shall submit the top soil management plan & over burden plan & incorporate the details in the EIA report.

vi. As per submition made the Project proponent intent to mine laterite mineral along with bauxite "Project proponent shall submit the valid lease/LOI and mining plan approved accordingly for the laterite mineral along with quantity and period of mining " the same shall be incorporated in the Final EIA/EMP report.

vii. The final approval of the state government for the mining of laterite mineral to be incorporated in to the mine lease / LOI and same need to be submitted along with the Final EIA/EMP report.

viii. Project proponent shall submit an affidavit for conservation of top soil within the premises and no top soil shall be dumped outside the mining premises. The Project proponent shall submit detail plan for waste Management.

ix. Project proponent shall submit affidavit for completion of Public Hearing Commitments.

x. Project proponent shall submit an affidavit for cutting of trees with prior permission from compenent authority and leaving minimum 50 meter from all around the human habitation.

xi. Project proponent shall undertake noise study and submit noise level report based on modelling (in worst and best case scenario).

xii. Project proponent shall ensure that mining lease area to be demarcated by erection of boundary pillars and the distance between the boundary pillars be 50 meters. Area will have to be fenced.

xiii. EIA study shall be done at minimum 8 no. of stations for data collection considering the pre-dominant wind direction.

xiv. Project proponent shall submit the land documents with consent letter from land owners for uses of land.

xv. Project proponent shall submit the details of 7.5 meter safety barrier zone area and also submit the detail proposal of plantation in 7.5 meter boundary area for 5 years, incorporating the plant cost, fencing cost, fertilizer cost, maintainace cost and irrigation cost etc.

xvi. Project proponent shall submit source of water requirement and its NOC for usage of water from competent authority.

xvii. Project proponent shall submit the detail proposals of garland drain, check dams, drainage and also submit Ground Vibration Study alongwith required mitigation measures.

xviii. Project proponent shall complete the fencing all along the boundary and submit photographs in the EIA report.

xix. Project proponent shall submit CER proposals (Eco-park Development with minimum 5 Ha. area) with details of works alongwith their estimates including land cost.

xx. The project proponent shall submit an undertaking that the project proponent shall as per rule carryout mining after leaving the prescribed

distance from the forest bourdary as laid down in forest act, forest conservation act 1980 and rule made there under and incorporate the same in EIA/EMP report.

xxi. The project proponent shall submit the revised mining plan duly approved from competent authority.

xxii. The project proponent shall submit an undertaking that there is no court case pending relating to this project before any Court of Law in India.

xxiii. The project proponent shall submit an undertaking in form of affidavit stating that there is no violation of Ministry of Environment, Forest and Climate Change, Notification S.O. 804(E) dated 14/03/2017.

सदस्य सचिव
एस.ई.ए.सी. छत्तीसगढ़

## ANNEXURE - II

### INVENTORY OF FLORAL DIVERSITY IN THE CORE & BUFFER ZONE OF MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

Habit: Tree (T), Shrub (S), Herb (H), Grass (G), and Climber (C)

### (a) Floral Diversity within Core Zone - Trees

| S. No. | Scientific name | Local name | Family | Habit |
|---|---|---|---|---|
| 1. | *Ficus religiosa* | Pipal | Moraceae | T |
| 2. | *Azadiracta indica* | Neem | Maliaceae | T |
| 3. | *Mangifera indica* | Mango | Anacardiaceae | T |
| 4. | *Cassia fistula* | Amaltas | Laguminosae | T |
| 5. | *Albizzia lebeck* | Kala Siris | Fabaceae | T |
| 6. | *Albizzia chinesis* | Kiragi | Laguminosae | T |
| 7. | *Albizzia odoratissima* | Chichwa | Laguminosae | T |
| 8. | *Anona squamosa* | Sitafal | Anonaceae | T |
| 9. | *Albizzia procera* | Safed Siris | Laguminosae | T |
| 10. | *Bauhinia variegata* | Kachnar | Laguminosae | T |
| 11. | *Bauhinia racemosa* | Asta | Laguminosae | T |
| 12. | *Pongamia Pinnata* | Karanj | Laguminosae | T |
| 13. | *Madhuca indica* | Mahua | Sapotaceae | T |
| 14. | *Diospyros monatana* | Bistendu | Ebenaceae | T |
| 15. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 16. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 17. | *Euphorbia nivulia* | Thuar | Euphorbiaceae | T |
| 18. | *Ficus hispida* | Kutumar | Moraceae | T |
| 19. | *Ficus lacor* | Pakar | Moraceae | T |
| 20. | *Flacourtia Indica* | Kakai | Bixaceae | T |
| 21. | *Randia dumetorum* | Mainphal | Rubiaceae | T |
| 22. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 23. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 24. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 25. | *Tectona grandis* | Teak | Verbinaceae | T |
| 26. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| | | **Shrubs** | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |

## (a) Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 5. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 6. | *Azanza lampus* | Banakpas | Malvaceae | S |
| 8. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 9. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 10. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 11. | *Clerodendronserratum* | Barangi | Verbenaceae | S |
| 12. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 13. | *Crotalaria juncea* | Son | Laguminosae | S |
| 14. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 15. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 16. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 17. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 18. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 19. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 20. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 21. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 22. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 23. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 24. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 25. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 26. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 27. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |
| 28. | *Olax scandens* | Harduli | Oleaceae | S |
| 29. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 30. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 31. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 32. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 33. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 34. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 35. | *Uraria labata* | - | Malvaceae | S |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 36. | *Urena siuta* | - | Malvaceae | S |
| 37. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 4. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 5. | *Lanandula burmanni* | - | Labistea | H |
| 6. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 7. | *Micromeria capitellata* | - | Labiateae | H |
| 8. | *Napeta ruderalis* | - | Labiateae | H |
| 9. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 10. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |
| 11. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 12. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 7. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 8. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 9. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 10. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 11. | *Vitis linnei* | Jangli angur | Ampelideae | C |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 12. | *Vitis tomentosa* | Purbel | Ampelideae | C |
| 13. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | **Grasses** | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj0 | - | G |
| 24. | *Sehima nervosum* | Shedo | - | G |

## (b) List of existing floristic composition within Buffer zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 1. | *Acacia catechu* | Khair | Mimosaceae | T |
| 2. | *Acacia arabica* | Babul | Laguminosae | T |
| 3. | *Acacia leucophloea* | Reunja | Mimosaceae | T |
| 4. | *Adinacordifolia* | Haldu | Rubiaceae | T |
| 5. | *Boswellia serrata* | Salayi | Burseraceae | T |
| 6. | *Bridelea retusa* | Kasai | Euphorbiaceae | T |
| 7. | *Buchnania lanzan* | Achar | Anacardiaceae | T |
| 8. | *Butea Monosperma* | Palash | Leguminaceae | T |
| 9. | *Aegle marmelos* | Bel | Rutaceae | T |
| 10. | *Ailanthus excelsa* | Mahaneem | Simaroubaceae | T |
| 11. | *Careya arborea* | Wild Guava/ kumbhi | Palmae | S |
| 12. | *Anogeissus latifolia* | Dhaura | Combretaceae | T |
| 13. | *Casearia graveolens* | Gilehi | Samydaceae | T |
| 14. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 15. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 16. | *Elaeodendron glaucum* | Jamrasi | Celastraceae | T |
| 17. | *Dillenia aurea* | Karmata | Dilleniaceae | T |
| 18. | *Delonix regia* | Gulmohar | Laguminosae | T |
| 19. | *Dillenia pentagyna* | Kalla | Dilleniaceae | T |
| 20. | *Ehretia laevis* | Datranga | Burseraceae | T |
| 21. | *Cordia latifolia* | Bara lasora | Baraginaceae | T |
| 22. | *Cordian macleodli* | Silwat | Baraginaceae | T |
| 23. | *Dalbergia latifolia* | Shisham | Leguminosae | T |
| 24. | *Dalbergia sissoo* | Sissoo | Leguminosae | T |
| 25. | *Euphorbia nivulia, Ham* | Thuar | Euphorbiaceae | T |
| 26. | *Ficus hispida* | Kutumar | Moraceae | T |
| 27. | *Chloroxylon swietenia* | Bhirra | Caesalpiniaceae | T |
| 28. | *Cleistanthus collinus* | Garari | Meliacea | T |
| 29. | *Cochlospermum religiosum* | Galgal | Euphorbiaceae | T |
| 30. | *Eucalyptus spp.* | Nilgiri | Myrtaceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 31. | *Ficus lacor* | Pakar | Moraceae | T |
| 32. | *Bauhinia malabarica* | Amta | Leguminaceae | T |
| 33. | *Casearia elliptica* | Tondri | Samydaceae | T |
| 34. | *Cordia dichotoma* | Lisoda/Gunda | Rubiaceae | T |
| 35. | *Litsea sebifera* | Maida lakri | Lauraceae | T |
| 36. | *Mitragyna parvifolia* | Mundi | Rubiaceae | T |
| 37. | *Pterocarpus marsupium* | Bija | Leguminosae | T |
| 38. | *Randia Dumetorum* | Mainphal | Rubiaceae | T |
| 39. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 40. | *Santalum album* | Chandan | Santalaceae | T |
| 41. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 42. | *Sterculia villosa* | Udal | Anacardiaceae | T |
| 43. | *Stereospermum suaveolens* | Padar | Bignoniaceae | T |
| 44. | *Terminalia belerica* | Bahera | Combretaceae | T |
| 45. | *Psidium guava* | Amrud | Myrtaceae | T |
| 46. | *Dalbergia paniculata* | Dhobin | Fabaceae | T |
| 47. | *Diospyros melanoxylon* | Tendu | Lythraceae | T |
| 48. | *Diospyros monatana* | Bistendu | Lythraceae | T |
| 49. | *Ficus benghalensis* | Bad | Moraceae | T |
| 50. | *Emblica officinalis* | Amla | Euphorbiaceae | T |
| 51. | *Ficus glomerata* | Gular | Moraceae | T |
| 52. | *Ficus hispida* | Hairy fig | Moraceae | T |
| 53. | *Ficus religiosa* | Pipal | Moraceae | T |
| 54. | *Strychnos potatorum* | Nirmali | Laguminosae | T |
| 55. | *Grewia disperma* | Chaturli | Tiliaceae | T |
| 56. | *Grewia tiliaefolia* | Dhaman | Tiliaceae | T |
| 57. | *Holoptelea integrifolia* | Papri/Churel | Asclepiadaceae | T |
| 58. | *Gardenia latifolia* | Papra | Rubiaceae | T |
| 59. | *Gardenia turgida* | Phetra | Rubiaceae | T |
| 60. | *Garuga pennata* | Kekad | Burseraceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 61. | *Gmelina arborea* | Gamari | Verbenaceae | T |
| 62. | *Hymenodictyon excelsum* | Bhonrsal | Rubiaceae | T |
| 63. | *Ixota arborea* | Lokhandi | Rubiaceae | T |
| 64. | *Kydia calycina* | Pula | Malvaceae | T |
| 65. | *Langerstroemia parviflora* | Lendia | Lythraceae | T |
| 66. | *Schrebera switenioides* | Mokha | Oleaceae | T |
| 67. | *Semecarpus anacardium* | Bhilwa | Anacardiaceae | T |
| 68. | *Xylia xylocarpa* | Suria | Mimisaceae | T |
| 69. | *Lannea coramandelica* | Mohin/ Ash tree | Anacardiaceae | T |
| 70. | *Pterocarpus marsupium* | Bija | Leguminoceae | T |
| 71. | *Pongamia pinnata* | Karanj | Fabaceae | T |
| 72. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 73. | *Spondias pinnata* | Amra | Leguminaceae | T |
| 74. | *Sterculia urens* | Kullu | Euphorbiaceae | T |
| 75. | *Stereospermum suaveolens* | Paddar | Bignoniaceae | T |
| 76. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| 77. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 78. | *Hardwikia binata* | Anjan | Leguminoceae | T |
| 79. | *Terminalia tomentosa* | Saja | Combretaceae | T |
| 80. | *Zizyphus mautatiana* | Bar | Rhamnaceae | T |
| 81. | *Tectona grandis* | Teak | Verbinaceae | T |
| 82. | *Terminalia arjuna* | Arjun | Combretaceae | T |
| | | **Shrubs** | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Ageratum conyzoids* | - | Compositae | S |
| 5. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 6. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 7. | *Azanza lampus* | Banakpas | Malvaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 8. | *Barleria cristata* | Koranta | Acanthaceae | S |
| 9. | *Barleria mantana* | Korat | Verbenaceae | S |
| 10. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 11. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 12. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 13. | *Clerodendron serratum* | Barangi | Verbenaceae | S |
| 14. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 15. | *Crotalaria juncea* | Son | Laguminosae | S |
| 16. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 17. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 18. | *Desmodium velutinum* | Chikati | Laguminosae | S |
| 19. | *Dioscorea anguina* | Bansora | Dioscoreaceae | S |
| 20. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 21. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 22. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 23. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 24. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 25. | *Grewia sapida* | Phalsa | Tiliaceae | S |
| 26. | *Helicteres isora* | Marorphali | Sterculiaceae | S |
| 27. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 28. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 29. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 30. | *Justieia betonica* | Kokander | Acanthaceae | S |
| 31. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 32. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 33. | *Maytenus emarginata* | Bahrti | Celastraceae | S |
| 34. | *Malastoma malababathricum* | Palor | Malastomaceae | S |
| 35. | *Maghania nana* | Chepati | Papilionaceae | S |
| 36. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 37. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 38. | *Olax scandens* | Harduli | Oleaceae | S |
| 39. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 40. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 41. | *Sida acuta* | Kareta | Mavaceae | S |
| 42. | *Sida cardifolia* | Mamas | Mavaceae | S |
| 43. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 44. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 45. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 46. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 47. | *Triumfetta bartramia* | Chirpat | Tiliaceae | S |
| 48. | *Triumfetta pilosa* | Chikati | Tiliaceae | S |
| 49. | *Uraria labata* | - | Malvaceae | S |
| 50. | *Urena siuta* | - | Malvaceae | S |
| 51. | *Vitex negundo* | Nirgudi | Verbenaceae | S |
| 52. | *Waltheria indica* | Haduli | Sterculiaceae | S |
| 53. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Chlorophylum tuberosum* | Safed Musali | Liliaceae | H |
| 4. | *Curculigo orachiolides* | Kali musli | Amaryullidaceae | H |
| 5. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 6. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 7. | *Lanandula burmanni* | - | Labistea | H |
| 8. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 9. | *Micromeria capitellata* | - | Labiateae | H |
| 10. | *Napeta ruderalis* | - | Labiateae | H |
| 11. | *Polygala chinesis* | Bijnori | Pigalaceae | H |
| 12. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 13. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 14. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 15. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| 3. | *Visum nepalene* | Bandha | Loranthaceae | - |
| 4. | *Orodanche oegyptica* | Bandha | Prkobancheaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Celastrus paniculata* | Malkangini | Celastraceae | C |
| 7. | *Combretum decandrum* | Piwarbel | Combretaceae | C |
| 8. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 9. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 10. | *Ichnocarpus frutescens* | Dhimarbel | Apocynaceae | C |
| 11. | *Marsdenia hamiltonia* | Dudhibel | Asclepiadaceae | C |
| 12. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 13. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 14. | *Mucuna pruriens* | Kewanch | Leguminosae | C |
| 15. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 16. | *Vitis linnei* | Jangli angur | Ampelideae | C |
| 17. | *Vitis fomentosa* | Purbel | Ampelideae | C |
| 18. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | **Grasses** | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj | - | G |
| 24. | *Imperata Cylidrica* | Chhir | - | G |
| 25. | *Sehima nervosum* | Shedo | - | G |

**Status of RET Species**

During Field Survey, rare, endangered and threatened species of flora recorded under threatened status in the study area are as follows:

1. Endemic- *Hardwikia binnata, Mucuna prurita*
2. Locally Endangered Species

   *A. Butea monosperma B. Clerodendron serratum C. Curculigo orchioides D. Curcuma augustifolia E. Pterocarpus marsupiyum.*
3. According to Chhattisgarh State Medicinal Plant Board endangered species are:

   *A. Diospyros peniculato B. Pterocarpus marsupiyum C. Terminalia arjuna D. Grewia rothi E. Vitextrifolia*-Critically endangered.

## ANNEXURE - III

### INVENTORY OF FAUNAL DIVERSITY IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

**a) Core Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Vulpes bengalenss* | Common fox | Sch. II |
| 2. | *Rattus rattus* | Black rat | Sch. V |
| 3. | *Tatera indica* | Indian Gerbil | Sch. V |
| 4. | *Funambulus palmarum* | Indian palm Squirrel | Sch. IV |
| 5. | *Canis aureus* | Jackal | Sch. III |
| 6. | *Boselaphus tragocamelus* | Nilgai | Sch. III |
| 7. | *Axis axis* | Chital | Sch. III |
| 8. | *Sus scrofa* | Wild boar | Sch. III |
| 9. | *Felis chaus* | Jungle cat | Sch. II |
| 10. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 11. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 12. | *Hystris indica* | Porcupine | Sch. IV |
| | | **Reptilian** | |
| 1. | *Ptyas mucosa* | Indian Rat snake | Sch. II |
| 2. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 3. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 4. | *Bungarus candidud* | Common krait | Sch. IV |
| 5. | *Naja naja* | Naag/Kobra | Sch. II |
| 6. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 7. | *Vipera russelli* | Russell's viper | Sch. II |
| 8. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| | | **Amphibian** | |
| 1. | *Rana tigrina* | Common Frog | Sch. IV |
| 2. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 3. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 7. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 8. | *Junonia almana* | Peacock pansy | Sch. IV |
| 9. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 10. | *Leptosia nina* | Psyche | Sch. IV |
| | | **Arthropods and Mollusca** | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Periplaneta amercana* | Cockroach | - |
| 3. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 4. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 5. | *Stegodyphus sp.* | Social Spider | - |
| | | **Avifaunal (Birds)** | |
| 1. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 2. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 3. | *Egretta garzetta* | Little egret | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 6. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 7. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 8. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 9. | *Acridotheres tristis* | Common myna | Sch. IV |
| 10. | *Spilopelia senegalensis* | Laughing dove | Sch. IV |
| 11. | *Ardeola grayii* | Pond heron | Sch. IV |
| 12. | *Aegithina tiphia* | Common iora | Sch. IV |
| 13. | *Anas crecca* | Common teal | Sch. IV |
| 14. | *Passer domesticus* | House sparrow | Sch. IV |

**Birds**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 15. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 16. | *Corvus splendens* | House crow | Sch. V |
| 17. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 18. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 19. | *Milvus migrans* | Black kite | Sch. IV |
| 20. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |
| 21. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 22. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 23. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| 24. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 25. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 26. | *Cuculus micropterus* | Indian Cuckoo | Sch. IV |
| 27. | *Apus affinis* | House swift | Sch. IV |
| 28. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 29. | *Milvus migrans* | Black kite | Sch. IV |
| 30. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 31. | *Tyto alba* | Barn owl | Sch. IV |

