

**LIST OF DOCUMENTS ENCLOSED ALONG WITH THE COMPLIANCE REPORT OF STAGE-I FOREST CLEARANCE CONDITIONS CHHAL OCP FOR 240.867 HA. OF FOREST LAND FOR COAL MINING.**

**PLEASE CLICK THE LINK BELOW TO VIEW THE CONCERNED FILE**

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"Under jurisdiction of Raigarh Court only"  
 SOUTH EASTERN COAL FIELDS LIMITED  
 (A Subsidiary of Coal India Limited)  
 Regd. Office: SEEPAT ROAD, BILASPUR (CG) 495006  
 Website: www.secl.gov.in

Office of the Dy.G.M.(MIA)/Sub Area Manager  
 CHHAL SUB AREA, RAIGARH AREA  
 At/PO: Chhal, Distt: Raigarh  
 Chhattisgarh PIN -496665  
 Phone - 07766-277625  
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 Email- [samchhal@secl.com](mailto:samchhal@secl.com)

Ref. No. : SECL/RGH/SAM/CSA/2022/ 2746

Date 31/10/2022

प्रति,  
 वनमण्डलाधिकारी,  
 धरमजयगढ़ वनमण्डल, धरमजयगढ़  
 छ.ग.।

**Sub:- Proposal for non-forestry use of 240.867 ha (185.017 ha Revenue Forest Land + 55.850 ha Deemed Forest) forest land under Forest (Conservation) Act, 1980 for Chhal OC seam III 6 MTY project of SECL in Raigarh District of Chhattisgarh.**

Ref. : (i) भारत सरकार पर्यावरण, वन एवं जलवायुमंत्रालय, नई दिल्ली का पत्र क्र./F.C.8-15/2021-FC,

दिनांक 06/07/2022

(ii) क्र./मू-प्रबंध/खनिज/331-259/1744 रायपुर, दिनांक 20.07.2022

(iii) क्र./मा.चि./3211 धरमजयगढ़, दिनांक 08-08-2022

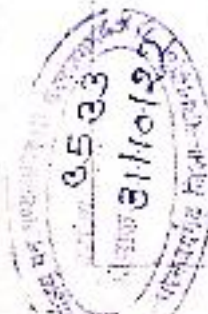
महोदय,

उपरोक्त विषयान्तर्गत संदर्भित पत्र के तहत भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय नई दिल्ली के पत्र क्र./F.C.8-15/2021-FC, दिनांक 06/07/2022 द्वारा वन मंजूरी के प्रथम चरण (संघातिक) स्वीकृति प्रदान की गई है।

उक्त स्वीकृति में अधिरोपित समस्त शर्तों का बिन्दुवार पालन प्रतिवेदन मय पृथक-पृथक वचन पत्र निम्नानुसार है :-

**A. COMPLIANCE OF STAGE-I FC CONDITIONS FOR 240.867 HA (185.017 HA OF REVENUE FOREST LAND + 55.850 HA OF DEEMED FOREST) OF CHHAL OCP PRIOR TO HANDING OVER OF FOREST LAND BY THE STATE FOREST DEPARTMENT**

Sl. No.	Conditions	Status of compliance
i	<b>Compensatory Afforestation:</b> The cost of compensatory afforestation at the prevailing wage rates as per compensatory afforestation scheme and the cost of survey, demarcation and erection of permanent pillars, if required on the CA land, shall be deposited in advance with the Forest Department by the user agency. The CA will be maintained for 10 years. The scheme	An amount of Rs.89,11,15,814.83 (Eighty-Nine Crore Eleven Lakh Fifteen Thousand Eight Hundred Fourteen Rupees and Eighty-three paise only) has been deposited in Chhattisgarh State CAMPA A/C No.150645816237745, IFSC Code-UBIN0996335 maintained at Union Bank of India, Lodhi Complex Branch, Block-11, CGO Complex, Phase-I, Lodhi Road, New Delhi - 110003 through NEFT/RTGS by e-challan



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	may include appropriate provision for anticipated cost increase for works scheduled for subsequent years.	vide UTR No.UTIBR52022090100354111 as per the demand raised by DFO, Dharamjaigarh Forest Division vide letter क्रमांक / मा. / वि. / 3370 धरमजयगढ़ दिनांक 18 / 08 / 2022 which includes <ul style="list-style-type: none"> <li>Rs.42,42,30,030.315/-towards the cost of compensatory afforestation.</li> <li>Rs. 2,07,08,615.655/- towards afforestation over safety zone area (copy enclosed as Annexure-01).</li> </ul>
ii	The KML files of diverted area, the CA areas, the proposed SMC treatment area and the WLMP area shall be uploaded on the e-Green watch portal with all requisite details prior to Stage II approval	Relates to State Forest department.
iii	Land identified for raising compensatory afforestation shall be notified as PF under the Indian Forest Act, 1927 or local Forest Act before grant of Stage-II approval, if applicable.	Relates to State Forest department.
iv	A Soil and Moisture Conservation (SMC) work plan to mitigate the impact of the proposed mining activity on the local river shall be prepared by the user agency in consultation with the State Forest Department and the same shall be submitted along with Stage-I compliance. Cost of implementation of the provisions of the said Plan will be deposited into the CAMPA and the same shall be intimated to the Ministry before Stage-II approval.	An amount of Rs.89,11,15,814.83 (Eighty-Nine Crore Eleven Lakh Fifteen Thousand Eight Hundred Fourteen Rupees and Eighty-three paise only) has been deposited in Chhattisgarh State CAMPA A/C No.150645816237745, IFSC Code-UBIN0996335 maintained at Union Bank of India, Lodhi Complex Branch, Block-11, CGO Complex, Phase-I, Lodhi Road, New Delhi - 110003 through NEFT/RTGS by e-challan vide UTR No.UTIBR52022090100354111 (copy enclosed as Annexure-01) as per the demand raised by DFO, Dharamjaigarh Forest Division vide letter क्रमांक / मा. / वि. / 3370 धरमजयगढ़ दिनांक 18 / 08 / 2022 which includes Rs.3,05,00,000.00towards the cost of implementation of the provisions of the Soil and Moisture Conservation (SMC) work plan (copy enclosed as Annexure-02).
v	Elephant/Wildlife Management Plans should be prepared keeping in view the locality factors, occurrence of wildlife, management interventions required for areas. State Government may also get the Plan verified by the Project Elephant Division of the Ministry. Cost of implementation of the Plan so finalized shall be deposited into State CAMPA and detail of the same along with approved Plan shall be submitted to the Ministry before Stage-II approval.	An amount of Rs.89,11,15,814.83 (Eighty-Nine Crore Eleven Lakh Fifteen Thousand Eight Hundred Fourteen Rupees and Eighty-three paise only) has been deposited in Chhattisgarh State CAMPA A/C No.150645816237745, IFSC Code-UBIN0996335 maintained at Union Bank of India, Lodhi Complex Branch, Block-11, CGO Complex, Phase-I, Lodhi Road, New Delhi - 110003 through NEFT/RTGS by e-challan vide UTR No.UTIBR52022090100354111 (copy enclosed as Annexure-01) as per the

		demand raised by DFO, Dharamjaigarh Forest Division vide letter क्रमांक / मा. / वि. / 3370 धरमजयगढ दिनांक 18/08/2022 which includes Rs.12,20,00,000.00 towards the cost of implementation of the provisions of Wildlife Management Plan (copy enclosed as <b>Annexure-03</b> ).
vi	Proposal involves displacement from non-forest land. A copy of approved R&R plan, prepared in consonance with the R&R policy of the State, shall be submitted along with the compliance of Stage-I approval.	A copy of the approved R&R plan of the project under reference prepared in consonance with the R&R policy of Chhattisgarh State is enclosed herewith as <b>Annexure-04</b> .
vii	The user agency shall prepare and submit a consolidated Reclamation Plan of the areas mined out completely which are not required for future mining and areas to be reclaimed in future in consonance with the Progressive Mine Closure Plan and detail of the same shall be submitted along with compliance of Stage-I approval.	A copy of the Progressive Mine Closure Plan of the project covering Reclamation Plan of the areas mined out completely which are not required for future mining and areas to be reclaimed in future with detail of the same is enclosed herewith as <b>Annexure-05</b> .
viii	The User Agency shall transfer online, the Net Present Value (NPV) of the forest land being diverted under this proposal, as per the guidelines issued by this Ministry vide its letters No. 5-3/2011-FC (Vol.) dated 06.01.2022 read with letter dated 22.03.2022. The requisite funds shall be transferred through online portal into National Authority (CAMP A) account of the State Concerned, new NPV guidelines.	An amount of Rs.89,11,15,814.83 (Eighty-Nine Crore Eleven Lakh Fifteen Thousand Eight Hundred Fourteen Rupees and Eighty-three paise only) has been transferred online into Chhattisgarh State CAMP A /C No.150645816237745, IFSC Code-UBIN0996335 maintained at Union Bank of India, Lodhi Complex Branch, Block-11, CGO Complex, Phase-I, Lodhi Road, New Delhi - 110003 through NEFT/RTGS by e-challan vide UTR No.UTIBR52022090100354111, dtd.31.08.2022 (copy enclosed as <b>Annexure-01</b> ) as per the demand raised by DFO, Dharamjaigarh Forest Division vide letter क्रमांक / मा. / वि. / 3370 धरमजयगढ दिनांक 18/08/2022 which includes Rs.29,36,77,168.86 towards the Net Present Value (NPV) of the diversion of 240.867 Ha. of forest land under this proposal (Rs.22,50,60,417.36 for 185.017 Ha. of Revenue Forestland and Rs.6,86,16,751.50 for 55.850 Ha. of Deemed Forest land), as per the guidelines issued by this Ministry vide its letters No. 5-3/2011-FC (Vol.) dated 06.01.2022 read with letter dated 22.03.2022.
ix	Compensatory levies to be realized from the User Agency under the project shall be transferred/ deposited, through e-challan, into the account of CAMP A pertaining to the State concerned	Compensatory levies amounting to Rs.89,11,15,814.83 (Eighty-Nine Crore Eleven Lakh Fifteen Thousand Eight Hundred Fourteen Rupees and Eighty-three paise only) has been transferred online

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	through eportal ( <a href="https://parivesh.nic.in/">https://parivesh.nic.in/</a> ).	(NEFT/RTGS) into Chattisgarh State CAMPA A/C No.150645816237745, IFSC Code-UBIN0996335 maintained at Union Bank of India, Lodhi Complex Branch, Block-11, CGO Complex, Phase-I, Lodhi Road, New Delhi - 110003 vide UTR No.UTIBR52022090100354111 through e-challan generated using eportal ( <a href="https://parivesh.nic.in/">https://parivesh.nic.in/</a> ) (copy enclosed as <b>Annexure-01</b> ) as per the demand raised by DFO, Dharamjaigarh Forest Division vide letter क्रमांक/मा./चि./3370 धरमजयगढ़ दिनांक 18/08/2022.
x	Following activities, as per approved plan / schemes, shall be undertaken in the lease area by the User Agency under the supervision of the State Forest Department. Approved scheme/plan shall be submitted to the Ministry along with compliance of Stage-I approval:	
a	Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department.	Agreed. The undertaking of the Project Proponent/ Mine Management for compliance of the provision of the conditions stipulated in clause-a, b, c, d & e of condition no.x of Stage-I FC granted to Chhal OCP is enclosed herewith as <b>Annexure-06</b> .
b	Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme.	1. Presently, there one (01) external dump & 2 no. of internal dumps. The external dump demarcated as 'A' & it has already been biologically reclaimed during the year 2006 to 2008 & there is no problem of Soil erosion & choking of streams in the adjoining dump area. Internal Dump will be re-handled, hence it was not biologically reclaimed. The Internal Dumps are demarcated as B & C. Details enclosed in <b>Annexure-06</b> .
c	Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme.	Renovation & re-alignment of drain all around the circumference of the mine.
d	Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and	Grass bedding on Dump Slope is taken up to prevent soil Erosion as per the requirement.
e	No damage shall be caused to the top-soil and the user agency will follow the top soil management plan.	2. Year wise Plantation details on Embankment areas & Dumps is enclosed in <b>Annexure-06</b> .  Plantation of 108000 Saplings Over an Area of 43.2 Ha. has been done from the year 2006 to 2022.  3. Check Dams in Dump Slope (Ext.

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		dumpnos. A) Drainage System, catch drain of dimension 1.5m X 15.m has been provided in External Dump & internal dumps to Prevent soil Erosion & Siltation.
xi	User agency either himself or through the State Forest Department shall undertake gap planting and soil & moisture conservation activities to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meters from outer perimeter of the mining lease. The plan for plantation and SMC activities will be prepared and submitted to MoEF&CC before Stage-II Clearance.	Agreed, The undertaking of the Project Proponent/ Mine Management to the effect that the Project Proponent shall carry out gap plantation and soil & moisture conservation activities through CGRVVN, CG to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meters from outer perimeter of the mining lease is enclosed herewith as Annexure-07.
xii	The User Agency shall prepare a list of existing village tanks and other water bodies with GPS co-ordinates located within five km from the mine lease boundary. This list is to be duly verified by the concerned Divisional Forest Officer. The User Agency shall regularly undertake desilting of these village tanks and other water bodies so as to mitigate the impact of siltation of such tanks/water bodies. A detailed approved plan for desilting of identified ponds and water bodies to be prepared in consultation with forest department and shall be submitted to MoEF& CC before Stage-II approval;	Agreed, Regular desilting of existing village ponds and water bodies located within five km from the mine lease boundary as identified in consultation with forest department shall be undertaken to mitigate the impact of siltation of such tanks/water bodies as delineated in the Desiltation Scheme of Village Tanks/Other water bodies (Copy of the Desiltation Scheme is enclosed herewith as Annexure-08).
xiii	Safety Zone Management: Following activities, at project cost, shall be undertaken by the user agency for the management of safety zone as per relevant guidelines issued by the Ministry's guidelines:	
	a	User agency shall ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the State Forest Department.
	b	Boundary of the safety zone of the mining lease, adjacent to habitation/roads, should be properly fenced by the user agency.
	c	Safety zone shall be maintained as
		Agreed, SECL and Chhattisgarh Rajya Van Vikas Nigam Limited (CGRVVN) Ltd. Raipur has MoU for plantation and safety zone fencing work. A) Demarcation of Safety Zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing will be done by CGRVVN, CG at the project cost (Undertaking attached as Annexure-09).

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	green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by the user agency at project cost under the supervision of the State Forest Department.	B) Fencing will be done by CGRVVN, CG at the project cost (Undertaking attached as Annexure-09).  C) Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area by CGRVVN at project cost (Undertaking attached as Annexure-09).
d	The State Government and the user agency shall ensure that safety zone is maintained as per the prescribed norms.	
e	The cost of felling of trees shall be deposited by the User Agency with the State Forest Department.	D) Agreed. (Undertaking attached as Annexure-09).  E) Agreed. (Undertaking attached as Annexure-09).
xiv	State Government shall complete settlement of rights, in term of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, if any, on the forest land to be diverted and submit the documentary evidence as prescribed by this Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 read with 05.07.2013, in support thereof, and	Documentary evidence as to completion of settlement of rights in respect of the proposed diversion of 240.867 Ha. of forest land of Chhal OCP, in terms of the Scheduled Tribes and Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006 as prescribed by the Ministry's letter No. 11-9/1998-FC (Pt.) dated 03.08.2009 (read with 05.07.2013) is enclosed herewith as <b>Annexure-10</b> .
xv	The complete compliance report of the conditions stipulated in this approval shall be uploaded on e-portal ( <a href="https://parivesh.nic.in/">https://parivesh.nic.in/</a> ).	Agreed to comply the provision of the condition stipulated.

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**TO BE SUBMITTED IN THE FORM OF UNDERTAKING PRIOR TO  
STAGE-II APPROVAL**

**B. COMPLIANCE OF STAGE-I FC CONDITIONS FOR 240.867 HA (185.017 HA OF REVENUE FOREST LAND + 55.850 HA OF DEEMED FOREST) OF CHHAL OCP AFTER HANDING OVER OF FOREST LAND BY THE STATE FOREST DEPARTMENT**

Sl. No.	Conditions	Status of compliance
i	Legal status of the diverted forest land shall remain unchanged	Undertaking enclosed as Annexure-A.
ii	Compensatory afforestation over orange forest land, double in extent to the forest land being diverted, shall be raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval.	Undertaking enclosed as Annexure-B.
iii	The user agency shall keep minimum of 120 meters distance from the bank of Mand River as intact and no mining should be carried out in this area. Embankment should be constructed to ensue protection of river and its hydrology from the mining.	Undertaking enclosed as Annexure-C.
iv	At the time of payment of the Net Present Value (NPV) at the present rate, the user agency shall furnish an undertaking to pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India.	Undertaking enclosed as Annexure-D.
v	Trees should be felled in phased manner as per the requirement in the approved Mining Plan with prior permission of concerned DFO.	Undertaking enclosed as Annexure-E.
vi	The user agency shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling shall be done only when it is unavoidable and that too under strict supervision of the State Forest Department.	Undertaking enclosed as Annexure-F.
vii	The User Agency shall comply with the Hon'ble Supreme Court order on re-grassing, and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a	Undertaking enclosed as Annexure-G.

*By*




	timely manner.	
viii	The User Agency shall undertake mining in a phased manner after taking due care for reclamation of the mined over area. The concurrent reclamation plan as per the approved mining plan shall be executed by the User Agency from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, in the concerned State Government and the concerned Integrated Regional Office of the Ministry. If it is found from the annual report that the activities indicated in the concurrent reclamation plan are not being executed by the User Agency, the Nodal Officer or the concern Head of the Integrated Regional Office may direct that the mining activities shall remain suspended till such time, such reclamation activities area satisfactorily executed.	Undertaking enclosed as Annexure-H.
ix	Period of diversion of the said forest land under this approval shall be for a period co-terminus with the period of the mining lease proposed to be granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under.	Undertaking enclosed as Annexure-I.
x	The User Agency shall obtain the Environment Clearance as per the provisions of the Environmental (Protection) Act, 1986, if required.	The User Agency/Project Proponent has already obtained Environment Clearance from MOEF & CC, GOI, New Delhi for the project under reference vide FileNo. J-11015/1000/2007-IA.II(M), Dtd. 02.08.2022. (Copy enclosed as Annexure-J).
xi	No labour camp shall be established on the forest land and the User Agency shall provide fuels preferably alternate fuels to the labourers and the staff working at the site so as to avoid any damage and pressure on the nearby forest areas.	Undertaking enclosed as Annexure-K.
xii	The boundary of the diverted forest land, mining lease and safety zone, as applicable, shall be demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates.	Undertaking enclosed as Annexure-L.
xiii	The layout plan of the mining plan/	Undertaking enclosed as Annexure-M.

	proposal shall not be changed without the prior approval of the Central Government and the forest land shall not be used for any purpose other than that specified in the proposal.	
xiv	The forest land proposed to be diverted shall under no circumstances be transferred to any other agency, department or person without prior approval of the Central Government	Undertaking enclosed as Annexure-N.
xv	No damage to the flora and fauna of the adjoining area shall be caused.	Undertaking enclosed as Annexure-O.
xvi	Any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation, protection and development of forests & wildlife; and	Undertaking enclosed as Annexure-P.
xvii	The user agency shall comply all the provisions of all the Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.	Undertaking enclosed as Annexure-Q.
xviii	Violation of any of these conditions will amount to violation of Forest (Conservation) Act, 1980 and action would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5- 2/2017-FC dated 28.03.2019.	Undertaking enclosed as Annexure-R.
xix	The User Agency shall submit the annual self -compliance report in respect of the above stated conditions to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly.	Undertaking enclosed as Annexure-S.

यह अग्रिम आवश्यक कार्यवाही हेतु आवश्यक और सादर प्रेषित है :

भवदीय

  
उपक्षेत्रीय प्रबंधक  
एस्ईसीएल धन उपक्षेत्र



SOUTH EASTERN COALFIELDS LIMITED  
"A Mini Ratna Company"  
A Subsidiary of Coal India Ltd.)  
Chhote Ataramda, Raigarh-495006  
G.M. Office (forest & Env't)  
Website: [www.secl.gov.in](http://www.secl.gov.in)

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ANNEXURE-01

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/58

Date: - 20/10/2022

To,  
The Divisional Forest Officer  
Dharamjaigarh Forest Division, C.G.

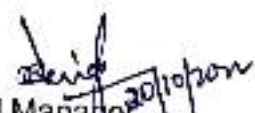
Subject: - Information of payment of Rs. 89,11,15,814.83 (Rupees Eighty-nine Crore Eleven Lakh Fifteen Thousand Eight Hundred ~~Five~~ and Eighty-three paise only) in Chhattisgarh State CAMPA A/C of Chhattisgarh for compliance of the requirement of conditions stipulated in Stage-I FC granted to Chhal OC Seam-III 6.0 MTY Project for 240.867 Ha. forest land (185.017 Ha. of Revenue Forest Land + 55.850 Ha. of Deemed Forest) for coal mining.

Ref:- letter क्रमांक/मा./चि./3370 धरमजयगढ़ दिनांक 18/08/2022

Sir,

In reference to your letter क्रमांक/मा./चि./3370 धरमजयगढ़ दिनांक 18/08/2022, Rs. 89,11,15,814.83 (Rupees Eighty-nine Crore Eleven Lakh Fifteen Thousand Eight Hundred ~~Five~~ and Eighty-three paise only) has been deposited online through RTGS/NEFT vide UTR No. UTIBR52022090100354111, dtd.01.09.2022 in Bank A/C No.150645816237745, IFSC Code: UBIN0996335 maintained at Union Bank Of India, Lodhi Complex Branch, Block 11, CGO Complex, Phase I, Lodhi Road, New Delhi -110003 as per the e-challan generated in e-portal (<https://parivesh.nic.in/>) of MOEF & CC (Copy enclosed) for compliance of the conditions stipulated in Stage-I FC granted to Chhal OC Seam-III 6.0 MTY Project for 240.867 Ha. forest land (185.017 Ha. of Revenue Forest Land + 55.850 Ha. of Deemed Forest) for coal mining.

Kindly acknowledge the receipt of the same.

  
General Manager  
Raigarh Area, SECL

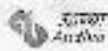
Encl- As above

Copy to:-

1. Sub-Area Manager, Chhal Sub-Area for kind information
2. AFM, Raigarh Area for kind information
3. SO(P&P), Raigarh Area for kind information
4. Office Copy

AGENCY COPY

यूनियन बैंक Union Bank of India



NEFT / RTGS CHALLAN for CAMPA Funds

Date : 24-08-2022

Agency Name.	SOUTH EASTERN COALFIELDS LIMITED
Application No.	5816237745
MeEF/SG File No.	8-15/2021-FC
Location.	CHATTISGARH
Address.	Post Box No 60 Seepat Road Bilaspur Chhattisgarh Bilaspur
Amount (in Rs)	881115814.63/-

Amount in Words (Eighty-Nine Crore Eleven Lakh Fifteen Thousand Eight Hundred and Fifteen Rupees Only)

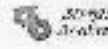
NEFT/RTGS to be made as per following details;

Beneficiary Name:	CHATTISGARH CAMPA
IFSC Code:	UBIN0996335
Pay to Account No.	150645816237745 Valid only for this challan amount.
Bank Name & Address:	Union Bank Of India Lodhi Complex Branch, Block 11, CGO Complex, Phase I, Lodhi Road, New Delhi -110003

This Challan is strictly to be used for making payment to CAMPA by NEFT/RTGS only

BANK COPY

यूनियन बैंक Union Bank of India



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After making successful payment, User Agencies may send a line of confirmation through Email: helpdeskcampa@corpbank.co.in

Note: After making the required payment through challan, if the payment status has not been updated even after 7 working days, then kindly mail a copy of your challan with transaction date to Email: cb0371@unionbankofindia.com

UTR UTIBR5202209010035411

Please pay as per list enclosed

Authorized Officer: *[Signature]*  
South Eastern Coalfields Limited,  
Raigarh Area

अक - 250260

31 AUG 2022

**ABHISHEK KEDIA**  
DVP & BRANCH HEAD  
SS No.- 8885  
RAIGARH (490) BRANCH

*[Signature]*  
31/08/22



# कार्यालय वनमण्डलाधिकारी, धरमजयगढ़

रायगढ़ रोड, धरमजयगढ़, जिला रायगढ़ [छ.ग.-496116]

Email - dfo\_dharamjagarh@rediffmail.com Phone&Fax :07766-266599,07766-266739

क्रमांक/मा.ति./  
प्रति,

3370

धरमजयगढ़, दिनांक 18/8/22

उप महाप्रबंधक,

साउथ इस्टर्न कोल फोल्डस लिमिटेड

छाल उपक्षेत्र SECL नावापारा, छाल जिला- रायगढ़ (छ.ग.)

विषय:-

Proposal for non- forestry use of 240.867 ha. (185.017) ha. Revenue Forest Land + 55.850 ha. Deemend Forest) forest land under Forest (Conservation) Act, 1980 for Chhal OC seam III 6 MTY project of SECL in Raigarh District of Chhattisgarh.