## B. Faunal Diversity in Buffer Zone

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Canis aureus* | Jackal | Sch. II |
| 2. | *Hyaena hyaena* | Hyena | Sch. III |
| **3.** | ***Melursus ursinus*** | **Sloth bear** | **Sch. I** |
| 4. | *Vulpes bengalenss* | Common fox | Sch. II |
| 5. | *Rattus rattus* | Black rat | Sch. V |
| 6. | *Rattus norvegicus* | Field mouse | Sch. V |
| 7. | *Bandicota indica* | Bandicoot | Sch. V |
| 8. | *Tatera indica* | Indian Gerbil | Sch. V |
| 9. | *Funambulus palmarumi* | Indian Palm Squirrel | Sch. IV |
| 10. | *Boselaphus tragocamelus* | Nilgai | Sch.III |
| **11.** | ***Elephas maximus*** | **Elephant** | **Sch.I** |
| 11. | *Rhinolophus spp.* | Horseshoe Bat | Sch. V |
| 12. | *Pteropus giganteus* | Indian flying fox | Sch. V |
| 13. | *Cervus unicolor* | Sambar | Sch. III |
| 14. | *Axis axis* | Chital | Sch. III |
| 15. | *Hystris indica* | Porcupine | Sch. II |
| 16. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 17. | *Presbytis entellus* | Common langur | Sch. II |
| 18. | *Macaca mulatta* | Rhesus macaque | Sch. II |
| 19. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 20. | *Sus scrofa* | Wild boar | Sch. III |
| 21. | *Cuon alpinus* | Wild dog | Sch. II |
| **22.** | ***Panthera pardus*** | **Common leopard** | **Sch. I** |
| | | **Reptilian** | |
| 1. | *Vipera russelli* | Russell's viper | Sch. II |
| **2.** | ***Varanus bengalensis*** | **Monitor lizard** | **Sch. I** |
| 3. | *Ptyas mucosa* | Indian Rat snake | Sch. II |
| 4. | *Lycodon aulicus* | Common wolf snake | Sch. IV |
| 5. | *Bungarus candidus* | Common krait | Sch. IV |
| 6. | *Boiga trigonata* | Cat snake | Sch. IV |

**Faunal Diversity in Buffer Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 7. | *Eryx johnii* | Red sand Boa | Sch. IV |
| 8. | *Naja naja* | Naag/Kobra | Sch. II |
| 9. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 10. | *Melanochelys trijuga* | Indian pond turtle | Sch. IV |
| 11. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 12. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 13. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| **14.** | ***Pythan molurns*** | **Pythan** | **Sch.I** |
| | | **Amphibian** | |
| 1. | *Rana limnocharis* | Indian cricket Frog | Sch. IV |
| 2. | *Hoplobatrachus tigerinus* | Indian bull frog | Sch. IV |
| 3. | *Rana tigrina* | Common Frog | Sch. IV |
| 4. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 5. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |
| 6. | *Hyla goeldii* | Tree frog | Sch. IV |
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Papilio polymnestor* | Blue mormon | |
| 5. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Neptis hylas* | Common sailer | Sch. IV |
| 7. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 8. | *Parantica aglea* | Glassy tiger | Sch. IV |
| 9. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 10. | *Junonia almana* | Peacock pansy | Sch. IV |
| 11. | *Junonia orythia* | Blue pansy | Sch. IV |
| 12. | *Junonia atlites* | Grey pansy | Sch. IV |
| 13. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 14. | *Leptosia nina* | Psyche | Sch. IV |
| 15. | *Chilades parrhassius* | Small cupid | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 16. | *Musca domestica* | Housfly | Sch. IV |
| 17. | *Aedes aegypti* | Dengue mosquito | Sch. IV |
| 18. | *Pieris napi* | Green- veined white butterfly | Sch. IV |
| 19. | *Eurema brigitta* | Small grass yellow | Sch. IV |
| 20. | *Parantica aglea* | Glassy tiger | Sch. IV |
| **Arthropods and Mollusca** | | | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Apis dorsata* | Badi Madhumakkhi | - |
| 3. | *Periplaneta amercana* | Cockroach | - |
| 4. | *Buthus sp.* | Scorpion | - |
| 5. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 6. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 7. | *Stegodyphus sp.* | Social Spider | - |
| **Avifaunal (Birds)** | | | |
| 1. | *Ardeola grayii* | Pond heron | Sch. IV |
| 2. | *Acridotheres tristis* | Common myna | Sch. IV |
| 3. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Egretta garzetta* | Little egret | Sch. IV |
| 6. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 7. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 8. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 9. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 10. | *Milvus migrans* | Black kite | Sch. IV |
| 11. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 12. | *Tockus birostris* | Indian Grey Hornbill | Sch. IV |
| 13. | *Tyto alba* | Barn owl | Sch. IV |
| 14. | *Accipiter badius* | Shikra | Sch. IV |
| 15. | *Bubo bubo* | Eurasian Eagle Owl | Sch. IV |
| 16. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 17. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 18. | *Corvus splendens* | Common crow | Sch. V |

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| 19. | *Passer domesticus* | House sparrow | Sch. IV |
| 20. | *Nectarinia asiatica* | Purple sunbird | Sch. IV |
| 21. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| **22.** | ***Pavo cristatus*** | **Peafowl** | **Sch. I** |
| 23. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 24. | *Turdoides striatus* | Jungle babbler | Sch. IV |
| 25. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 26. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 27. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 28. | *Vanellus indicus* | Red-wattled lapwing | Sch. IV |
| 29. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 30. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 31. | *Apus affinis* | House swift | Sch. IV |
| 32. | *Halcyon smyrnensis* | White throated kingfisher | Sch. IV |
| 33. | *Francolinus pondicerianus* | Grey francolin | Sch. IV |
| 34. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 35. | *Centropus sinensis* | Greater coucal | Sch. IV |
| 36. | *Amaurornis phoenicurus* | White breasted water hen | Sch. IV |
| 37. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |

**Analysis of Fauna**

Two Schedule- I fauna was recorded in the study area during field survey as per (IWPA) Indian Wildlife Protection Act, 1972.

| | | | |
|---|---|---|---|
| **1.** | **Indian monitor lizard** | ***Varanus benglensis*** | **Sch. I** |
| **2.** | **Indian peafowl** | ***Pavo cristatus*** | **Sch. I** |
| **3.** | **Sloth bear** | ***Melursus ursinus*** | **Sch. I** |
| **4.** | **Elephant** | ***Elephas maximus*** | **Sch. I** |
| **5.** | **Indian Rock Python** | ***Python molurus*** | **Sch. I** |
| **6.** | **Common Leopard** | ***Panthera pardus*** | **Sch. I** |

## INVENTORY OF AQUATIC FLORA IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| | | **Aquatic diversity of buffer zone** | |
| 1. | *Harpadon nehereus* | Bombil | - |
| 2. | *Sperata seenghala* | Singara | - |
| 3. | *Penaeus monodon* | Prawn | - |
| 4. | *Labeo rohita* | Rohu | - |
| 5. | *Oreochromis niloticus* | Tilapia | - |
| 6. | *Lamellidens corrianus* | Shells | - |
| 7. | *Rita rita* | Rita | - |
| 8. | *Mastacembelus armatus* | Bam | - |
| 9. | *Alysfus tengara* | Tengara | - |
| 10. | *Cirrhinas mrigala* | Mrigal | - |
| 11. | *Boleophithalmus spp.* | Mudskippers | - |
| 12. | *Catla catla* | Catla | - |
| 13. | *Mugil cephalus* | Mullet | - |

Sub Divisional Officer
Kawardha

Divisional Forest Officer
Kawardha Division

Chief Conservator of Forest (T)
Durg Circle, Durg (C.G.)

# WILDLIFE CONSERVATION & MANAGEMENT PLAN

PROJECT PROPONENT

PLAN PERIOD : FIVE YEARS

**FOR SALGI BAUXITE MINES**

( FOR 10 KM RADIUS AREA , BUFFER ZONE IN CHHATTISGARH )

**M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)**

Village-Salgi, Tehsil-Bodla,
District-Kabirdham, Chhattisgarh


Prepared By:
HARESH CHANDRA TIWARI I.F.S. (RETD.)

ENVIRO GREENS

CENTRE FOR CONSERVATION OF FORESTS WILDLIFE AND ENVIRONMENT
Head Office : 222, Officer's Colony,
New Airport Road, Dharampura, Raipur (CG)
Contact : +91 9425226796,
Email : hareshctiwari@gmail.com

requirement. A preliminary estimate has been made to indicate the order of manpower requirement. The detail of manpower requirement is given in Table 2-16.

**Table 2-16: Proposed Employment Potential**

| Sr. No. | Management and Supervisory Personnel | Nos. employed per day |
|---|---|---|
| 1 | Semi-skilled workers | 80 |
| 2 | Skilled workers | 3 |
| 3 | Excavator Operator | 4 |
| **Managerial** | | |
| 4 | Supervisor | 2 |
| 5 | 1st Class | 1 |
| 6 | Mining Engineer | 1 |
| 7 | Geologist | 1 |
| 8 | Others | 1 |
| 9 | **Average Daily Employment per Shift Person** per Day) / (A)) | **93** |
| 10 | **Material to be Handled per Shift** | **2677** |

***Source: Mining Plan***

## 2.10 Assessment of Infrastructure Demand

The Mukam Bauxite Block is a virgin block and the proposed Mining Project is a Greenfield Project. Therefore, all the required Mine Infrastructure for the Project shall be established newly. However, the village level infrastructure is available in the village MUKAM located in and around the lease. All the basic infrastructure facilities like availability of Bus Services, School, College, Hospital etc., are available in and around Bodla tehsil which is located at a distance of about 5 Km from the Bauxite Block. The Project Proponent will obtain all the relevant clearances from the Central / State / Local Government Authorities before initiating any mining activities in the leasehold area.

### 2.10.1 Connectivity

The block is connected by a fair-weather metal road near the mine area exist in good condition, it gets connected to NH-130A after transversing 40 km in southeast direction. NH-130A connects to Kabirdham District Headquarter which is approximately 42 kms away from Mukam Bauxite Mine and 25 km approx. from Bodla Tehsil. The distance of mine site to state highway SH-5 is approx. 33km.The nearest Railway Station is Raipur at 135 km approximately and Bilaspur railway station at a distance of About 110 km approx. Dharma Port is at Approx. 656 Km. The nearest airport is Raipur at 145 km away from mine area. Mukam village approx. 0.5km. from project boundary. Other certain villages are located within 15 kms of the project area. Ropakhar, Kudaridih approx. 9 to 6 Km. Kawardha, Bodla, Mungeli , Bemetra are the nearby Cities to Mukam.

### 2.10.2 Transportation

#### 2.10.2.1 Traffic Density Survey

The traffic study was carried out on metal road which is connected to mine site. The block is connected by a fair-weather road which gets connected to NH-130A in southeast after traversing 40

km. NH- 130A connects to Kabirdham District Headquarter is approximately 53 kms away from Mukam Bauxite Mine and Bodla Tehsil. The main objective of the survey is to characterize the type, category and number of vehicles plying on the road.

### 2.10.2.2 Methodology of Vehicle Count

The vehicle plying on road in both the directions was counted continuously for 24 hours. The vehicles were counted every hour and stipulated by Indian Road Congress (IRC). The vehicles were counted every hour and stipulated by Indian Road Congress (IRC).

The loaded & unloaded dumpers / trucks will move on the State Highway and National Highway for the further transportation of minerals from the lease area to other places of demand for the Bauxite. Keeping in view that, the movement of trucks / dumpers may increase the traffic density of the nearest State Highway and National Highway. A traffic Study on the present traffic scenario have been made to measure the increase PCU/hr.

Traffic study measurements were performed at one location on metal road connecting project site to NH-130A via Daldali village which is in South-east after traversing 40 km, to assess impact on local transport infrastructure due to this mining project. The traffic volume at the location is summarized as per the categorization and given below.

**Details of Production & Dispatches:-**

This is a lease area allotted to the lessee. Future production programme has been planned as per the details given below:

**Table 2-17: Traffic Monitoring Locations**

| S. No. | Location | Distance & Direction |
|---|---|---|
| 1 | Project site to NH-130 A Road | ( 7 km, Southeast from mine site) |

***Details of Production & Dispatches***

Total annual production: 3,84,615.4 TPA

Total working days: 300 days

Dumper capacity (on hired basis): 18 T

22 dumpers are required to transport the material.

Post Project Incremental Passenger Car Units (PCU) post project on Project site to NH-130A Metal road are given in table 2-19

**Table 2-18: Existing Passenger Car Unit (PCU) on Project site to NH-130A Metal road**

| S. No. | Vehicles | Number of Vehicles Distribution/Day | PCU Factor | Total Number of Vehicle in PCU |
|---|---|---|---|---|
| 1. | Cycle | 20 | 0.50 | 10 |
| 2. | Two Wheelers(Motor Cycle or Scooter) | 113 | 0.50 | 56.5 |
| 3. | Four Wheelers (Passenger Car, Pick Up, Van or Auto Rickshaw Cars) | 300 | 1.00 | 291 |

| S. No. | Vehicles | Number of Vehicles Distribution/Day | PCU Factor | Total Number of Vehicle in PCU |
|---|---|---|---|---|
| 4. | Truck or Bus | 60 | 3.0 | 180 |
| 5. | Heavy Vehicles (Truck trailer) | 79 | 4.50 | 355.5 |
| 6. | Tractor | 52 | 4.50 | 261 |
| 7. | Bullock Cart | - | 8.00 | - |
| **Total** | | **624** | **-** | **1136** |

### 2.10.2.3 Post project Increase in Traffic Density

Post Project incremental Passenger Car Units (PCU) on Project site to NH-130A metal road, are given in below:

**Table 2-19: Proposed Passenger Car Unit on Project site to NH-130A metal road**

| S. No. | Vehicles | Number of Vehicles Distribution/Day | PCU Factor | Total Number of Vehicle in PCU |
|---|---|---|---|---|
| 1. | Cycle | 20 | 0.50 | 10 |
| 2. | Two Wheelers (Motor Cycle or Scooter) | 113 | 0.50 | 56.5 |
| 3. | Four Wheelers (Passenger Car, Pick Up, Van Or Auto Rickshaw Cars) | 300 | 1.00 | 300 |
| 4. | Truck or Bus | 60 | 3.0 | 180 |
| 5. | Heavy Vehicles (Truck trailer) | 79+22=101 | 4.50 | 454.5 |
| 6. | Tractor | 52 | 4.50 | 234 |
| 7. | Bullock Cart | - | 8.00 | - |
| **Total** | | **646** | **-** | **1235** |

### 2.10.2.4 Carrying Capacity of the Roads

Post project PCU will be 1235 PCUs (1136 PCUs Existing + 99 PCUs Post) on Project site to NH-130A Metal road. It can be clearly stated that the road used for carrying mineral to the end users is capable of handling the additional load due to mining activities. The Metal road is an intermediate lane road in hilly terrain with low curvatures.

**Table 2-20 Carrying Capacity of Roads**

| Project site to NH | Vol. of vehicle in PCU/day | Capacity of Roads in PCU/day | LOS |
|---|---|---|---|
| Project site to NH-130A Metal road | **1136** | **5200** | 0.22(Very Good) |
| Project site to NH-130A Metal road (Post project) | **1235** | **5200** | 0.24(Very Good) |

**LOS- Level of Services*

| V/C | LOS | Performance |
|---|---|---|
| 0.0-0.2 | A | Excellent |
| 0.2-0.4 | B | Very Good |
| 0.4-0.6 | C | Good/ Average/ Fair |
| 0.6-0.8 | D | Poor |
| 0.8-0.10 | E | Very Poor |

***Note**: Capacity as per IRC: 64-1990*

**Conclusion**

Not much impact will be there on the local transport. The LOS value from the proposed mine may be "very good" for Project site to NH-130A Road. So, the additional load on the carrying capacity of the concern roads is not likely to have any significant adverse effect.

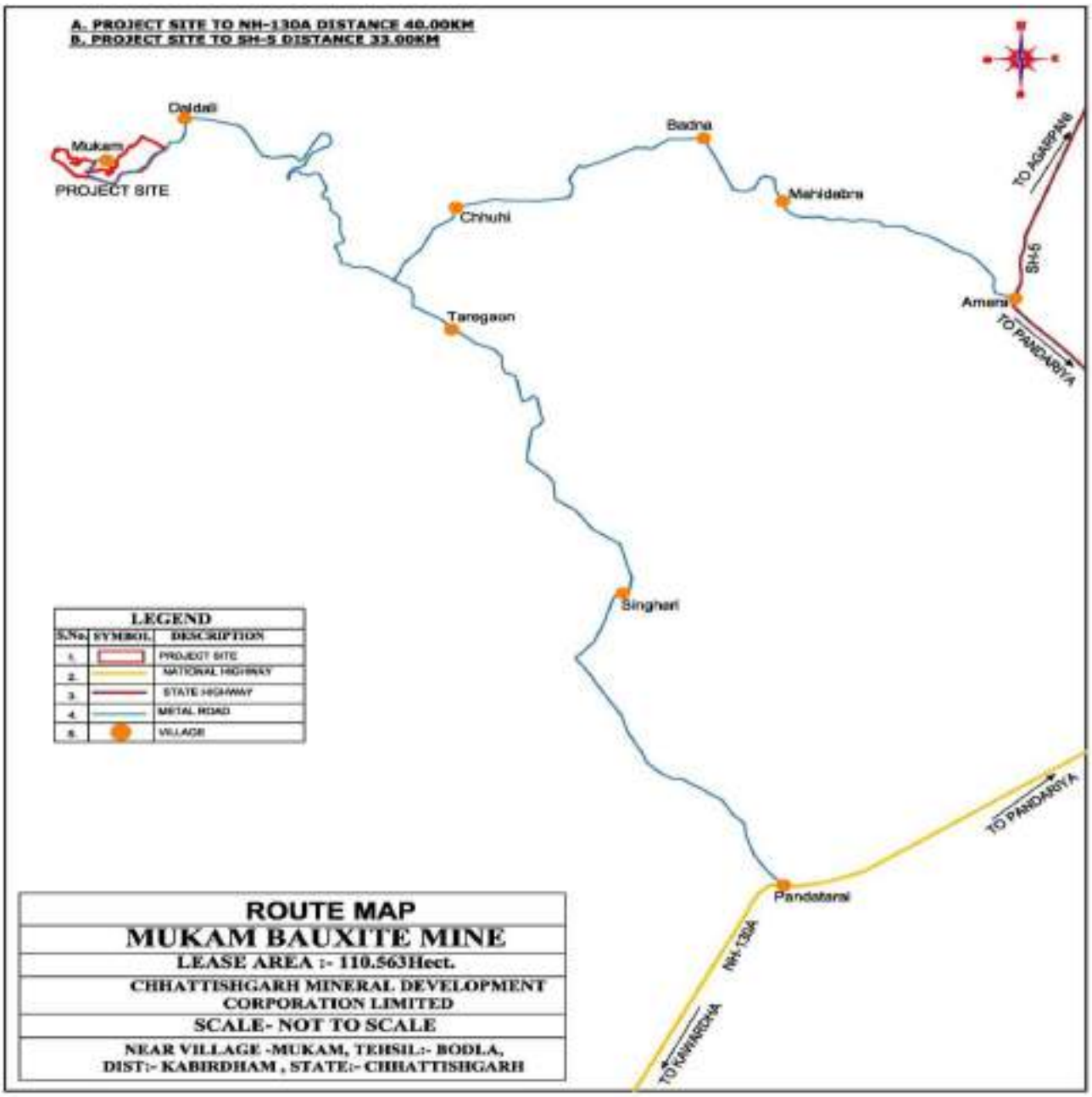



**Figure 2-105: Route Map of Mukam Bauxite Mine**

### 2.10.3 Sewerage System

Though, all the persons shall not be residing / staying in the Project Area, a suitable capacity Septic tank followed by soak pit shall be installed to deal with the Domestic Effluents. The Mine shall be employing direct manpower of 93 persons. Further, the Project Area shall witness inflow of substantial numbers of external persons as transporters, vehicle drivers, laborers etc.