संदर्भ :-

1. भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, नई दिल्ली का पत्र क्र./ File No. FC-11/43/2021-FC दिनांक 07.06.2022
2. भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, क्षेत्रीय कार्यालय नागपुर का पत्र क्र./File No. 8-15/2021-FC दिनांक 06.07.2022
3. अपर प्रधान मुख्य वनसंरक्षक (मू-प्रबंध) नवा रायपुर का पत्र क्र./मू-प्रबंध/खनिज /331-259/1744 दिनांक 20.07.2022

—0—

विषयांतर्गत प्रकरण में संदर्भित पत्र का अवलोकन करें, प्रकरण में SECL छाल खुली खदान Seam III 6 MTY रकबा 185.017 हे. (संरक्षित वनभूमि 176.710 हे. एवं राजस्व वनभूमि 8.307 हे.) हेतु वनभूमि के गैर-वानिकी प्रकरण एवं अतिरिक्त क्षेत्र रकबा 55.850 हे. (Deemend Forest) कुल रकबा 240.867 हे. प्रकरण में भारत सरकार, पर्यावरण, वन एवं जलवायु परिवर्तन मंत्रालय, क्षेत्रीय कार्यालय नागपुर का पत्र क्र./ File No. 8-15/2021-FC दिनांक 06.07.2022 द्वारा प्रथम चरण की स्वीकृति जारी की गई है। छोगो राज्य कैम्पा (CAMP) खाते में निम्नानुसार राशि जमा करना है :-

क्र.	विवरण	छोगो राज्य कैम्पा (CAMP) खाते में जमा योग्य राशि (रु. में)
1.	CA हेतु - 482.745 Ha X 878787- 424230030.315 Rs.	424230030.315 Rs.
2.	NPV हेतु - 1. 185.017 हे. प्रकरण में - 225060417.36 Rs. 2. 55.850 हे. (डीमंड फॉरेस्ट) में - 68616751.50 Rs. <b>कुल NPV राशि - 293677168.86 Rs.</b>	293677168.86 Rs.
3.	वन्यप्राणी प्रबंधन योजना की राशि (संदर्भित पत्र क्र. 01 के परियालन में 6100000000 Rs. का 2 % = 122000000.00 Rs.	122000000.00 Rs.

or

4.	Soil and Moisture Conservation Plan की राशि(संदर्भित पत्र क्र. 01 के परिपालन में - 6100000000 Rs. का 0.5 % = 30500000.00 Rs.	30500000.00 Rs.
5.	Safety Zone क्षेत्र का देढ़ गुना क्षेत्र में वृक्षोत्पण की राशि (Safety Zone Area- 15.71 Ha. का देढ़ गुना क्षेत्र = 23.565 Ha. 23.565 X 878787 = 20708615.655Rs.	20708615.655Rs.
<b>TOTAL :-</b>		<b>891115814.83 Rs.</b>

अतः प्रथम धरण स्वीकृति में अधिरोधित शर्तों के परिपालन में राशि 891115814.83 रु. छठगठ राज्य कैंम्पा (CAMP) खाते में ई- पेमेंट के माध्यम से वेब पोर्टल द्वारा जमा करें एवं चलान की प्रति इस कार्यालय में प्रस्तुत करते हुए समस्त शर्तों का बिन्दुवार पालन प्रतिवेदन एवं चाही गई WLPlan, SMC Plan आदि प्रस्तुत करें।

इसके अतिरिक्त वरिष्ठ कार्यालय/ वन विभाग को और भी राशि की आवश्यकता होती है तो आपको देय होगा।

  
वन मण्डलाधिकारी

धरमजयगढ़ वनमण्डल

पृ. क्रमांक/मा.ति./2022/ 337/

/धरमजयगढ़ दिनांक 18/8/22

- प्रतिलिपि :-**
1. अपर प्रधान मुख्य वनसंरक्षक (भू-प्रबंध) नवा रायपुर छठगठ की ओर सूचनार्थ सम्प्रेषित।
  2. मुख्य वनसंरक्षक बिलासपुर वृत्त बिलासपुर छठगठ की ओर सूचनार्थ सम्प्रेषित।

  
वनमण्डलाधिकारी

धरमजयगढ़ वनमण्डल



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# SOIL CONSERVATION PLAN IN COMPLIANCE TO THE CONDITION NO. X OF STAGE- I FOREST CLEARANCE

F.NO. 8-15/2021-FC

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FOR CHHAL OPENCAST MINE OF SECL, RAIGARH AREA

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*Condition – x: The following activities shall also be undertaken in the lease area by the User Agency under the supervision of the State Forest Department at the project cost;*

- a. Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three year with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department;*
  - b. Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme;*
  - c. Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme;*
  - d. Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and*
  - e. Strict adherence to the prescribed top soil management.*
- 

**SOUTH EASTERN COALFIELDS LIMITED**  
**Raigarh Area, District Raigarh, Chhattisgarh**

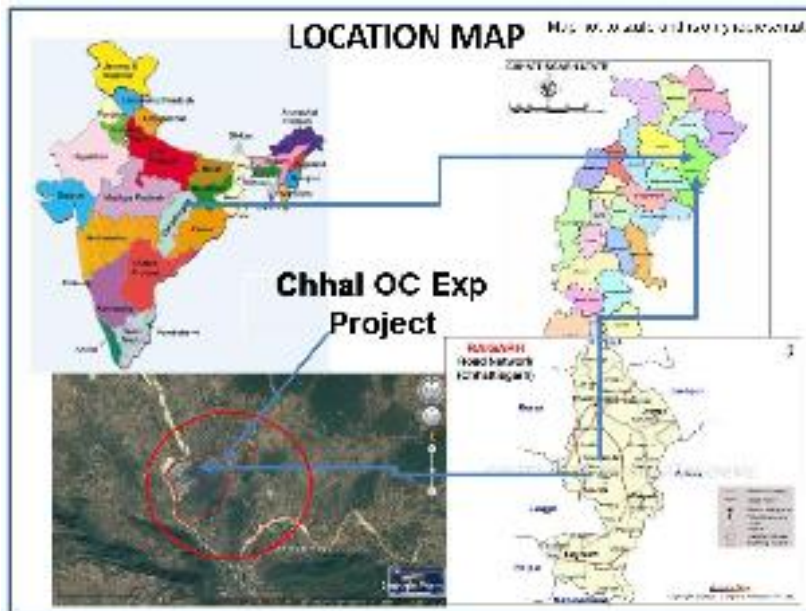
**SOIL AND MOISTURE CONSERVATION PLAN IN COMPLIANCE TO**  
**THE CONDITION No. X OF STAGE- I FOREST CLEARANCE.**

**INTRODUCTION**

**Location and accessibility**

The project is located south of village Chhal at an approximate distance of 2.5 km on Kharsia - Dharamjaygarh State Highway and 16 km from Kharsia town. The block is bounded by latitude 22°4'40" and 22°6'27" N and longitudes 83°6'10" and 83°9'10" E and is included in the Survey of India Topo Sheet No. 64 N/4. It is situated in the Raigarh district of Chhattisgarh.

Mand-Raigarh Coalfield in general and Chhal Block in particular are well connected by two all weather motorable roads from Kharsia and Raigarh Railway Stations on Howrah-Nagpur



section of South Eastern Railway. The distance of Chhal Block from Kharsia and Raigarh are only 16 km and 65 km respectively. Chhal Block is also connected with Bilaspur and Ranchi by all weather motorable road and is located at a distance of 160 km and 310 km from Bilaspur and Ranchi respectively. Chhal Block is also accessible by unmetalled roads of forest department.

**Other relevant project specific information**

Total geological reserve in the mine lease area is 197.257 MT with 151.36 MT mineable reserve and 852.07 Mm<sup>3</sup> of overburden is to be removed with an average stripping ratio of 5.63 cum/tonne. 13 seams with thickness ranging from 0.5 m to 11 m are workable. Grade of coal is G-11 while gradient of coal seams are ranging from is 4° to 11°.

Total land requirement of project is 1342.86 ha. Out of this, forest land is 240.867 Ha. of forest land (185.017 Ha. is Revenue Forest land and 55.850 Ha. is Deemed Forest land). There are 7 villages namely, Khedapali, Bandhapali, Chhal, Navapara, Chandrasekharpur (Edu), Pusalda & Lat involved in the project.



### **Physiography and Drainage**

The Chhal Block is largely characterised by a plain country. The altitude varies between 231 m in the west to 267 m above MSL in the north eastern part of the block. The elevation of the ground varies between 255 m to 267 m along a linear patch running NE-SW in the central part of the property. The ground has a general slope towards NE, SE & SW. Most of the area is covered by soil and cultivate land. The southerly flowing Mand River and westerly flowing Kurket River with their tributaries form the main drainage of the Chhal Block. A small earthen dam has been constructed for the purpose of irrigation near village Khedapali in the eastern part of the block.

### **Mine water environment:**

**Surface Water Sources:** The drainage pattern in the area is controlled by Mand River which flows southerly, and drains through the north and western part of the block. Kurket River, flowing along east-west direction, joins Mand River near to south of Chhal OCP. The Project area is traversed by a small first order stream, flowing along south-north and joining a nala in north. This nalla joins with the master drainage Mand River.

Other nallas which drain the buffer zone are Dom nalla, Jhampi nalla, Sukhia nalla, Chinni nalla etc. Borai River drains the extreme western part of the study area. The drainage is mostly dendritic in nature.

**Ground Water Sources:** The formations within the study area are Gondwanas, Talchirs and Metamorphics. The project area is situated on Barakars consisting mainly of fine to coarse grained sandstone with shale beds and coal seams. The permeable sandstone beds become saturated and behave as aquifers. Impermeable shale and thick coal seam act as aquiclude. Stratification and presence of aquiclude divide the aquifer into multiaquifer system.

The formation comprising mainly of alluvium and weathered sandstone lying above the topmost working coal seam VI behave as unconfined aquifer. The permeable formations sandwiched between the confining layers (i.e. coal seams and shale beds) act as semi-confined to confined aquifer. In the unconfined aquifer ground water movement follows the topographical slopes. The ground water flows towards south to southeast.

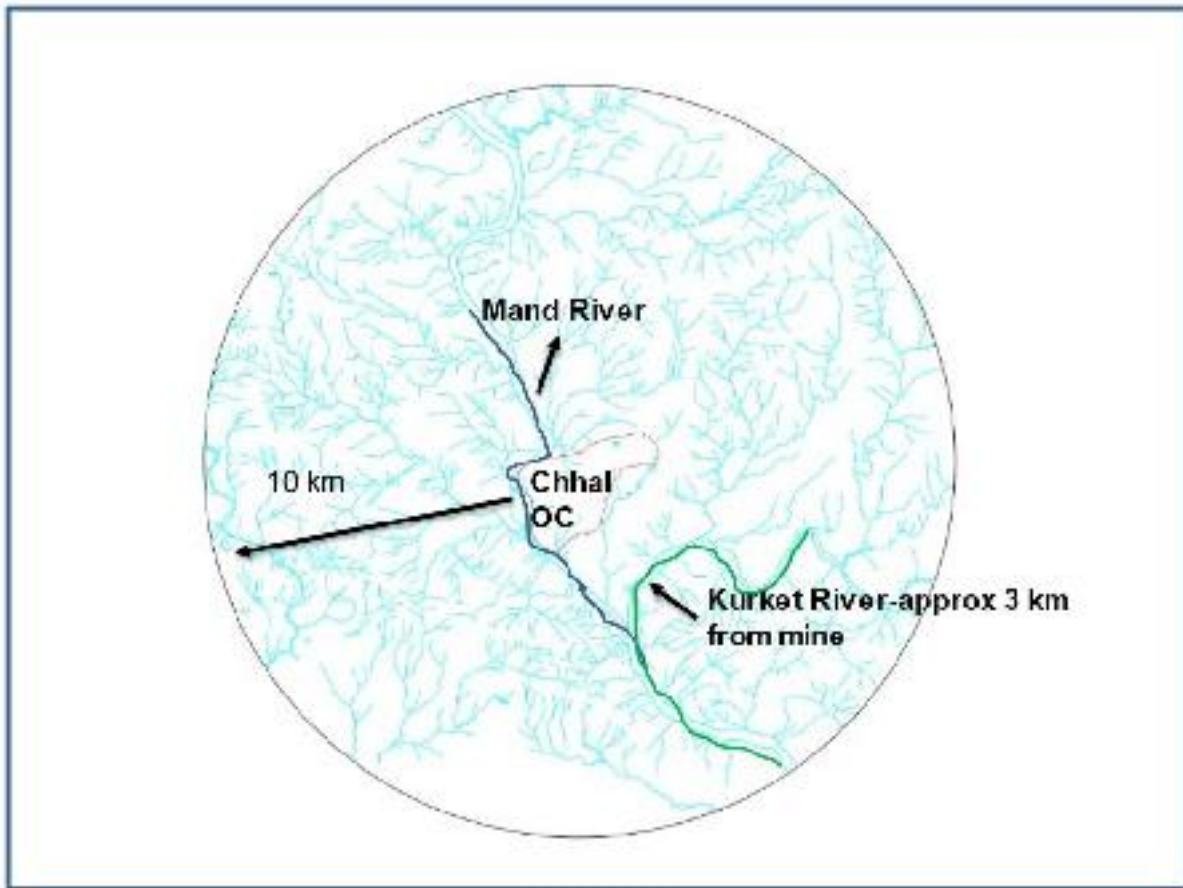


Fig. Plan showing hydrological features of the area

**a. Preparation and implementation of a plan containing appropriate mitigative measures to minimize soil erosion and choking of streams;**

**Soil erosion**

Soil conservation in its widest sense includes not only control over erosion but all those measures like correction of soil defects, application of manures and fertilizers, proper crop rotations, irrigation, drainage etc. which aim at maintaining the productivity of the soil at a high level. In this sense, soil conservation is closely allied to improvement of land use in general.

In OC mines, the earth material is dug out to extract coal. The excavated over burden material consists of alluvial, top soil, sub soil and rocks. The OB is placed in the nearby areas in the form of dumps. If no measures are taken for the management of OB dumps, after precipitation, water will take away the soil particles along with itself thereby causing soil erosion.

This eroded soil will flow into the nearby streams, rivers, water channels and cause choking/contamination of the water bodies.

In order to prevent this, an effective soil erosion management plan needs to be prepared and implemented.

## **Mitigative measures to minimize Soil Erosion and choking of streams**

In order to control soil erosion, a step by step procedure needs to be adopted so that the water flows through a proper path and does not take away with it the essential soil material. The steps to be followed are:

- I. **Garland Drains:** Garland drains will be made around the periphery of the quarry. These garland drains will be connected to the local nalla which is not likely to be disturbed by mining operation. In the workings, heavy duty pumps will be deployed in rainy season which will throw the accumulated water from the working face into these garland drains. As the extraction of the quarry advances, the position of garland drain will also advance. Thus these garland drains will drain of the rain water away from the workings. Catch pits will be provided at suitable regular intervals to allow the silt and sedimentations to settle down. The effectiveness of the drainage system depends on proper maintenance of all drainage pipes/channels. Regular cleaning of drains will be done to remove accumulated sludge/sediments. The catch-pits linked to the storm water drainage system from the areas will also be regularly cleaned to ensure their effectiveness. This exercise will be carried out during the pre-monsoon.
- II. **Water Coursing Channel:** The topography of the area is planned and designed in such a way that the water takes a pre-determined path to flow and does not reach the other areas. In between the two OB dump slopes, a narrow water coursing channel is made in which water flown down the slopes gets collected and drifts through a preset channel.

Initial provision of Rs.40 lakhs has been made in the project report. Subsequent additional provision will be made as and when required.

### ***b. Planting of adequate drought hardy plant species and sowing of seeds in the appropriate area within the mining lease to arrest soil erosion;***

In view of importance of vegetal cover towards environment, the technical reclamation will be strengthened by biological reclamation for conserving the environment.

#### **Plantation Technique on Overburden Dumps**

The top surface of the overburden dumps selected for afforestation will be roughly levelled by dozer keeping a mild slope of about 1 in 200 for surface water drainage.

Seeds of grass legumes will be sown on beds of 1.5 m x 0.5 m, alternating with slopes to be planted with tree species. Gully plugging and constructing check dams on water courses flowing through OB dumps with boulders, will also be made to arrest soil erosion.

The pit of sizes 45x45x45 cm will be dug at spacing of 2.0x2.0 metre on the top surface as well as on the gentle slopes of the dumps.

In SECL plantations are carried out by CGRVVN (Chhattisgarh Rajya Van Vikas Nigam Limited.) Long term MoU was signed between SECL and CGRVVN Ltd. Raipur for five consecutive years plantation works i.e. 2018-19 to 2022-23 with subsequent maintenance of four years in SECL command area in Chhattisgarh state at a total value of Rs. 98,35,17,705.81/- only .

Various species suggested for Plantation.

- Fruit Bearing Trees: Jamun, Imli, Ganga Imli, Bel, Mango, Sitaphal etc.,
- Medicinal / Herbal Plants: Neem, Karanj, Harra, Bahera, Aonla (Amla), Arjun, Shekakai, Kusum, Mahua, etc.,
- Timber Value Trees: Teak, Shivan / Ghamar, Sissoo, Kala Sisham, Safed Sirus, Bamboo, Peltaform, Babool, Acacia Auriculiformis etc.,
- Ornamental / Avenue Plants (by the side of roads and colonies): Gulmohar, Kachnar, Amaltas, Saptaparni, Gravalia, Peepal, Palm tree etc.,

### **Green Belt Development**

In the directions where natural forest does not exist, there is need for creating green belt of adequate width as an effective dust and sight curtain in the periphery of mining area. The trees planted in the green belt area shall act as buffers and shock absorber against dusts, noise and stone flying. The trees in the green belt will be tall, wind firm, broad leaved and evergreen. A green belt of adequate width on either side of the haul road will be raised and the existing vegetation will be protected. The plants will be raised at spacing of 2.0x2.0 metre. Along the roads other than the haul roads also, dust resistant plants as mentioned above will be planted.

#### ***c. Construction of check dams, retention/toe walls along the contour to arrest sliding down of the excavated material;***

- I. **Toe walls:** Toe walls are low walled structures constructed at the bottom of an embankment to prevent slippage or spreading of the soil. Toe walls shall be provided around the top soil dump.
- II. **Gabion Structures:** A gabion wall is a retaining wall made of stacked stone-filled gabions tied together with wire. For erosion control, caged riprap is used
- III. **Check Dams:** A **check dam** is a small, sometimes temporary, dam constructed across a swale, drainage ditch, or waterway to counteract erosion by reducing water flow velocity. Gully plugging and constructing check dams on water courses flowing through OB dumps with boulders, will also be made to arrest soil erosion.



**Fig. Gabion structure**



**Fig. Check dams**

- d. Stabilize the overburden dumps by appropriate grading/benching so as to ensure that that angles of repose at any given place is less than 28°; and*

## **Planning of OB dumps**

### **A) Dumping strategy**

The proposed sequence of mining is ideally suited for achieving the objective of placing maximum possible waste in the internal dumps. External dumps will be created mainly during the initial years of mine expansion. The proposed reconstruction of the mine gives best possible back-filling opportunity. Thus, external dump quantities will be minimized.

By adopting the proposed sequence of mining, as the quarry advances, the amount of external dump will decrease and that of internal dump will increase as more space for the economic dumping is created. From the sixth year onwards majority dump will be accommodated internally.

The total volume of overburden has been estimated as 852.07 Mcum, including 40 Mcum rehandling. 71.52 Mcum will be placed in the external dumps located on the present site of external dumping. The balance 780.55 Mcum will be accommodated in the internal dump.

The land for external dump site will have to be acquired. Internal dump, due to the position of haul road, has been divided into two parts i.e. north-eastern dump and south-western dump.

The spoil dump in the internally backfilled OB will be in the form of benches. With the sufficient advance of coal production bench, the non-active backfilled OB will be levelled with dozer. Dumper/Tipper will transport soil/alluvium OB from the top OB bench and will dump the soil directly on the leveled backfilled OB.

Otherwise; top soil will be removed and stored separately. This soil will be directly spread over the levelled graded backfilled spoil for reclamation of the quarried-out land. OB dumps will be properly benched and the maximum height of the bench will be kept not more than 30m. Dump benches will have a mild gradient of 0.6% to facilitate the drainage. Wherever possible, simultaneous land reclamation will be done along with the OB dumping.

### **B) Dumping arrangements**

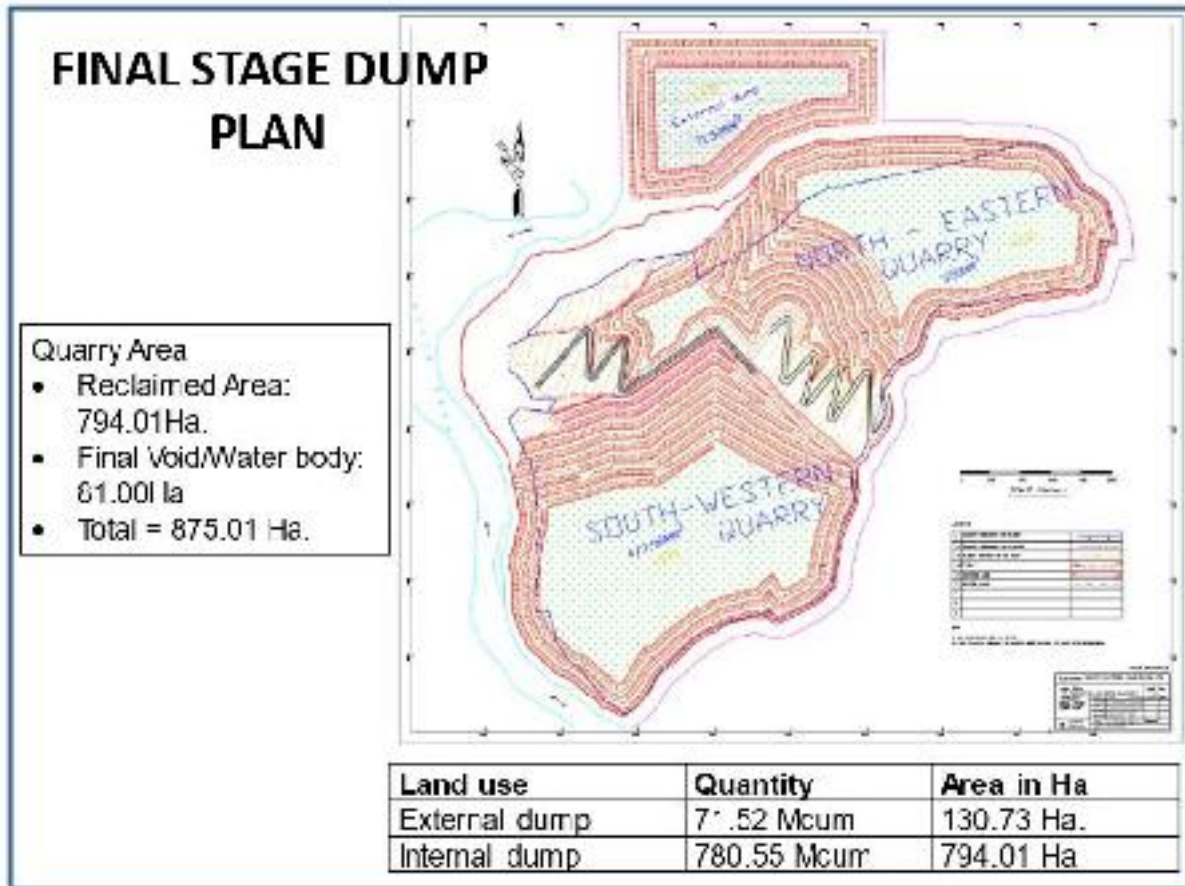
The following design criteria have been considered for waste dumps.

- (i) OB in external dumps will be stacked in 30 m high benches.
- (ii) OB in internal dumps will also be stacked in 30 m high benches.
- (iii) A berm width of 30 m has been provided for transport etc.
- (iv) Dump slope for each deck to be at natural repose (37°).

(v) Dozers to be deployed for shaping the dumps overall slope to 280.

Final reclamation will be achieved using the equipment provided for the purpose.

Once, the external dumping is completed, the spoil will be graded and landscaped in harmony with surrounding topography and biological reclamation carried out. The final void at the end of mining operations in the mine can be converted into a water reservoir. The total final void left at the end of the mining operations will be 81 Ha.



OB dump management of Chhal OC Seam-III 6.0 MTY Project

**e. Strict adherence to the prescribed topsoil management**

**Systematic handling of topsoil**

For surface mining activities are required to remove topsoil or other approved plant growth materials before beginning operations, save it for a later use in a manner conducive to protecting the primary root medium from contamination and erosion, and enhance its productivity. Topsoil shall be removed before any drilling, blasting, mining, or other surface disturbance. The stock piling of topsoil will be as follows:

- Top soil and other materials removed shall be stock-piled only when it is impractical to promptly redistribute such materials on regraded areas.
- Stock-piled materials shall be selectively placed on a stable area, not disturbed, and protected from wind and water erosion, unnecessary compaction, and contaminants which lessen the capability of-the materials to support vegetation when redistributed.

### **Topsoil redistribution**

After the final grading the topsoil would be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the post mining land uses, contours, and surface water drainage system.

### **Biological Reclamation**

In view of importance of vegetal cover towards environment, the technical reclamation will be strengthened by biological reclamation for conserving the environment.

## **Financial Provisions**

### **I. Financial provision for soil erosion management**

Initial Financial provision have been made in the Project Report is as shown below:

<b>S. No.</b>	<b>Activity</b>	<b>Amount (in Rs. Lakhs)</b>
1.	Garland Drains	10.00
2.	Arboriculture/plantation in industrial area	10.00
3.	Barbed fencing/boundary walls/Toe walls/Gabion structures for the project	30.00
4.	Reclamation of Dumps	10.00
6	Green Belt in and around the Mine	20.00
	<b>Total</b>	<b>80.00</b>

\* Subsequent additional provision will be made as and when required.

### **II. Mine Closure cost for OC Mine**

Mine closure plan has been approved by SECL Board on 16.12.2013

As per the guidelines of the MoC, the cost of the mine closure is to be computed based on the basis of project area involved in the project.

In Chhal OC (Seam III), the total mining lease area is 1226.67 Ha. So, the closure cost is to be computed considering a total project area of 1342.86 **Ha**. Considering the wholesale price index as 171.6 as on May 2013, the updated cost of the mine closure is estimated to be Rs. 7.94 lakhs per hectare considering the admissible escalation over Rs. 6.00 lakh per Ha as on August 2009 when wholesale price index was 129.60.

Total Final mine closure cost (@ Rs.7.94/Ha.):**Rs. 10662.31lakhs** upto two decimal place.

### **III. Detail of Escrow Account**

The current value of corpus is Rs.10662.31 Lakhs (as on May. 2013). This corpus is to be divided by balance life of mine. Since, this is a running mine and the balance life after expansion is estimated as 30 years as on 01/04/2013, the annual corpus comes to Rs. 355.41 Lakhs (up to



two decimal place) by dividing 30 years. This amount is to be deposited in escrow account every year.

This amount is to be deposited in escrow account every year with 5% annual escalation.

**Fund to be deposited in escrow account and reimbursement schedule**

Year	Fund Deposited in Escrow Fund	Fund to be Reimbursed (Maximum)	
1	355.41	Nil	(+) accrued interest as applicable
2	373.18	Nil	
3	391.84	Nil	
4	411.43	Nil	
5	432.00	Nil	
<b>Phase-1 Total</b>	<b>1963.86</b>	<b>1571.09</b>	
6	453.60	Nil	
7	476.28	Nil	
8	500.10	Nil	
9	525.10	Nil	
10	551.36	Nil	
<b>Phase-2 Total</b>	<b>2506.44</b>	<b>2005.16</b>	
11	578.93	Nil	
12	607.87	Nil	
13	638.27	Nil	
14	670.18	Nil	
15	703.69	Nil	
<b>Phase-3 Total</b>	<b>3198.93</b>	<b>2559.14</b>	
16	738.87	Nil	
17	775.82	Nil	
18	814.61	Nil	
19	855.34	Nil	
20	898.10	Nil	
<b>Phase-4 Total</b>	<b>4082.73</b>	<b>3266.19</b>	
21	943.01	Nil	
22	990.16	Nil	
23	1039.67	Nil	
24	1091.65	Nil	
25	1146.23	Nil	
<b>Phase-5 Total</b>	<b>5210.72</b>	<b>4168.57</b>	
26	1203.54	Nil	
27	1263.72	Nil	
28	1326.91	Nil	
29	1393.25	Nil	
30	1462.92	Nil	
<b>Final Stage-Total</b>	<b>6650.34</b>	<b>5320.27</b>	
<b>Grand Total</b>	<b>23613.03</b>		

**IV. Tentative Final Mine Closure Activities and Cost Break-up**

**Type of mine:** Open cast  
**Mining Lease Area:** 1342.855 Ha.

**Production Capacity:** 6.0 MTY  
**Depth of the mine:** 300m

Sl. No.	Major Closure Activities	Quantity	% of Total Closure Cost
<b>A</b>	<b>Dismantling of Structures</b>		
	Service Buildings		0.20
	Residential Buildings,		2.67
	Industrial Structures i.e. workshop complex, 33kv/3.3kv Sub-Station, Unit Stores, Security Barrack		0.30
<b>B</b>	<b>Permanent fencing of mine void &amp; other dangerous areas</b>		
	Random rubble masonry of height 1.2m including levelling up in cement concrete 1:6:12 in mud mortar.		1.50
<b>C</b>	<b>Grading of highwall slopes</b>		
	Levelling & grading of highwall slopes		1.77
<b>D</b>	<b>OB Dump Reclamation</b>		
	Handling/Dozing of external OB dump into mine void.		88.66
	Bio-reclamation including soil spreading, plantation & maintenance.		0.00
<b>E</b>	<b>Landscaping</b>		
	Landscaping of the cleared land for improving its esthetic		0.30
<b>F</b>	<b>Plantation</b>		
	Plantation over area obtained after dismantling.		0.50
	Plantation around fencing		0.20
	Plantation over the cleared off external OB dump.		0.00
<b>G</b>	<b>Monitoring / testing of environmental parameters for three years.</b>		
	Air quality		0.22
	Water quality		0.20
<b>H</b>	<b>Entrepreneurship development (vocational and skill development training for sustainable income of affected people)</b>		0.26
<b>I</b>	<b>Miscellaneous &amp; other mitigative measures</b>		2.60
<b>J</b>	<b>Manpower Cost for supervision</b>		0.80
	<b>Total (%)</b>		<b>100.00</b>

**Note :-** The above cost expenditure will be met from the corpus escrow account deposited by the mine operator. In case of mines having acid mine drainage, post closure acid mine drainage management cost shall also be included in the total closure cost.

However, the additional amount beyond the escrow account will be provided by the mine operator after estimating the final mine closure cost five years prior to mine closure (as per the mine closure guidelines).

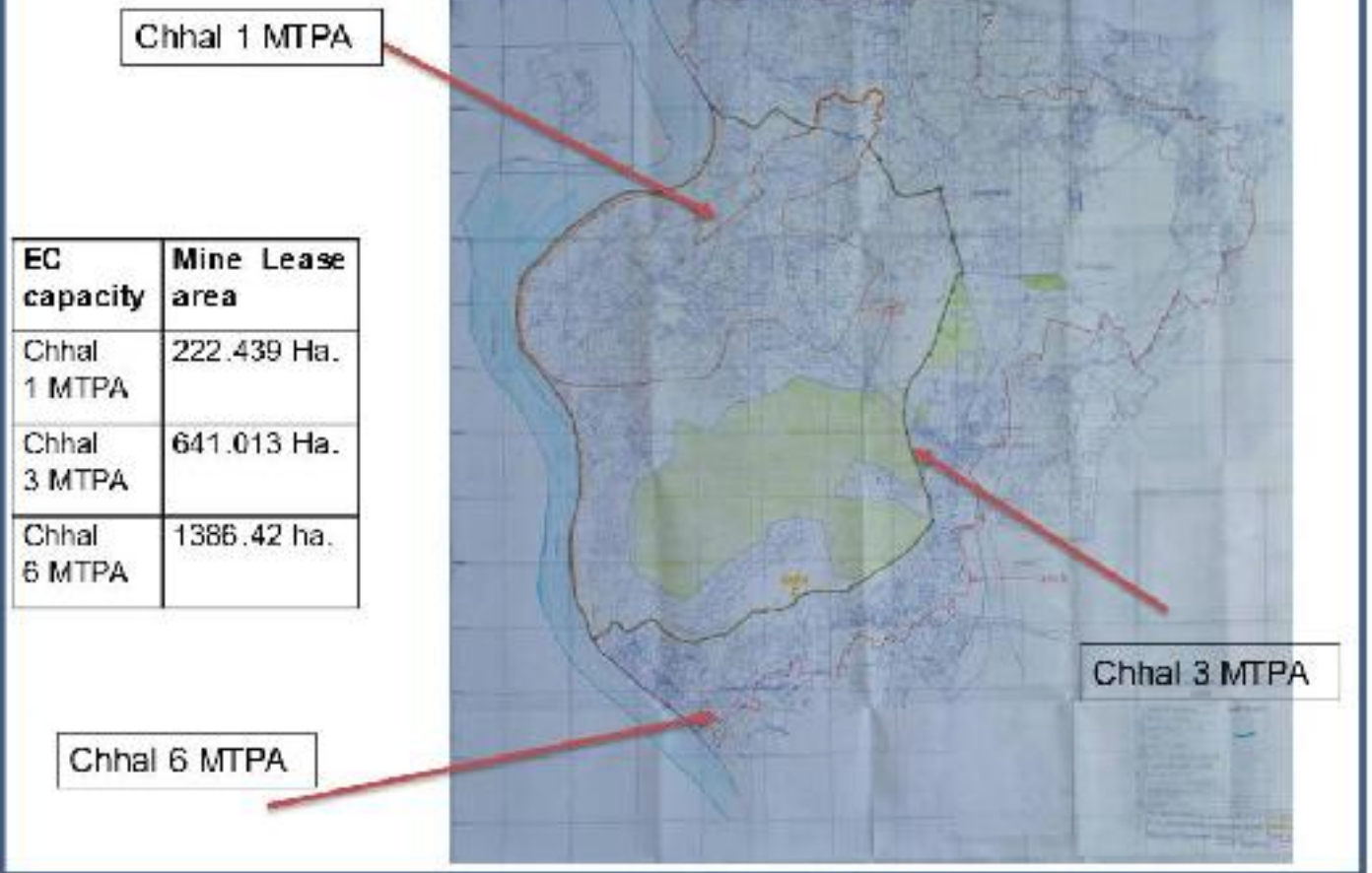
## Time Schedule

The different activities considered for mine closure are mentioned along with their schedule for implementation in the Figure below:

**Schedule for implementation of progressive mine closure activities**

S. No.	Activities in Reclamation Phase	1 <sup>st</sup>			2 <sup>nd</sup>			3 <sup>rd</sup>			4 <sup>th</sup>			5 <sup>th</sup>			6 <sup>th</sup>			MC				
<b>For Chhal OCP (30 Years)</b>																						1	2	3
1	Grading of External dump																							
A	Internal dump																							
a	Filling and simultaneous Leveling																							
2	Provision of water coursing channels																							
3	Provision of Sedimentation Pond																							
4	Provision of Garland Drains																							
5	Provision of Check dams at high velocity points																							
6	Topsoil Preservation & Application																							
7	Topsoil Application																							
8	Site preparation and plantation																							
a	Within de-coaled area																							
b	Out of de-coaled area																							
9	Environmental Monitoring																							

## CHHAL OC EXP. PROJECT LAND BOUNDARY (INCLUDING BOUNDARY FOR EARLIER CAPACITIES)

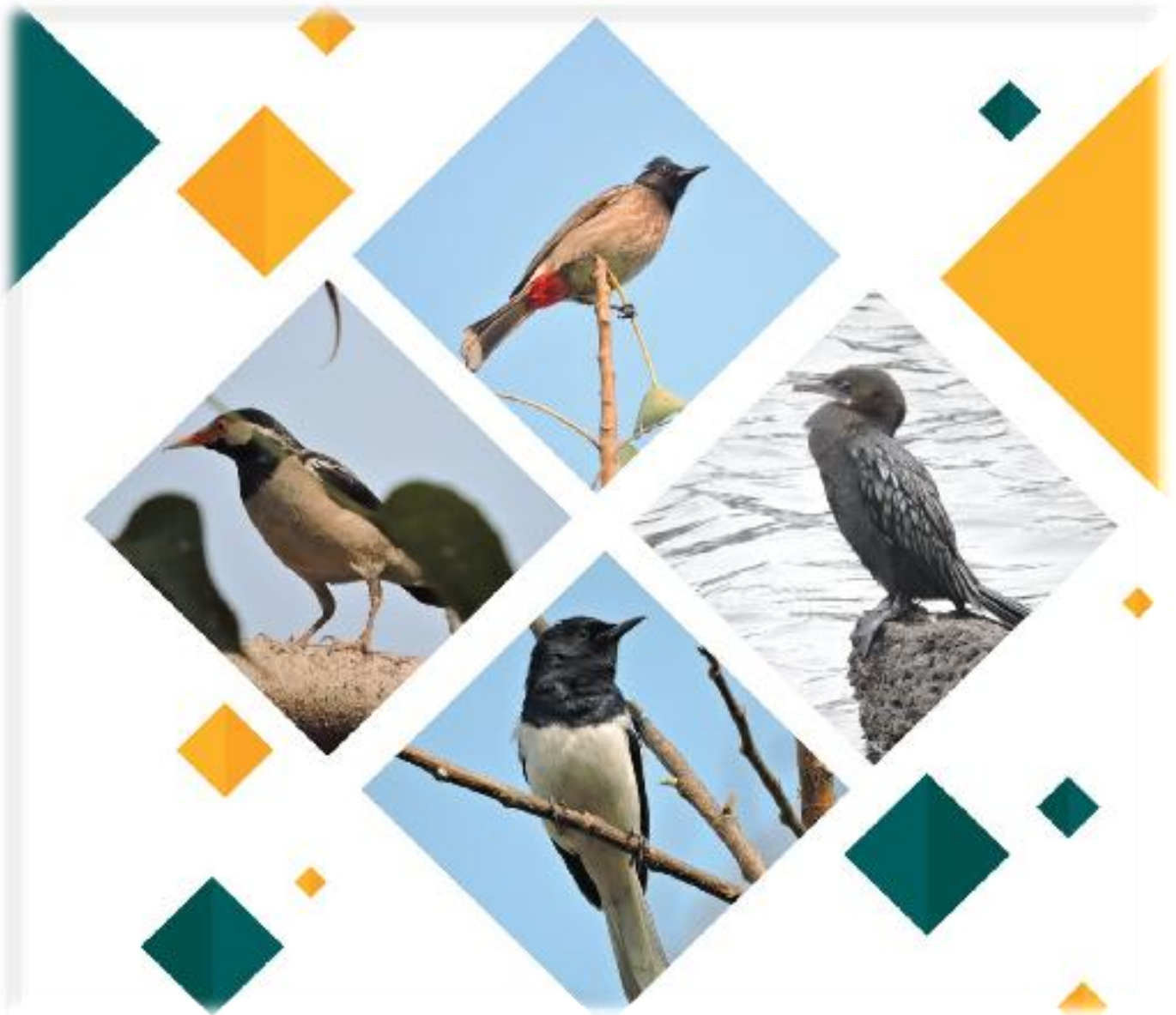


### References:-

- *Project Report of Chhal OC seam-III 6.0 MTY Project*
- *Environment Impact Assessment report*
- *Environment Management Plan*
- *Progressive Mine Closure Plan of Chhal OC seam-III 6.0 MTY Project.*



**“WILDLIFE CONSERVATION PLAN INCLUDING ALTERNATIVE  
HABITAT DEVELOPMENT PLAN FOR THE AFFECTED AVIFAUNA  
OF CORE AREA OF OCP CHAAL, RAIGARH AREA”**



Published by



**STATE FOREST RESEARCH & TRAINING INSTITUTE  
RAIPUR, CHHATTISGARH**

*Published by: State Forest Research and Training Institute  
Raipur, Chhattisgarh  
Published in July 2019*

*Front Cover:*

*Red Vented Bulbul, Little Cormorant, Oriental Magpie-robin and Pied Myna in core mining area of OCP Chhal, Dharamjaigarh, C.G.*

*Back Cover:*

*Indian Golden Orioles in core mining area of OCP Chhal, Dharamjaigarh, C.G.*

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## PREFACE

This project is a scientific and systematic study of real site-specific issues related to the conservation of wildlife and avifauna with the application of management concept and expertise. The project “Alternative Habitat Development Plan for affected Avifauna and Wildlife Conservation Plan for affected wildlife species of OCP Chhal, SECL Raigarh, Chhattisgarh” was proposed by the South Eastern Coalfield Limited (Coal India Limited), Open Cast Project Chhal, SECL Raigarh, for stage II clearance for the diversion of 185.155 hectare of Protected Forest and Revenue Forest land for Chhal Open Cast Mine (OCM) in Chhal Forest Range, Raigarh District, Chhattisgarh in favour of SECL and the project was undertaken by State Forest Research and Training Institute, Raipur (C.G).

The major objectives were:

1. To survey and documentation of the existing wildlife (mammals, reptiles) of OCP Chhal area (core and buffer zone).
2. To estimate species diversity and population dynamics of avifauna in the OCP Chhal area (core and buffer zone).
3. To study the habit, habitat and nesting pattern of different species of avifauna of core and buffer zone.
4. GPS survey of the densities, water bodies, nesting areas, migratory birds area, and wildlife corridor of any in the proposed study area.
5. To study the presence and movement of animals and birds by seasonal survey.
6. To study the impact assessment of proposed mining activities along with the existing biotic pressure on habit and habitat of the existing wildlife species including avifauna of the core zone.
7. Pilot testing, evaluation and monitoring of appropriate measures for the desired site.



8. Preparation of habitat enrichment/development plan for the wildlife species and avifauna of the core zone for preferential adoption of the surrounding area as alternative habitat.
9. Initial monitoring and guidance to the executing agency (Forest Department) for the implementation of the plan.

The research teams of State Forest Research and Training Institute Raipur (C.G) have conducted extensive scientific surveys and conceptualized the alternative plan for the avian species and the conservation plan for the affected wildlife species in the study area.

As result of three seasonal studies, 1653 individual from 106 different species of 32 families' avifauna were recorded in the affected area, which indicates the rich diversity of avian species in the study area. The alternative habitat as per the developed action plan is to be provided. The primary data analysis was based on "**Lines Transect Methodology**" in which the avian biodiversity as well as their habitat were studied and analyzed.

The project report attempts to bring under one cover the entire hard work and dedication put in by the research team for the completion of this work.

The key findings and recommendations have been provided in the document, which we trust, will be useful for all the stakeholders and decision makers associated with the OCP Chhal area. The final conclusion and the recommendations, along with the conservation plan and budget proposal have also been prepared for the implementation of the project.

I hope this report will help, not only the management of OCP Chhal but also help the Forest Department to conserve and protect the wildlife, avifauna and their habitat.



(S.S Bajaj IFS)  
APCCF

**State Forest Research and Training Institute  
Raipur, Chhattisgarh**

## Acknowledgement

The preparation of Wildlife Conservation Plan including Alternative Habitat Development Plan for Avifauna within the OCP Chhal lease area and its surroundings would not have taken shape but, for the valuable inputs, suggestions, guidance, support and efforts of a number of resource persons.

I would like to thank Shri Mudit Kumar Singh IFS, PCCF & HoFF, Director, State Forest Research and Training Institute for his continuous support, valuable suggestions and guidance.

I would also like to thank Shri A.B Minz IFS, Ex-Additional Director, SFRTI, and Smt. Nirmala Xess A.C.F, SFRTI for their help and support.

I would like to appreciate the efforts of Shri M.M Ujjaini, Technical Assistant and Project in-charge, Shri Jeevan Shirin Toppo S.R.F, Shri Vijay Kumar Bhagat J.R.F, Shri Kamlesh Kumar Dadsena J.R.F, Shri Amit Kumar Baghel J.R.F, Shri Rajesh Kumar Toppo F.A. and Shri Ashutosh Pandey Ex-S.R.F. in field survey, data collection, analysis and report writing.

My special thanks to Chief Conservator of Forest, Bilaspur, Divisional Forest Officer, Dharamjaigarh Forest Division, and his field staffs, General Manager SECL Raigarh, Sub-area Manager of OCP Chhal and Nodal officer SECL Raigarh and the officers involved with the project for sparing their valuable time and providing facilities for the research team.

The Conservation Management Plan remains open to alteration so as to offer protection to the local birds, wildlife species and their habitat. It should be interpreted as a static design remaining flexible to inputs from the concerned authorities, of whom I am appreciative in advance.

I hope this report will be helpful to develop alternative habitat for avifauna. Wildlife Conservation Plan will also ensure efficient protection, conservation & management for avifauna and wildlife species of the OCP Chhal mining area.



(S.S Bajaj IFS)  
APCCF

**State Forest Research and Training Institute  
Raipur, Chhattisgarh.**



## TEAM MEMBERS FOR

*Preparation of Wildlife Conservation Plan including Alternative Habitat Development Plan for affected Avifauna of core mining area of OCP Chhal, Dharamjaigarh, area C.G*

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## Abbreviations

<b>OCP</b>	Open Cast Project
<b>SFRTI</b>	State Forest Research and Training Institute Raipur, C.G.
<b>ESMP</b>	Environmental and Social Mitigation Project
<b>MoEF</b>	Ministry of Environment and Forest
<b>CC</b>	Climate Change
<b>EIA</b>	Environmental Impact Assessment
<b>EMP</b>	Environmental Management Plan
<b>CIL</b>	Coal India Limited
<b>SECL</b>	South Eastern Coal Field Limited
<b>SC</b>	Scheduled Caste
<b>ST</b>	Scheduled Tribe
<b>FRA</b>	Forest Reclamation Approach
<b>SEIAA</b>	State Environment Impact Assessment Authority
<b>SPM</b>	Suspended Particulate Matter
<b>OB</b>	Overburden
<b>GLC</b>	Ground Level Concentrations
<b>NTFP</b>	Non Timber Forest Produce
<b>PPE</b>	Personal Protective Equipment
<b>LC</b>	Least Concern
<b>GPS</b>	Global Positioning System
<b>Hec</b>	Hectare
<b>CSBSAP</b>	Chhattisgarh Biodiversity Strategy and Action Plan
<b>IUCN</b>	International union for Conservation of Nature and Natural resources
<b>EX</b>	Extinct
<b>EW</b>	Extinct in the Wild
<b>CR</b>	Critically Endangered
<b>EN</b>	Endangered
<b>VU</b>	Vulnerable
<b>NT</b>	Near Threatened
<b>LC</b>	Least Concern
<b>DD</b>	Data Deficient
<b>NE</b>	Not Evaluated
<b>Land Cover Related Abbreviations Used in Datasheets</b>	
<b>R</b>	Resident
<b>B</b>	Barren land
<b>A</b>	Agriculture land



<b>G</b>	Grassland
<b>W</b>	Woodland
<b>S</b>	Scrubland
<b>Human settlement related Abbreviations used in datasheets</b>	
<b>S</b>	Settlement
<b>R</b>	Metal Road
<b>E</b>	Electricity
<b>P</b>	Pond
<b>W</b>	Well/Tube well
<b>Observations related Abbreviations used in datasheets</b>	
<b>1</b>	Illicit Felling
<b>2</b>	Girdling
<b>3</b>	Dead Tree
<b>4</b>	Living / Healthy Tree
<b>5</b>	Diseased Tree

## **EXECUTIVE SUMMARY**

Chhattisgarh state is identified as having one of the richest biodiversity habitats in the country; it has one of the densest forests in India, rich flora and fauna, several species of exotic flora and fauna and abundant non-timber forest products (NTFP's), with tremendous potential for value addition.

The variability among living organisms from all sources including Terrestrial, Marine and other Aquatic ecosystems and the ecological complexes to which they are part of, includes diversity within species, between species, and Ecosystems. Diversity within species (or genetic diversity) refers to variability in the functional units of heredity present in any material of plant, animal, microbial or another origin. Species diversity is used to describe the variety of species, whether wild or domesticated within a geographical area.

Similarly, Chhattisgarh is one of the richest Indian State in terms of mineral wealth, with 28 varieties of major minerals, including diamonds and rank second in the country in mineral production. The state holds a major share of coal deposits in India, which has led to the state also being a major power producer and being power surplus state.

The environmental impact of the coal industry involves issues like land degradation, waste disposal, water, air and noise pollution etc. caused by mining, processing and uses of coal products. In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue gas desulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

The removal of vegetative cover and activities associated with the construction of haul roads, stockpiling of topsoil, displacement of overburden and hauling of soil and coal increase the quantity of dust around mining operations. Dust degrades air quality in the immediate area, has an adverse impact on vegetative life, and creates health and safety hazards for mine workers and nearby residents.

Surface mining may affect groundwater in numerous ways like draining of usable water from shallow aquifers, lowering of water levels in adjacent areas and change in flow direction within aquifers, contamination of usable aquifers below mining area due to infiltration of poor quality mine water; and increased infiltration of rainwater on spoil piles.

Surface mining of coal causes direct and indirect damage to wildlife. The impact on wildlife stems primarily from disturbing, removing and redistributing the land surface. The most direct impact on wildlife is destruction or displacement of species in areas of excavation and spoils piling. Pit and spoil areas are not capable of providing food and cover for most species of wildlife. More sedentary animals like invertebrates, reptiles, burrowing rodents and small mammals may also disappear or destroyed due to mining activities.

Displacement of wildlife population from the mine site is another direct impact of mining. As mining proceeds on a site, wildlife moves to adjacent areas and establishes territories and home ranges.

In some species, reproduction is likely to be affected during the breeding season, when displacement occurs. Wildlife response to post-mining reclamation is based on the wildlife species in question, their habitat requirements, and presence of a source population to colonize the mine site and the structure and composition of the vegetation on the mine site post-reclamation and in the surrounding landscape. The majority of studies on wildlife response were focused simply on documenting the numerical response of species in question on the mine site for a brief period of post-reclamation.

Therefore the Ministry of Environment, Forest and Climate Change has notified the Environmental Impact Assessment (EIA) notification, 2006 under the provisions of the Environment (Protection) Act, 1986, which regulates development and their expansion/modernization of 39 sectors/activities listed in the schedule to the EIA notification, 2006. The Government of Chhattisgarh has identified the State Forest Department as nodal agency to prepare the Chhattisgarh Biodiversity Strategy and Action Plan i.e. CSBSAP.

The study involved detailed systematic and scientific processes of identifying, predicting, evaluating and analyzing the potential impacts of Open Cast Mining on avian bird species, wildlife and its habitat within the OCP Chhal boundary and surrounding area of Dharamjaigarh Forest Division. Extensive field studies were undertaken within the mining lease boundary of OCP Chhal and observations were made during the course of first and second seasonal field visits that formed the foundation of a conservation management plan for the betterment of affected species.

The major objectives were:

1. To survey and documentation of the existing wildlife (mammals, reptiles) of OCP Chhal area (core and buffer zone).
2. To estimate species diversity and population dynamics of avifauna in the OCP Chhal area (core and buffer zone).
3. To study the habit, habitat and nesting pattern of different species of avifauna of core and buffer zone.
4. GPS survey of the densities, water bodies, nesting areas, migratory birds area, and wildlife corridor of any in the proposed study area.
5. To study the presence and movement of animals and birds by seasonal survey.
6. To study the impact assessment of proposed mining activities along with the existing biotic pressure on habit and habitat of the existing wildlife species including avifauna of the core zone.
7. Pilot testing, evaluation and monitoring of appropriate measures for the desired site.
8. Preparation of habitat enrichment/development plan for the wildlife species and avifauna of the core zone for preferential adoption of the surrounding area as alternative habitat.
9. Initial monitoring and guidance to the executing agency (Forest Department) for the implementation of the plan.

The proposed mining area is located in the south of village Chhal at an approximate distance of 2.5 km on Kharsia - Dharamjaigarh State Highway and 16 km from Kharsia town. The block is bounded by latitude 22°04'40" and 22°06'27" and longitudes 83°06'10" and 83°09'10" and is included in the Survey of India Topo Sheet No. 64 N/4. It is situated in the Raigarh district of Chhattisgarh. There are about 826.07 hectare area lands to be acquired out of which 185.155 hectare of forest land in mining area will be proposed to acquire. Out of 185.155 hectare land 176 ha land including the protected forest area and rest 9.155 hectare area will be proposed from revenue forest area. Only one compartment should fall under proposed mining area namely comp. no. 478 PF.

Line transect method has been applied for the bird count and their habitat survey. Line-transect distance sampling methods were also used to estimate the abundance of many biological populations such as animals, birds and plant species including nonliving things. Total of 26 transects have been taken during the three seasonal field survey in the core and buffer zone. Distance sampling in every 300 m and 10 m circular quadrates have been taken for observation of vegetation composition (Grass, herb, shrub and regeneration).

On the basis of three seasonal field surveys, **total 1653 individuals of 106 different bird species** have been recorded. The 1653 individuals belongs to 106 species they are categorized on the basis of nesting pattern, the population of avifauna abundant by Purple Sun Bird, Jungle Babbler, Indian Silver Bill, Red Vented Bulbul, Green Bee Eater, Cattle Egret, Black Drongo, Eurasian Collared Dove, Sulphur Bellied Warbler and Common Myna etc. Mostly the birds found during the survey are endemic and resident. In the study area, dominated floral species found mainly Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Koriya (*Pinus koraiensi*), Teak (*Tectona grandis*), Bhelwa (*Semecarpus anacardium*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Tendu (*Diospyros melanoxylon*), Kekat (*Garuga pinnata*), Plash (*Butea monosperma*), Anjan (*Hardwickia binata*), Bargad (*Ficus bengalensis*), Harra

(*Terminalia chebula*), Baheda (*Terminalia bellerica*), Semal (*Bombax ceiba*), Jamun (*Syzygium cumini*) and Mahaneem (*Ailanthus excelsa*) etc.

The overall ecological value of an area, where mining is carried out, must also be considered. This should include the interconnections between habitats in the vicinity of the mining project which may be affected by fragmentation of the habitat. Many species, particularly avifauna, mammals and their dynamic territories that extend beyond site boundaries, making them vulnerable to changes in external or local environmental conditions.

The proposed coal mine would create an impact on the environment in two distinct phases; during the development phase, which may be regarded as temporary or short term. During the operation which would have long term effects. These impacts will have a negative effect on the avifauna of the area.

To minimize the impacts of mining on different environmental factors with reference to avifauna and wildlife species, recommendations are given as follows:

1. Green belts should be developed around the mining boundary, along the roads, lease periphery, benches and backfilled areas. The impact on the biological environment due to amount of dust generation is minimized by well-developed green belt in and around mining lease area.
2. The wastage coal dust particles in the dumping site of coal mine's should be managed properly to reduce air pollution and loss of avifaunal diversity & habitats.
3. Biological reclamation should be done to transform the degraded land and waste dump into a self - sustaining ecologically stable land form. Re-vegetation of waste dump is recommended to the slope stability, enhances the infiltration of rain water to increases the soil fertility.
4. Top soil management is needed to maintain the top soil stockpile to retain fertility. Excavated top soil can be dumped for future use such as meadow development and plantation purpose in order to further mitigation for habitat conservation of avifauna.

5. Fruit bearing and feeder tree species that are preferred by the birds available in the area, to be needed to plant in the buffer zone for plantation of avifauna conservation. Some of the tree species to be planted are: Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Pipal (*Ficus religiosa*), Bargad (*Ficus benghalensis*), Bhelwa (*Semecarpus anacardium*), Gular (*Ficus glomerata*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Baheda (*Terminalia bellerica*), Harra (*Terminalia chebula*), Tendu (*Diospyros melanoxylon*), Dhawda (*Anogeissus latifolia*) and Amaltas (*Cassia fistula*) etc.
6. Multiple water storage facilities are to be developed in the buffer boundaries to assure the water availability throughout the year. The existing ponds, river, dam and canals water resources recharge should be maintained.
7. The mining in the buffer zone along the river bank of Mand River must be avoided to insure of the river changing the path.
8. The social awareness program should be conducted among the local communities and villagers to provide information & awareness about birds and wild life their contribution in ecosystem and environment.
9. Artificial nest made up of local, light and fine wood materials. Nests will be prepared with the help of active JFM Committee and local forest staff and placed in the buffer area for the affected avifauna of core zone.
10. Assisted natural regeneration (ANR) should be done for the regeneration and reclamation, protection and preservation of natural tree seedlings in forest areas.
11. Best practices from forest department should be implemented for the prevention of forest fire.
12. Plantation and conservation efforts should be monitor regularly during various growth stages of site.
13. Establishment of artificial avifauna habitat “*Pakshi Vihar*” on dumping site.

# CHAPTER 1

## INTRODUCTION

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### 1.1 BIODIVERSITY

The variability among living organisms from all sources including inter alia, Terrestrial, Marine and other Aquatic Ecosystems and the Ecological Complexes of which they are part; includes diversity within species, between species and of Ecosystems.

Diversity within species (or genetic diversity) refers to variability in the functional units of heredity present in any material of plant, animal, microbial or other origins. Species diversity is used to describe the variety of species-whether wild or domesticated) within a geographical area. Estimates of the total number of species (defined as a population of organisms which are able to interbreed freely under natural conditions) range from 2 to 100 million, though less than 1.5 million have actually been described. Ecosystem diversity refers to the enormous variety of plant, animal and micro-organism communities and ecological processes that make them function. In short, biodiversity refers to the variety of life on earth. This variety provides the building blocks to adapt to changing environmental conditions in the future.