Article-IX

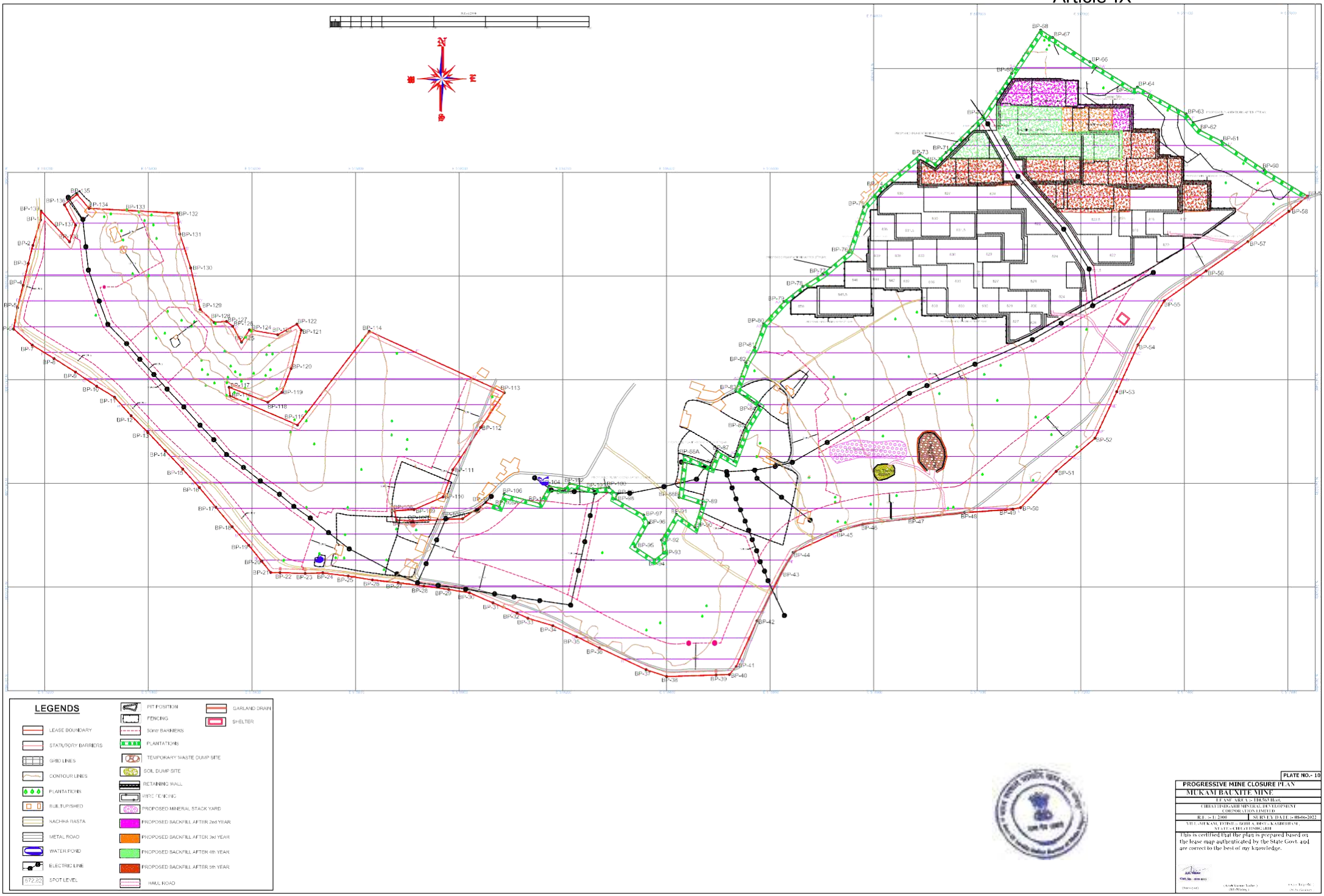



PLATE NO.- 10

**PROGRESSIVE MINE CLOSURE PLAN**

**MUKAM BAUXITE MINE**

LEASE AREA :- 110.563 Hect.

CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LIMITED

R.F. :- 1: 2000 | SURVEY DATE :- 08-06-2022

VILL.- MUKAM, TEHSIL :- BIRRA, DIST :- KAWARDHA, STATE :- CHHATTISGARH

This is certified that the plan is prepared based on the lease map authenticated by the State Govt. and are correct to the best of my knowledge.

## Article -X

## ACTION PLAN OF ISSUE RAISED DURING PUBLIC HEARING

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| 1 | Shree Ajit Singh Meravi Village-Mukam Dis-Kabirdham | Regarding consent for the operation of the mine on the condition of giving preference to local educated people in employment and leveling of land after mining. | CMDC will give first priority in employment to local people during Mining operation. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | 93 nos Technical and non-technical workers (Directly) of the nearby villages as per their qualification will be employed | will be given by CMDC |
| 2 | Shree Sant Ram Tekam Daldali Dis- kabirdham | Regarding Consent for Bauxite Mine | During Sales / Dispatch of Bauxite, Royalty, D.M.F, NMET, Infrastructure & Development cess, Environment Cess and Panchayat Cess etc. will be paid to government which will develop this area. | CMDC will submit taxes and cess timely as per the Government norms. | |
| 3 | Shree Suresh Chandra Merawi, Daldali Dis-kabirdham | Regarding Consent for Bauxite Mine | During Sales / Dispatch of Bauxite, Royalty, D.M.F, NMET, Infrastructure & Development cess, Environment Cess and Panchayat Cess etc. will be paid to government which will develop this area, | CMDC will submit taxes and cess timely as per the Government norms. | |
| 4 | Shri Ashwini Singh Thakur Kawardha Dis-Kabirdham | Regarding Consent to start Bauxite mine as soon as possible | Mining and dispatch from Mukam Bauxite Mine will be started after getting all the legal issuing working approvals and after permission from collector kabirdham. Crop compensation to respective land owners will be paid through district | Total compensation for 7 years will be provided | Rs. 5,07,500.00/ acre in 7 years |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | | administration. | | |
| 5 | Shri Bharat Singh Dhruve Village-Salgi Dis-Kabirdham | Children are going abroad for employment. If the mine comes, they will get employment. I have come to know that the opening of the mine in the district and<br>and the amount received from it will be discussed at the government level. | The amount of royalty and other taxes levied on the sale of mineral bauxite from the operation of Mukam bauxite mine will lead to the development of the area, local villagers will get first priority in employment so that they will be able to strengthen their economic condition and prevent the migration of villagers. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur, | | |
| 6 | Shri Tulsi Ram Merawi, Village-Salgi, Dis-Kabirdham | Regarding consent on providing Employment and compensation | CMDC has made a provision to give crop compensation to the land owners coming under Mukam bauxite mine. First priority will be given in Employment to the villagers according to their qualifications. | First priority will be given in Employment to the villagers according to their qualifications. | |
| 7 | Re introduction Shree Sant Ram Tekam Daldali Dis-kabirdham | Regarding presentation of view of Mukam residents | This Question is not clear | | |
| 8 | Re introduction Shree Sant Ram Tekam Daldali Dis | Regarding employment for whatever work is there in the mine. | During the operation of the Mukam Bauxite mine, the villagers will be provided employment according to their qualification. | First priority will be given in Employment to the villagers according | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | kabirdham | | | to their qualifications. | |
| 9 | Shri Sonalal Dewadiya, Baiga Mukam, Dis-Kabirdham | Infromation Bauxite Mine not giving to Balco, | This question Is not related to CMDDC. | | |
| 10 | Shree Aklu Ram Mukam Dis-Kabirdham | Where will we go if our land is given for mining so we do not Want to give the land, | Rehabilitation and resettlement policy Is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. | | |
| 11 | Shree Charu Singh Baiga Gram Mukam, Dis-Kabirdham | Our land is called mother, so.we will not glve land for miníng | Rehabilitation and resettlement policy is not applicable in Mukam bauxlte mine, due to which the situation of migration of even single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines Raipur. | Rehabilitation and resettlement policy is not applicable in Mukam bauxlte mine. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines Raipur. | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| 12 | Shree Sukra Singh Dewadiya Gram Mukam Dis-Kabirdham | Regarding not giving land for mining | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan/ Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | - | |
| 13 | Shree Milap Singh Gram Mukam, Dis-Kabidram | Regarding not giving land for mining | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, thelr land will be returned to the land owners after levellng work done under the provision mentioned in Mining Plan /Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur | - | |
| 14 | Shree Fagu Ram Gram Mukam Dis | Regarding not giving land for mining | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of | - | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | Kabirdham | | even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | | |
| 15 | Shree Roop Singh<br>Gram Mukam<br>Dis-<br>Kabirdham | Regarding not giving land for mining | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur | - | |
| 16 | Shrimati Suni Bai<br>Mukam Dis-<br>Kabirdham | Regarding not starting the mine. | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will | - | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | | be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur | | |
| 17 | Re introduction Shree Sant Ram Tekam Daldali Dis- kabirdham | Everyone says that the mine should be closed, what is the opinion of kawardha union? | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | - | |
| 18 | Shree Narayan Yadav Village Mukam Dis- Kabirdham | Regarding not giving land for mining | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to | - | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | | the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | | |
| 19 | Shree Tulsi Ram Mehariya Village- Mukam Dis- Kabirdnam | Regarding not giving land for mining | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | - | |
| 20 | Shree Rameya Singh Merawi Village-Daldali, Dis- Kabirdham | Providing fair compensation and employment as per their qualification if mine starts, | CMDC has made a provision to give crop damage compensation to the land owners coming under Mukam bauxite mine. Along with this, employment will be provided to the villagers according to their qualification. | - | |
| 21 | Shree Madhesh Kumar porte Village-Salgi Dis- Kabirdham | Will the mine be opened with consent or without consent of the villagers, we have no objection to start the mine on condition of fulfillment of points, | Mining and dispatch from Mukam Bauxite Mine will be started after getting all the legal approvals and after issuing working permission from collector kabirdham. Crop compensation to respective land owners will be paid through district | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | | administration. | | |
| 22 | Shree Ratan Singh Merawi Village-Rabda Dis-Kabirdham | The land that the government is in, that era is ours, today it has been told to the people that the bauxite under the ground has been organized, it has to be said that there will be digging, the environment will be affected earlier, when the Balco mines were running, the water here was affected, Balco Mines is closed today so the crop is getting better, This is the Government of India and that is us, It is written in the Indian Revenue Land Code 1959 that no tribal can buy non-tribal land But in Balco, the land of tribals has been bought by non-tribals In Balco, it was said to dig up the land and level it, but after doing it for a day or two, it was stopped. If someone gives temptation here, then the brothers | During mine operation, mining and other works will be ensured by following the conditions mentioned in environment and other statutory approvals and permissions, CMDC is commited to follow all applicable rules / regulations/laws etc. | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | should not fall in their words, some people were filling their pockets by misleading the farmer brothers. We are the owner of the country, we have the right to speak, the government cannot buy the land of tribals, it can only take it on lease. | | | |
| 23 | Shri Arjit santram Gram panchayat Daldall, Dis-Kabirdham | It is a request to all the common citizens of the place that we keep our point in support of the villagers, our unity should remain | This Question is not clear. | | |
| 24 | Shri Prem singh yadav Gram Mukam, dis-Kabirdham | I request everyone that whether it is government or semi- government land, we do not want to give our land to the mine. | No villagers will be displaced due to the operation of Mukam bauxite mine, that is, all of Rehabale them will live in their own houses. Provision of crop damage compensation for private lands coming under the mine. The assessment / fixation of crop damage compensation will be done under the chairmanship of the district administration in the presence of the villagers and the distribution of compensation will also be done through the district administration. Even after distribution of compensation, they will | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | | have first priority in employment according to their qualification. And after the exhaust of bauxite from the mine, their lands will be levelled and returned. It is clear from the above that the owners of the land will be the ones who have received crop damage compensation and they will be able to do farming on their land again. | | |
| 25 | Shri kumar Singh Gram Salgi Dis-Kabirdham | Regarding non starting of the mine | Rehabilitation and resettlement policy is not applicable in Mukam bauxite mine, due to which the situation of migration of even a single private land owner will not be created. Local villagers will get first priority in employment so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur. | - | |
| 26 | Shri Suresh Kunjam Gram Koilari Dis-kabirdham | We grow on our land, do our hard work once the mining is opened, the money that will remain in our pocket, when the mining is closed, we will become unemployed, | No villagers will be displaced due to the operation of Mukam bauxite mine, that is, all of them will live in their own houses. Provision of crop damage compensation for private lands coming under the mine. The assessment fixation of crop damage compensation will be done under the | - | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | that's why we don't want to dig. | chairmanship of the district administration in the presence of the villagers and the distribution of compensation will also be done through the district administration. Even after distribution of compensation, they will have first priority in employment according to their qualification. And after the end of bauxite from the mine, their lands will be levelled and returned. It is clear from the above that the owners of the land will be the ones who have received crop damage compensation and they will be able to do farming on their land again. | | |
| 27 | Shri Hiramani Gwala Gram Darai Dis-Kabirdham | Balco Mines opened, poor farmer laborers were exploited. The voice of the general public is suppressed. Land leveling has not yet been done in Balco mine. We need land for farming. Balco mine even today if land leveling is done then farming can be done. Today people are cutting trees under compulsion. This is causing Environmental pollution. | The operation of Mukam bauxite mine will be in accordance with the law. All the labours engaged in the mine will be registered with Employees Provident Fund Organization and minimum wages will be ensured. All the miners will be undergone free of cost Initial Medical Examination as per Mine Rule 1955 and all the miners will be distributed safety shoe, helmet, dust mask, goggles etc. free of cost. time to time medical camp and awareness campaign will be organized. Women will be given training for sewing. Water will be spread through water | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | Blasting was done up to 60 feet depth to open the Balco mine, while they were allowed up to 30 feet. Due to which the problem of ground nwater has arisen. Due to the leveling of Balco mine, the farmer can do farming and does not cut trees due to drought. Mahavir Mineral is also operated here. There, day-in- day-out there is a fight between brother and brother. We want mines but they should follow the rules and regulations. Some conditions were laid by the local people to open the mine in the daldali area, some of which are as follows- 1. Before opening the mine, the farmer, mine and the government should sit together and make an agreement. 2. The rules of the MoU should be followed. Land should be | tanker during the mining operation to control the dust. District administration has control over all statutory levies Fund however cmdc will request to collector kabirdham for expenditure the Royalty, DMF etc. in affetcted gram panchayat to be deposited by cmdc during sale and dispatch of bauxite. | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | given for land, house should be given for house, etc. The land in BALCO has not been returned till date. In Rabda village, small huts were made for the local people, in which it is very hot. 3. Schools have been ruined due to blasting by BALCO mines but they have not been repaired. 4. Basic facilities in the settlement area. 5. Local people should get employment first. Outsiders should not enter. 6. 50 percent of the royalty should be spent in the local village. 7. The children of the local village have studied up to 10-12th standard but they did not get work in Balco mine. So keep them in regular jobs. 8. Vehicle should be made available to the local people for transportation in the mine by giving loans. | | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | 9. Transport for the people of the affected villages to reach the work site should be arranged by the miners. 10. In the mining sector, 75 percent work should be done manually and 25 percent by machines. Crusher should not be installed. 11. Labor law should be uniform throughout the mine. 12. Villages within 15 km radius around the mining area should be adopted. 13. Reservoir should be constructed by the operator in the mining area considering the environment. 14. Ear plugs, helmets, shoes etc. should be made available to the labourers, 15. Vehicle loader laborers should get full security and regular employment. 16. Leave should be given once a week. 17. Each labor | | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | should be given 100 grams of jaggery in a week. 18. People should get work on daily basis instead of taking work on contract. 19. There should be a hospital and doctor with modern facilities in the area. 20. Work should be taken from laborers only from 8 in the morning to 5 in the evening, 21. Farmer laborers will also follow the rules and regulations. 22. Mining is done in the local area, so the mine should be run in the name of Kawardha. 23. Canteen facility should be available for all the labourers. 24. Excavation should be done on grass land also by giving compensation to the farmer. 25. Any decision should be taken after considering the regional head. Decision should be taken in front of the laborer. There should be a | | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | | meeting before the decision. 26. Education system should be made available from first class to higher education by the mine operator. 27. Mining should start before all laborers get insurance of 50 lakhs. | | | |
| 28 | Shri Lamtu singh bakturia former member of Janpad gram Bhursipakri Dis-Kabirdham | Many thanks to the former speaker Sarpanch sir. He kept the problems of the regional people. The Bodai Daldali Bauxite mine has been operating for the last 20 years, which has been closed for 2-3 years. The problem of all the affected people of the area has been explained by the former speaker. All the villagers are in favor of his talk. All mine operators should follow these rules in future. We have to stay united. Water, forest, land is our right, we will fight for it. | This question is not related to CMDC. | | |
| 29 | Shri Jehar Singh | Mother's birthplace Si | This question is not clear. | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | Baiga village-Mukam Dis-Kabirdham | Gariyasi, the land of the mother is like heaven. No matter how much someone has progressed in his life, he is handed over the land of his village. | | | |
| 30 | Shri Bhadur Singh Kunjam, Sarpanch Chendradadar Dis-kabirdham | Regarding not starting the mine. | No villagers will be displaced due to the operation of Mukam bauxite mine, that is, all of them will live in their own houses. Provision of crop damage compensation for private lands coming under the mine. The assessment / fixation of crop damage compensation will be done under the chairmanship of the district administration in the presence of the villagers and the distribution of compensation will also be done through the district administration. Even after distribution of compensation, they will have first priority in employment according to their qualification. And after the end of bauxite from the mine, their lands will be levelled and returned. It is clear from the above that the owners of the land will be the ones who have received crop damage compensation and they will be able to do farming on their land again. | | |
| 31 | Shri Vishram | I have been fighting for | Rehabilitation and resettlement policy is | - | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | Singh Merawi gram Daldali Dis- Kabirdham | three years, I have asked patwari for the receipt given by tahsildar, my address has been changed to someone elses name field should be given instead of field; land should be given instead of land. Balco Mines has not given compensation to the local people. The time has come for the people there to beg. This area is marked under the 5th schedule. No work has been done in this area. | not applicable in Mukam bauxite mine, due to which the situation of migration of not even a single private land owner is being created; there is a provision for distribution of crop damage compensation to the concerned farmers through the district administration after assessment. Local villagers will get first priority in employment during mine operation, so that they will be able to strengthen their economic condition. After completion and exhaust of Bauxite, their land will be returned to the land owners after leveling work done under the provision mentioned in Mining Plan / Final Mine Closure Plan approved by Indian Bureau of Mines, Raipur | | |
| 32 | Shri Pramod Singh Markam Gram Chendradadar Dis- kabirdham | If a mine opens in a village, then whatever situation happened in Balco mine, Mahavir mine should not happen again. Whatever work is done, be in the midst of all of us. We have to live and die on this. | During mine operation, CMDC is commited to Follow all the applicable rules and regulations, it is also committed to work according to the mining plan / final mine closure plan approved by Indian Bureau of Mines, Raipur. | As per the provisions of Mines Act and rules and regulations made there under, the management will undertake all the necessary precautions. | A budget of 7.5 lakhs per annum has been proposed for mine workers out of which 2.00 lakhs cover for the insurance. |
| 33 | Shri Tulsi Ram Yadav Gramo- Daldali Dis- | My parents have become old in my house, so I have to bring water for them. I | This Question is not related to cmdc | | |

| S. No. | Name & Address | Questions asked by Public | Statement of CMDC | Action Plan | Budget |
|---|---|---|---|---|---|
| | Kabirdham | fetch water from Kanwar and then go to work. The facility of drinking water should be made available to me. A pit was dug near my house by Mahavir mine, in which my cow fell. That mine was asked to be levelled, but till date it has not been levelled. I request that it should be levelled and water facility should be made available. | | | |

**Article - XI**

## EMPLOYMENT SCHEME/SKILL DEVELOPMENT PLAN

The Skill Development and Employment for employing the local persons in mine plays a key role in (i) building and sharing knowledge for accelerating policy initiatives for making Indian youth and workforce employable, (ii) identifying as well as offering solutions to critical issues concerning employment, jobs and livelihood creation.

### Skill Scheme/training

Employees at every level want to see a clear development path in front of them and be supported in development through training. The more engaged and motivated an employee feels, the more useful they are to the company and the longer they'll stay with the organization.

Employment scheme/skill development plan will be adopted for employing the local persons in mine are as follows:

- Pradhan Mantri Kaushal Vikas Yojana (PMKVY) is a flagship scheme for skill training of youth implemented by the Ministry of Skill Development and Entrepreneurship through the National Skill Development Corporation (NSDC).
- SANKALP and STRIVE: The SANKALP programme which focuses on the district-level skilling ecosystem and the STRIVE project which aims to improve the performance of ITIs are other significant skilling interventions.
- Vocational training will be provided to all the people before deploying in the mine.