### 1.2 WILDLIFE CONSERVATION

Wildlife Conservation is the practice of protecting animal species and their habitats. In order to survive, a species requires adequate food, water, shelter, space, and opportunities to reproduce. Wildlife conservation refers to the considered practice of ensuring protection for wild fauna species, their habitats, and plants. It has sustainable Effort to maintain and use natural resources including wildlife in ways they ensure that those resources will be available in the future.

“Wildlife Conservation is the application of ecological knowledge to populations of vertebrate animals and their plant and animal associates in a manner that strikes a balance between the needs of those populations and the needs of people” (*Robinson and Bolen 1999*).



Wildlife Conservation aims to stop the progress of the loss in the ecological biodiversity by taking into consideration ecological principles such as carrying capacity, disturbance and succession and environmental conditions such as food, water, shelter, space, and opportunities to reproduce with the aim of balancing the needs of wildlife with the needs of people. Wildlife is best preserved in their natural habitat. Wildlife wing of the forest department has adopted two-pronged strategies for the Wildlife Conservation: protection and awareness generation.

The government of Chhattisgarh has identified the state forest department as a nodal agency to prepare the Chhattisgarh Biodiversity Strategy and Action Plan i.e. CSBSAP.

Chhattisgarh state is identified as having one of the richest biodiversity habitats in the country; it has one of the densest forests in India, rich flora and fauna, several species of exotic flora and fauna and abundant non-timber forest products (NTFP's), with tremendous potential for value addition. Chhattisgarh state falls under the deccan biodiversity area. The forests of the state fall under two major forest types, i.e. Tropical Moist Deciduous forest and the Tropical Dry Deciduous forest.

Chhattisgarh has 55,674 sq km of forests, which is 41.18 percent of its geographical area. It has the third largest area under forest cover after Madhya Pradesh and Arunachal Pradesh. Of this, three percent is under very dense forest, 25.82 percent is moderately dense, 12.28 percent is open forest and 0.09 percent is scrub (Fig.1.1). The forest ecosystem of the state has very rich biodiversity comprises primarily with Sal dominated forests, followed by Teak forests and mixed forest ecosystem. As per the latest status of Chhattisgarh Forest policy report 2011, there has been a net decrease of 192 sq.km in the forest cover from 2009 (Forest Survey report 2013).

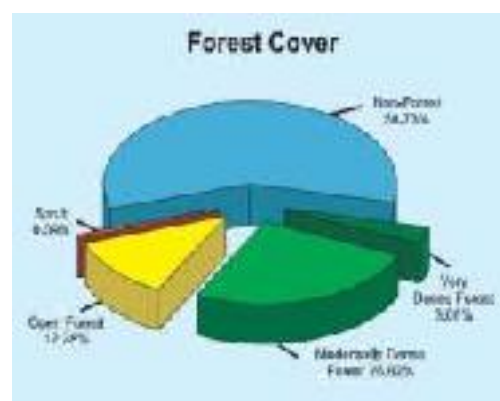


Fig.1.1 Forest cover in Chhattisgarh (State Action

Chhattisgarh is among the richest Indian states in terms of mineral wealth, with 28 varieties of major minerals, including diamonds and ranks second in the country in mineral production. The state holds a major share of coal deposits in India, which has led to the state also being a major power producer and being power surplus. It is the only state in India to have tin ore reserves. About one-fifth of the iron-ore in the country is mined in the state and one of the best-quality, iron-ore deposits in the world is found at the Bailadila mines in the south of Chhattisgarh from where it is exported to Japan and other countries (table 1.1). Rich deposits of bauxite, limestone, dolomite, and corundum are also found in the state, making it the ideal location for low-cost of production of end products such as cement and aluminum. During 2009-10, the state had contributed 14.09 per cent in the national revenue from minerals (State Action Plan 2011).

**Table No1.1: Production of key minerals**

<b>Mineral</b>	<b>Production – 2008-09 (Million Tons)</b>
<b>Coal</b>	97.0
<b>Iron Ore</b>	32.9
<b>Limestone</b>	15.6
<b>Dolomite</b>	1.2
<b>Bauxite</b>	1.6
<b>Tin ore (Concentrate)</b>	57500*

\* In Kilogram

Chhattisgarh state has richest of energy resources such as Coal, Mineral this state is the second largest coal producing region after Jharkhand in India. The environmental impact of the coal industry includes issues such as land use, waste management, water, and air pollution, caused by coal mining, processing and the use of its products. In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly ash, bottom ash, and flue-gas desulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

Coal is the only natural energy resource and fossil fuel available in abundance in India. The major environmental challenges encountering the coal

industry are impacts of mine fires, dust suppression and control particularly haul road dust consolidation, treatment of mine waters containing heavy metals/acid mine drainage, restoration of water table and quality of ground and surface water, augmentation of pumped out mine water for drinking purpose, reclamation of mined out areas with pre-determined land use patterns conducive to the local populations etc. The biggest environmental challenge facing the coal industry is the issue of greenhouse gases and acid rain. Overall environmental management improvement has been taking place with the implementation of state of art environmental management schemes particularly under Environmental and Social Mitigation Project (ESMP) of (CIL) Coal India Limited (*Dr.Gurdeep Singh, June 2008*).

Chhattisgarh state is rich in energy resources. The main energy resource is coal. The state produces 15% of total coal of the country; the main coal-producing areas are: Korba - Produces 75% coal of the state and 11% of the country. The main coal producing areas are Hasdeo-Rampur Colliery, Mand-Raigarh Colliery, Vishrampur Colliery, Lakhanpur Colliery, Tatapani-Ramkola Colliery, Jhilmili Colliery, Sonhat Colliery, Jhagrakhand Colliery, Chirmiri-Kurasiya Colliery (*Chhattisgarh Biodiversity plan*).

The environmental impact of the coal industry includes issues such as land use, waste management, water, and air pollution, caused by coal mining, processing and the use of its products. In addition to atmospheric pollution, coal burning produces hundreds of millions of tons of solid waste products annually, including fly-ash, bottom-ash, and flue-gas de-sulfurization sludge, that contain mercury, uranium, thorium, arsenic, and other heavy metals.

The removal of vegetative cover and activities associated with the construction of haul roads, stockpiling of topsoil, displacement of overburden and hauling of soil and coal increase the quantity of dust around mining operations. Dust degrades air quality in the immediate area, has an adverse impact on vegetative life, and constitutes health and safety hazards for mine workers and nearby residents.

Surface mining of coal causes direct and indirect damage to wildlife. The impact on wildlife primarily from disturbing, removing and redistributing the land surface. Some impacts are short-term, and confined to the mine site; others have far-reaching, long-term effects. The most direct effect on wildlife is destruction or displacement of species in areas of excavation and spoils piling. Pit and spoil areas are not capable of providing food and cover for most species of wildlife. Mobile wildlife species like game animals, birds, and predators leave these areas. More sedentary animals like invertebrates, reptiles, burrowing rodents and small mammals may be destroyed (*Anurag et al. 2018*).

As per MoEF clearance regarding a condition (Clause 9) “The user agency in consultation with the state government, shall create and maintain alternate habitat/ home for avifauna, their nesting trees are to be cleared under this project. Birds nests will be artificially made out of eco-friendly material, placed in the area including the forest area and human settlements; adjoining the forest area being diverted for the project.”

To overcome the impact of mining activities on avifauna and wildlife found in Chhal Range, Dharamjaigarh Forest Division Chhattisgarh, SECL Raigarh had given an assignment to SFRTI, Raipur to prepare a Wildlife Conservation Plan including alternative habitat development plan for affected avifauna.

### **1.3 PROJECT BACKGROUND**

A Project Report for Chhal OCP in Chhal Geological block was prepared in March 2003, and was approved in May 2003 for a targeted capacity of 1.00 MTY at a capital expenditure of Rs.19.99 crores.

The proposed Chhal opencast falls under the administrative control of Raigarh area of SECL. The project report is based on the “Geological report on Chhal block” prepared by CMPDI in March 1991. Eight coal seams, namely, VI, V (T), V (B), Local, IV, III, II, II (A) and I occur within the block. Of these, older seams I, II and IIA are generally thin and impersistent. In Dharam and Chhal Underground Mines, Seam III is being exploited.

During the discussion of Planning Committee Meeting, it was decided that as no firm linkage is available for the coal from this project, a project report of annual production capacity (1.00 MTY) may be prepared. In future if demand arises and firm linkage is established, annual production capacity may be revised, considering remaining promising areas.

With an increased demand projected on SECL in XIth plan, Chhal OCP was proposed to expand from 1.0 MTY to 3.0 MTY.

Accordingly, an expansion PR of Chhal OCP (1.0 – 3.0 MTY) was prepared and approved in September 2007 within the sanctioned mine boundary with an initial capital requirement of Rs. 50.38 crores. This report was completed March 2010 at a completion cost of Rs. 46.95 crores.

Liberalization of power sector has resulted in a sharp increase in demand for power grade coal. Expansion of Chhal opencast is, again therefore, proposed with a view to fulfill the growth in demand. In this context, this project named Chhal OCP (Seam-III) Project (6.0 MTY) has been conceived.

## **1.4 HISTORY OF MINING**

The proposed area under consideration falls in Mand - Raigarh Coalfield of Raigarh district (Chhattisgarh). Mining activities in the area started long back in 1940 but remained confined to very small manual quarrying. The coalfield is almost virgin barring two small opencast mines i.e. Domnara in the south-west and barod in the north-east. Domnara opencast mine was closed due to lack of demand of grade 'G' coal produced by this mine. Baroud opencast mine is running.

## **1.5 PROJECT SITE INFORMATION OCP CHHAL**

### **1.5.1 LOCATION**

The project is located south of village Chhal at an approximate distance of 2.5 km on Kharsia - Dharamjaigarh State Highway and 16 km from Kharsia town. The block is bounded by latitude 22<sup>0</sup>04'40" and 22<sup>0</sup>06'27" and longitudes 83<sup>0</sup>06'10" and 83<sup>0</sup>09'10" and is included in the Survey of India Topo Sheet No. 64 N/4. It is situated in the Raigarh district of Chhattisgarh.

### **1.5.2 CLIMATE**

The area is characterized by tropical climate with well defined summer from April to June, rainy season from July to September and winter from November to February. May and up to mid June is the hottest month when the temperature rises to a maximum of 48<sup>0</sup>C. December and January are the coldest month, the temperature falls to a minimum of 7<sup>0</sup>C.

The average annual rainfall is about 1500 mm. The wind direction is generally westerly to north westerly. Relative humidity during monsoon ranges from 75% to 80% and in summer ranges from 18% to 60%.

### **1.5.3 PHYSIOGRAPHY**

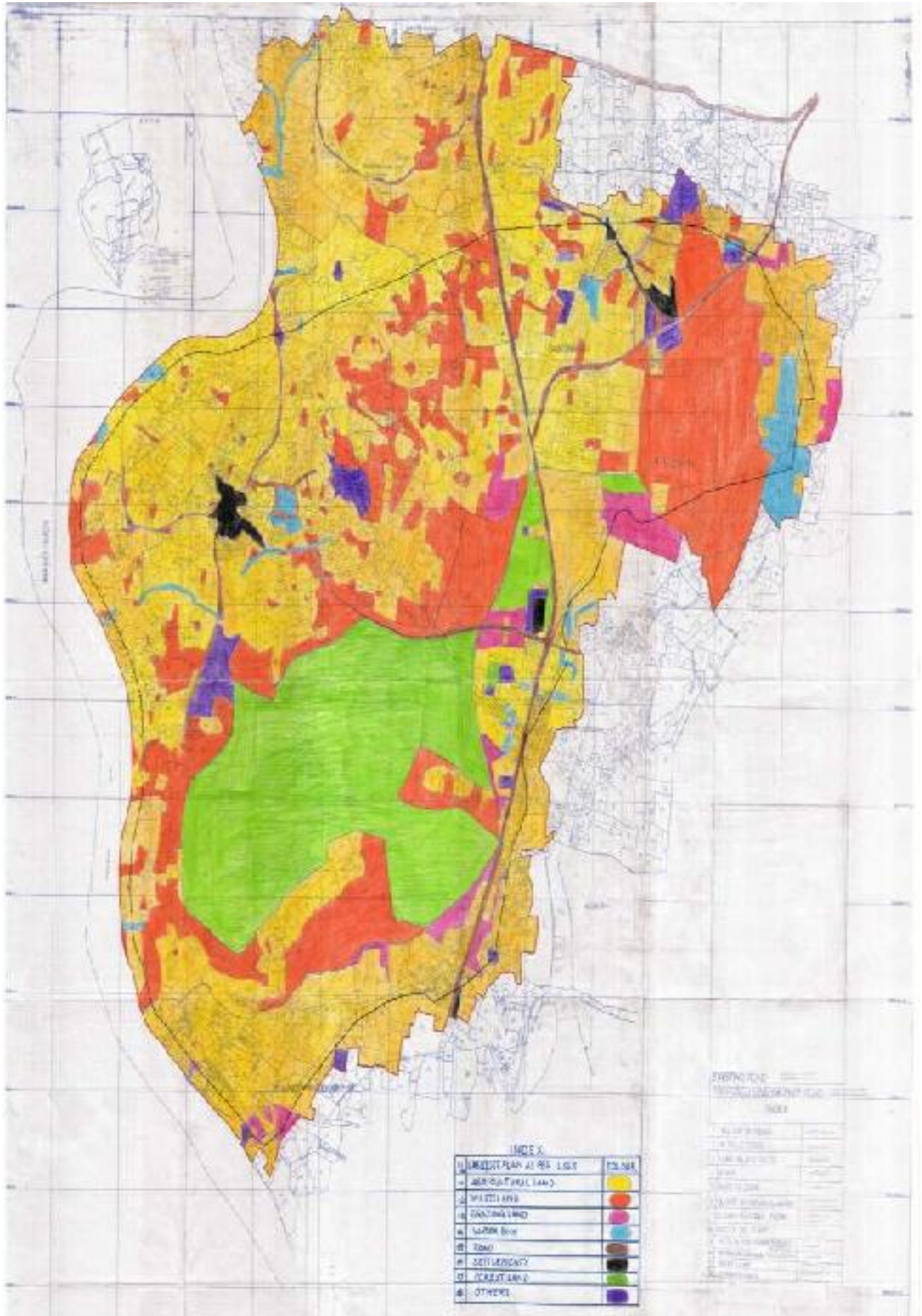
The Chhal Block is largely characterized by a plain country. The altitude varies between 231 m in the west to 267 m above MSL in the north eastern part of the block. The elevation of the ground varies between 255 m to 267 m along a linear patch running NE-SW in the central part of the property. The ground has a general slope towards NE, SE & SW. Most of the area is covered by soil and cultivate land. The southerly flowing Mand River and westerly flowing Kurket River with their tributaries form the main drainage of the Chhal Block. A small earthen dam has been constructed for the purpose of irrigation near village Khedapali in the eastern part of the block.

### **1.5.4 LAND USE PLAN**

The project envisages 1342.86 Ha of land for quarry, industrial and residential complex, safety zone and external dumps etc. This includes 516.59 Ha of land already acquired/under process and, 826.07Ha of land to be acquired. The break-up of the land is as follows:-

**Table No 1.2: Requirement of land in hec.**

REQUIREMENT OF LAND IN Ha							
Sl No.	Particulars	Land already acquired/u nder process	Land to be acquired				Total land requirement
			Tenancy / agricultur e land	Fore st land	Gov t. Lan d	Tota l	
1	Land for quarry	516.79	16.64	185. 155	156. 42	358. 22	875.00
2	For external dump	-	110.73		20.0 0	130. 73	130.73
3	Surface industrial developments rely. Siding, colony, approach road, etc.	-	50	-	-	50	50.00
4	Land for homestead/family	-	50	-	-	50	50
5	Land for environment and safety	-	92.65	-	-	92.6 5	92.65
6	Safety zone	-	144.47	-	-	144. 47	144.47
	<b>TOTAL LAND</b>	<b>516.79</b>	<b>464.49</b>	<b>185. 16</b>	<b>176. 42</b>	<b>826. 07</b>	<b>1342.86</b>



Land use plan of OCP Chhal



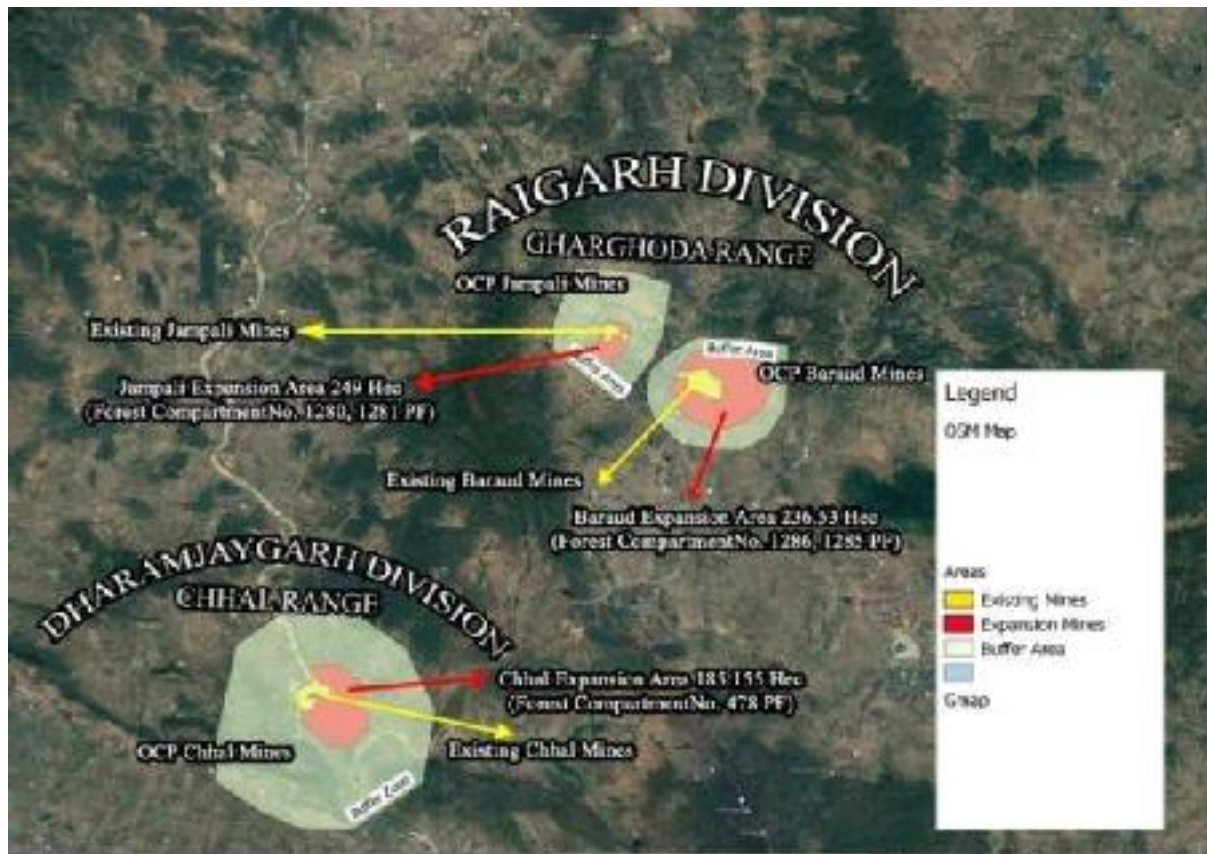


Fig 1.2: Google map of mining area of OCP Jampali, Bharaud & Chhal

#### 1.4.5 IMPACT ON LAND USE FOREST

There are about **826.07 ha** area land to be acquired out of which **185.155 ha. of forest land** in mining area will be proposed to acquire. Out of 185.155 ha land 176 ha land including the protected forest area and rest 9.155 ha area will be proposed from revenue forest area. Only one compartment should fall under proposed mining area namely comp. no. 478 PF.

The inventory of forest resource is made based on the guidelines of the forest department. The pilot survey is pre-requisite to finalized the most efficient survey design about 40 to 50 sample plot is lead out to cover up entire range variation existing within the forest population of the working plan area.

The earlier survey of flora & fauna in the proposed mining area was done by CMPDI and they adopted a similar methodology as applied in working plan therefore, the shape of the sampling unit is square. Sizes of the sampling selected are 0.1 ha. or 0.16 ha.

## CHAPTER 2

### REVIEW OF LITERATURE

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The mining of coal in India has significant effects on wildlife populations and their habitats. The extraction of coal by various means (deep mining, long wall mining, contour mining, area mining or mountain top removal mining with valley fill) has a significant impact on terrestrial and aquatic ecosystems which can be felt for decades. Given the difficulty in extracting coal from geologic strata that are generally not readily accessible from the surface, it is inevitable that there will be some significant changes in the flora and fauna of the area within and surrounding the mine site.

The impacts of coal mining on wildlife populations occur at two primary levels:

- 1) Immediate, direct effects of mining in terms of direct mortality, disturbance and displacement of wildlife populations during mining activities, and
- 2) Changes in wildlife populations associated with long-term changes in land cover associated with mine sites and their reclamation.

#### **The goals of this literature review are to**

- 1) Review the extant literature on the effects of coal mining on aquatic and terrestrial Avifauna populations and habitat;
- 2) Review the literature relative to the effectiveness of reclamation practices in restoring conditions conducive for avifauna habitat; and
- 3) Identify areas where research is needed to further the science needed to better mitigate the impacts of mining on avian resources.

#### **2.1 DIRECT EFFECTS OF MINING ON WILDLIFE**

Very little literature exists on the direct effects of coal mining on wildlife. Mining certainly has direct effects as individuals and populations of species that occurred on the site pre-mining may sometimes be killed or displaced. Direct mortality will occur when the species in question is not mobile enough to avoid mining equipment, especially young ones. We did not find any literature that estimates the rate of direct mortality for any potentially affected species.

Displacement of wildlife populations from the mine site is another direct effect of mining. As mining proceeds on a site, wildlife moves to adjacent areas and establishes territories and home ranges. We were unable to locate any studies that documented the extent of this displacement and the implications in terms of survival and reproduction for coal mining in the Chhal. Some studies have been conducted on this topic in the Korba (C.G). In some species, reproduction is likely interrupted during the breeding season in which the displacement occurs. Survival of displaced individuals may be lower than survival would have been during the pre-mining period because displaced individuals may experience greater competition for resources in unfamiliar areas and may experience greater predation rates initially as they learn how to adjust to new surroundings.

## **2.2 WILDLIFE RESPONSE TO POST-MINING RECLAMATION**

Wildlife response to post-mining reclamation is based on the wildlife species in question, their habitat requirements, and presence of a source population to colonize the mine site, and the structure and composition of the vegetation on the mine site post-reclamation and in the surrounding landscape. Wildlife response can be characterized in a variety of ways, including relative abundance on the site, survival, reproduction, movements, foraging behavior, and other behavioural traits. The majority of studies on wildlife response focused simply on documenting the numerical response of species in question on the mine site during some time period post-reclamation. To understand the full implications of wildlife response and effects on habitat quality, more in-depth research is needed to document the demography (reproduction, survival, immigration, emigration) of the species that colonize mine sites post-reclamation.

## **2.3 AVIFAUNA**

Birds provide several ecological functions such as pest control, pollination, seed dispersal and plant reproduction in thousands of economically and culturally important plant species through its consumption of various terrestrial, aquatic and aerial resources (*Whelan et al., 2015*). Foraging ecology of birds contribute regulating services such as scavenging carcasses and nutrient

cycling (*Whelan et al., 2008*). Bird communities also provide a reliable ecological indicator of forest condition (*Canterbury et al., 2000*) due to their sensitivity to environmental perturbations, relevance to ecosystem functioning (e.g., in pollination and seed dispersal), and relative ease in sampling (*Brown, 1991*). Moreover, birds are associated with singular habitats, they are short-lived species so any change in the composition may manifest shortly after a disturbance. Hence, they can be used to develop habitat associations which are predictors of relative human disturbance levels and may be affected by some tourist activities (*Higginbottom et al., 2003; Newsome et al., 2004*). The bird population is an indication of environmental changes as they respond fast to threats and changing environment conditions (*Barov, 2011*).

As significant as being one of the mega diverse countries, Mining and mineral processing have the potential to be important sources of income and driving forces behind broader economic development (*Eggert, 2001*). With this, the country is faced with a great challenge in utilizing the rich available mineral resources for economic growth and development without compromising its ecological integrity and species diversity.

#### **2.4 AVIFAUNA RESPONSE TO POST-MINING RECLAMATION**

The vast majority of studies conducted on wildlife response have focused on birds in part because birds are easily monitored using various count-based surveys. The effects of mining on avian communities occur initially by the removal of vegetation in preparation for mining. If the site is forested, vegetation removal occurs through timber harvest or clearing. Although few studies have been done to specifically evaluate the changes associated with mine sites from pre-mining to post-mining land uses, there is substantial literature of the effects of timber harvest on avian communities and populations-see review in (*Sallabanks et al. 2000*). There are substantial differences in avian response to timber harvest for forest regeneration and avian response to timber harvest or clearing in preparation for mining because of the nature and timing of the re-vegetation that occurs. In timber harvest for forest management, tree regeneration begins within the first growing season post-harvest on the site and

birds respond relatively quickly to the vigorous flush of woody re-growth. On mine sites, the reclamation process takes more time, and the vegetation responds more slowly, especially if the site is being reclaimed with shrubs and trees for reforestation.

On reclaimed mine lands which were originally forested, avian communities shift from forest bird communities to communities associated with early succession habitats, grassland birds and scrub-shrub birds. These changes in bird communities have conservation implications because in some cases there are forest bird species present that have declining populations and are of high conservation concern, such as the Cerulean Warbler (*Setophaga cerulea*) in the Appalachian Mountains (Buehler et al. 2006). Negative impacts on forest bird populations have to be weighed against positive gains in early succession bird populations. Many species associated with early successional habitats, such as the Henslow's Sparrow (*Ammodramus henslowii*) and the Golden-winged Warbler (*Vermivora chrysoptera*) are also of high conservation priority (Hunter et al. 2001, Buehler et al. 2007).

Coal mining in the eastern United States seldom encounters bird species that are federally listed as threatened or endangered but most of the bird studies associated with mining have focused on characterizing songbird communities post-reclamation. Post-mining songbird studies have documented grassland bird response to reclamation when the reclamation has resulted in grassland cover. In general, grassland mine reclamation has been successful in creating habitat suitable for grassland bird's use. The grassland species attracted to reclaim mine lands include a diversity of songbirds and grassland raptors such as Northern Harriers (*Circus cyaneus*) and Short-eared Owls (*Asio flammeus*) (Rohrbaugh and Yahner 1996, Vukovich 2004, Vukovich et al. 2006).

Reclaimed mine sites in Pennsylvania, Kentucky, Illinois, Indiana, West Virginia, and Ohio are supporting breeding populations of Henslowe's Sparrows (Bajema et al. 2001, Bajema and Lima 2001, DeVault et al. 2002, Scott et al. 2002, Mattice et al. 2005, Monroe and Ritchison 2005, Stauffer 2008, Stauffer et al. 2011) and/or Grasshopper Sparrows (*Ammodramus*

savannarum) (Whitmore 1979, Whitmore 1981, Wray et al. 1982, DeVault et al. 2002, Scott et al. 2002, Ammer 2003, Mattice et al. 2005, Galligan et al. 2006, Stauffer 2008, Stauffer et al. 2011), two grassland species of conservation concern. Reproductive rates by these species were comparable to reproduction in other settings (Ammer 2003, Monroe and Ritchison 2005, Galligan et al. 2006, Stauffer et al. 2011). No published survival data are available for grassland songbirds breeding on reclaimed mine lands. Adult and juvenile survival data are generally unavailable for most grassland songbirds (Perlut et al. 2008), because adult dispersal, depending on the species, may be high and return rates in ephemeral grassland habitats is often very poor (Jones et al. 2007). Without survival data, it is impossible to accurately determine whether reclaimed mine lands are providing conditions conducive for supporting source populations for priority species (Anders and Marshall 2005). Several authors have noted that reclaimed coal mine lands in the region were providing important grassland habitat contributing significantly to grassland bird conservation range-wide (Rohrbaugh and Yahner 1996, Bajema et al. 2001, Mattice et al. 2005, Monroe and Ritchison 2005, Stauffer et al. 2011).

Golden-winged Warbler populations have been declining precipitously in the Appalachian region (Buehler et al. 2007), and the species has been petitioned for listing under the Endangered Species Act in 2010 (USFWS 2011). Golden-winged populations occupy shrubby, early succession habitats often associated with reclamation of contour and area mines (Bulluck and Buehler 2008). Plant succession on mine lands is often slow, which provides for a prolonged period in which habitat conditions are conducive for Golden-winged Warblers.

Succession on mine lands post-reclamation can be successfully set back by prescribed burning to further prolong the period of suitability for Golden-winged (D. Buehler and K. Percy, unpubl. data). In some cases, however, recent coal mining may compromise Golden-winged habitat where remaining is occurring on old contour and area mine sites that are currently occupied by Golden-winged (D. Buehler, unpubl. data). A mine land reclamation

prescription is being developed for Golden-winged Warbler habitat restoration to address this issue (D. Buehler and K. Percy, unpubl. data).

Although grassland and scrub-shrub birds benefit from the early successional habitat developed from post-mining reclamation, forest-dwelling birds are adversely affected by land use change from forest to grassland, regardless of the origin of the change. Concern has been expressed related to habitat loss for Cerulean Warblers in the Appalachian Mountains associated with deforestation from coal mining (*Buehler et al. 2006, Wood et al. 2006, Bulluck 2007*).

Mining also affects forest songbirds in adjacent forested areas because of the creation of edge effects and because of forest fragmentation. Cerulean Warbler abundance, for example, was lower in forests adjacent to mountaintop removal mining with valley fill (*Wood et al. 2006*), although edges associated with contour mines in Tennessee were not associated with lower cerulean abundance (*Beachy 2008*). Cerulean Warbler reproduction was lower adjacent to forest disturbances from timber harvest than in undisturbed forest stands (*Boves 2011*). Similar relationships with cerulean reproduction and edges created by mining might be expected, although these relationships need to be documented.

Reclaimed coal mine lands can also provide habitat that supports upland game bird populations, including Northern Bobwhite (*Colinus virginiana*) (*Beckerle 2004*), American Woodcock (*Scolopax minor*) (*Gregg 1997*), Eastern Wild Turkey (*Meleagris gallopavo*) (*Rice 1986*), and Ruffed Grouse (*Bonasa umbellus*) (*Kimmel and Samuel 1984*). Although the potential for mine lands to contribute to Northern Bobwhite population recovery is cited in the National Bobwhite Conservation Initiative revised plan (*Palmer et al. 2011*), we were unable to locate any literature that demonstrated how this might be accomplished. Kentucky Department of Fish and Wildlife Resources (KDFWR), in

with the University of Tennessee, is conducting a northern bobwhite population ecology and habitat management project on Peabody Wildlife

Management area, a reclaimed coal mining area, which will generate information on how bobwhites are doing on reclaimed mine grasslands and how to enhance their habitat (J. Morgan, KDFWR, pers. comm.). Reclamation of mine lands in grasses and legumes provided poor quality grouse brood habitat, although later successional stages provided better brood habitat quality (*Kimmel and Samuel 1984*). Wild Turkeys used reclaimed mine lands extensively and densities on mine lands exceeded densities on nearby control areas (*Rice 1986*).

## 2.5 ECOLOGICAL EFFECTS OF PAVED ROADS INSIDE THE FOREST ON BIRDS

While the most obvious threat of paved roads to individual birds is injury or mortality due to vehicle collisions, this is often considered less compelling when compared to the more insidious effects of roads, such as behaviour modification or decreased population density, diversity, and/or breeding success (*Reijnen and Foppen 1994, Forman and Alexander 1998, Jacobson 2005, Ramp et al. 2006, Reijnen and Foppen 2006*). However, in some cases, direct road mortality is the major threat to a population (*Mumme et al. 2000, Ramsden 2003, Reijnen and Foppen 2006*). Given the vast network of roads in combination with other persistent anthropogenic factors at work (e.g., habitat loss, fragmentation, non-native species invasions, climate change), the potential impact of road mortality on specific wildlife populations should not be dismissed (*Erritzoe et al. 2003, Glista et al. 2008*).

Many studies report that certain species of birds avoid roads, paved or otherwise, when selecting habitat during some part of their life cycle (*Ferrer and Harte 1997, Parrish et al. 2001, Sara and DiVittorio 2003, Bollinger and Gavin 2004, Arcos and Salvadores 2005, Balbontin 2005, Carrascal et al. 2006, Gavashelishvili and McGrady 2006*). The risk of nest abandonment can also increase near roads (*Gorog et al. 2005*). In an extreme case, Great Bustard populations in Portugal appear to be concentrating themselves geographically, with new road building responsible for three of the local population declines (*Pinto et al. 2005*). Long-term trends suggest the Portuguese population may ultimately become confined to a single high-quality site, thereby increasing the probability of extinction (*Pinto et al. 2005*). For those species which use



roadways as habitat, maintenance activities to roads and ditches can inadvertently destroy nests, a particular concern for declining species such as the Burrowing Owl (*Catlin and Rosenberg 2006*).

Road-related threats to bird populations deserve more attention, however, conservation or mitigation action is often considered to be warranted only after a population-level decline can be demonstrated (*Reijnen and Foppen 2006*). Many road-related bird studies are conducted in or adjacent to protected areas, illustrating there may be no panacea that escapes road-related impacts (*Reijnen and Foppen 1994, Bard et al. 2002, Gutzwiller and Barrow 2003, Clevenger et al. 2003, Frey and Conover 2006, Ramp et al. 2006*).

## 2.6 RECLAMATION PRACTICES

Coal mining results in large landscape changes as soils and vegetation are removed. Changes to forested areas can shift habitat availability and bird communities (*James and Wamer, 1982; Hardt and Forman, 1989; Bolger et al., 1991; Winter et al., 2000; Herzog et al., 2001; Galligan et al., 2006; Wickham et al., 2007; and Loss et al., 2009*). Several bird species have benefited in recent decades from the reclamation of surface coal mines (*Bajema et al. 2001, DeVault et al. 2002, Ingold 2002*). Burger (2011) defined four periods of reclamation: tree-planting by hand, grassland, shrub/scrub, and the Forest Reclamation Approach (FRA) (*Angel et al., 2005*).

Managing and reclaiming land to establish vegetation patches (e.g., grasslands, forest, wetlands, early succession) of different stages can provide habitat for diverse wildlife and aquatic species. Restoring a diverse community of native and site-adapted vegetation that includes a variety of structural features is the first step to attract wildlife species (*Brenner and Kelly 1981; Camenzind 1984; Parmenter and MacMahon 1990*).

Birds are generally one of the first types of wildlife to visit a mine site following reclamation due to their mobility and active search for suitable habitat (*Brändle et al. 2003*). Many bird species are not restricted to a single vegetation type, but rather depend on some combination of early successional habitat, open

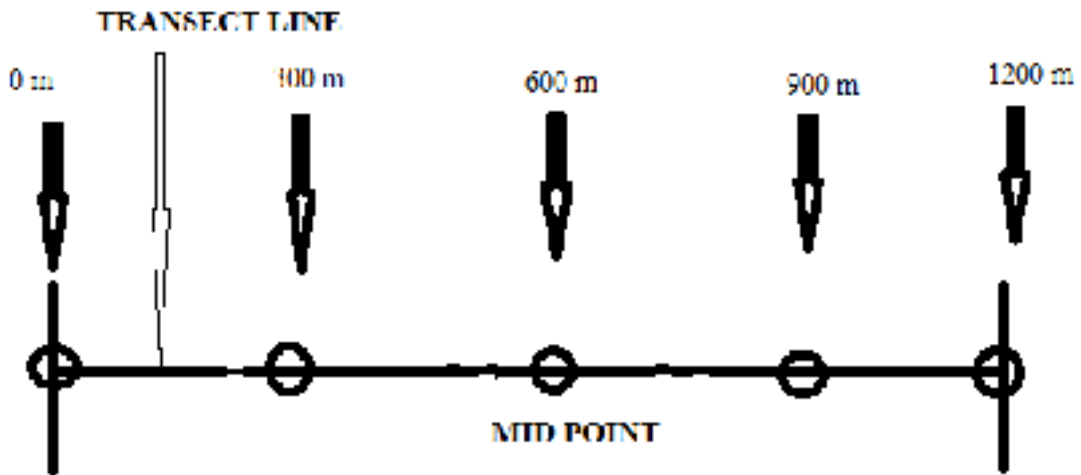
areas, and young and mature forests to find food and shelter and raise young (*Hunter et al. 2001*).

Although mining activities can have several negative impacts on wildlife populations, animals can return to reclaimed areas after mining if reclamation produces suitable habitat and individuals that can serve as colonists persist in the surrounding area. Site characteristics created by reclamation and the development of post-mining vegetation and habitat features influence the types of wildlife that use mined sites. The reclamation process provides habitat management opportunities for some species; through various reclamation techniques and procedures, mine lands can be manipulated to attract and support desired wildlife species (*Scott and Zimmerman 1984*).

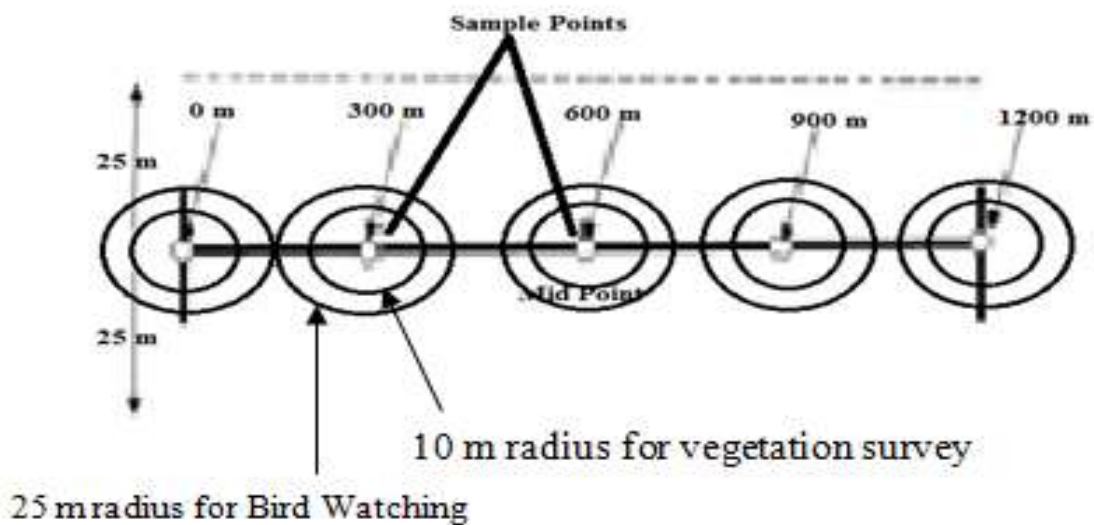
## CHAPTER 3

### METHODOLOGY

**3.1 Line Transect Methodology:** Line transects method had been applied for the bird count and their habitat survey. Line-transect distance sampling methods were also used to estimate the abundance of many biological populations such as animals, birds and plant species including nonliving things. In a line-transect survey method, an observer moves along a transect line and note the location of all birds detected to the line (*Bird census and survey techniques, Richard D. Gregory, David W. Gibbons, and Paul F. Donald, 2004*).



**Fig 3.1: Line Transect Methodology**



**Fig 3.2: Detail survey methodology of Line Transect Methodology**

### 3.2 Basic procedures in line transect sampling

Two types of data are recorded in line transect sampling, as shown in data collection point page no. 20. These are either (1) the perpendicular distances from the transect line  $x$  or (2) the sighting distances  $r$  and angles  $\theta$ . However, studies based on sighting distances and angles have been found to be subject to biases and are only discussed briefly here.

The usual assumptions made with line transect sampling are the following:

1. All objects on the transect line are detected.
2. Objects do not move in response to the observer before the detection is recorded.
3. Objects are only counted once.
4. Objects are recorded at the point of initial detection.
5. Distances are measured without errors.
6. Transect lines are randomly located in the study area.

A further assumption sometimes made for the estimation of standard errors is that

7. Sightings are independent events, and the number of objects detected follows a Poisson distribution.

### 3.3 Field survey

The field survey technique to observe the abundance of wildlife, avifauna, habitat, nesting pattern & surrounding vegetation in core zone applied seasonally; to estimate the current status of species diversity of avifauna & wildlife in the mining area. On the basis of species of wildlife & avifaunal diversity survey; it should be easy to determine the ecological behavior of each individual species and resulting to develop alternate habitat of affected avifauna & wildlife conservation plan at the 5-10 km periphery or buffer zone of the mining area.

Total 26 line transect was taken in the core and buffer zone during the first second and third seasonal survey i.e. summer, winter and autumn Season. During the field surveys, we made a line transect of 1200 m (mostly used a path

/ trail followed by the villagers to enter in the forest) in which distance sampling were taken in every 300 m in the transect to estimate the population of avifauna, its habit, habitat and nesting pattern including the floral diversity of the proposed mining area. A circular sample plot of 10 m radius had been taken in each transect at an interval of 300 m i.e. total 5 sample plots made in one transect namely 0m, 300m, 600m, 900m, 1200m in which vegetation composition (grass, herb, shrub and regeneration) and all tree species data had been taken including height and girth along with the counting of avifauna & wildlife. The data sheets used during the field survey are as follows:

**Table N0. 3.1: Datasheet for bird status survey**

Date: ----- Cell-ID: ----- Team: -----, Trail-length: -----

GPS at every 300 m			Sighting information					Remark	
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing			Observation
						A	T		

**Table No 3.2: Datasheet for habitat study at every 300 m on the transect line**

Date: ----- Cell-ID: ----- Team: -----, Trail-length: -----

S · N ·	GPS Location		Time (hrs.)	Land cover (100 m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)	
	Lat.	Long.			B / A / G / W / S	Tree spp.	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub		Regeneration

--	--	--	--	--	--	--	--	--	--	--	--	--	--

\* Land cover – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

\*\* Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

\*\*\* Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

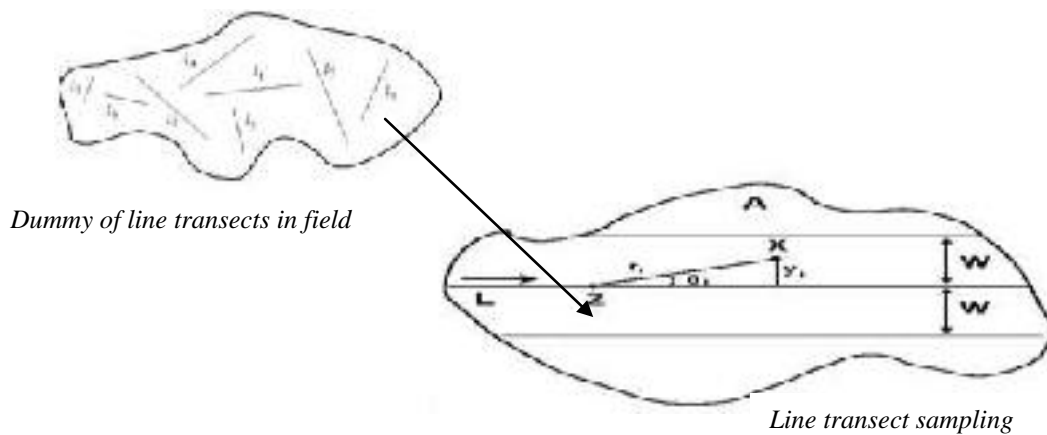
**Table No 3.3: Datasheet for wildlife study on transect line**

Date: \_\_\_\_\_ Cell-ID: \_\_\_\_\_ Team: \_\_\_\_\_ Trail-length: \_\_\_\_\_

GPS at every 300 m			Sighting information							
S. N.	Latitude	Longitude	Wildlife Species			Perp. Dist.	Bearing		Type of Species	Observation
			Direct Sighting	Indirect Sighting	Number		A	T		

**Basic concepts of line-transect sampling**

**a) Data collection (overview)**



**L** = transect line, **Z** = position of observer, **X** = position of object, **W** = strip width (1/2), **r<sub>i</sub>** = sighting distance (flushing distance), **θ<sub>i</sub>** (theta) = sighting angle, **y<sub>i</sub>** = perpendicular distance (note:  $y_i = r_i \sin \theta_i$ )

## CHAPTER 4

## OBSERVATIONS, DATA COLLECTION AND ANALYSIS

## 4.1 SUMMER SEASON SURVEY

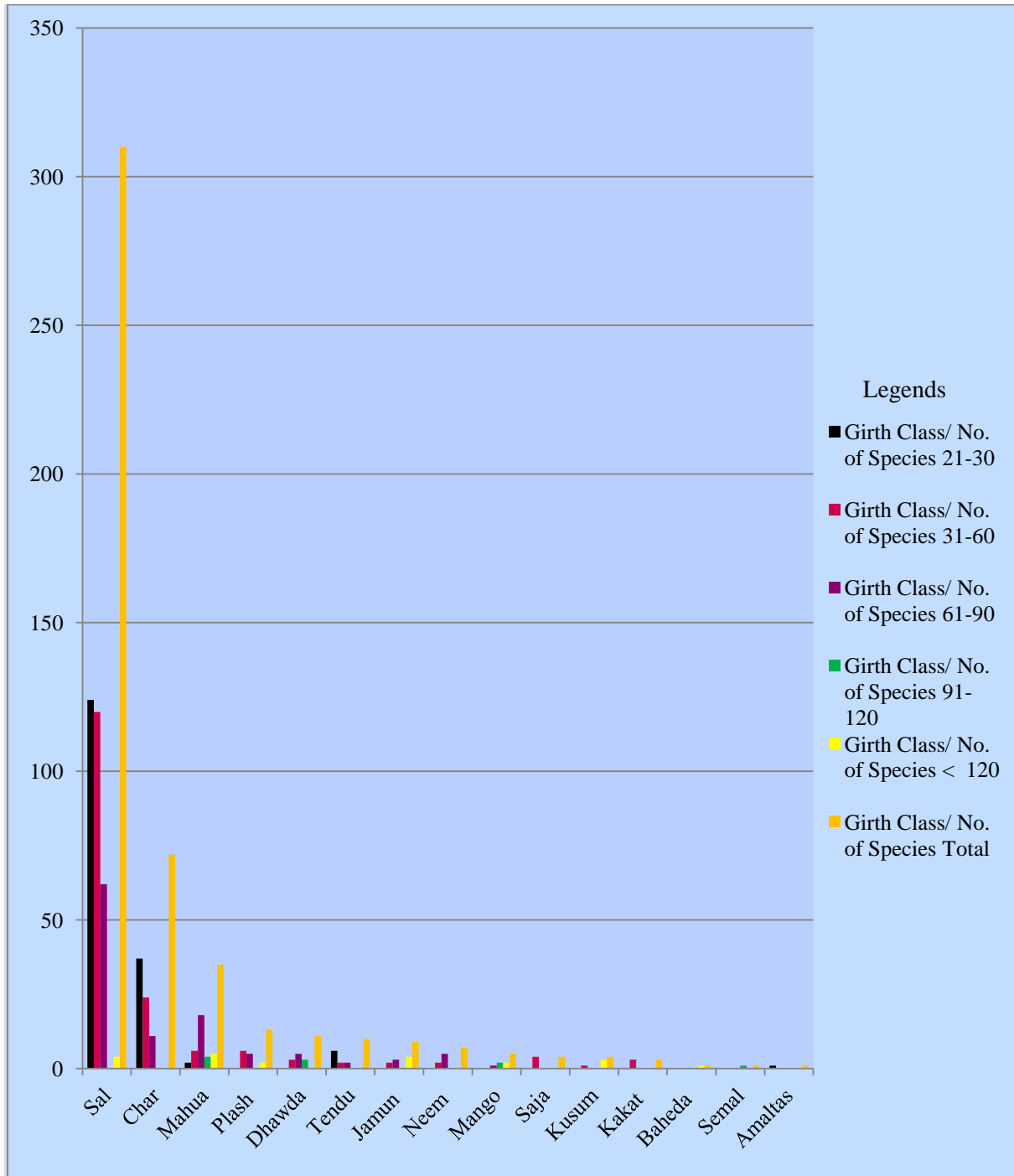
## 4.1.1 Floral diversity of study site

On the basis of the field survey, the data have been collected and analyzed. The core and buffer zone vegetation of study area are mainly surrounded by dominated tree species i.e. Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Palash (*Butea monosperma*), Dhawda (*Anogeissus latifolia*), Tendu (*Diospyros melanoxylon*), Jamun (*Syzygium cumini*), Neem (*Azadirachta indica*), Mango (*Mangifera indica*), Saja (*Terminalia tomentosa*), Kusum (*Schleichera oleosa*), Kekat (*Garuga pinnata*), Baheda (*Terminalia bellerica*), Semal (*Bombax ceiba*) and Amaltash (*Cassia fistula*) etc. Floral diversity data have been recorded and tabulated during the seasonal field survey of core and buffer zone of proposed mining site is given below in table no 4.1

Table No. 4.1: Floral diversity along with girth class of study site

Summary of available tree species in 35 sample plot (Total area = 10,995.6 m square)								
S. no.	Tree Species	Girth Class						Regeneration Status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	124	120	62	0	4	310	10
2	Char	37	24	11	0	0	72	47
3	Mahua	2	6	18	4	5	35	1
4	Palash	0	6	5		2	13	0
5	Dhawda	0	3	5	3	0	11	8
6	Tendu	6	2	2	0	0	10	4
7	Jamun	0	2	3	0	4	9	0
8	Neem	0	2	5	0	0	7	3
9	Mango	0	0	1	2	2	5	0
10	Saja	0	4	0	0	0	4	0
11	Kusum	0	1	0	0	3	4	0
12	Kakat	0	3	0	0	0	3	0
13	Baheda	0	0	0	0	1	1	0
14	Semal	0	0	0	1	0	1	0
15	Amaltas	1	0	0	0	0	1	0
Area details : Total number of transect = 7; Total number of plots = 7x5 = 35; Area of one sample plot = 314.16 m Square								





**Graph 4.1: Floral diversity along with girth class of study site**

**Overall vegetation cover -** The data of all 7 transect have been recorded which is given in table no 4.2

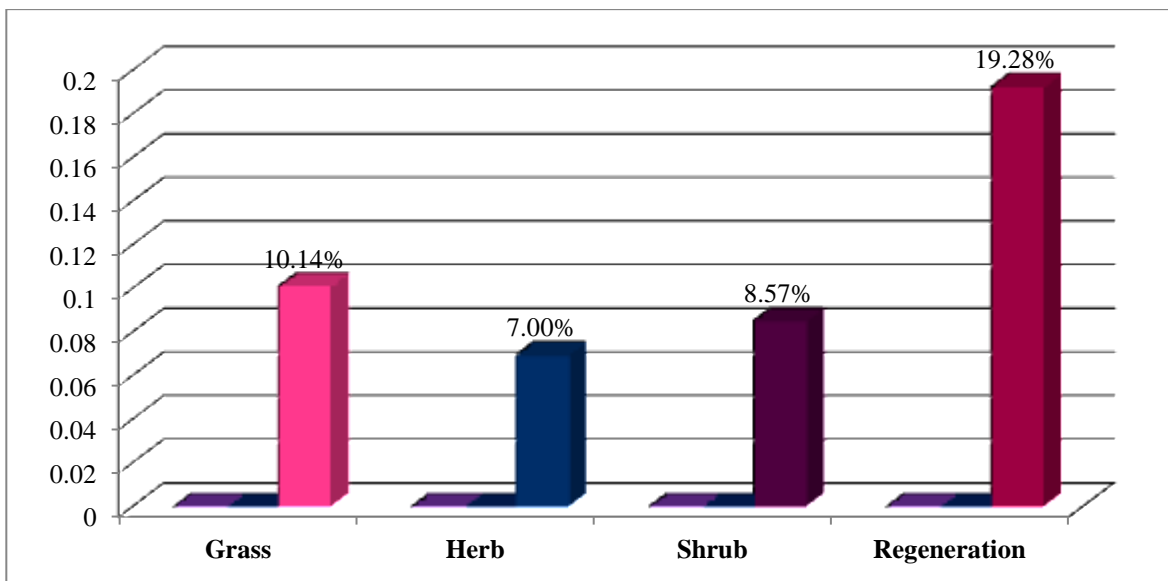
**Table No. 4.2: Average vegetation percentage of study site**

Transect No.	Grass	Herb	Shrub	Reg.
1	9%	9%	8%	25%
2	7%	8%	12%	31%
3	5%	9%	10%	28%
4	3%	5%	6%	2%
5	7%	13%	9%	19%
6	32%	10%	5%	15%

7	8%	11%	10%	14%
<b>Average</b>	<b>71%</b>	<b>65%</b>	<b>60%</b>	<b>135%</b>
<b>% (Total average divided by 7)</b>	<b>10.14%</b>	<b>7.00%</b>	<b>8.57%</b>	<b>19.28%</b>

**Table no. 4.3 Overall vegetation cover of study site**

<b>Vegetation</b>	<b>Average</b>
<b>Grass</b>	<b>10.14%</b>
<b>Herb</b>	<b>7.00%</b>
<b>Shrub</b>	<b>8.57%</b>
<b>Regeneration</b>	<b>19.28%</b>



**Graph 4.2: Overall status of vegetation average percentage**

According to vegetation survey, it has been analyzed that the diversity of tree species categorized under five girth classes i.e. 21-30 cm, 31-60 cm, 61-90 cm, 91-120 cm followed by <120 cm whereas the overall vegetation comparison of floral diversity other than tree species have been analyzed in average percent i.e. grassland 10.14 %, herbs 7.00 %, shrubs 8.57 % and the regeneration average percentage is 19.28% (Table no. 4.3 and Graph 4.2).