### Labour Requirement

Labors will be required for different purposes like excavation and loading of Bauxite in various vehicle, management, maintenance & development of mine, making and maintenance of ramp, transportation of material and book keeping. Experience personals will be employed as per requirement. A preliminary estimate has been made to indicate the order of manpower requirement. A total of 93 number of manpower will be required for proposed mining operation.

**Proposed Employment Potential**

| S. No. | Management and Supervisory Personnel | Number |
|---|---|---|
| 1 | Semi-skilled workers | 80 |
| 2 | Skilled workers | 3 |
| 3 | Excavator Operator | 4 |
| 4 | Supervisor | 2 |
| 5 | 1st Class Mining Engineer | 1 |
| 6 | Mining Engineer | 1 |
| 7 | Geologist | 1 |
| 8 | Others | 1 |
| **Total** | | **93** |

**Proposed Action Plan for Skill Development & Employment :**

| S. No. | Proposed No. of Employee/Local Person | Cost (INR) |
|---|---|---|
| 1 | Semi-skilled workers (20 No.) for first year | 7,20,000.00 |
| 2 | Semi-skilled workers (20 No.) for Second year | 7,50,000.00 |
| 3 | Local Person (20 No.) for first year | 7,20,000.00 |
| 4 | Local Person (20 No.) for Second year | 7,50,000.00 |

## Article - XII

### Dust Pollution Mitigation Measure Plan

The proposed mining operations are not anticipated to increase the concentration of the pollutants beyond the prescribed limits. Air pollution is the very major and common during drilling and blasting operations. However, higher levels of SPM are envisaged on air environment.

Impacts envisaged during mining operations are:

- Higher dust levels.
- Higher NOx levels
- Higher CO levels

Mitigation measures should be adopted:

- ✓ Water sprinkling on haul road and approach road.
- ✓ Plantation (Green Belt) around the mining lease area will be provided to arrest dust emissions.
- ✓ Monitoring of Air quality will be done on regular basis.
- ✓ Tractors/Trolleys will be covered by tarpaulin sheets during transportation.
- ✓ Regular maintenance of vehicles.
- ✓ Sharp drill bits will be used for drilling to reduce generation of dust and noise level.
- ✓ Drilling machines will be equipped with water injecting system to prevent dust to get air borne.
- ✓ Rock breaker will be used for breaking over size boulders in order to reduce dust and noise generation, which otherwise generates due to secondary blasting.
- ✓ Controlled blasting and optimization of use of explosive energy will be done which helps in reducing the above emissions.
- ✓ All the vehicles that will be used for transportation i.e. trucks, tippers, and dumpers will be maintained regularly and checked for Pollution under Control.
- ✓ Personal Protective Equipment like dust mask will be provided to all employees working in the likely dusty areas.
- ✓ Covered transport of the stone from mine to the crusher location.

**Budgetary Cost Estimate**

Sufficient fund allocation will be made towards environmental management and monitoring program for dust pollution. The budget for the same is given in table below :

| S. No. | Items | Capital Cost (in Lakh) | Recurring Cost (in Lakh) |
|---|---|---|---|
| 1 | Pollution control & Dust suppression | 2.0 | 1.0 |
| 2 | Air monitoring | 2.5 | 1.0 |
| 3 | Plantation and green belt development | 2.0 | 3.0 |
| 4 | Health checkups and Emergency support | 1.0 | 1.0 |
| 5 | Safety Drills and PPEs | 2.0 | 1.5 |
| | **Total** | **9.5** | **7.5** |

**Government of India**
**Ministry of Environment, Forest and Climate Change**
**IA Division**
**(Non-Coal Mining)**
***

**Minutes of Expert Appraisal Committee meeting Non-Coal Mining held from 21/09/2023 to 22/09/2023**

**Date:** 29/09/2023

**MoM ID:** EC/MOM/EAC/553451/9/2023

**Agenda ID:** EC/AGENDA/EAC/553451/9/2023

**Meeting Venue:** N/A

**Meeting Mode:** Virtual

**Date & Time:**

| | | |
|---|---|---|
| 21/09/2023 | 10:30 AM | 05:30 PM |
| 22/09/2023 | 10:30 AM | 05:30 PM |

**1. Opening remarks**

The 20th meeting of the Re-constitution of Expert Appraisal Committee (EAC) for Environmental Appraisal of Mining Projects (Non-Coal) of the Ministry of Environment, Forest and Climate Change was held during 21-22 September, 2023 through video conference. The list of participants is annexed herewith. After login of the Committee Members through video conference link provided by NIC discussion on each of the Agenda Items was taken up ad-seriatim.

**2. Confirmation of the minutes of previous meeting**

The minutes of the 19th EAC meeting held during 24-25 August, 2023 were placed before the members of the EAC.

**3. Details of proposals considered by the committee**

**Day 1 -21/09/2023**

**3.1. Agenda Item No 1:**

**3.1.1. Details of the proposal**

| **Majhgawan Diamond Mine of M/s. NMDC Ltd for 0.72 LTPA of overburden removal and processing of kimberlite ore (8 LTPA) for production of 1.00 lakh carats of Diamond per annum within mine lease area of 162.631 Ha (Supplementary Mine Lease) Located at Majhgawan, Tehsil & District Panna, Madhya Pradesh by NMDC LIMITED** located at **PANNA,MADHYA PRADESH** | |
|---|---|
| **Proposal For** | Fresh EC |

in the mine lease area of 110.563 Ha, located at Village: Mukam, Tehsil- Bodla, District-Kabirdham, Chhattisgarh.

2. The project was considered in the 12th EAC (Non-Coal Mining) meeting held during 21-22 March, 2023. During the meeting, the EAC observed that the Project Proponent/Consultant was unable to bring out the technical details before the EAC. The EAC felt that the issues related to Wildlife and measures for protection of tiger have not been properly addressed and due to sensitivity of the Phen Wildlife Sanctuary, BufferZone of Kanha National Park and Kanha-Achanakmar Tiger Corridor, it is necessary to ascertain the ground reality. The EAC was of the view that a site visit needs to be conducted by a sub- committee comprising of EAC Members, officers from MoEF&CC and representative of the National Tiger Conservation Authority (NTCA). The EAC opined that the Ministry may constitute a sub-committee and submit its report to enable the committee to take a decision on the proposal. Further M/s Chhattisgarh Mineral Development Corporation Ltd vide letter dated 20.07.2023 informed to the Ministry that validity of mine lease has been extended till 26.03.2024.

3. Accordingly, Ministry vide letter dated 31.07.2023 constituted a sub-committee comprising of the following members to ascertain the ground realities of the project.

1. Shri N K Vasu, EAC Member
2. Shri Bandi Ramchandra Reddy, EAC Member
3. Shri Pankaj Verma, Scientist E and MS, EAC (NCM), MoEF&CC
4. Dr Saurabh Upadhyay, Scientist C, MoEF&CC
5. Dr Purshottam R Sakhre, Scientist E, Representative of Regional Office at Nagpur.
6. Dr Anil Dashahre, Biologist, Representative of NTCA

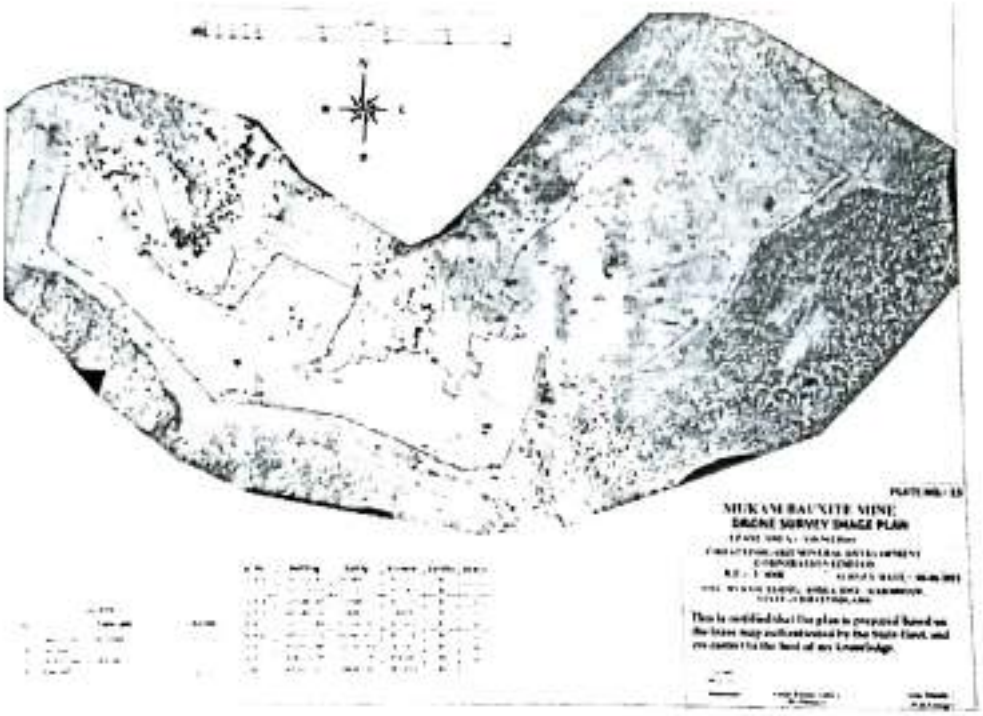
The Committee members conducted a day-long field visit on 18.08.2023, visiting the mine site and proposed mining pits within the mine lease area. During the field visit, it was slightly raining. The project proponent gave a brief overview about the existing structure of the mine and the proposed course of action planned by them. The following officers from M/s Chhattisgarh Mineral Development Corporation Ltd along with consultant were present i.e Shri Upendra Kumar, DGM/ Agent Mines, Shri Deepak Gupta, Regional Officer, Bhanupratapur and Shri Sushil Kumar Chandraker, AGM Mines.

4. The sub-committee during the site visit observed the following:

The proposed mine is located in village Mukam, Tehsil Bodla, District Kabirdham, Chhattisgarh. The village Mukam is adjacent to the site. The sub-committee found a school is situated near the mine site.

Proposed mining area with an extent of 110.0563 ha, is located at the Kawardha forest division adjoining Kanha Tiger Reserve (Phen Wildlife Sanctuary) and Bhoramdeo Wildlife Sanctuary.

The GPS coordinates were written on permanent point boundary pillars which is fixed on the ground. Team compared and verified the GPS coordinates recorded vis-à-vis coordinates mentioned on permanent points as well as GIS KML file of proposed mining area provided by user agency.



Pilar no. 59 of project site

Village Mukam adjacent to mine site

Mine site near the the pillar number 68


GPS Map Camera
Mukam, Chhattisgarh, India
Unnamed Road, Mukam, Chhattisgarh 491559, India
Lat 22.387724°
Long 81.171315°
18/08/23 03:23 PM GMT +05:30
Google


GPS Map Camera
Tarpongi, Chhattisgarh, India
FMMR+H63, Tarpongi, Chhattisgarh 493221, India
Lat 21.483052°
Long 81.690747°
18/08/23 01:18 PM GMT +05:30
Google

**Issues of Phen Wildlife Sanctuary, BufferZone of Kanha National Park and Kanha-Achanakmar Tiger Corridor**

The Project Proponent has informed that Phen Wildlife Sanctuary, Buffer Zone of Kanha National Park and Kanha-Achanakmar Tiger Corridor lies in the proximity of 10 km radius periphery of mines lying within the State of Madhya Pradesh which is about 5kms from the site of mines. The proposed mining area is situated at an aerial distance of approx. 2.18 Km from Eco sensitive zone boundary of Kanha Tiger Reserve and approx. 22.14 Km away from the Bhoramdeo WLS proposed site is outside of Eco sensitive zone of Kanha Tiger Reserve Madhya Pradesh.

As per all India Tiger Monitoring exercise 2022 report, there is no presence of tiger, but presence of Leopard and other endangered Carnivores and herbivores is recorded in the proposed mining area.

After the GIS appraisal it has been verified that the proposed area falls with the Kanha- Achanakmar corridor (Figure-1) as per corridor/adjoining area plan of TCP of Achanakmar Tiger Reserve Chhattisgarh.

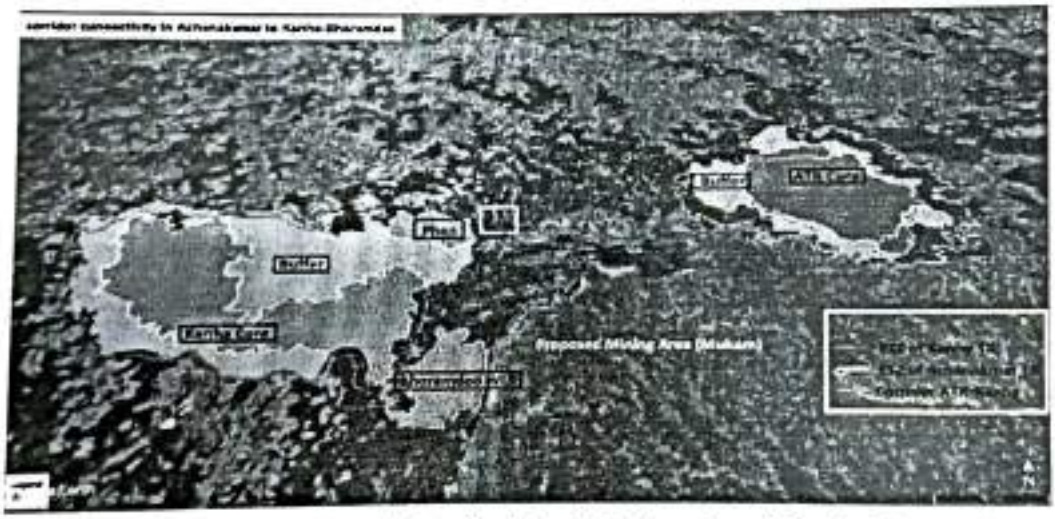
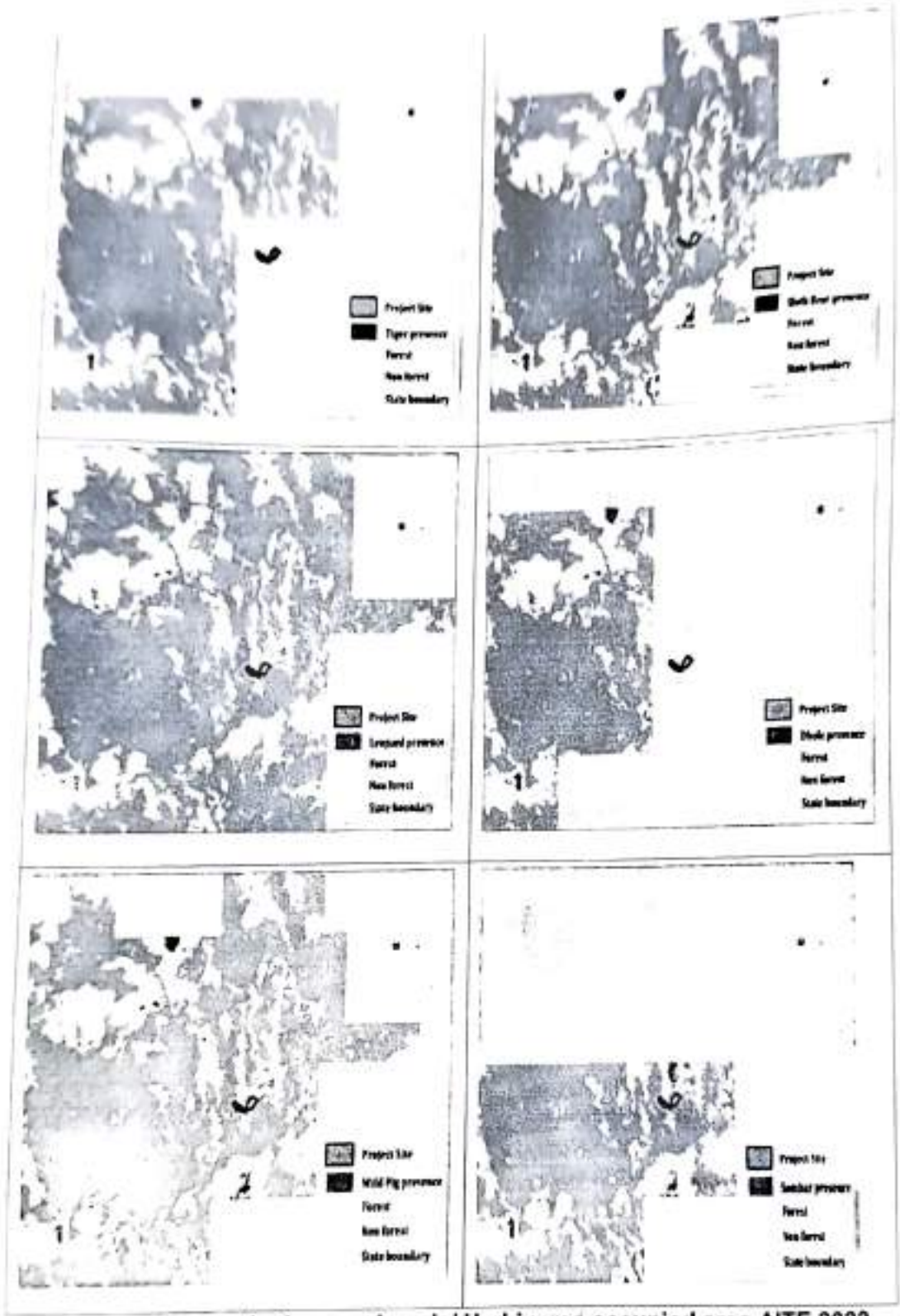


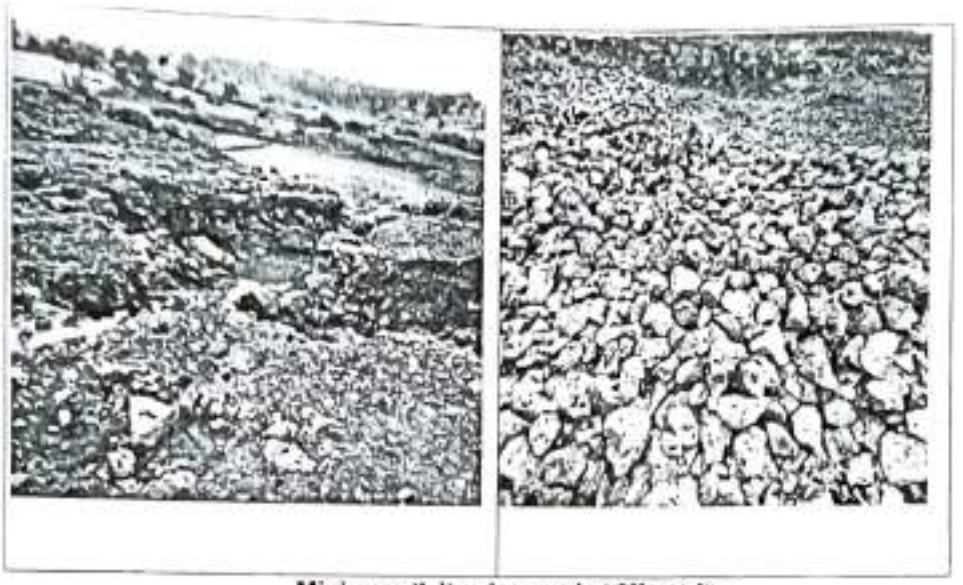

**Figure-1: Map showing mining location in Achanakmar-Kanha-Bhoramdeo corridor**



**Map showing tiger and other carnivore's/ Herbivores occupied area AITE 2022**

**Mining activity observed at Mine site**

The sub-committee observed that the mining activity has been carried out at the mine site area. The project proponent has informed that the same has not been done by the M/s CMDC. The sub-committee suggested for seeking comments from State DMG, if any illegal mining done by project proponent.