#### **4.1.2 Avifauna**

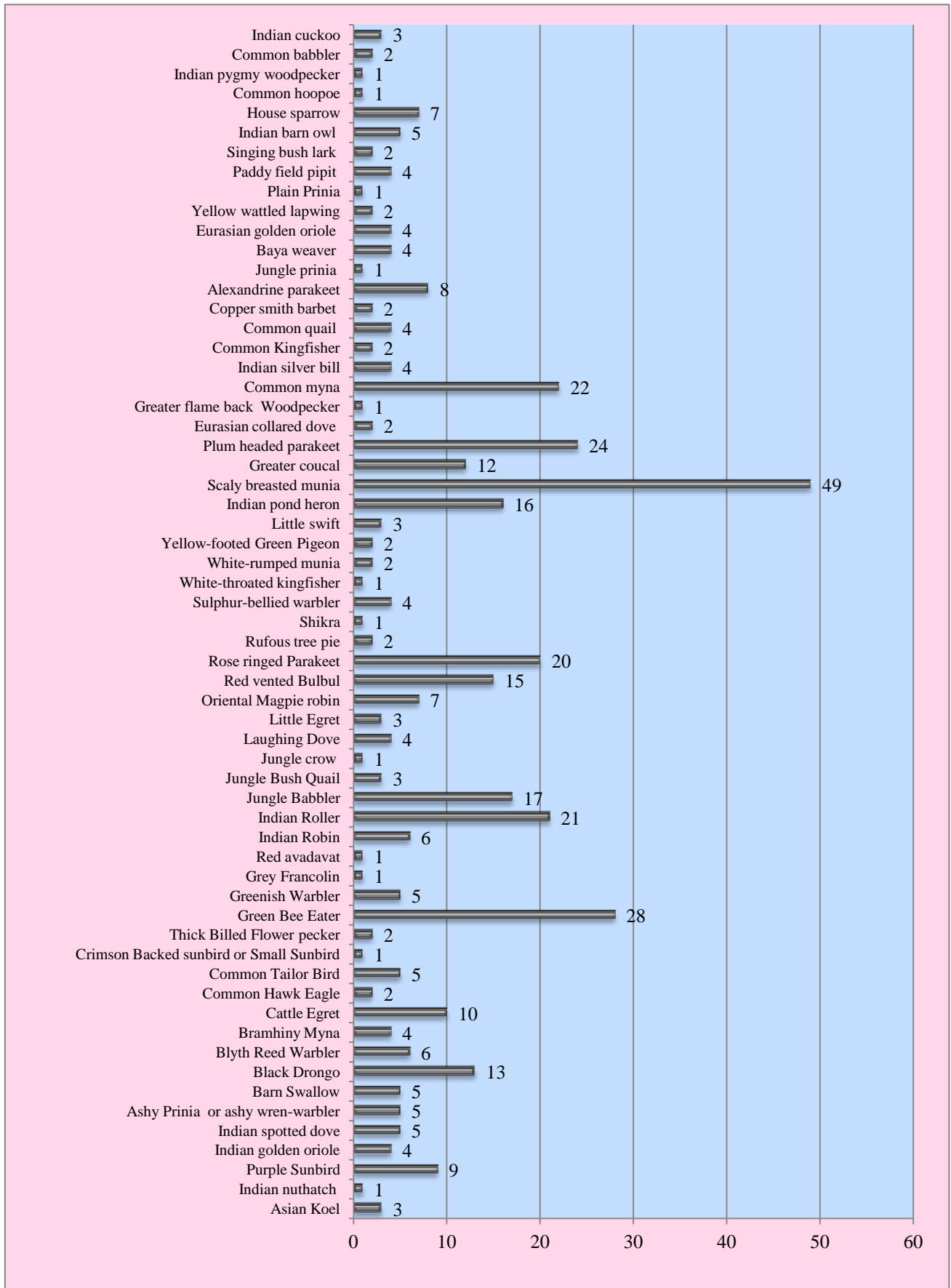
According to seasonal survey, 405 individual belongs to 61 different bird species has been recorded. As per recorded data, it has been analyzed that the population of avifauna dominated by Scaly Breasted Munia, Green Bee Eater, Rose Ringed Parakeet, Red Vented Bulbul, Indian Roller, Common Myna and Black Drongo etc. Mostly the birds found during the survey are endemic and

resident. The avifaunal diversity of study site have been tabulated in table no 4.4 and graph 4.3.

**Table No. 4.4: Check list of birds species in summer season**

S. No.	Common Name	Local Name	Zoological Name	Number of Birds	Family	IUCN Status
1	Asian Koel	Koel, Cuckoo	<i>Eudynamys scolopacea</i>	03	Cuculidae	LC
2	Indian Nuthatch	-	<i>Sitta casetana</i>	01	Sittidae	LC
3	Purple Sunbird	-	<i>Nectarania asiatica</i>	09	Nectariniini	LC
4	Indian Golden Oriole	-	<i>Oriolus oriolus kundoo</i>	04	Oriolidae	LC
5	Indian Spotted Dove	Padki	<i>Streptopelia chinensis</i>	05	Columbidae	LC
6	Ashy Prinia or Ashy Wren-warbler	-	<i>Prinia socialis</i>	05	Cisticolidae	LC
7	Barn Swallow	-	<i>Hirundo rustica</i>	05	Hirundinidae	LC
8	Black Drongo	Karrauna	<i>Dicrurus macrocercus</i>	13	Dicruridae	LC
9	Blyth Reed Warbler	-	<i>Acrocephalus dumetorum</i>	06	Acrocephalidae	LC
10	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	04	Sturnidae	LC
11	Cattle Egret	Gay Bagula	<i>Bubulcus ibis</i>	10	Ardeidae	LC
12	Common Hawk Eagle	Cheel	<i>Hierococyx varius</i>	02	Cuculidae	LC
13	Common Tailor Bird	-	<i>Orthotomus sutorius</i>	05	Cisticolidae	LC
14	Crimson Backed Sunbird or Small Sunbird	-	<i>Leptocoma minima</i>	01	Nectariniidae	LC
15	Thick Billed Flower	-	<i>Dicaeum agile</i>	02	Dicaeidae	LC
16	Green Bee Eater	Patinga	<i>Merops orientalis</i>	28	Meropidae	LC
17	Greenish Warbler	-	<i>Phylloscopus trochiloides</i>	05	Phylloscopidae	LC
18	Grey Francolin	-	<i>Francolinus</i>	01	Phasianidae	LC
19	Red Avadavat	-	<i>Amandava amandava</i>	01	Estrildidae	LC
20	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	06	Muscicapidae	LC
21	Indian Roller	Nilkanth/teohra	<i>Coracias benghalensis</i>	21	Coraciidae	LC
22	Jungle Babbler	Satbhaiya	<i>Turdoides striata</i>	17	Leiotherichidae	LC
23	Jungle Bush Quail	Titar	<i>Perdica asiatica</i>	03	Phasianidae	LC
24	Jungle Crow	Koua	<i>Corvus culminatus</i>	01	Corvidae	LC
25	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	04	Columbidae	LC
26	Little Egret	Kokda	<i>Egretta garzetta</i>	03	Ardeidae	LC
27	Oriental Magpie-robin	-	<i>Copsychus saularis</i>	07	Muscicapidae	LC
28	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	15	Pycnonotidae	LC
29	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	20	Psittaculidae	LC
30	Rufous Tree Pie	-	<i>Dendrocitta vagabunda</i>	02	Corvini	LC
31	Shikra	Cheel	<i>Accipiter badius</i>	01	Accipitridae	LC
32	Sulphur-Bellied Warbler	-	<i>Phylloscopus griseolus</i>	04	Acrocephalidae	LC
33	White-Throated Kingfisher	Kilkila	<i>Halcyon smyrnensis</i>	01	Alcedinidae	LC
34	White-Rumped Munia	-	<i>Lonchura striata</i>	02	Estrildidae	LC
35	Yellow-Footed Green	Kabootar	<i>Treron phoenicoptera</i>	02	Columbidae	LC
36	Little Swift	-	<i>Apus affinis</i>	03	Apodidae	LC
37	Indian Pond Heron	Khokho bakli	<i>Ardeola grayii</i>	16	Ardeidae	LC
38	Scaly Breasted Munia	-	<i>Lonchura punctulata</i>	49	Estrildidae	LC
39	Greater Coucal	Koyal	<i>Centropus sinensis</i>	12	Cuculidae	LC
40	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	24	Psittacidae	LC
41	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	02	Columbidae	LC
42	Greater Flame Back	Katpodva	<i>Dryocopus martius</i>	01	Picidae	LC
43	Common Myna	Salhai/desimyna	<i>Acridotheres tristis</i>	22	Sturnidae	LC

44	Indian Silver Bill	-	<i>Euodice malabarica</i>	04	Estrildidae	LC
45	Common Kingfisher	Kilkila	<i>Alcedo atthis</i>	02	Alcedinidae	LC
46	Common Quail	Titar	<i>Coturnix coturnix</i>	04	Phasianidae	LC
47	Copper Smith Barbet	-	<i>Psilopogon</i>	02	Megalaimidae	LC
48	Alexandrine Parakeet	-	<i>Psittacula eupatria</i>	08	Psittacidae	LC
49	Jungle Prinia	-	<i>Prinia sylvatica</i>	01	Cisticolidae	LC
50	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	04	Ploceidae	LC
51	Eurasian Golden Oriole	-	<i>Oriolus oriolus</i>	04	Oriolidae	LC
52	Yellow Wattled Lapwing	-	<i>Vanellus malabaricus</i>	02	Charadriidae	LC
53	Plain Prinia	-	<i>Prinia inornata</i>	01	Cisticolidae	LC
54	Paddy Field Pipit	-	<i>Anthus rufulus</i>	04	Motacillidae	LC
55	Singing Bush Lark	-	<i>Mirafra javanica</i>	02	Alaudidae	LC
56	Indian Barn Owl	-	<i>Tyto alba</i>	05	Tytonidae	LC
57	House Sparrow	Gouriaya	<i>Passer domesticus</i>	07	Passeridae	LC
58	Common Hoopoe		<i>Upupa epops</i>	01	Upupidae	LC
59	Indian Pygmy	-	<i>Yungipicus nanus</i>	01	Picidae	LC
60	Common Babbler	-	<i>Turdoides caudate</i>	02	Lieothrichidae	LC
61	Indian Cuckoo	-	<i>Cuculus micropterus</i>	03	cuculidae	LC
<b>Total</b>				<b>405</b>		



Graph No. 4.3: Status of individual avifauna species found in OCP Chhal

## 4.2 WINTER SEASON SURVEY

### 4.2.1 Floral diversity of study site

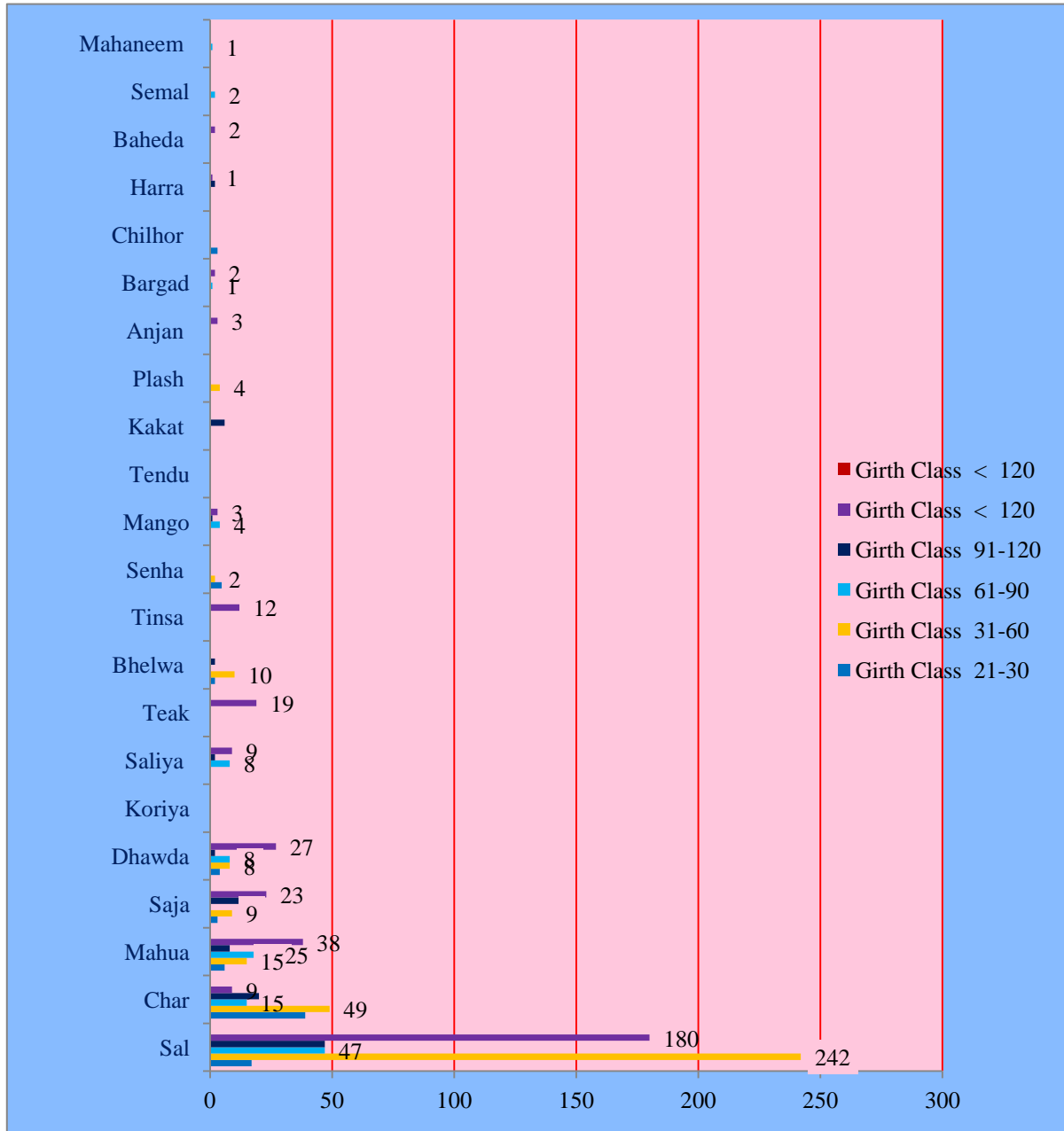
On the basis of the field survey, the data had been collected and analyzed. That the core and buffer zone vegetation of study area are mainly surrounded by dominated tree species i.e. Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*), Koriya (*Pinus koraiensi*), Teak (*Tectona grandis*), Bhelwa (*Semecarpus anacardiam*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Tendu (*Diospyros melanoxylon*), Kekad (*Garuga pinnata*), Plash (*Butea monosperma*), Anjan (*Hardwickia binata*), Bargad (*Ficus bengalensis*), Harra (*Terminalia chebula*), Baheda (*Terminalia bellerica*), Semal (*Bombax ceiba*), Jamun (*Syzygium cumini*) and Mahaneem (*Ailanthus excelsa*) etc. Floral diversity data have been recorded and tabulated during the seasonal field surveys of core and buffer zone of proposed mining site given below in table no 4.5.

**Table No. 4.5: Floral diversity along with girth class in study site**

Summary of available tree species in 60 sample plot (Total area = 18,849.6 m square)								
S. no.	Tree Species	Girth class						Regeneration status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	17	242	47	47	180	533	17
2	Char	39	49	15	20	9	132	12
3	Mahua	06	15	25	08	38	92	0
4	Saja	03	09		16	23	51	0
5	Dhawda	04	08	08	02	27	49	0
6	Koriya	0	0	0	0	0	0	33
7	Saliya	0	0	08	02	09	19	0
8	Teak	0	0	0	0	19	19	0
9	Bhelwa	02	10	0	2		14	0
10	Tinsa	0	0	0	0	12	12	0
11	Senha	07	02	0	0	0	09	0
12	Mango	0	0	04	01	03	08	0
13	Tendu	0	0	0	0	0	0	08
14	Kakat	0	0	0	06	0	06	0
15	Plash	0	04	0	0	0	04	0
16	Anjan	0	0	0	0	03	03	0
17	Bargad	0	0	01	0	02	03	0
18	Chilhor	03	0	0	0	0	03	0

19	Harra	0	0	0	02	01	03	0
20	Baheda	0	0	0	0	02	02	0
21	Semal	0	0	02	0	0	02	0
22	Mahaneem	0	0	01	0	0	01	0

**Area details : Total number of transect = 12; Total number of plots = 12x5 = 60; Area of one sample plot = 314.16 m Square**

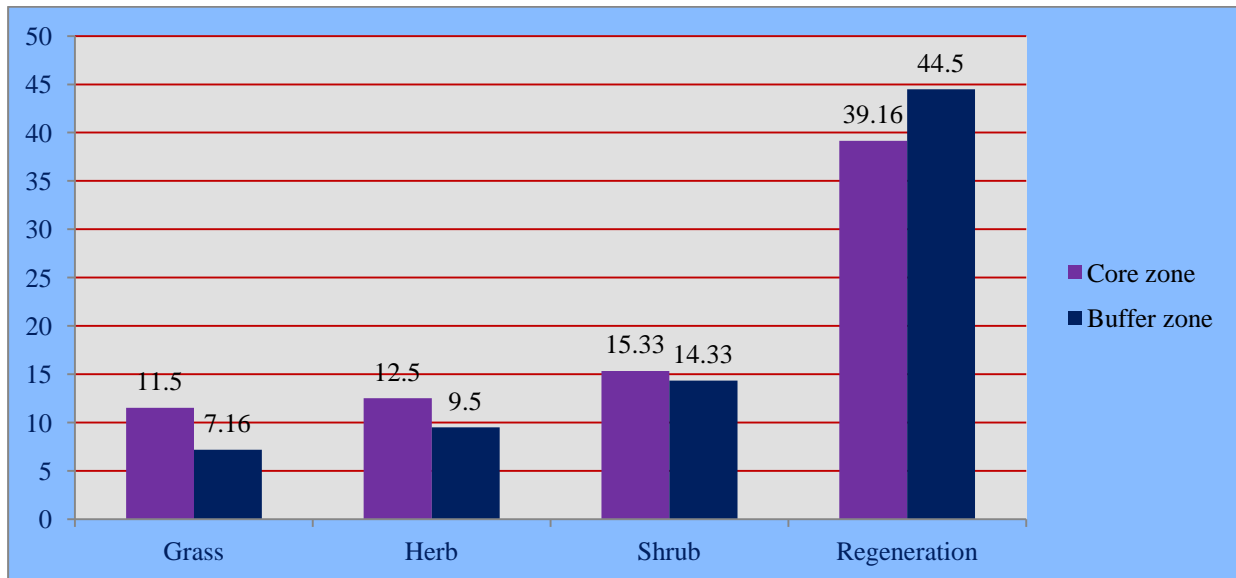


**Graph 4.4: Floral diversity along with girth class in study site**

**4.2.2 Overall vegetation cover** – The data of all 12 transect have been recorded which is given below in table no.4.6

Table No. 4.6: Average vegetation percentage of core and buffer zone

Vegetation	Core zone	Buffer zone
Grass	11.5%	7.16%
Herb	12.5%	9.5%
Shrub	15.33%	14.33%
Regeneration	39.16%	44.5%



Graph 4.5: Overall vegetation comparisons of core and buffer zone

According to vegetation survey, it has been analyzed that the diversity of tree species categorized under five girth classes i.e. 21-30 cm, 31-60 cm, 61-90 cm, 91-120 cm followed by above 120 cm which shows in the table no 4.5 and graph 4.4 whereas the overall vegetation comparison of floral diversity other than tree species are recorded in percent i.e. grassland 11.5:7.16 %, herbs 12.5:9.5 %, shrubs 15.33:14.33 % and the regeneration percentage is 39.16:44.5 % (Table no 4.6 and Graph 4.5).

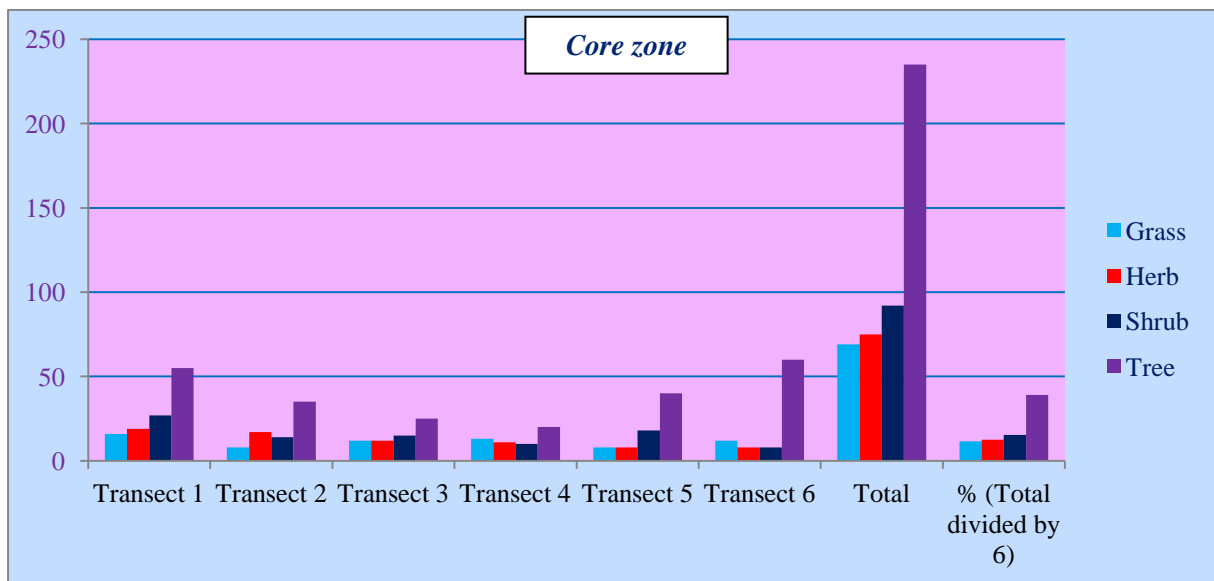
#### 4.2.3 Core zone

The core zone area comprises about 185.155 hectare. The winter seasonal field visits have been conducted in December 2018. The observation shows floral phenology of core zone in mining area is mostly dominated by Sal (*Shorea robusta*) species followed by Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Saja (*Terminalia tomentosa*), Dhawda (*Anogeissus latifolia*) etc.



**Table No. 4.7: Vegetation covers percentage of core mining area.**

S. No.	Grass	Herb	Shrub	Tree
1	16%	19%	27%	55%
2	8%	17%	14%	35%
3	12%	12%	15%	25%
4	13%	11%	10%	20%
5	8%	8%	18%	40%
6	12%	8%	8%	60%
<b>Average</b>	<b>69%</b>	<b>75%</b>	<b>92%</b>	<b>235%</b>
<b>% (Total average divided by 6)</b>	<b>11.5%</b>	<b>12.5%</b>	<b>15.33%</b>	<b>39.16%</b>



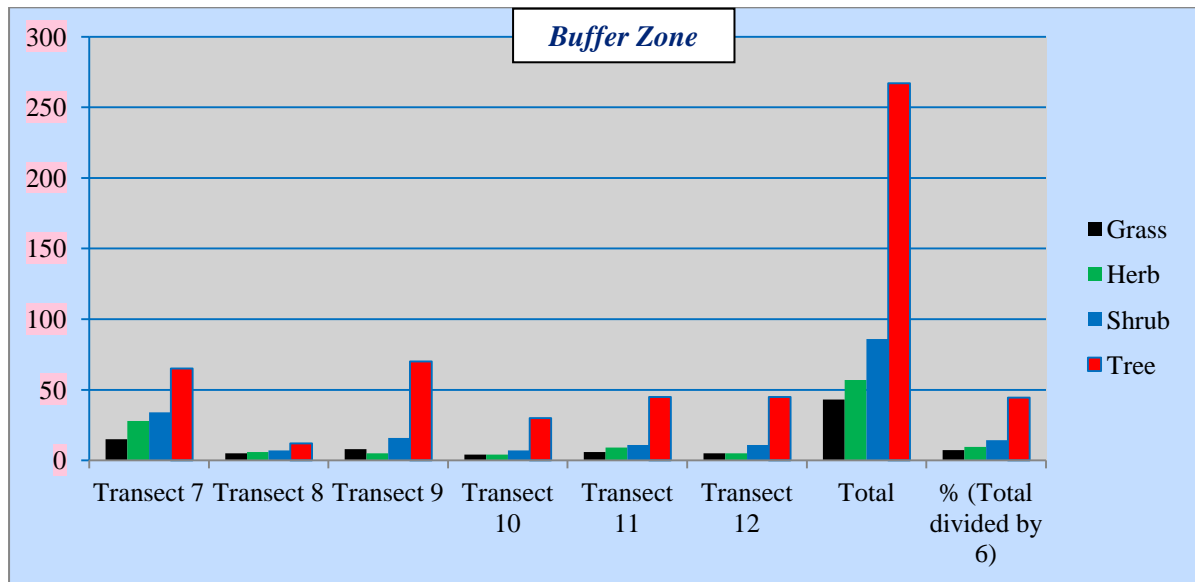
**Graph 4.6: Vegetation composition of core zone**

#### 4.2.3 Buffer zone:

The buffer zone of mining area is situated at 5-10 km distance from the core mining boundary. The floral vegetation diversity of buffer zone is illustrated in graph 4.7 and tabulated in table no 4.8.

**Table No 4.8: Vegetation percentage of buffer zone.**

S. No.	Grass	Herb	Shrub	Tree
1	15	28	34	65
2	5	6	7	12
3	8	5	16	70
4	4	4	7	30
5	6	9	11	45
6	5	5	11	45
<b>Average</b>	<b>43</b>	<b>57</b>	<b>86</b>	<b>267</b>
<b>% (Total average divided by 6)</b>	<b>7.16</b>	<b>9.5</b>	<b>14.33</b>	<b>44.5</b>



Graph 4.7: Vegetation composition of buffer zone

#### 4.2.4 Avifauna diversity

According to seasonal survey, 776 individual belongs to 89 different species has been recorded. As per recorded data, the population of avifauna dominated by Indian Pond Heron, Black Drongo, Red Vented bulbul, Indian Roller and Common Myna. Mostly the birds found during the survey are endemic and resident. The avifaunal diversity of mining area are tabulated in table no 4.9 and graph 4.8.