**Mining activity observed at Mine site**

5. Based on its observation, the committee recommended the following: -

1. The Project Proponent shall undertake a survey to count the number of trees present in the lease area.
2. The project proponent should take permission before felling of trees and shall submit the action plan for compensatory afforestation.
3. During site visit, habitation and school are seen near the mine lease area. Project proponent should submit the precaution measures with an action plan.
4. To maintain the dust free environment, the committee was of the opinion that project proponent should include provision for permanent sprinklers for the entire mineral transportation route.
5. The Committee was of the opinion that the project proponent may explore the expand the road width and accordingly a plan needs to be submitted along with timeline and cost.
6. The Project Proponent needs to submit the sequence of mining as the mine lease area involves an area of 67.401 ha of agriculture land and shall submit the action plan for restoration of ecology.

7. The Project Proponent needs to submit the letter from the State Forest Dept. Madhya Pradesh regarding the distance of the Tiger Corridor and ESZ along with the authenticated map and authenticated list of flora and fauna since the study area of the 10km radius of the buffer zone falling in the State of Madhya Pradesh. PP also needs to submit the letter from the State Forest Dept, Chhattisgarh regarding the list of flora and fauna by indicating the type of Schedule species found in the study area.
8. The project proponent needs to seek comments from the State DMG, if any illegal mining done by Project Proponent or not.
9. The project proponent needs to provide the exact distance of school and mukam village near the mine lease area.

**6. Observation and Recommendation of the EAC: -**

The EAC deliberated on the observation and recommendations of the subcommittee. After detailed deliberations, the EAC agreed to the recommendations of the subcommittee.

***

**List of members of Expert Appraisal Committee participated through VC**

| S.No | Member Name | Member Address | Designation | 21st Sept., 2023 | 22nd Sept., 2023 |
|---|---|---|---|---|---|
| 1 | Dr. Dinesh Misra, IFS (Retd.) | Plot No 65, Sector 8, Gandhinagar, Gujarat, 382 008 | Chairman | Yes | Yes |
| 2 | Sh. Niranjan Kumar Vasu, IFS (Retd.) | 816, Shanti Nagar, Opposite Durgapur Railway Station, Jaipur-Rajasthan, 302018 | Member | Yes | Yes |
| 3 | Dr. Asha Rajvanshi, Scientist 'G' (Retd.), WII | B/104/106 Rock Valley Apartments, GMSRoad, Sewla Kalan, P.O. Majra, Dehradun, Uttarakhand-248171 | Member | Yes | Yes |
| 4 | Shri. Avijit Ghosh (CMD- Heavy Engineering CorporationLimited) (Retd.) | Singhee Marg, A- 604 Shahadeo Tower, P.P.Compound, Ranchi 834001, Jharkhand | Member | Yes | Yes |

| | | | | | |
|---|---|---|---|---|---|
| 5 | Shri. BandiRamchandra Reddy (Former CMD-South Eastern Coalfields Limited)-(Retd.) | Flat No-503 A, Jyoti Cosmos, White Fields, Hi-Tech City, Kondapur,Hyderabad-500081 | Member | Yes | Yes |
| 6 | Prof. Pramod Kumar, Professor,ShriAurobindoCollege,University of Delhi | Shri Aurobindo College, University of Delhi 1372, B-1, Vasant Kunj, New Delhi-110070 | Member | No | No |
| 7 | Prof.DeveshWalia, Department of Environmental Studies | Department of Environmental Studies, NEHU,Shillong-793022 Meghalaya | Member | Yes | No |
| 8 | Dr. Suresh Tiwari Scientist-F | Indian Institute of Tropical Meteorology, Pune,New Delhi Branch, Prof. Ram NathVijMargRajinder Nagar, New Delhi - 110060 | Member | No | No |
| 9 | Dr. K.G Asha Manjari, Professor, University of Mysore | 10/B, "SPARSHA", 2nd Main, 2ndCross,BhogadiIInd Stage, Mysore-570026, Karnataka | Member | Yes | Yes |
| 10 | Prof. Dev Dutt Sharma, Vice-Chancellor | Sardar Patel University,Mandi H.P. 175001 | Member | No | No |
| 11 | Shri V. K. Soni, Representative of India Meteorological Department | Government of India, Ministry of Earth Sciences, India Meteorological Department, Mausam Bhawan, Lodi Road, New Delhi – 110003 | Member | Yes | No |
| 12 | Shri Yogesh Kale, Representative of Indian Bureau of Mines | Controller of Mines, IBM Block D, Second Floor, Indira Bhavan, Civil Lines, Nagpur - 440001 | Member | Yes | Yes |
| 13 | Shri Upendra Rapolu/Shri Niazi Mohammed | Representative of Directorate General of Mines Safety | Member | Yes | Yes |
| 14 | Shri Abhir Hede, Deputy Director | Department of Mines and Geology, Govt. of Goa | Special Invitee | - | Yes |
| 15 | Shri Pankaj Verma | 3rd Floor, Vayu Block, Indira ParyawaranBhawan, MoEF&CC, Jorbagh, New Delhi- 110003. | Member Secretary | Yes | Yes |

| | | | | | |
|---|---|---|---|---|---|
| 16 | Dr. Saurabh Upadhyay | 2nd Floor, Vayu Block, Indira ParyawaranBhawan, MoEF&CC, Jorbagh, New Delhi- 110003. | Scientist C | Yes | Yes |

*****

# —:: कार्यालय वनमंडलाधिकारी कवर्धा वनमंडल कवर्धा (छ.ग.) ::—

Tel No.: 232230
E-mail : dfokabirdham@gmail.com

क्रमांक / तक.अधि. / ..... 11012 कवर्धा, दिनांक :— 20 / 10 / 2023

प्रति,

छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड,
रायपुर, सेक्टर 24, तृत्तीय तल,
ब्लॉक नं. 07 ए, अटल नगर, नवा रायपुर

विषय :— **जिला कबीरधाम, तहसील बोड़ला, के ग्राम मुकाम रकबा 110.563 हे. क्षेत्र के पर्यावरण स्वीकृति हेतु EAC की 20वीं बैठक के माध्यम से चाही गई वांछित जानकारी उपलब्ध कराने बाबत्।**

संदर्भ :— आपका पत्र.क्र. / 916 / बाक्सा. / 2023 दिनांक 04.10.2023।

—✿✿✿—

उपरोक्त विषयांतर्गत संदर्भित पत्र के संबंध में स्थल निरीक्षण अधिनस्थ अधिकारी / कर्मचारियों के द्वारा कराया गया है। उन्होंने अपने जांच प्रतिवेदन में लेख किया है कि ग्राम मुकाम के रकबा 110.563 हे. क्षेत्र में विभिन्न प्रजाति के वृक्ष पाये गये है। उक्त क्षेत्र के अंदर वनभूमि शामिल नहीं है।

| क्र. | वृक्ष की प्रजाति का नाम | संख्या |
|---|---|---|
| 01 | सेन्हा | 18 नग |
| 02 | कुम्ही | 23 नग |
| 03 | बरगद | 18 नग |
| 04 | जामुन | 17 नग |
| 05 | साजा | 09 नग |
| 06 | बहेड़ा | 05 नग |
| 07 | हर्रा | 12 नग |
| 08 | कुसुम | 02 नग |
| 09 | साल | 34 नग |
| 10 | तेन्दू | 01 नग |
| 11 | बीजा | 01 नग |
| 12 | पकरी (गस्ती) | 03 नग |
| 13 | बांस | 01 नग |
| 14 | धावड़ा | 03 नग |
| | कुल | 147 नग |

वनमण्डलाधिकारी
कवर्धा वनमण्डल कवर्धा

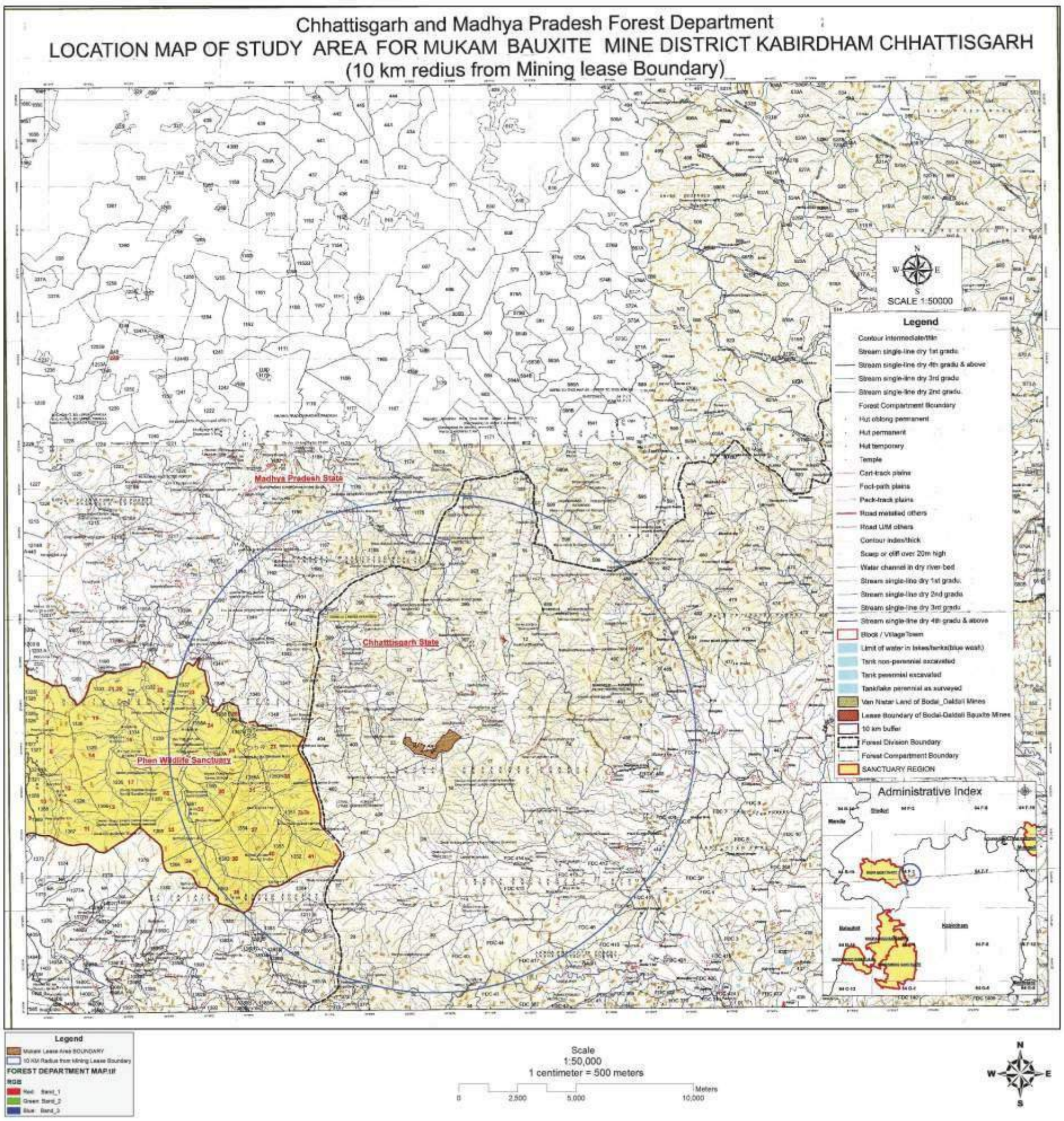
**Document – II**

Document - III

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh



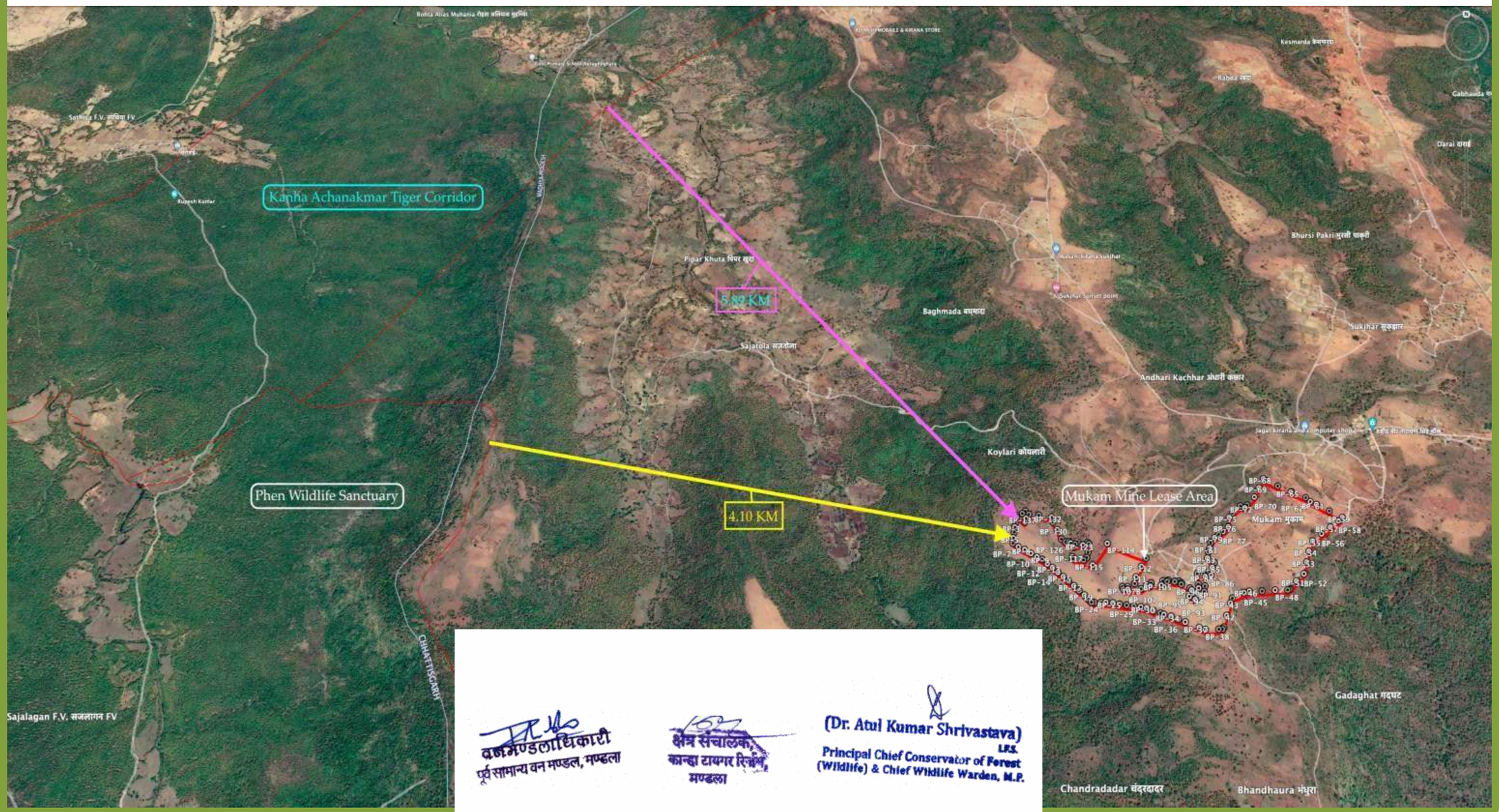

(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

ANNEXURE - V

# MUKAM BAUXITE MINES

## M/S. CHHATTISGARH MINERAL DEVELOPMENT CORPORATION LTD. (CMDC)

### Map showing distance of Phen Wildlife Sanctuary & Kanha Achanakmar Tiger Corridor from mine lease area.




वनमण्डलाधिकारी
पूर्व सामान्य वन मण्डल, मण्डला

क्षेत्र संचालक,
कान्हा टायगर रिजर्व,
मण्डला

(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

Document-IV

# MUKAM BAUXIT MINES

**M/s. Chhattisgarh Mineral Development Corporation Ltd. (CMDC)**

Village-Mukam, Tehsil-Bodla, District-Kabirdham, Chhattisgarh

# AUTHENTICATED LIST OF FLORA & FAUNA IN 10 KM RADIOUS AREA FALLEN IN MP

## ANNEXURE - II

## INVENTORY OF FLORAL DIVERSITY IN THE CORE & BUFFER ZONE OF MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

Habit: Tree (T), Shrub (S), Herb (H), Grass (G), and Climber (C)

### (a) Floral Diversity within Core Zone - Trees

| S. No. | Scientific name | Local name | Family | Habit |
|---|---|---|---|---|
| 1. | *Ficus religiosa* | Pipal | Moraceae | T |
| 2. | *Azadiracta indica* | Neem | Maliaceae | T |
| 3. | *Mangifera indica* | Mango | Anacardiaceae | T |
| 4. | *Cassia fistula* | Amaltas | Laguminosae | T |
| 5. | *Albizzia lebeck* | Kala Siris | Fabaceae | T |
| 6. | *Albizzia chinesis* | Kiragi | Laguminosae | T |
| 7. | *Albizzia odoratissima* | Chichwa | Laguminosae | T |
| 8. | *Anona squamosa* | Sitafal | Anonaceae | T |
| 9. | *Albizzia procera* | Safed Siris | Laguminosae | T |
| 10. | *Bauhinia variegata* | Kachnar | Laguminosae | T |
| 11. | *Bauhinia racemosa* | Asta | Laguminosae | T |
| 12. | *Pongamia Pinnata* | Karanj | Laguminosae | T |
| 13. | *Madhuca indica* | Mahua | Sapotaceae | T |
| 14. | *Diospyros monatana* | Bistendu | Ebenaceae | T |
| 15. | *Eriolaena hookeriana* | Bolbi | Sterculiaceae | T |
| 16. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 17. | *Euphorbia nivulia* | Thuar | Euphorbiaceae | T |
| 18. | *Ficus hispida* | Kutumar | Moraceae | T |
| 19. | *Ficus lacor* | Pakar | Moraceae | T |
| 20. | *Flacourtia Indica* | Kakai | Bixaceae | T |
| 21. | *Randia dumetorum* | Mainphal | Rubiaceae | T |
| 22. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 23. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 24. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 25. | *Tectona grandis* | Teak | Verbinaceae | T |
| 26. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| | | **Shrubs** | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |

## (a) Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 5. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 6. | *Azanza lampus* | Banakpas | Malvaceae | S |
| 8. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 9. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 10. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 11. | *Clerodendronserratum* | Barangi | Verbenaceae | S |
| 12. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 13. | *Crotalaria juncea* | Son | Laguminosae | S |
| 14. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 15. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 16. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 17. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 18. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 19. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 20. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 21. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 22. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 23. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 24. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 25. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 26. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 27. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |
| 28. | *Olax scandens* | Harduli | Oleaceae | S |
| 29. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 30. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 31. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 32. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 33. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 34. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 35. | *Uraria labata* | - | Malvaceae | S |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 36. | *Urena siuta* | - | Malvaceae | S |
| 37. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Hemidesmum indicus* | Sarsaparilla | Asclepidiaceae | H |
| 4. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 5. | *Lanandula burmanni* | - | Labistea | H |
| 6. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 7. | *Micromeria capitellata* | - | Labiateae | H |
| 8. | *Napeta ruderalis* | - | Labiateae | H |
| 9. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 10. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |
| 11. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 12. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 7. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 8. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 9. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 10. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 11. | *Vitis linnei* | Jangli angur | Ampelideae | C |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 12. | *Vitis tomentosa* | Purbel | Ampelideae | C |
| 13. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | Grasses | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj0 | - | G |
| 24. | *Sehima nervosum* | Shedo | - | G |

## (b) List of existing floristic composition within Buffer zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 1. | *Acacia catechu* | Khair | Mimosaceae | T |
| 2. | *Acacia arabica* | Babul | Laguminosae | T |
| 3. | *Acacia leucophloea* | Reunja | Mimosaceae | T |
| 4. | *Adinacordifolia* | Haldu | Rubiaceae | T |
| 5. | *Boswellia serrata* | Salayi | Burseraceae | T |
| 6. | *Bridelea retusa* | Kasai | Euphorbiaceae | T |
| 7. | *Buchnania lanzan* | Achar | Anacardiaceae | T |
| 8. | *Butea Monosperma* | Palash | Leguminaceae | T |
| 9. | *Aegle marmelos* | Bel | Rutaceae | T |
| 10. | *Ailanthus excelsa* | Mahaneem | Simaroubaceae | T |
| 11. | *Careya arborea* | Wild Guava/ kumbhi | Palmae | S |
| 12. | *Anogeissus latifolia* | Dhaura | Combretaceae | T |
| 13. | *Casearia graveolens* | Gilehi | Samydaceae | T |
| 14. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 15. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 16. | *Elaeodendron glaucum* | Jamrasi | Celastraceae | T |
| 17. | *Dillenia aurea* | Karmata | Dilleniaceae | T |
| 18. | *Delonix regia* | Gulmohar | Laguminosae | T |
| 19. | *Dillenia pentagyna* | Kalla | Dilleniaceae | T |
| 20. | *Ehretia laevis* | Datranga | Burseraceae | T |
| 21. | *Cordia latifolia* | Bara lasora | Baraginaceae | T |
| 22. | *Cordian macleodli* | Silwat | Baraginaceae | T |
| 23. | *Dalbergia latifolia* | Shisham | Leguminosae | T |
| 24. | *Dalbergia sissoo* | Sissoo | Leguminosae | T |
| 25. | *Euphorbia nivulia, Ham* | Thuar | Euphorbiaceae | T |
| 26. | *Ficus hispida* | Kuturmar | Moraceae | T |
| 27. | *Chloroxylon swietenia* | Bhirra | Caesalpiniaceae | T |
| 28. | *Cleistanthus collinus* | Garari | Meliacea | T |
| 29. | *Cochlospermum religiosum* | Galgal | Euphorbiaceae | T |
| 30. | *Eucalyptus spp.* | Nilgiri | Myrtaceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 31. | *Ficus lacor* | Pakar | Moraceae | T |
| 32. | *Bauhinia malabarica* | Amta | Leguminaceae | T |
| 33. | *Casearia elliptica* | Tondri | Samydaceae | T |
| 34. | *Cordia dichotoma* | Lisoda/Gunda | Rubiaceae | T |
| 35. | *Litsea sebifera* | Maida lakri | Lauraceae | T |
| 36. | *Mitragyna parvifolia* | Mundi | Rubiaceae | T |
| 37. | *Pterocarpus marsupium* | Bija | Leguminosae | T |
| 38. | *Randia Dumetorum* | Mainphal | Rubiaceae | T |
| 39. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 40. | *Santalum album* | Chandan | Santalaceae | T |
| 41. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 42. | *Sterculia villosa* | Udal | Anacardiaceae | T |
| 43. | *Stereospermum suaveolens* | Padar | Bignoniaceae | T |
| 44. | *Terminalia belerica* | Bahera | Combretaceae | T |
| 45. | *Psidium guava* | Amrud | Myrtaceae | T |
| 46. | *Dalbergia paniculata* | Dhobin | Fabaceae | T |
| 47. | *Diospyros melanoxylon* | Tendu | Lythraceae | T |
| 48. | *Diospyros monatana* | Bistendu | Lythraceae | T |
| 49. | *Ficus benghalensis* | Bad | Moraceae | T |
| 50. | *Emblica officinalis* | Amla | Euphorbiaceae | T |
| 51. | *Ficus glomerata* | Gular | Moraceae | T |
| 52. | *Ficus hispida* | Hairy fig | Moraceae | T |
| 53. | *Ficus religiosa* | Pipal | Moraceae | T |
| 54. | *Strychnos potatorum* | Nirmali | Laguminosae | T |
| 55. | *Grewia disperma* | Chaturli | Tiliaceae | T |
| 56. | *Grewia tiliaefolia* | Dhaman | Tiliaceae | T |
| 57. | *Holoptelea integrifolia* | Papri/Churel | Asclepiadaceae | T |
| 58. | *Gardenia latifolia* | Papra | Rubiaceae | T |
| 59. | *Gardenia turgida* | Phetra | Rubiaceae | T |
| 60. | *Garuga pennata* | Kekad | Burseraceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 61. | *Gmelina arborea* | Gamari | Verbenaceae | T |
| 62. | *Hymenodictyon excelsum* | Bhonrsal | Rubiaceae | T |
| 63. | *Ixota arborea* | Lokhandi | Rubiaceae | T |
| 64. | *Kydia calycina* | Pula | Malvaceae | T |
| 65. | *Langerstroemia parviflora* | Lendia | Lythraceae | T |
| 66. | *Schrebera switenioides* | Mokha | Oleaceae | T |
| 67. | *Semecarpus anacardium* | Bhilwa | Anacardiaceae | T |
| 68. | *Xylia xylocarpa* | Suria | Mimisaceae | T |
| 69. | *Lannea coramandelica* | Mohin/ Ash tree | Anacardiaceae | T |
| 70. | *Pterocarpus marsupium* | Bija | Leguminoceae | T |
| 71. | *Pongamia pinnata* | Karanj | Fabaceae | T |
| 72. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 73. | *Spondias pinnata* | Amra | Leguminaceae | T |
| 74. | *Sterculia urens* | Kullu | Euphorbiaceae | T |
| 75. | *Stereospermum suaveolens* | Paddar | Bignoniaceae | T |
| 76. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| 77. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 78. | *Hardwikia binata* | Anjan | Leguminoceae | T |
| 79. | *Terminalia tomentosa* | Saja | Combretaceae | T |
| 80. | *Zizyphus mautatiana* | Bar | Rhamnaceae | T |
| 81. | *Tectona grandis* | Teak | Verbinaceae | T |
| 82. | *Terminalia arjuna* | Arjun | Combretaceae | T |
| | | **Shrubs** | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Ageratum conyzoids* | - | Compositae | S |
| 5. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 6. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 7. | *Azanza lampus* | Banakpas | Malvaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 8. | *Barleria cristata* | Koranta | Acanthaceae | S |
| 9. | *Barleria mantana* | Korat | Verbenaceae | S |
| 10. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 11. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 12. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 13. | *Clerodendron serratum* | Barangi | Verbenaceae | S |
| 14. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 15. | *Crotalaria juncea* | Son | Laguminosae | S |
| 16. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 17. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 18. | *Desmodium velutinum* | Chikati | Laguminosae | S |
| 19. | *Dioscorea anguina* | Bansora | Dioscoreaceae | S |
| 20. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 21. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 22. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 23. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 24. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 25. | *Grewia sapida* | Phalsa | Tiliaceae | S |
| 26. | *Helicteres isora* | Marorphali | Sterculiaceae | S |
| 27. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 28. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 29. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 30. | *Justieia betonica* | Kokander | Acanthaceae | S |
| 31. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 32. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 33. | *Maytenus emarginata* | Bahrti | Celastraceae | S |
| 34. | *Malastoma malababathricum* | Palor | Malastomaceae | S |
| 35. | *Maghania nana* | Chepati | Papilionaceae | S |
| 36. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 37. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 38. | *Olax scandens* | Harduli | Oleaceae | S |
| 39. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 40. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 41. | *Sida acuta* | Kareta | Mavaceae | S |
| 42. | *Sida cardifolia* | Mamas | Mavaceae | S |
| 43. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 44. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 45. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 46. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 47. | *Triumfetta bartramia* | Chirpat | Tiliaceae | S |
| 48. | *Triumfetta pilosa* | Chikati | Tiliaceae | S |
| 49. | *Uraria labata* | - | Malvaceae | S |
| 50. | *Urena siuta* | - | Malvaceae | S |
| 51. | *Vitex negundo* | Nirgudi | Verbenaceae | S |
| 52. | *Waltheria indica* | Haduli | Sterculiaceae | S |
| 53. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Chlorophylum tuberosum* | Safed Musali | Liliaceae | H |
| 4. | *Curculigo orachiolides* | Kali musli | Amaryullidaceae | H |
| 5. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 6. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 7. | *Lanandula burmanni* | - | Labistea | H |
| 8. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 9. | *Micromeria capitellata* | - | Labiateae | H |
| 10. | *Napeta ruderalis* | - | Labiateae | H |
| 11. | *Polygala chinesis* | Bijnori | Pigalaceae | H |
| 12. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 13. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 14. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 15. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| 3. | *Visum nepalene* | Bandha | Loranthaceae | - |
| 4. | *Orodanche oegyptica* | Bandha | Prkobancheaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Celastrus paniculata* | Malkangini | Celastraceae | C |
| 7. | *Combretum decandrum* | Piwarbel | Combretaceae | C |
| 8. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 9. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 10. | *Ichnocarpus frutescens* | Dhimarbel | Apocynaceae | C |
| 11. | *Marsdenia hamiltonia* | Dudhibel | Asclepiadaceae | C |
| 12. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 13. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 14. | *Mucuna pruriens* | Kewanch | Leguminosae | C |
| 15. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 16. | *Vitis linnei* | Jangli angur | Ampelideae | C |
| 17. | *Vitis fomentosa* | Purbel | Ampelideae | C |
| 18. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | **Grasses** | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj | - | G |
| 24. | *Imperata Cylidrica* | Chhir | - | G |
| 25. | *Sehima nervosum* | Shedo | - | G |

**Status of RET Species**

During field Survey, rare, endangered and threatened species of flora recorded under threatened status in the study area are as follows:

1. Endemic- *Hardwikia binnata, Mucuna prurita*
2. Locally Endangered Species
   A. *Butea monosperma* B. *Clerodendron serratum* C. *Curculigo orchioides* D. *Curcuma augustifolia* E. *Pterocarpus marsupiyum.*
3. According to Madhya Pradesh State Medicinal Plant Board endangered species are:
   A. *Diospyros peniculato* B. *Pterocarpus marsupiyum* C. *Terminalia arjuna* D. *Grewia rothi* E. *Vitextrifolia*-Critically endangered.

## ANNEXURE - III

### INVENTORY OF FAUNAL DIVERSITY IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

**a) Core Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Vulpes bengalenss* | Common fox | Sch. II |
| 2. | *Rattus rattus* | Black rat | Sch. V |
| 3. | *Tatera indica* | Indian Gerbil | Sch. V |
| 4. | *Funambulus palmarum* | Indian palm Squirrel | Sch. IV |
| 5. | *Canis aureus* | Jackal | Sch. III |
| 6. | *Boselaphus tragocamelus* | Nilgai | Sch. III |
| 7. | *Axis axis* | Chital | Sch. III |
| 8. | *Sus scrofa* | Wild boar | Sch. III |
| 9. | *Felis chaus* | Jungle cat | Sch. II |
| 10. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 11. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 12. | *Hystris indica* | Porcupine | Sch. IV |
| | | **Reptilian** | |
| 1. | *Ptyas mucosa* | Indian Rat snake | Sch. II |
| 2. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 3. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 4. | *Bungarus candidud* | Common krait | Sch. IV |
| 5. | *Naja naja* | Naag/Kobra | Sch. II |
| 6. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 7. | *Vipera russelli* | Russell's viper | Sch. II |
| 8. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| | | **Amphibian** | |
| 1. | *Rana tigrina* | Common Frog | Sch. IV |
| 2. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 3. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 7. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 8. | *Junonia almana* | Peacock pansy | Sch. IV |
| 9. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 10. | *Leptosia nina* | Psyche | Sch. IV |
| | | **Arthropods and Mollusca** | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Periplaneta americana* | Cockroach | - |
| 3. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 4. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 5. | *Stegodyphus sp.* | Social Spider | - |
| | | **Avifaunal (Birds)** | |
| 1. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 2. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 3. | *Egretta garzetta* | Little egret | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 6. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 7. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 8. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 9. | *Acridotheres tristis* | Common myna | Sch. IV |
| 10. | *Spilopelia senegalensis* | Laughing dove | Sch. IV |
| 11. | *Ardeola grayii* | Pond heron | Sch. IV |
| 12. | *Aegithina tiphia* | Common iora | Sch. IV |
| 13. | *Anas crecca* | Common teal | Sch. IV |
| 14. | *Passer domesticus* | House sparrow | Sch. IV |

**Birds**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 15. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 16. | *Corvus splendens* | House crow | Sch. V |
| 17. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 18. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 19. | *Milvus migrans* | Black kite | Sch. IV |
| 20. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |
| 21. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 22. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 23. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| 24. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 25. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 26. | *Cuculus micropterus* | Indian Cuckoo | Sch. IV |
| 27. | *Apus affinis* | House swift | Sch. IV |
| 28. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 29. | *Milvus migrans* | Black kite | Sch. IV |
| 30. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 31. | *Tyto alba* | Barn owl | Sch. IV |

## B. Faunal Diversity in Buffer Zone

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Canis aureus* | Jackal | Sch. II |
| 2. | *Hyaena hyaena* | Hyena | Sch. III |
| **3.** | ***Melursus ursinus*** | **Sloth bear** | **Sch. I** |
| 4. | *Vulpes bengalenss* | Common fox | Sch. II |
| 5. | *Rattus rattus* | Black rat | Sch. V |
| **6.** | ***Panthera tigris tigris*** | **Bengal tiger** | **Sch. I** |
| 7. | *Rattus norvegicus* | Field mouse | Sch. V |
| 8. | *Bandicota indica* | Bandicoot | Sch. V |
| 9. | *Tatera indica* | Indian Gerbil | Sch. V |
| 10. | *Funambulus palmarumi* | Indian Palm Squirrel | Sch. IV |
| **11** | ***Tetracerus quadricornis*** | **Chousingha** | **Sch. I** |
| 12. | *Boselaphus tragocamelus* | Nilgai | Sch.III |
| **13.** | ***Elephas maximus*** | **Elephant** | **Sch.I** |
| 14. | *Rhinolophus spp.* | Horseshoe Bat | Sch. V |
| **15.** | ***Bos qaurus*** | **Bison** | **Sch.I** |
| 16. | *Pteropus giganteus* | Indian flying fox | Sch. V |
| 17. | *Cervus unicolor* | Sambar | Sch. III |
| 18. | *Axis axis* | Chital | Sch. III |
| 19. | *Hystris indica* | Porcupine | Sch. II |
| **20.** | ***Panthera Pardus*** | **Common leopard** | **Sch.I** |
| 21. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 22. | *Presbytis entellus* | Common langur | Sch. II |
| 23. | *Macaca mulatta* | Rhesus macaque | Sch. II |
| 24. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 25. | *Sus scrofa* | Wild boar | Sch. III |
| 26. | *Cuon alpinus* | Wild dog | Sch. II |
| | | **Reptilian** | |
| 1. | *Vipera russelli* | Russell's viper | Sch. II |
| **2.** | ***Varanus bengalensis*** | **Monitor lizard** | **Sch. I** |
| 3. | *Ptyas mucosa* | Indian Rat snake | Sch. II |

**Faunal Diversity in Buffer Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 4. | *Lycodon aulicus* | Common wolf snake | Sch. IV |
| 5. | *Bungarus candidus* | Common krait | Sch. IV |
| 6. | *Boiga trigonata* | Cat snake | Sch. IV |
| 7. | *Eryx johnii* | Red sand Boa | Sch. IV |
| 8. | *Naja naja* | Naag/Kobra | Sch. II |
| 9. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 10. | *Melanochelys trijuga* | Indian pond turtle | Sch. IV |
| 11. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 12. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 13. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| **14.** | ***Pythan molurns*** | **Pythan** | **Sch.I** |
| | | **Amphibian** | |
| 1. | *Rana limnocharis* | Indian cricket Frog | Sch. IV |
| 2. | *Hoplobatrachus tigerinus* | Indian bull frog | Sch. IV |
| 3. | *Rana tigrina* | Common Frog | Sch. IV |
| 4. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 5. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |
| 6. | *Hyla goeldii* | Tree frog | Sch. IV |
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Papilio polymnestor* | Blue mormon | |
| 5. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Neptis hylas* | Common sailer | Sch. IV |
| 7. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 8. | *Parantica aglea* | Glassy tiger | Sch. IV |
| 9. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 10. | *Junonia almana* | Peacock pansy | Sch. IV |
| 11. | *Junonia orythia* | Blue pansy | Sch. IV |
| 12. | *Junonia atlites* | Grey pansy | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 13. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 14. | *Leptosia nina* | Psyche | Sch. IV |
| 15. | *Chilades parrhassius* | Small cupid | Sch. IV |
| 16. | *Musca domestica* | Housfly | Sch. IV |
| 17. | *Aedes aegypti* | Dengue mosquito | Sch. IV |
| 18. | *Pieris napi* | Green- veined white butterfly | Sch. IV |
| 19. | *Eurema brigitta* | Small grass yellow | Sch. IV |
| 20. | *Parantica aglea* | Glassy tiger | Sch. IV |
| | | **Arthropods and Mollusca** | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Apis dorsata* | Badi Madhumakkhi | - |
| 3. | *Periplaneta amercana* | Cockroach | - |
| 4. | *Buthus sp.* | Scorpion | - |
| 5. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 6. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 7. | *Stegodyphus sp.* | Social Spider | - |
| | | **Avifaunal (Birds)** | |
| 1. | *Ardeola grayii* | Pond heron | Sch. IV |
| 2. | *Acridotheres tristis* | Common myna | Sch. IV |
| 3. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Egretta garzetta* | Little egret | Sch. IV |
| 6. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 7. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 8. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 9. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 10. | *Milvus migrans* | Black kite | Sch. IV |
| 11. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 12. | *Tockus birostris* | Indian Grey Hornbill | Sch. IV |
| 13. | *Tyto alba* | Barn owl | Sch. IV |
| 14. | *Accipiter badius* | Shikra | Sch. IV |
| 15. | *Bubo bubo* | Eurasian Eagle Owl | Sch. IV |

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| 16. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 17. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 18. | *Corvus splendens* | Common crow | Sch. V |
| 19. | *Passer domesticus* | House sparrow | Sch. IV |
| 20. | *Nectarinia asiatica* | Purple sunbird | Sch. IV |
| 21. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| **22.** | ***Pavo cristatus*** | **Peafowl** | **Sch. I** |
| 23. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 24. | *Turdoides striatus* | Jungle babbler | Sch. IV |
| 25. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 26. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 27. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 28. | *Vanellus indicus* | Red-wattled lapwing | Sch. IV |
| 29. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 30. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 31. | *Apus affinis* | House swift | Sch. IV |
| 32. | *Halcyon smyrnensis* | White throated kingfisher | Sch. IV |
| 33. | *Francolinus pondicerianus* | Grey francolin | Sch. IV |
| 34. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 35. | *Centropus sinensis* | Greater coucal | Sch. IV |
| 36. | *Amaurornis phoenicurus* | White breasted water hen | Sch. IV |
| 37. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |

**Analysis of Fauna**

Schedule-I fauna was recorded in the study area during field survey as per (IWPA) Indian Wildlife Protection Act, 1972.

| | | | |
|---|---|---|---|
| **1.** | **Indian monitor lizard** | ***Varanus benglensis*** | **Sch. I** |
| **2.** | **Indian peafowl** | ***Pavo cristatus*** | **Sch. I** |
| **3.** | **Sloth bear** | ***Melursus ursinus*** | **Sch. I** |
| **4.** | **Elephant** | ***Elephas maximus*** | **Sch. I** |
| **5.** | **Indian rock python** | ***Python molurus*** | **Sch. I** |
| **6.** | **Bengal tiger** | ***Panthera tigris tigris*** | **Sch. I** |
| **7.** | **Chousingha** | ***Tetracerus quadricornis*** | **Sch. I** |
| **8.** | **Bison** | ***Bos gaurus*** | **Sch. I** |
| **9.** | **Common leopard** | ***Panthera Pardus*** | **Sch. I** |

## INVENTORY OF AQUATIC FLORA IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| | | Aquatic diversity of buffer zone | |
| 1. | *Harpadon nehereus* | Bombil | - |
| 2. | *Sperata seenghala* | Singara | - |
| 3. | *Penaeus monodon* | Prawn | - |
| 4. | *Labeo rohita* | Rohu | - |
| 5. | *Oreochromis niloticus* | Tilapia | - |
| 6. | *Lamellidens corrianus* | Shells | - |
| 7. | *Rita rita* | Rita | - |
| 8. | *Mastacembelus armatus* | Bam | - |
| 9. | *Alysfus tengara* | Tengara | - |
| 10. | *Cirrhinas mrigala* | Mrigal | - |
| 11. | *Boleophithalmus spp.* | Mudskippers | - |
| 12. | *Catla catla* | Catla | - |
| 13. | *Mugil cephalus* | Mullet | - |

उप मण्डलाधिकारी
पूर्व सामान्य वन मण्डल, मण्डला

क्षेत्र संचालक,
कान्हा टाइगर रिजर्व,
मण्डला

(Dr. Atul Kumar Shrivastava)
I.F.S.
Principal Chief Conservator of Forest
(Wildlife) & Chief Wildlife Warden, M.P.