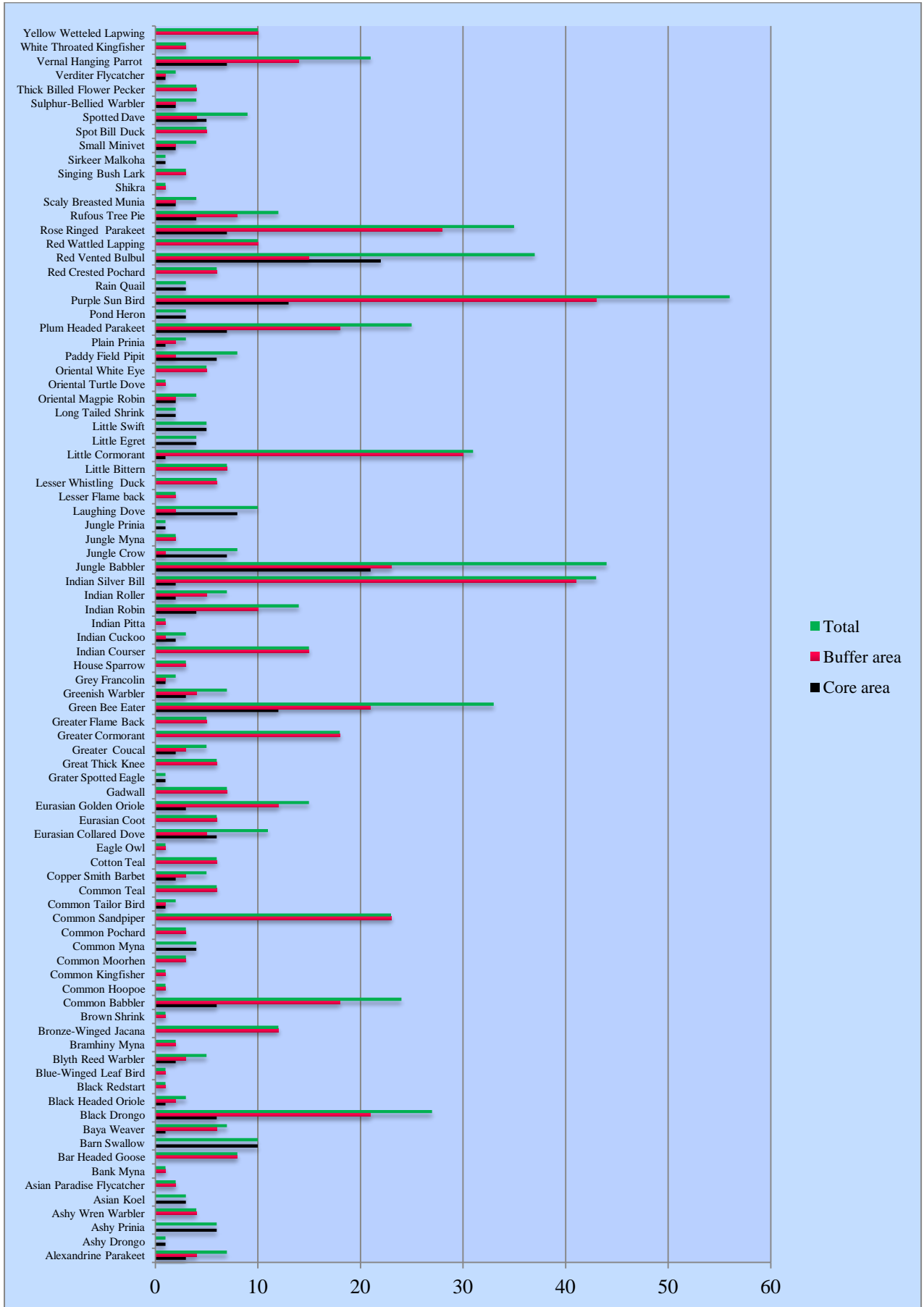
Table No 4.9: Checklist of avifauna recorded in the study site

S. No	Common Name	Local Name	Scientific Name	Family	IUCN Status	Core zone	Buffer zone	No of birds
1	Alexandrine Parakeet	Parrot, Tota	<i>Psittacula eupatria</i>	Psittacidae	NT	3	4	7
2	Ashy Drongo	-----	<i>Dicrurus leucophaeus</i>	Dicruridae	LC	1		1
3	Ashy Prinia	-----	<i>Prinia socialis</i>	Cisticolidae	LC	6		6
4	Ashy Wren Warbler	-----	<i>Prinia socialis</i>	Cisticolidae	LC		4	4
5	Asian Koel	Koel, Cuckoo	<i>Eudynamys</i>	Cuculidae	LC	3		3
6	Asian Paradise Flycatcher	-----	<i>Terpsiphone paradisi</i>	Monarchidae	LC		2	2
7	Bank Myna	Myna	<i>Acridotheres ginginianus</i>	Sturnidae	LC		1	1
8	Bar Headed Goose	-----	<i>Anser indicus</i>	Anatidae	LC		8	8
9	Barn Swallow	-----	<i>Hirundo rustica</i>	Hirundinidae	LC	10		10
10	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	Ploceidae	LC	1	6	7
11	Black Drongo	Karrauna	<i>Dicrurus macrocercus</i>	Dicruridae	LC	6	21	27

12	Black Headed Oriole	-----	<i>Oriolus larvatus</i>	Oriolidae	LC	1	2	3
13	Black Redstart	-----	<i>Phoenicurus ochruros</i>	Muscicapidae	LC		1	1
14	Blue-Winged Leaf Bird	-----	<i>Chloropsis cochinchinensis</i>	Chloropseidae	NT		1	1
15	Blyth Reed Warbler	-----	<i>Acrocephalus dumetorum</i>	Acrocephalidae	LC	2	3	5
16	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	Sturnidae	LC		2	2
17	Bronze-Winged Jacana	-----	<i>Metopidius indicus</i>	Jacanidae	LC		12	12
18	Brown Shrink	-----	<i>Lanius cristatus</i>	Laniidae	LC		1	1
19	Common Babbler	-----	<i>Turdoides caudate</i>	Lieothrichidae	LC	6	18	24
20	Common Hoopoe	-----	<i>Upupa epops</i>	Upupidae	LC		1	1
21	Common Kingfisher	Kilkila	<i>Alcedo atthis</i>	Alcedinidae	LC		1	1
22	Common Moorhen	-----	<i>Gallinula chloropus</i>	Rallidae	LC		3	3
23	Common Myna	Salhai /desimyna	<i>Acridotheres tristis</i>	Sturnidae	LC	4		4
24	Common Pochard	-----	<i>Aythya ferina</i>	Anatidae	VU		3	3
25	Common Sandpiper	-----	<i>Actitis hypoleucos</i>	Scolopacidae	LC		23	23
26	Common Tailor Bird	-----	<i>Orthotomus sutorius</i>	Cisticolidae	LC	1	1	2
27	Common Teal	-----	<i>Anas crecca</i>	Anatidae	LC		6	6
28	Copper Smith Barbet	-----	<i>Psilopogon haemacephalus</i>	Megalaimidae	LC	2	3	5
29	Cotton Teal	-----	<i>Nettapus coromandelianus</i>	Anatidae	LC		6	6
30	Eagle Owl	Ullu	<i>Bubo bubo</i>	Strigidae	LC		1	1
31	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	Columbidae	LC	6	5	11
32	Eurasian Coot	-----	<i>Fulica atra</i>	Rallidae	LC		6	6
33	Eurasian Golden Oriole	-----	<i>Oriolus oriolus</i>	Oriolidae	LC	3	12	15
35	Gadwall	-----	<i>Mareca strepera</i>	Anatidae	LC		7	7
36	Grater Spotted Eagle	-----	<i>Clanga clanga</i>	Accipitridae	VU	1		1
37	Great Thick Knee	-----	<i>Esacus recurvirostris</i>	Burhinidae	NT		6	6
38	Greater Coucal	Koyal	<i>Centropus sinensis</i>	Cuculidae	LC	2	3	5
39	Greater Cormorant	-----	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LC		18	18
40	Greater Flame Back	-----	<i>Chrysocolaptes guttacristatus</i>	Picidae	LC		5	5
41	Green Bee Eater	Patinga	<i>Merops orientalis</i>	Meropidae	LC	12	21	33
42	Greenish Warbler	-----	<i>Phylloscopus trochiloides</i>	Phylloscopidae	LC	3	4	7
43	Grey Francolin	-----	<i>Francolinus pondicerianus</i>	Phasianidae	LC	1	1	2
44	House Sparrow	Gouriaya	<i>Passer domesticus</i>	Passeridae	LC		3	3
45	Indian Courser	-----	<i>Cursorius coromandelicus</i>	Glareolidae	LC		15	15
46	Indian Cuckoo	-----	<i>Cuculus micropterus</i>	cuculidae	LC	2	1	3
47	Indian Pitta	-----	<i>Pitta brachyura</i>	Pittidae	LC		1	1

48	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	Muscicapidae	LC	4	10	14
49	Indian Roller	Nilkanth/ teohra	<i>Coracias benghalensis</i>	Coraciidae	LC	2	5	7
50	Indian Silver Bill	-----	<i>Euodice malabarica</i>	Estrildidae	LC	2	41	43
51	Jungle Babbler	Satbhaiya	<i>Turdoides striata</i>	Leiotherichidae	LC	21	23	44
52	Jungle Crow	Koua	<i>Corvus culminatus</i>	Corvidae	LC	7	1	8
53	Jungle Myna	Maina	<i>Acridotheres fuscus</i>	Sturnidae	LC		2	2
54	Jungle Prinia	-----	<i>Prinia sylvatica</i>	Cisticolidae	LC	1		1
55	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	Columbidae	LC	8	2	10
56	Lesser Flame back	-----	<i>Dinopium benghalense</i>	Picidae	LC		2	2
57	Lesser Whistling Duck	-----	<i>Dendrocygna javanica</i>	Anatidae	LC		6	6
58	Little Bittern	-----	<i>Ixobrychus minutus</i>	Ardeidae	LC		7	7
59	Little Cormorant	-----	<i>Microcarbo niger</i>	Phalacrocoracidae	LC	1	30	31
60	Little Egret	Kokda	<i>Egretta garzetta</i>	Ardeidae	LC	4		4
61	Little Swift	-----	<i>Apus affinis</i>	Apodidae	LC	5		5
62	Long Tailed Shrink	-----	<i>Lanius schach</i>	Laniidae	LC	2		2
63	Oriental Magpie Robin	-----	<i>Copsychus saularis</i>	Muscicapidae	LC	2	2	4
64	Oriental Turtle Dove	-----	<i>Streptopelia orientalis</i>	Columbidae	LC		1	1
65	Oriental White Eye	-----	<i>Zosterops palpebrosus</i>	Zosteropidae	LC		5	5
66	Paddy Field Pipit	-----	<i>Anthus rufulus</i>	Motacillidae	LC	6	2	8
67	Plain Prinia	-----	<i>Prinia inornata</i>	Cisticolidae	LC	1	2	3
68	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	Psittacidae	LC	7	18	25
69	Pond Heron	Khokho bakli	<i>Ardeola grayii</i>	Ardeidae	LC	3		3
70	Purple Sun Bird	-----	<i>Nectarania asiatica asiatica</i>	Nectariniini	LC	13	43	56
71	Rain Quail	Quail	<i>Coturnix coromandelica</i>	Phasianidae	LC	3		3
72	Red Crested Pochard	-----	<i>Netta rufina</i>	Anatidae	LC		6	6
73	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	Pycnonotidae	LC	22	15	37
74	Red Wattled Lapping	-----	<i>Vanellus indicus</i>	Charadriidae			10	10
75	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	Psittaculidae	LC	7	28	35
76	Rufous Tree Pie	-----	<i>Dendrocitta vagabunda</i>	Corvini	LC	4	8	12
77	Scaly Breasted Munia	-----	<i>Lonchura punctulata</i>	Estrildidae	LC	2	2	4
78	Shikra	Cheel	<i>Accipiter badius</i>	Accipitridae	LC		1	1
79	Singing Bush Lark	-----	<i>Mirafra javanica</i>	Alaudidae	LC		3	3
80	Sirkeer Malkoha	-----	<i>Taccocua leschenaultii</i>	Cuculidae	LC	1		1

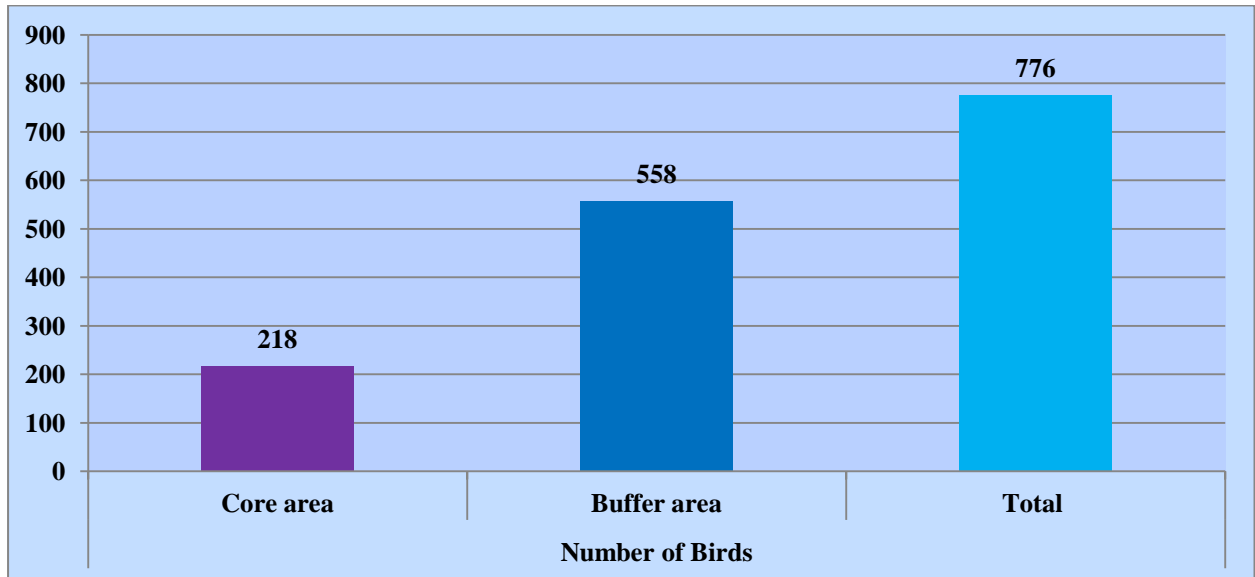
81	Small Minivet	-----	<i>Pericrocotus cinnamomeus</i>	Campephagidae	LC	2	2	4	
82	Spot Bill Duck	-----	<i>Anas poecilorhyncha</i>	Anatidae	LC		5	5	
83	Spotted Dave	-----	<i>Streptopelia chinensis suratensis</i>	Columbidae	LC	5	4	9	
84	Sulphur-Bellied Warbler	-----	<i>Phylloscopus griseolus</i>	Acrocephalidae	LC	2	2	4	
85	Thick Billed Flower Pecker	-----	<i>Dicaeum agile</i>	Dicaeidae	LC		4	4	
86	Verditer Flycatcher	-----	<i>Eumyias thalassinus</i>	Muscicapidae	LC	1	1	2	
87	Vernal Hanging Parrot	-----	<i>Loriculus vernalis</i>	Psittaculidae	LC	7	14	21	
88	White Throated Kingfisher	Kilkila	<i>Halcyon smyrnensis</i>	Alcedinidae	LC		3	3	
89	Yellow Wetteled Lapwing		<i>Vanellus malabaricus</i>	Charadriidae	LC		10	10	
<b>Total</b>							<b>218</b>	<b>558</b>	<b>776</b>



Graph 4.8: Overview of recorded avifauna (2<sup>nd</sup> seasonal survey)

**Table No.4.10 Birds population difference between core and buffer zone**

S.No.	Number of birds		
	Core zone	Buffer zone	Total
2.	218	558	776



**Graph No.4.9 Birds population difference between core and buffer zone**

### 4.3 AUTUMN SEASON SURVEY

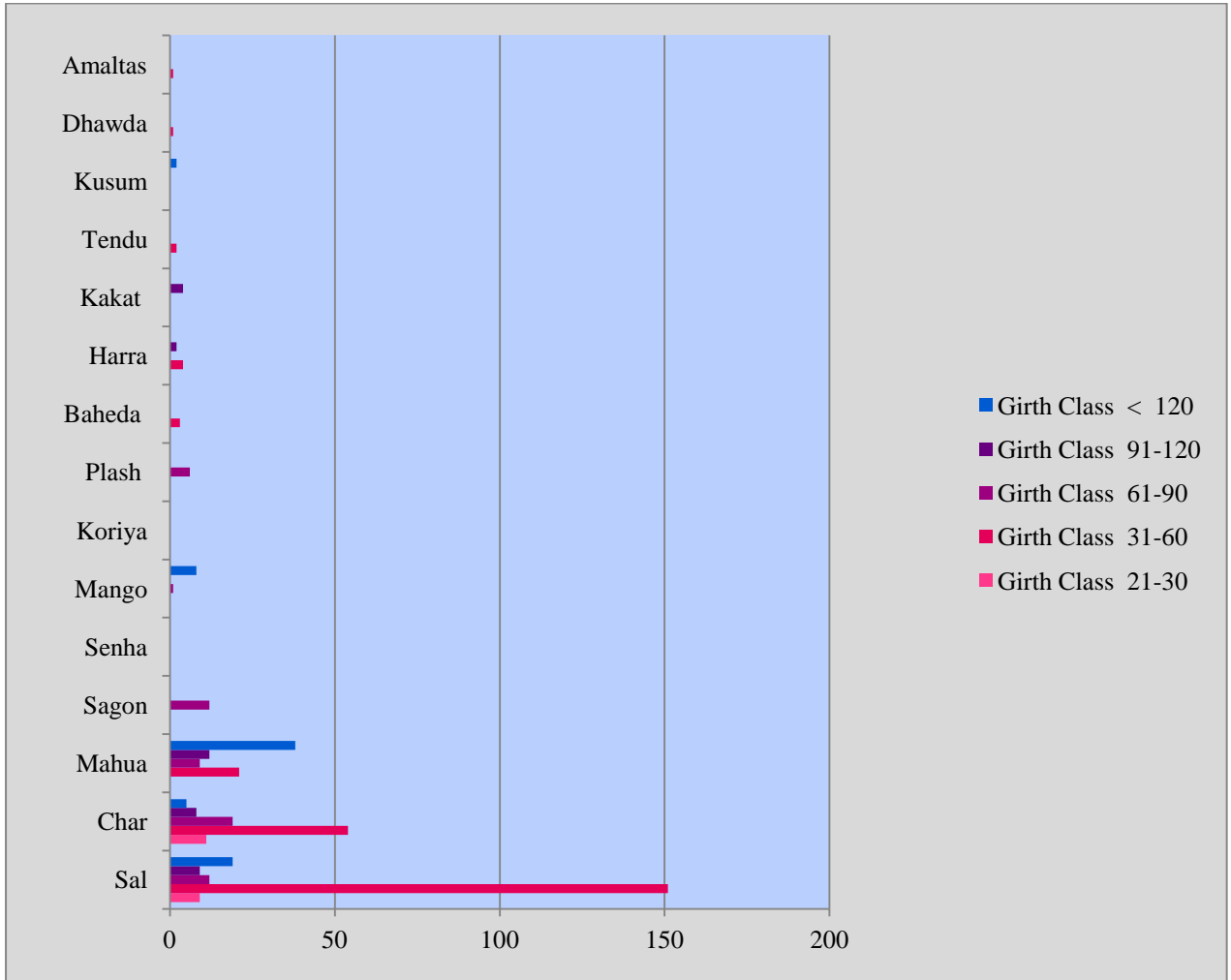
#### 4.3.1 Floral diversity of study site

On the basis of the field survey, the data had been collected and analyzed. That the core and buffer zone vegetation of study site are mainly surrounded by dominated tree species i.e. Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Teak (*Tectona grandis*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Koriya (*Pinus koraiensi*), Plash (*Butea monosperma*), Baheda (*Terminalia bellerica*), Harra (*Terminalia chebula*), Kekad (*Garuga pinnata*), Tendu (*Diospyros melanoxylon*), Dhawda (*Anogeissus latifolia*) and Amaltas (*Cassia fistula*) etc. Floral diversity data have been recorded and tabulated during the seasonal field surveys of core and buffer zone of proposed mining site is given below in table no 4.11

**Table No. 4.11: Floral diversity along with girth class in study site**

Summary of available tree species in 35 sample plot (Total area = 10,995.6 m square)								
S. no.	Tree species	Girth class						Regeneration status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	9	151	12	9	19	200	0
2	Char	11	54	19	8	5	97	7
3	Mahua	0	21	9	12	38	80	2
4	Sagon	0	0	12	0	0	12	3
5	Senha	0	0	0	0	0	0	12
6	Mango	0	0	1	0	8	9	0
7	Koriya	0	0	0	0	0	0	8
8	Plash	0	0	6	0	0	6	0
9	Baheda	0	3	0	0	0	3	3
10	Harra	0	4	0	2	0	6	0
11	Kakat	0	0	0	4	0	4	0
12	Tendu	0	2	0	0	0	2	0
13	Kusum	0	0	0	0	2	2	0
14	Dhawda	0	1	0	0	0	1	0
15	Amaltas	0	1	0	0	0	1	0
Area details : Total number of transect = 7; Total number of plots = 7x5 = 35 ; Area of one sample plot = 314.16 m square								



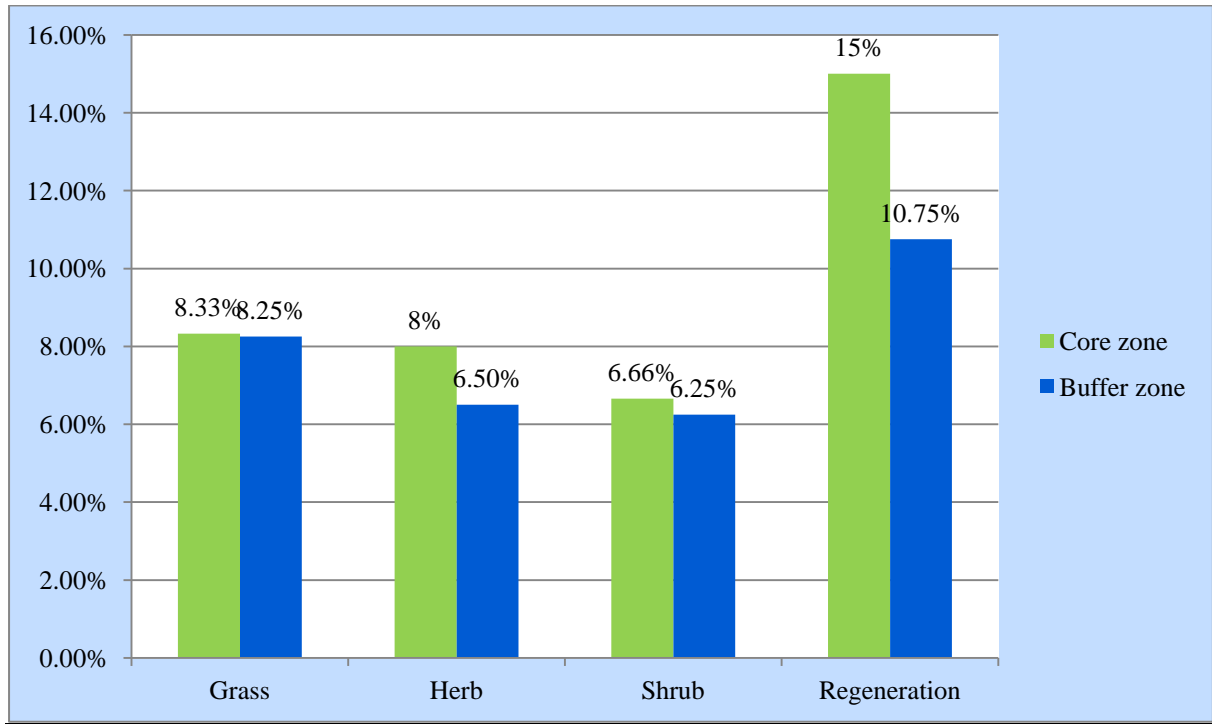


Graph 4.10: Floral diversity along with girth class in study site

**4.3.2 Overall vegetation cover** – The data of 7 transect have been recorded which is given below in table no 4.11

Table No. 4.12: Vegetation percentage of core and buffer zone

Vegetation	Core zone	Buffer zone
Grass	8.33%	8.25%
Herb	8%	6.50%
Shrub	6.66%	6.25%
Regeneration	15%	10.75%



**Graph 4.11: Vegetation comparisons of core and buffer zone**

According to vegetation survey, 7 transects with 5 intervals (7x5) in each sample plots have been drawn in the core and buffer zone respectively; in which the diversity of tree species categorized under five girth classes i.e. 21-30 cm, 31-60 cm, 61-90 cm, 91-120 cm followed by above 120 cm which shows in the table no 4.11 and graph 4.10 whereas the overall vegetation comparison of floral diversity other than tree species are recorded in percent i.e. grassland 8.33:8.25%, herbs 8:6.5%, shrubs 6.66:6.5% and the regeneration percentage is 15:10.75% (Table no 4.12 and Graph 4.11).

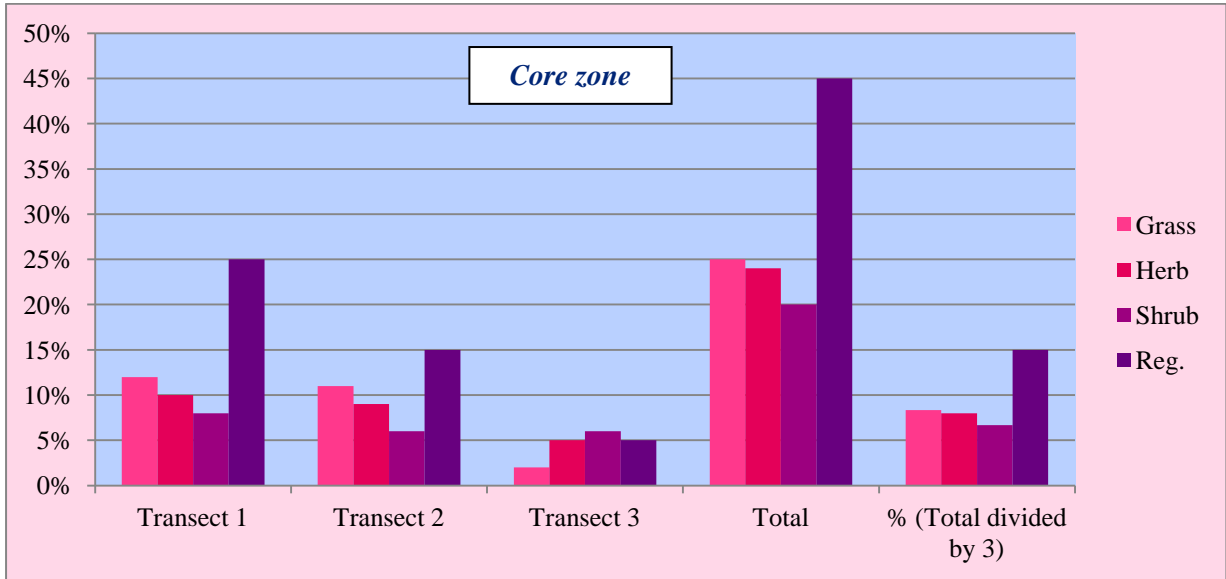
### 4.3.2 Core zone

The core zone comprises about 185.155 hectare. The third seasonal field visits were conducted in the month of March 2019. The observation shows the floral phenology of core zone in mining area is mostly dominated by Sal (*Shorea robusta*) species followed by Char (*Buchanania lanzan*)

**Table No. 4.13: Vegetation covers percentage of core mining area.**

Transect No.	Grass	Herb	Shrub	Reg.
1	12%	10%	8%	25%
2	11%	9%	6%	15%
3	2%	5%	6%	5%

<b>Average</b>	<b>25%</b>	<b>24%</b>	<b>20%</b>	<b>45%</b>
<b>% (Total average divided by 3)</b>	<b>8.33%</b>	<b>8%</b>	<b>6.66%</b>	<b>15%</b>



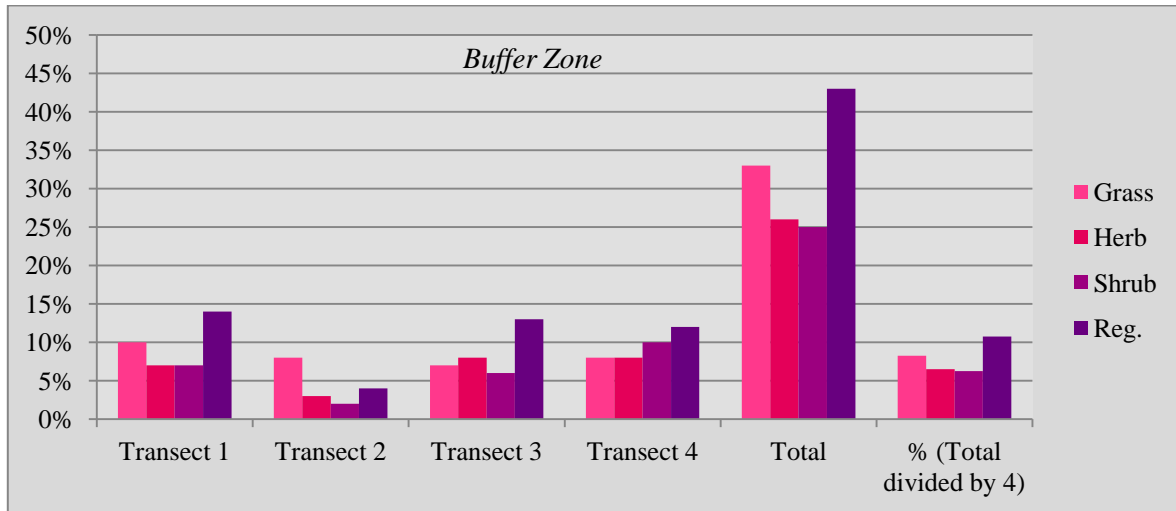
**Graph 4.12: Vegetation composition of core zone**

#### 4.3.3 Buffer zone:

The buffer zone of mining area is situated in 5-10 km distance from the core mining boundary. The floral vegetation diversity of buffer zone is illustrated in graph 4.13 and tabulated in table no 4.14.