# AUTHENTICATED LIST OF FLORA & FAUNA OF MUKAM BAUXIT MINES 10 KM RADIOUS AREA FALLEN IN CHHATTISGARH

ANNEXURE - II

## INVENTORY OF FLORAL DIVERSITY IN THE CORE & BUFFER ZONE OF MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

Habit: Tree (T), Shrub (S), Herb (H), Grass (G), and Climber (C)

### (a) Floral Diversity within Core Zone - Trees

| S. No. | Scientific name | Local name | Family | Habit |
|---|---|---|---|---|
| 1. | *Ficus religiosa* | Pipal | Moraceae | T |
| 2. | *Azadiracta indica* | Neem | Maliaceae | T |
| 3. | *Mangifera indica* | Mango | Anacardiaceae | T |
| 4. | *Cassia fistula* | Amaltas | Laguminosae | T |
| 5. | *Albizzia lebeck* | Kala Siris | Fabaceae | T |
| 6. | *Albizzia chinesis* | Kiragi | Laguminosae | T |
| 7. | *Albizzia odoratissima* | Chichwa | Laguminosae | T |
| 8. | *Anona squamosa* | Sitafal | Anonaceae | T |
| 9. | *Albizzia procera* | Safed Siris | Laguminosae | T |
| 10. | *Bauhinia variegata* | Kachnar | Laguminosae | T |
| 11. | *Bauhinia racemosa* | Asta | Laguminosae | T |
| 12. | *Pongamia Pinnata* | Karanj | Laguminosae | T |
| 13. | *Madhuca indica* | Mahua | Sapotaceae | T |
| 14. | *Diospyros monatana* | Bistendu | Ebenaceae | T |
| 15. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 16. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 17. | *Euphorbia nivulia* | Thuar | Euphorbiaceae | T |
| 18. | *Ficus hispida* | Kutumar | Moraceae | T |
| 19. | *Ficus lacor* | Pakar | Moraceae | T |
| 20. | *Flacourtia Indica* | Kakai | Bixaceae | T |
| 21. | *Randia dumetorum* | Mainphal | Rubiaceae | T |
| 22. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 23. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 24. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 25. | *Tectona grandis* | Teak | Verbinaceae | T |
| 26. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| | | Shrubs | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |

## (a) Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 5. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 6. | *Azanza lampus* | Banakpas | Malvaceae | S |
| 8. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 9. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 10. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 11. | *Clerodendronserratum* | Barangi | Verbenaceae | S |
| 12. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 13. | *Crotalaria juncea* | Son | Laguminosae | S |
| 14. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 15. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 16. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 17. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 18. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 19. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 20. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 21. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 22. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 23. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 24. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 25. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 26. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 27. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |
| 28. | *Olax scandens* | Harduli | Oleaceae | S |
| 29. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 30. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 31. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 32. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 33. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 34. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 35. | *Uraria labata* | - | Malvaceae | S |

## Floral Diversity within Core Zone

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 36. | *Urena siuta* | - | Malvaceae | S |
| 37. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | Herbs | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 4. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 5. | *Lanandula burmanni* | - | Labistea | H |
| 6. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 7. | *Micromeria capitellata* | - | Labiateae | H |
| 8. | *Napeta ruderalis* | - | Labiateae | H |
| 9. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 10. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |
| 11. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 12. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | Epiphytes & Parasites | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| | | Climbers | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlii* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 7. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 8. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 9. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 10. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 11. | *Vitis linnei* | Jangli angur | Ampelideae | C |

**Floral Diversity within Core Zone**

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 12. | *Vitis tomentosa* | Purbel | Ampelideae | C |
| 13. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | Grasses | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj0 | - | G |
| 24. | *Sehima nervosum* | Shedo | - | G |

**(b) List of existing floristic composition within Buffer zone**

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 1. | *Acacia catechu* | Khair | Mimosaceae | T |
| 2. | *Acacia arabica* | Babul | Laguminosae | T |
| 3. | *Acacia leucophloea* | Reunja | Mimosaceae | T |
| 4. | *Adinacordifolia* | Haldu | Rubiaceae | T |
| 5. | *Boswellia serrata* | Salayi | Burseraceae | T |
| 6. | *Bridelea retusa* | Kasai | Euphorbiaceae | T |
| 7. | *Buchnania lanzan* | Achar | Anacardiaceae | T |
| 8. | *Butea Monosperma* | Palash | Leguminaceae | T |
| 9. | *Aegle marmelos* | Bel | Rutaceae | T |
| 10. | *Ailanthus excelsa* | Mahaneem | Simaroubaceae | T |
| 11. | *Careya arborea* | Wild Guava/ kumbhi | Palmae | S |
| 12. | *Anogeissus latifolia* | Dhaura | Combretaceae | T |
| 13. | *Casearia graveolens* | Gilehi | Samydaceae | T |
| 14. | *Eriolaena hookeriana* | Bothi | Sterculiaceae | T |
| 15. | *Erythrina suberosa* | Panjra | Leguminosae | T |
| 16. | *Elaeodendron glaucum* | Jamrasi | Celastraceae | T |
| 17. | *Dillenia aurea* | Karmata | Dilleniaceae | T |
| 18. | *Delonix regia* | Gulmohar | Laguminosae | T |
| 19. | *Dillenia pentagyna* | Kalla | Dilleniaceae | T |
| 20. | *Ehretia laevis* | Datranga | Burseraceae | T |
| 21. | *Cordia latifolia* | Bara lasora | Baraginaceae | T |
| 22. | *Cordian macleodli* | Silvat | Baraginaceae | T |
| 23. | *Dalbergia latifolia* | Shisham | Leguminosae | T |
| 24. | *Dalbergia sissoo* | Sissoo | Leguminosae | T |
| 25. | *Euphorbia nivulia, Ham* | Thuar | Euphorbiaceae | T |
| 26. | *Ficus hispida* | Kutumar | Moraceae | T |
| 27. | *Chloroxylon swietenia* | Bhirra | Caesalpiniaceae | T |
| 28. | *Cleistanthus collinus* | Garari | Meliacea | T |
| 29. | *Cochlospermum religiosum* | Galgal | Euphorbiaceae | T |
| 30. | *Eucalyptus spp.* | Nilgiri | Myrtaceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 31. | *Ficus lacor* | Pakar | Moraceae | T |
| 32. | *Bauhinia malabarica* | Amta | Leguminaceae | T |
| 33. | *Casearia elliptica* | Tondri | Samydaceae | T |
| 34. | *Cordia dichotoma* | Lisoda/Gunda | Rubiaceae | T |
| 35. | *Litsea sebifera* | Maida lakri | Lauraceae | T |
| 36. | *Mitragyna parvifolia* | Mundi | Rubiaceae | T |
| 37. | *Pterocarpus marsupium* | Bija | Leguminosae | T |
| 38. | *Randia Dumetorum* | Mainphal | Rubiaceae | T |
| 39. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 40. | *Santalum album* | Chandan | Santalaceae | T |
| 41. | *Spondias pinnata* | Amra | Anacardiacea | T |
| 42. | *Sterculia villosa* | Udal | Anacardiaceae | T |
| 43. | *Stereospermum suaveolens* | Padar | Bignoniaceae | T |
| 44. | *Terminalia belerica* | Bahera | Combretaceae | T |
| 45. | *Psidium guava* | Amrud | Myrtaceae | T |
| 46. | *Dalbergia paniculata* | Dhobin | Fabaceae | T |
| 47. | *Diospyros melanoxylon* | Tendu | Lythraceae | T |
| 48. | *Diospyros monatana* | Bistendu | Lythraceae | T |
| 49. | *Ficus benghalensis* | Bad | Moraceae | T |
| 50. | *Emblica officinalis* | Amla | Euphorbiaceae | T |
| 51. | *Ficus glomerata* | Gular | Moraceae | T |
| 52. | *Ficus hispida* | Hairy fig | Moraceae | T |
| 53. | *Ficus religiosa* | Pipal | Moraceae | T |
| 54. | *Strychnos potatorum* | Nirmali | Laguminosae | T |
| 55. | *Grewia disperma* | Chaturli | Tiliaceae | T |
| 56. | *Grewia tiliaefolia* | Dhaman | Tiliaceae | T |
| 57. | *Holoptelea integrifolia* | Papri/Churel | Asclepiadaceae | T |
| 58. | *Gardenia latifolia* | Papra | Rubiaceae | T |
| 59. | *Gardenia turgida* | Phetra | Rubiaceae | T |
| 60. | *Garuga pennata* | Kekad | Burseraceae | T |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 61. | *Gmelina arborea* | Gamari | Verbenaceae | T |
| 62. | *Hymenodictyon excelsum* | Bhonrsal | Rubiaceae | T |
| 63. | *Ixota arborea* | Lokhandi | Rubiaceae | T |
| 64. | *Kydia calycina* | Pula | Malvaceae | T |
| 65. | *Langerstroemia parviflora* | Lendia | Lythraceae | T |
| 66. | *Schrebera switenioides* | Mokha | Oleaceae | T |
| 67. | *Semecarpus anacardium* | Bhilwa | Anacardiaceae | T |
| 68. | *Xylia xylocarpa* | Suria | Mimisaceae | T |
| 69. | *Lannea coramandelica* | Mohin/ Ash tree | Anacardiaceae | T |
| 70. | *Pterocarpus marsupium* | Bija | Leguminoceae | T |
| 71. | *Pongamia pinnata* | Karanj | Fabaceae | T |
| 72. | *Schleichera oleosa* | Kusum | Sapindaceae | T |
| 73. | *Spondias pinnata* | Amra | Leguminaceae | T |
| 74. | *Sterculia urens* | Kullu | Euphorbiaceae | T |
| 75. | *Stereospermum suaveolens* | Paddar | Bignoniaceae | T |
| 76. | *Syzygium cumini* | Jamun | Myrtaceae | T |
| 77. | *Tamarindus indica* | Imli | Caesalpinaceae | T |
| 78. | *Hardwikia binata* | Anjan | Leguminoceae | T |
| 79. | *Terminalia tomentosa* | Saja | Combretaceae | T |
| 80. | *Zizyphus mautatiana* | Bar | Rhamnaceae | T |
| 81. | *Tectona grandis* | Teak | Verbinaceae | T |
| 82. | *Terminalia arjuna* | Arjun | Combretaceae | T |
| | | | | |
| 1. | *Arbus prectatotrius* | Gunj | Papilionaceae | S |
| 2. | *Achyranthes aspera* | Chirchira | Amarantaceae | S |
| 3. | *Adhatoda vasica* | Adusa | Acanthaceae | S |
| 4. | *Ageratum conyzoids* | - | Compositae | S |
| 5. | *Andrographis paniculata* | Chirchira | Acanthaceae | S |
| 6. | *Antidesma ghaesenbilla* | Jondhri | Euphorbiaceae | S |
| 7. | *Azanza lampus* | Banakpas | Malvaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 8. | *Barleria cristata* | Koranta | Acanthaceae | S |
| 9. | *Barleria mantana* | Korat | Verbenaceae | S |
| 10. | *Carissa opaca* | Karonda | Apocynaceae | S |
| 11. | *Calotropis procera* | Aak | Asclepediaceae | S |
| 12. | *Cassia Tora* | Tarwar | Laguminosae | S |
| 13. | *Clerodendron serratum* | Barangi | Verbenaceae | S |
| 14. | *Colebrookia oppositifolia* | Bhandar | Labiatae | S |
| 15. | *Crotalaria juncea* | Son | Laguminosae | S |
| 16. | *Dalbergia voluvilis* | Birach | Laguminosae | S |
| 17. | *Desmodium pulchellum* | Chikati | Laguminosae | S |
| 18. | *Desmodium velutinum* | Chikati | Laguminosae | S |
| 19. | *Dioscorea anguina* | Bansora | Dioscoreaceae | S |
| 20. | *Dondonoea visocosa* | Jangli Mehandi | Sapindaceae | S |
| 21. | *Embelia robusta* | Baibirang | Myrsiaceae | S |
| 22. | *Eranthemum purpureseens* | Bantulsi | Acanthaceae | S |
| 23. | *Gardnia lucida* | Dikamali | Rukbiaceae | S |
| 24. | *Grewia hirsuta* | Gudsaki | Tiliaceae | S |
| 25. | *Grewia sapida* | Phalsa | Tiliaceae | S |
| 26. | *Helicteres isora* | Marorphali | Sterculiaceae | S |
| 27. | *Indigophera pulchella* | Neel | Papilionaceae | S |
| 28. | *Ipomea spp.* | Besharm | Convolvulaceae | S |
| 29. | *Jasminum multiflorum* | Kunda | Oleaceae | S |
| 30. | *Justieia betonica* | Kokardet | Acanthaceae | S |
| 31. | *Jatropa curcas* | Rattanjot | Euphorbiaceae | S |
| 32. | *Lantana camara* | Raimunia | Verbenaceae | S |
| 33. | *Maytenus emarginata* | Bahrti | Celastraceae | S |
| 34. | *Malastoma malababathricum* | Palor | Malastomaceae | S |
| 35. | *Maghania nana* | Chepati | Papilionaceae | S |
| 36. | *Moghania semilata* | Banrahar | Papilionaceae | S |
| 37. | *Nyctanthes arbortristis* | Harsingar | Oleaceae | S |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 38. | *Olax scandens* | Harduli | Oleaceae | S |
| 39. | *Petalidiun barlerioides* | Inderjata | Acanthaceae | S |
| 40. | *Phoenix acaulis* | Chhind | Palmeae | S |
| 41. | *Sida acuta* | Kareta | Mavaceae | S |
| 42. | *Sida cardifolia* | Mamas | Mavaceae | S |
| 43. | *Strobilanthes auricalatus* | Muruadona | Acanthaceae | S |
| 44. | *Tephrosia candida* | Unhali | Leguminoceae | S |
| 45. | *Trema politoria* | Jilmila | Ulmaceae | S |
| 46. | *Tribulus terrestris* | Gokhru | Zygophylaceae | S |
| 47. | *Triumfetta bartramia* | Chirpat | Tiliaceae | S |
| 48. | *Triumfetta pilosa* | Chikati | Tiliaceae | S |
| 49. | *Uraria labata* | - | Malvaceae | S |
| 50. | *Urena siuta* | - | Malvaceae | S |
| 51. | *Vitex negundo* | Nirgudi | Verbenaceae | S |
| 52. | *Waltheria indica* | Haduli | Sterculiaceae | S |
| 53. | *Zizyphus rotundifolia* | Jharberi | Rhamnaceae | S |
| | | **Herbs** | | |
| 1. | *Asparagus racemosum* | Sataori | Liliaceae | H |
| 2. | *Careya herabacea* | Chhiti Kumbhi | Myrtaceae | H |
| 3. | *Chlorophylum tuberosum* | Safed Musali | Liliaceae | H |
| 4. | *Curculigo orachioides* | Kali musli | Amaryullidaceae | H |
| 5. | *Hemidesmum indicus* | Sarsaparilla | Asclepidlaceae | H |
| 6. | *Hibiscus cancellatus* | Ambari | Malovaceae | H |
| 7. | *Lanandula burmanni* | - | Labistea | H |
| 8. | *Leea rotusta* | Korum | Ampelidaceae | H |
| 9. | *Micromeria capitellata* | - | Labiateae | H |
| 10. | *Napeta ruderalis* | - | Labiateae | H |
| 11. | *Polygala chinesis* | Bijnori | Pigalaceae | H |
| 12. | *Rubia cordifolis* | Manjeti | Rubiaceae | H |
| 13. | *Tamarix ericoides* | Jhau | Tamaricaceae | H |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 14. | *Zingibar capitatum* | Randa | Zingiberaceae | H |
| 15. | *Ocimum sactum* | Tulsi | Labiatae | H |
| | | **Epiphytes & Parasites** | | |
| 1. | *Cuscuta reflexa* | Amarbel | Canvolvulaceae | - |
| 2. | *Laranthus logiflorus* | Bandha | Laranthaceae | - |
| 3. | *Visum nepalene* | Bandha | Loranthaceae | - |
| 4. | *Orodanche oegyptica* | Bandha | Prkobancheaceae | - |
| | | **Climbers** | | |
| 1. | *Acacia caesia* | Gurar | Leguminosae | C |
| 2. | *Acacia pennata* | Raoni | Mimoseae | C |
| 3. | *Bauhinia vahlli* | Mahul | Leguminosae | C |
| 4. | *Butea superba* | Palasbel | Leguminosae | C |
| 5. | *Butea parvifolia* | Palasbel | Leguminosae | C |
| 6. | *Celastrus paniculata* | Malkangini | Celastraceae | C |
| 7. | *Combretum decandrum* | Piwarbel | Combretaceae | C |
| 8. | *Dioscorea belophylla* | Musalkand | Dioscoreaceae | C |
| 9. | *Dioscorea bulbifera* | Gothalu | Dioscoreaceae | C |
| 10. | *Ichnocarpus frutescens* | Dhimarbel | Apocynaceae | C |
| 11. | *Marsdenia hamiltonia* | Dudhibel | Asclepiadaceae | C |
| 12. | *Milettea auriculate* | Gauj | Leguminosae | C |
| 13. | *Millettea recemosa* | Junjinar | Leguminosae | C |
| 14. | *Mucuna pruriens* | Kewanch | Leguminosae | C |
| 15. | *Pueraria tuberosa* | Ghorbel | Leguminosae | C |
| 16. | *Vitis linnei* | Jangli angur | Ampelideae | C |
| 17. | *Vitis fomentosa* | Purbel | Ampelideae | C |
| 18. | *Zyzyphus rugosa* | Churna | Rhamnaceae | C |
| | | **Grasses** | | |
| 1. | *Andropogon intermedius* | Ghonsi | - | G |
| 2. | *Andopogon pumilus* | Dewartari | - | G |
| 3. | *Arthraxon quartinianus* | Basin | - | G |

| S. No. | Scientific name | Local Name | Family | Habit |
|---|---|---|---|---|
| 4. | *Apluda mutica* | Phuli | - | G |
| 5. | *Bombusa arundinaceae* | Kantabans | - | G |
| 6. | *Chionachne koenigii* | Kurpi | - | G |
| 7. | *Chrysopogon montanus* | Chikula | - | G |
| 8. | *Coix lacrumajobi* | Garu | - | G |
| 9. | *Cymbopogon martini* | Rusa | - | G |
| 10. | *Cynodon dactylon* | Doob | - | G |
| 11. | *Dendrocalamus strictus* | Bans | - | G |
| 12. | *Eragrostis tenella* | Bhurbhusi | - | G |
| 13. | *Dichanthium annulatum* | Marwel | - | G |
| 14. | *Eulali trispicata* | Chunai | - | G |
| 15. | *Eulaliopsis binata* | Sabai | - | G |
| 16. | *Heteropogon contortus* | Sukla | - | G |
| 17. | *Imperata cylidrica* | Chhir | - | G |
| 18. | *Iseilema prostratum* | Ukri | - | G |
| 19. | *Sehima sulcatum* | Paonia | - | G |
| 20. | *Sorghum halepense* | Barru | - | G |
| 21. | *Themeda caudata* | Gunhar | - | G |
| 22. | *Thysanolaena maxima* | Phulbahari | - | G |
| 23. | *Saccharum munja* | Munj | - | G |
| 24. | *Imperata Cylidrica* | Chhir | - | G |
| 25. | *Sehima nervosum* | Shedo | - | G |

**Status of RET Species**

During Field Survey, rare, endangered and threatened species of flora recorded under threatened status in the study area are as follows:

1. Endemic- *Hardwikia binnata, Mucuna prurita*
2. Locally Endangered Species

   *A. Butea monosperma B. Clerodendron serratum C. Curculigo orchioides D. Curcuma augustifolia E. Pterocarpus marsupiyum.*
3. According to Chhattisgarh State Medicinal Plant Board endangered species are:

   *A. Diospyros peniculato B. Pterocarpus marsupiyum C. Terminalia arjuna D. Grewia rothi E. Vitextrifolia*-Critically endangered.

## ANNEXURE - III

### INVENTORY OF FAUNAL DIVERSITY IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

a) Core Zone

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Vulpes bengalenss* | Common fox | Sch. II |
| 2. | *Rattus rattus* | Black rat | Sch. V |
| 3. | *Tatera indica* | Indian Gerbil | Sch. V |
| 4. | *Funambulus palmarum* | Indian palm Squirrel | Sch. IV |
| 5. | *Canis aureus* | Jackal | Sch. III |
| 6. | *Boselaphus tragocamelus* | Nilgai | Sch. III |
| 7. | *Axis axis* | Chital | Sch. III |
| 8. | *Sus scrofa* | Wild boar | Sch. III |
| 9. | *Felis chaus* | Jungle cat | Sch. II |
| 10. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 11. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 12. | *Hystris indica* | Porcupine | Sch. IV |
| | | **Reptilian** | |
| 1. | *Ptyas mucosa* | Indian Rat snake | Sch. II |
| 2. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 3. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 4. | *Bungarus candidud* | Common krait | Sch. IV |
| 5. | *Naja naja* | Naag/Kobra | Sch. II |
| 6. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 7. | *Vipera russelli* | Russell's viper | Sch. II |
| 8. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| | | **Amphibian** | |
| 1. | *Rana tigrina* | Common Frog | Sch. IV |
| 2. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 3. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Butterflies** | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 7. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 8. | *Junonia almana* | Peacock pansy | Sch. IV |
| 9. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 10. | *Leptosia nina* | Psyche | Sch. IV |
| | | **Arthropods and Mollusca** | |
| 1. | *Apis indica* | Choti Madhumakkhi | - |
| 2. | *Periplaneta amercana* | Cockroach | - |
| 3. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 4. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 5. | *Stegodyphus sp.* | Social Spider | - |
| | | **Avifaunal (Birds)** | |
| 1. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 2. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 3. | *Egretta garzetta* | Little egret | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 6. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 7. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 8. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 9. | *Acridotheres tristis* | Common myna | Sch. IV |
| 10. | *Spilopelia senegalensis* | Laughing dove | Sch. IV |
| 11. | *Ardeola grayii* | Pond heron | Sch. IV |
| 12. | *Aegithina tiphia* | Common iora | Sch. IV |
| 13. | *Anas crecca* | Common teal | Sch. IV |
| 14. | *Passer domesticus* | House sparrow | Sch. IV |

**Birds**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 15. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 16. | *Corvus splendens* | House crow | Sch. V |
| 17. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 18. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 19. | *Milvus migrans* | Black kite | Sch. IV |
| 20. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |
| 21. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 22. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 23. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| 24. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 25. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 26. | *Cuculus micropterus* | Indian Cuckoo | Sch. IV |
| 27. | *Apus affinis* | House swift | Sch. IV |
| 28. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 29. | *Milvus migrans* | Black kite | Sch. IV |
| 30. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 31. | *Tyto alba* | Barn owl | Sch. IV |

**B. Faunal Diversity in Buffer Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| | | **Mammalian** | |
| 1. | *Canis aureus* | Jackal | Sch. II |
| 2. | *Hyaena hyaena* | Hyena | Sch. III |
| **3.** | ***Melursus ursinus*** | **Sloth bear** | **Sch. I** |
| 4. | *Vulpes bengalenss* | Common fox | Sch. II |
| 5. | *Rattus rattus* | Black rat | Sch. V |
| 6. | *Rattus norvegicus* | Field mouse | Sch. V |
| 7. | *Bandicota indica* | Bandicoot | Sch. V |
| 8. | *Tatera indica* | Indian Gerbil | Sch. V |
| 9. | *Funambulus palmarumi* | Indian Palm Squirrel | Sch. IV |
| 10. | *Boselaphus tragocamelus* | Nilgai | Sch.III |
| **11.** | ***Elephas maximus*** | **Elephant** | **Sch.I** |
| 11. | *Rhinolophus spp.* | Horseshoe Bat | Sch. V |
| 12. | *Pteropus giganteus* | Indian flying fox | Sch. V |
| 13. | *Cervus unicolor* | Sambar | Sch. III |
| 14. | *Axis axis* | Chital | Sch. III |
| 15. | *Hystris indica* | Porcupine | Sch. II |
| 16. | *Herpestes edwardsii* | Common Mongoose | Sch. II |
| 17. | *Presbytis entellus* | Common langur | Sch. II |
| 18. | *Macaca mulatta* | Rhesus macaque | Sch. II |
| 19. | *Lepus nigricollis* | Indian hare | Sch. IV |
| 20. | *Sus scrofa* | Wild boar | Sch. III |
| 21. | *Cuon alpinus* | Wild dog | Sch. II |
| **21.** | ***Panthera pardus*** | **Common leopard** | **Sch.I** |
| | | **Reptilian** | |
| 1. | *Vipera russelli* | Russell's viper | Sch. II |
| **2.** | ***Varanus bengalensis*** | **Monitor lizard** | **Sch. I** |
| 3. | *Ptyas mucosa* | Indian Rat snake | Sch. II |
| 4. | *Lycodon aulicus* | Common wolf snake | Sch. IV |
| 5. | *Bungarus candidus* | Common krait | Sch. IV |
| 6. | *Boiga trigonata* | Cat snake | Sch. IV |

**Faunal Diversity in Buffer Zone**

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 7. | *Eryx johnii* | Red sand Boa | Sch. IV |
| 8. | *Naja naja* | Naag/Kobra | Sch. II |
| 9. | *Hemidactylus flaviviridis* | House Gecko/Chhipkali | Sch. V |
| 10. | *Melanochelys trijuga* | Indian pond turtle | Sch. IV |
| 11. | *Calotes versicolor* | Common Garden Lizard/ Girgit | Sch. IV |
| 12. | *Chamaeleo zeylanicus* | Indian Chameleon | Sch. IV |
| 13. | *Mabuya carinata* | Brahminy Skink | Sch. IV |
| **14.** | ***Pythan molurns*** | **Pythan** | **Sch.I** |
| | | Amphibian | |
| 1. | *Rana limnocharis* | Indian cricket Frog | Sch. IV |
| 2. | *Hoplobatrachus tigerinus* | Indian bull frog | Sch. IV |
| 3. | *Rana tigrina* | Common Frog | Sch. IV |
| 4. | *Bufo melanostictus* | Common Indian toad | Sch. IV |
| 5. | *Euphlyctis hexadactylus* | Rana hexadactyla | Sch. IV |
| 6. | *Hyla goeldii* | Tree frog | Sch. IV |
| | | Butterflies | |
| 1. | *Danaus chrysippus* | Plain tiger | Sch. IV |
| 2. | *Pachliopta hector* | Crimson rose | Sch. IV |
| 3. | *Hypolimnas bolina* | Great eggfly | Sch. IV |
| 4. | *Papilio polymnestor* | Blue mormon | |
| 5. | *Euploea core* | Common crow | Sch. IV |
| 6. | *Neptis hylas* | Common sailer | Sch. IV |
| 7. | *Papilio demoleus* | Lime butterfly | Sch. IV |
| 8. | *Parantica aglea* | Glassy tiger | Sch. IV |
| 9. | *Eurema hecabe* | Common grass yellow | Sch. IV |
| 10. | *Junonia almana* | Peacock pansy | Sch. IV |
| 11. | *Junonia orythia* | Blue pansy | Sch. IV |
| 12. | *Junonia atlites* | Grey pansy | Sch. IV |
| 13. | *Catopsilia pomona* | Common emigrant | Sch. IV |
| 14. | *Leptosia nina* | Psyche | Sch. IV |
| 15. | *Chilades parrhassius* | Small cupid | Sch. IV |

| S. No. | Scientific name | Common name | Status according to IWPA, 1972 |
|---|---|---|---|
| 16 | *Musca domestica* | Housfly | Sch. IV |
| 17 | *Aedes aegypti* | Dengue mosquito | Sch. IV |
| 18 | *Piens napi* | Green- veined white butterfly | Sch. IV |
| 19 | *Eurema brigitta* | Small grass yellow | Sch. IV |
| 20 | *Parantica aglea* | Glassy tiger | Sch. IV |
| | **Arthropods and Mollusca** | | |
| 1 | *Apis indica* | Choti Madhumakkhi | - |
| 2 | *Apis dorsata* | Badi Madhumakkhi | - |
| 3 | *Periplaneta amercana* | Cockroach | - |
| 4 | *Buthus sp.* | Scorpion | - |
| 5. | *Sympetrum fonscolombii* | Red veined darter dragonfly | - |
| 6. | *Diplacodes triviallis* | Ground skimmer dragonfly | - |
| 7. | *Stegodyphus sp.* | Social Spider | - |
| | **Avifaunal (Birds)** | | |
| 1. | *Ardeola grayii* | Pond heron | Sch. IV |
| 2. | *Acridotheres tristis* | Common myna | Sch. IV |
| 3. | *Eudynamys scolopaceus* | Asian koel | Sch. IV |
| 4. | *Alcedo atthis* | Common kingfisher | Sch. IV |
| 5. | *Egretta garzetta* | Little egret | Sch. IV |
| 6. | *Oriolus oriolus* | Golden Oriole | Sch. IV |
| 7. | *Bubulcus ibis* | Cattle egret | Sch. IV |
| 8. | *Caprimulgus asiaticus* | Nightjar | Sch. IV |
| 9. | *Streptopelia decaocto* | Eurasian collared dove | Sch. IV |
| 10. | *Milvus migrans* | Black kite | Sch. IV |
| 11. | *Haliastur indus* | Brahminy kite | Sch. IV |
| 12. | *Tockus birostris* | Indian Grey Hornbill | Sch. IV |
| 13. | *Tyto alba* | Barn owl | Sch. IV |
| 14. | *Accipiter badius* | Shikra | Sch. IV |
| 15. | *Bubo bubo* | Eurasian Eagle Owl | Sch. IV |
| 16. | *Merops orientalis* | Small bee- eater | Sch. IV |
| 17. | *Corvus macrorhynchos* | Jungle crow | Sch. V |
| 18. | *Corvus splendens* | Common crow | Sch. V |

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| 19. | *Passer domesticus* | House sparrow | Sch. IV |
| 20. | *Nectarinia asiatica* | Purple sunbird | Sch. IV |
| 21. | *Sturnus pagodarum* | Brahminy starling | Sch. IV |
| **22.** | ***Pavo cristatus*** | **Peafowl** | **Sch. I** |
| 23. | *Psittacula krameri* | Rose ringed parakeet | Sch. IV |
| 24. | *Turdoides striatus* | Jungle babbler | Sch. IV |
| 25. | *Coracias benghalensis* | Indian roller | Sch. IV |
| 26. | *Copsychus saularis* | Oriental magpie robin | Sch. IV |
| 27. | *Saxicoloides fulicata* | Indian robin | Sch. IV |
| 28. | *Vanellus indicus* | Red-wattled lapwing | Sch. IV |
| 29. | *Ploceus philippinus* | Baya- weaver bird | Sch. IV |
| 30. | *Gallus gallus* | Jungle fowl | Sch. IV |
| 31. | *Apus affinis* | House swift | Sch. IV |
| 32. | *Halcyon smyrnensis* | White throated kingfisher | Sch. IV |
| 33. | *Francolinus pondicerianus* | Grey francolin | Sch. IV |
| 34. | *Columba livia* | Blue rock pigeon | Sch. IV |
| 35. | *Centropus sinensis* | Greater coucal | Sch. IV |
| 36. | *Amaurornis phoenicurus* | White breasted water hen | Sch. IV |
| 37. | *Pycnonotus cafer* | Red vented bulbul | Sch. IV |

**Analysis of Fauna**

Two Schedule- I fauna was recorded in the study area during field survey as per (IWPA) Indian Wildlife Protection Act, 1972.

| | | | |
|---|---|---|---|
| **1.** | **Indian monitor lizard** | ***Varanus benglensis*** | **Sch. I** |
| **2.** | **Indian peafowl** | ***Pavo cristatus*** | **Sch. I** |
| **3.** | **Sloth bear** | ***Melursus ursinus*** | **Sch. I** |
| **4.** | **Elephant** | ***Elephas maximus*** | **Sch. I** |
| **5.** | **Indian Rock Python** | ***Python molurus*** | **Sch. I** |
| **6.** | **Common leopard** | ***Panthera pardus*** | **Sch.I** |

## INVENTORY OF AQUATIC FLORA IN THE CORE & BUFFER ZONE OF PROPOSED MINE SITE

Based on Actual Sighting, based on inputs from locals and Perused from Secondary Data

| S. No. | Scientific name | Common name | Family |
|---|---|---|---|
| | | Aquatic diversity of buffer zone | |
| 1. | *Harpadon nehereus* | Bombil | - |
| 2. | *Sperata seenghala* | Singara | - |
| 3. | *Penaeus monodon* | Prawn | - |
| 4. | *Labeo rohita* | Rohu | - |
| 5. | *Oreochromis niloticus* | Tilapia | - |
| 6. | *Lamellidens corrianus* | Shells | - |
| 7. | *Rita rita* | Rita | - |
| 8. | *Mastacembelus armatus* | Bam | - |
| 9. | *Alysfus tengara* | Tengara | - |
| 10. | *Cirrhinas mrigala* | Mrigal | - |
| 11. | *Boleophithalmus spp.* | Mudskippers | - |
| 12. | *Catla catla* | Catla | - |
| 13. | *Mugil cephalus* | Mullet | - |

Sub Divisional Officer
Kawardha

Divisional Forest Officer
Kawardha Division

Chief Conservator of Forests
Durg Circle, Durg (C.G.)

Principal Chief Conservator of Forest
(Wild Life)
Chhattisgarh, Atal Nagar, Raipur

Document-V

# संचालनालय भौमिकी तथा खनिकर्म, छत्तीसगढ़

इन्द्रावती भवन, ब्लॉक 4, द्वितीय तल, अटल नगर जिला रायपुर, छत्तीसगढ़ – 492002
फोन 0771 – 2412840, 44, फैक्स No. 2412841 45 टेलेक्स 0771 – 2412841 Email : dgm.cg@nic.in

क्रमांक 8752 / खनि 02 / बॉक्साईट / क 09 / 2023 नवा रायपुर अटल नगर, दिनांक 1 DEC 2023

प्रति,

प्रबंध संचालक,
छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन,
सेक्टर 24, ब्लॉक 7 ए, तृतीय तल,
नवा रायपुर अटल नगर (छ.ग.)

विषयः– जिला कबीरधाम तहसील बोड़ला के ग्राम मुकाम रकबा 110.563 हे0 क्षेत्र के पर्यावरण स्वीकृति हेतु **EAC** की 20वीं बैठक के माध्यम से चाही गई वांछित जानकारी उपलब्ध कराने बाबत् ।

संदर्भः– आपका पत्र कमांक 950 / बाक्साईट / 2023 दिनांक 10.10.2023

–00–

विषयांतर्गत भारत सरकार, पर्यावरण, वन और जलवायु परिवर्तन मंत्रालय द्वारा जारी कार्यवाही विवरण दिनांक 29.09.2023 के कम में आपके द्वारा जिला कबीरधाम तहसील बोड़ला स्थित मुकाम बाक्साईट खदान रकबा 110.563 हे0 क्षेत्र पर सी0एम0डी0सी0 द्वारा अवैध उत्खनन नहीं किए जाने के संबंध में प्रमाण पत्र उपलब्ध कराने हेतु निवेदन किया गया है ।

उपरोक्तानुसार कार्यालय कलेक्टर जिला कबीरधाम (छ0ग0) के पत्र पृ0क0 8689 / स्टेनो / अपर कले. 2023 दिनांक 10.10.2023 को प्राप्त पत्र की प्रति आपकी ओर आवश्यक कार्यवाही हेतु संलग्न कर प्रेषित् है ।

संलग्नः उपरोक्तानुसार

संचालक 01/12/23
भौमिकी तथा खनिकर्म
छत्तीसगढ़

# कार्यालय कलेक्टर जिला कबीरधाम (छ.ग.)

क्रमांक / 8689 / स्टेनो / अपर कले. / 2023 कवर्धा, दिनांक 10 / 10 / 2023

## —: प्रमाण पत्र :—

मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड (मुकाम बाक्साईट खदान) ग्राम–मुकाम, तहसील–बोड़ला, जिला कबीरधाम (छ.ग.) स्थित बाक्साईट (मुख. खनिज) खदान उत्खनन क्षमता–8,02,977.5 टन प्रतिवर्ष (3,84,615.4 टन प्रतिवर्ष (ROM) एंड OB 4,18,362.10 टन प्रतिवर्ष) कुल क्षेत्रफल–110.563 हेक्टेयर (निजी भूमि–67.401 हेक्टेयर एवं शासकीय भूमि–43.162 हेक्टेयर के पर्यावरणीय स्वीकृति हेतु भारत सरकार पर्यावरण वन एवं जलवायु परिवर्तन मंत्रालय, नई दिल्ली की 20वीं बैठक दिनांक 21–22 सितम्बर 2023 के सरल क्रमांक 5 के बिंदु क्रमांक 8 " **The project proponent needs to seek comments from the State DMG, if any illegal mining done by Project Proponent or not** " के संबंध में प्रमाणित किया जाता है कि, मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड द्वारा किसी भी प्रकार का उक्त क्षेत्र में अवैध उत्खनन नही किया गया है। क्योंकि जिला प्रशासन द्वारा आज दिनांक 10.10.2023 की स्थिति में किसी भी प्रकार का भू–प्रवेश की अनुमति अथवा उक्त क्षेत्र में कार्य करने का कोई भी अधिकार मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड को प्रदाय नही किया गया है। अतः पुनः स्पष्ट किया जा रहा है कि, मेसर्स छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड द्वारा उक्त क्षेत्र में अवैध उत्खनन नही किया गया है।

10.12.23

Office of the Director of Geology & Mining
5536
Received on
11 DEC 2023

10.10.23

अपर कलेक्टर
जिला कबीरधाम

पृ.क्रमांक / 8689 / स्टेनो / अपर कले., 2023 कवर्धा, दिनांक 10 / 10 / 2023

**प्रतिलिपि :—**

1. संचालक, संचालनालय भौमिकी तथा खनिकर्म, इन्द्रावती भवन, अटल नगर नवा रायपुर छत्तीसगढ़ की ओर आवश्यक कार्यवाही हेतु अग्रेषित।
2. कलेक्टर (खनिज शाखा), जिला–कबीरधाम (छ.ग.) की ओर सूचनार्थ अग्रेषित।
3. प्रबंध संचालक, छत्तीसगढ़ मिनरल डेव्हलपमेंट कार्पोरेशन लिमिटेड नवा रायपुर की ओर सूचनार्थ अग्रेषित।

अपर कलेक्टर
जिला कबीरधाम


Point 1- Primary School
Point 1- Primary School
Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length:
173.50
Meters
Ground Length:
171.69
Heading:
195.18 degrees
Mouse Navigation
Save
Clear
BP-113
BP-113
Image © 2024 Maxar Technologies
Google Earth
Imagery Date: 5/24/2020


Point 2- Mukam Village
Point 2
Ruler
Line
Path
Polygon
Circle
3D path
3D polygon
Measure the distance between two points on the ground
Map Length:
547.74
Meters
Ground Length:
548.87
Heading:
210.93 degrees
Mouse Navigation
BP-68
BP-68
BP-67
BP-66
BP-66
BP-69
BP-69
BP-64
BP-65
BP-65
BP-63
BP-62
BP-6
BP-73
BP-71
Image © 2021 Maxar Technologies
Google Earth
1985