**Table No 4.14: Vegetation percentage of buffer zone.**

<b>Transect No.</b>	<b>Grass</b>	<b>Herb</b>	<b>Shrub</b>	<b>Reg.</b>
<b>1</b>	10%	7%	7%	14%
<b>2</b>	8%	3%	2%	4%
<b>3</b>	7%	8%	6%	13%
<b>4</b>	8%	8%	10%	12%
<b>Average</b>	<b>33%</b>	<b>26%</b>	<b>25%</b>	<b>43%</b>
<b>% (Total average divided by 7)</b>	<b>8.25%</b>	<b>6.50%</b>	<b>6.25%</b>	<b>10.75%</b>



**Graph 4.13: Vegetation composition of buffer zone**

### 4.3.4 Avifauna

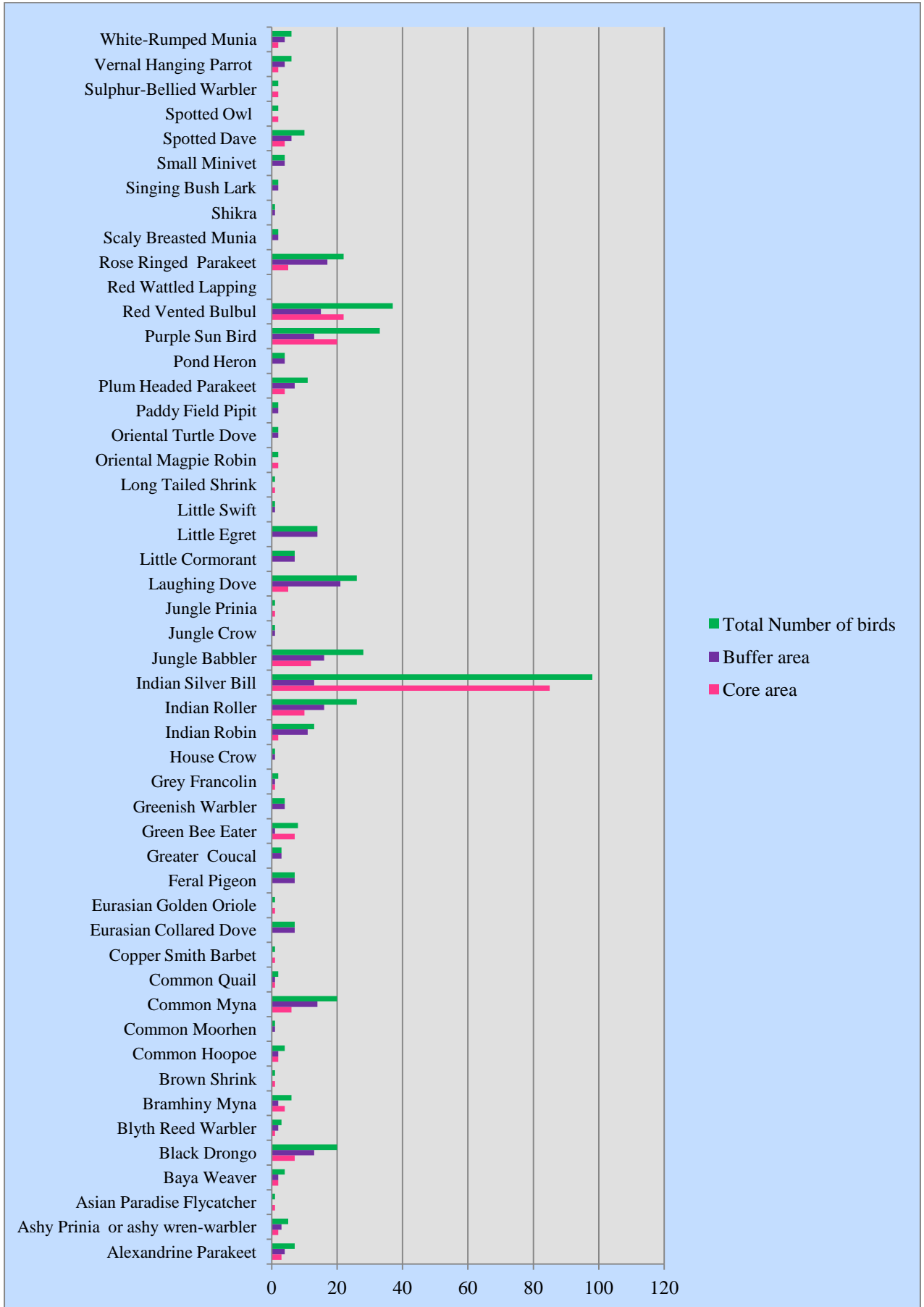
According to seasonal survey, 472 individual belongs to 50 different species has been recorded. As per recorded data, the population of avifauna dominated by Indian Pond Heron, Black Drongo, Red Vented Bulbul, Indian Roller and Common Myna etc. Mostly the birds found during the survey are endemic and resident. The avifaunal diversity of mining area are tabulated in table no 4.15 and graph 4.14.

**Table No 4.15: Checklist of avifauna recorded in the mining area**

S. No	Common Name	Local Name	Scientific Name	Family	IUCN Status	Core zone	Buffer zone	No of birds
1	Alexandrine Parakeet	Parrot, Tota	<i>Psittacula eupatria</i>	Psittacidae	NT	3	4	7
2	Ashy Prinia or ashy wren-warbler	-----	<i>Prinia socialis</i>	Cisticolidae	LC	2	3	5
3	Asian Paradise Flycatcher	-----	<i>Terpsiphone paradisi</i>	Monarchidae	LC	1		1
4	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	Ploceidae	LC	2	2	4
5	Black Drongo	Karrauna	<i>Dicrurus macrocercus</i>	Dicruridae	LC	7	13	20
6	Blyth Reed Warbler	-----	<i>Acrocephalus dumetorum</i>	Acrocephalidae	LC	1	2	3
7	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	Sturnidae	LC	4	2	6
8	Brown Shrink	-----	<i>Lanius cristatus</i>	Laniidae	LC	1		1
9	Common Hoopoe	-----	<i>Upupa epops</i>	Upupidae	LC	2	2	4
10	Common Moorhen	-----	<i>Gallinula chloropus</i>	Rallidae	LC		1	1
11	Common Myna	Salhai /desimyna	<i>Acridotheres tristis</i>	Sturnidae	LC	6	14	20
12	Common Quail	Titar	<i>Coturnix coturnix</i>	Phasianidae	LC	1	1	2

13	Copper Smith Barbet	-----	<i>Psilopogon haemacephalus</i>	Megalaimidae	LC	1		1
14	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	Columbidae	LC		7	7
15	Eurasian Golden Oriole	-----	<i>Oriolus oriolus</i>	Oriolidae	LC	1		1
16	Feral Pigeon	Kabut ar	<i>Columba livia domestica</i>	Columbidae	LC		7	7
17	Greater Coucal	Koyal	<i>Centropus sinensis</i>	Cuculidae	LC		3	3
18	Green Bee Eater	Pating a	<i>Merops orientalis</i>	Meropidae	LC	7	1	8
19	Greenish Warbler	-----	<i>Phylloscopus trochiloides</i>	Phylloscopidae	LC		4	4
20	Grey Francolin	-----	<i>Francolinus pondicerianus</i>	Phasianidae	LC	1	1	2
21	House Crow	Kauaa	<i>Corvus splendens</i>	Corvidae	LC		1	1
22	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	Muscicapidae	LC	2	11	13
23	Indian Roller	Nilkanth/teohra	<i>Coracias benghalensis</i>	Coraciidae	LC	10	16	26
24	Indian Silver Bill	-----	<i>Euodice malabarica</i>	Estrildidae	LC	85	13	98
25	Jungle Babbler	Satbhaya	<i>Turdoides striata</i>	Leiotherichidae	LC	12	16	28
26	Jungle Crow	Koua	<i>Corvus culminatus</i>	Corvidae	LC		1	1
27	Jungle Prinia	-----	<i>Prinia sylvatica</i>	Cistacolidae	LC	1		1
28	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	Columbidae	LC	5	21	26
29	Little Cormorant	-----	<i>Microcarbo niger</i>	Phalacrocoracidae	LC		7	7
30	Little Egret	Kokda	<i>Egretta garzetta</i>	Ardeidae	LC		14	14
31	Little Swift	-----	<i>Apus affinis</i>	Apodidae	LC		1	1
32	Long Tailed Shrike	-----	<i>Lanius schach</i>	Laniidae	LC	1		1
33	Oriental Magpie Robin	-----	<i>Copsychus saularis</i>	Muscicapidae	LC	2		2
34	Oriental Turtle Dove	-----	<i>Streptopelia orientalis</i>	Columbidae	LC		2	2
35	Paddy Field Pipit	-----	<i>Anthus rufulus</i>	Motacillidae	LC		2	2
36	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	Psittacidae	LC	4	7	11
37	Pond Heron	bagula	<i>Ardeola grayii</i>	Ardeidae	LC		4	4
38	Purple Sun Bird	-----	<i>Nectarania asiatica asiatica</i>	Nectariniini	LC	20	13	33
39	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	Pycnonotidae	LC	22	15	37
40	Red Wattled Lapping	-----	<i>Vanellus indicus</i>	Charadriidae				
41	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	Psittaculidae	LC	5	17	22
42	Scaly Breasted Munia	-----	<i>Lonchura punctulata</i>	Estrildidae	LC		2	2
43	Shikra	Cheel	<i>Accipiter badius</i>	Accipitridae	LC		1	1
44	Singing Bush Lark	-----	<i>Mirafra javanica</i>	Alaudidae	LC		2	2

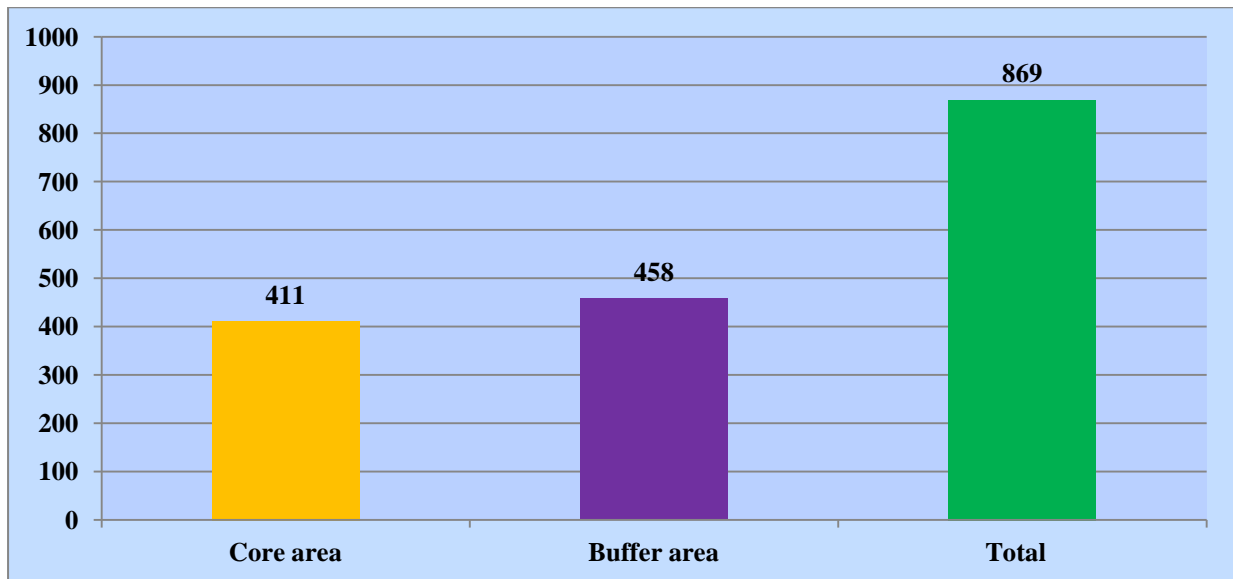
45	Small Minivet	-----	<i>Pericrocotus cinnamomeus</i>	Campephagidae	LC		4	4
46	Spotted Dove	Padki	<i>Streptopelia chinensis suratensis</i>	Columbidae	LC	4	6	10
47	Spotted Owl	Ullu	<i>Strix occidentalis</i>	Strigidae	NT	2		2
48	Sulphur-Bellied Warbler	-----	<i>Phylloscopus griseolus</i>	Acrocephalidae	LC	2		2
49	Vernal Hanging Parrot	Tota	<i>Loriculus vernalis</i>	Psittaculidae	LC	2	4	6
50	White-Rumped Munia	-----	<i>Lonchura striata</i>	Estrildidae	LC	2	4	6
<b>Total</b>						<b>221</b>	<b>251</b>	<b>472</b>



Graph 4.14: Overview of recorded avifauna

**Table No.4.16 Birds population difference between core and buffer zone**

Number of birds		
Core zone	Buffer zone	Total
411	458	869



**Graph No.4.15 Birds population difference between core and buffer zone**



## CHAPTER 5

### RESULT AND DISCUSSION

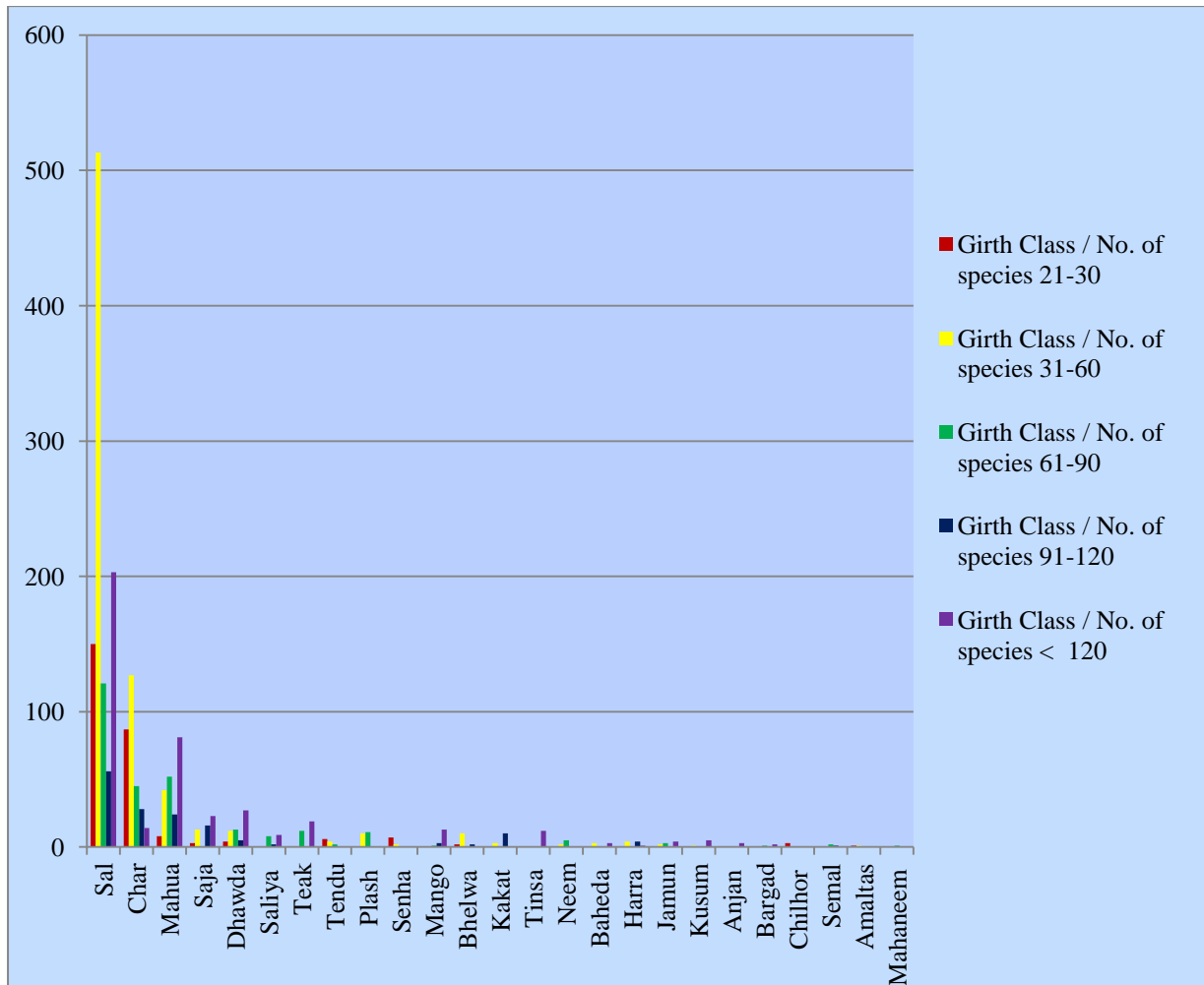
#### 5.1 Floral diversity of study site

On the basis of the field survey (as discussed above in chapter 4) the study have been revealed that the core and buffer zone vegetation of proposed area for excavation are mainly surrounded by dominated tree species i.e. Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Teak (*Tectona grandis*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Koriya (*Pinus koraiensi*), Plash (*Butea monosperma*), Baheda (*Terminalia bellerica*), Harra (*Terminalia chebula*), Kekad (*Garuga pinnata*), Tendu (*Diospyros melanoxylon*), Dhawda (*Anogeissus latifolia*) and Amaltas (*Cassia fistula*) etc. The floral diversity data have been recorded during the seasonal field survey of core and buffer zone have been tabulated in table no.5.1

**Table No 5.1. Floral diversity along with girth class in study site**

Summary of available tree species in 130 sample plot (Total area = 40480.8 m square)								
S. no.	Tree Species	Girth Class						Regeneration Status
		21-30	31-60	61-90	91-120	< 120	Total	Up to 20 cm
1	Sal	150	513	121	56	203	1043	27
2	Char	87	127	45	28	14	301	66
3	Mahua	8	42	52	24	81	207	4
4	Saja	3	13	0	16	23	55	0
5	Dhawda	4	12	13	5	27	61	8
6	Koriya	0	0	0	0	0	0	41
7	Saliya	0	0	8	2	9	19	0
8	Teak	0	0	12	0	19	31	3
9	Tendu	6	4	2	0	0	12	12
10	Plash	0	10	11	0	0	21	0
11	Senha	7	2	0	0	0	9	12
12	Mango	0	0	1	3	13	17	0
13	Bhelwa	2	10	0	2		14	0
14	Kakat	0	3	0	10	0	13	0
15	Tinsa	0	0	0	0	12	12	0
16	Neem	0	2	5	0	0	7	3
17	Baheda	0	3	0	0	3	6	3
18	Harra	0	4	0	4	1	9	0
19	Jamun	0	2	3	0	4	9	0
20	Kusum	0	1	0	0	5	6	0

21	Anjan	0	0	0	0	3	3	0
22	Bargad	0	0	1	0	2	3	0
23	Chilhor	3	0	0	0	0	3	0
24	Semal	0	0	2	1	0	3	0
25	Amaltas	1	1	0	0	0	2	0
26	Mahaneem	0	0	1	0	0	1	0
<b>Area details : Total number of transect = 26 ; Total number of plots = 26 x 5 = 130 ; Area of one sample plot = 314.16 m Square</b>								



**Graph No. 5.1 Floral diversity along with girth class of study site**

The table below shows the total numbers of 58 tree species which have been recorded through three seasonal surveys including Sal, Char, Mahua and Tendu which have been mostly found in the study area.

**Table No.5.2 Floral diversity of study site**

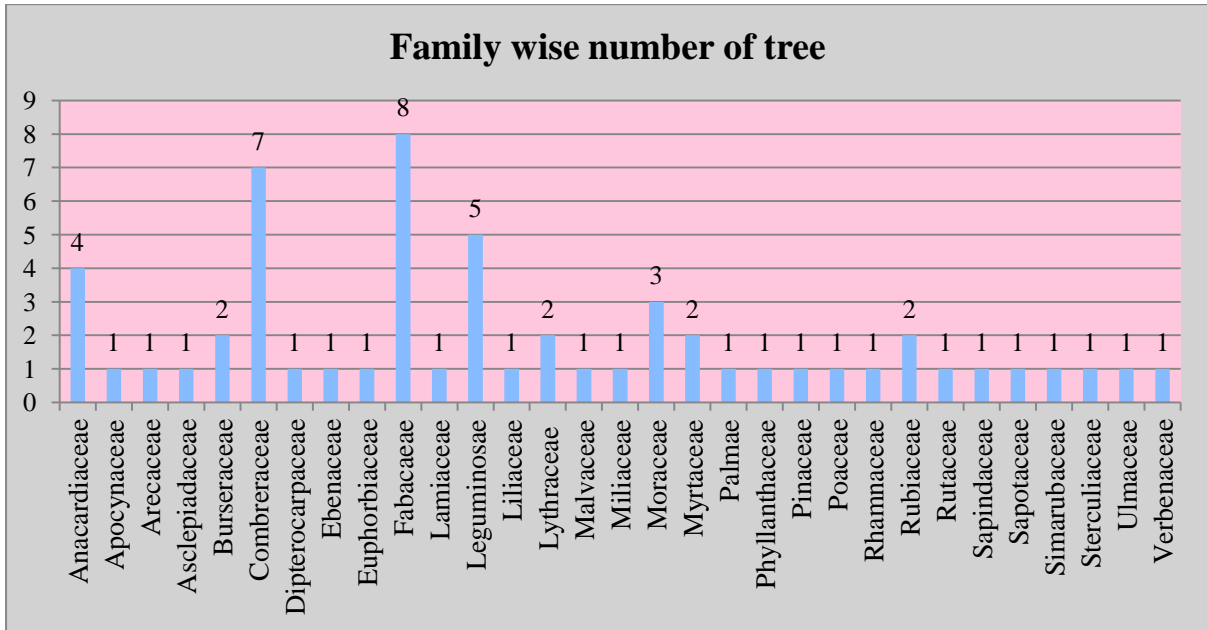
S. N	Local Name	Common Name	Botanical name	family
1.	Aam	Mango	<i>Mangifera indica</i>	Ancardiaceae
2.	Amaltash	amaltash	<i>Cassia fistula</i>	Fabaceae

3.	Amla	Aonla	<i>Phyllanthus emblica</i>	Phyllanthaceae
4.	Arkasiya	Arkasiya	<i>acacia mangium</i>	Fabaceae
5.	Ashan	Saja	<i>Terminalia tomentosa</i>	Combretaceae
6.	Bad	Bargad	<i>Ficus benghalensis</i>	Moraceae
7.	Bahera	Bahera	<i>Terminalia bellerica</i>	Combretaceae
8.	Bakli, Dhau	Dhawra	<i>Anogiessus latifolia</i>	Combretaceae
9.	Bamoor/Bamri	Babul	<i>Acacia arabica</i>	Leguminosae
10.	Bel	Beal	<i>Aegle marmelos, correa.</i>	Rutaceae
11.	Ber	Ber	<i>Zizyphus mauritiana</i>	Rhamnaceae
12.	Bhelwa	Bhelwa	<i>Semecarpus anacardiam</i>	Anacardiaceae
13.	Bhirra	Bhirra	<i>Chloroxylon swietenia</i>	Miliaceae
14.	Bija	Bija	<i>Pterocarpus marsipium</i>	Fabaceae
15.	Chhind	Khajur	<i>Phoenix dactylifera</i>	Arecaceae
16.	Chirol	Chirol	<i>Holoptelea integrifolia</i>	Ulmaceae
17.	Chironji	Char	<i>Buchanania lanzan</i>	Anacardiaceae
18.	Chui	Chind	<i>Phoinex acaulis</i>	Palmae
19.	Dhawai	Dhawai	<i>Woodfordia fruticosa</i>	Lythraceae
20.	Dhawda	Dhawra	<i>Anogeissus latifolia</i>	Combretaceae
21.	Dumar	Gular	<i>Ficus glomerata</i>	Moraceae
22.	Gamari	Khamar	<i>Gmelina arborea</i>	Verbenaceae
23.	Harra	Harra	<i>Terminalia chebula</i>	Combretaceae
24.	Imli	Imli	<i>Tamarindus indica</i>	Fabaceae
25.	Jamun	Jamun	<i>Syzygium cumini</i>	Myrtaceae
26.	Kachnar	Kachnar	<i>Bauhinia variegata</i>	Leguminosae
27.	Kaju	Kaju	<i>Anacrdium occidentale</i>	Anacardiaceae
28.	Karam	Haldu	<i>Adina cordifolia</i>	Rubiaceae
29.	Karanj	Karanj	<i>Pongamia pinnata</i>	Fabaceae
30.	Kasai	Kashi	<i>Bridelia retusa</i>	Euphorbiaceae
31.	Kauha	Arjun	<i>Terminalia arjuna</i>	Combretaceae
32.	Kekad	Kekar	<i>Garuga pinnata</i>	Burseraceae
33.	Kem	Mundi	<i>Mitrangyna parviflora</i>	Rubiaceae
34.	Koriya	Koriya	<i>Pinus koraiensis</i>	Pinaceae
35.	Kossum	Kusum	<i>Schleichera oleosa</i>	Sapindaceae
36.	Kurru	kurru	<i>Sterculia urens</i>	Sterculiaceae
37.	Lathi Bans	Bamboo	<i>Dendrocalamus strictus</i>	Poaceae
38.	Madhar	Aak	<i>Calotropis gigantea</i>	Asclepiadaceae
39.	Mahaneem	Mahaneem	<i>Ailanthus excelsa</i>	Simarubaceae
40.	Mahua	Mahua	<i>Madhuca indica</i>	Sapotaceae
41.	Senha	Senha	<i>Lagerstoemia parviflora</i>	Lythraceae
42.	Neelgiri	Neelgiri	<i>Eucalyptus globulus</i>	Myrtaceae
43.	Neem	Neem	<i>Azadirachta indica</i>	Liliaceae
44.	Pakri	Pipal	<i>Ficus religiosa</i>	Moraceae
45.	Parsa	Palash	<i>Butea monosperma</i>	Fabaceae
46.	Pat koria, Kurchi	Koria	<i>Holarrhena antidysenterica</i>	Apocynaceae

47.	Safed Siris	Siris	<i>Albezia procera</i>	Fabaceae
48.	Kachnar	Kachnar	<i>Bauhinia variegata</i>	Fabaceae
49.	Sagaon	Teak	<i>Tectona grandis</i>	Lamiaceae
50.	Saja	Saja	<i>Terminallia tomentosa</i>	Combretaceae
51.	Salai	Salai	<i>Boswellia serrata</i>	Burseraceae
52.	Sarai	Sal	<i>Shorea robusta</i>	Dipterocarpaceae
53.	Semal	Semul	<i>Bombax ceiba</i>	Malvaceae
54.	Senha	Senha	<i>Lagerstoemia parviflora</i>	Lythraceae
55.	Shisham	Shisham	<i>Dalbergia latifolia</i>	Leguminosae
56.	Sissoo	Sissoo	<i>Dalbergia sissoo</i>	Leguminosae
57.	Tendu	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae
58.	Tilsa	Tilsa	<i>Ougeinia oojeinensis</i>	Leguminosae

Table No. 5.3 Family wise number of tree

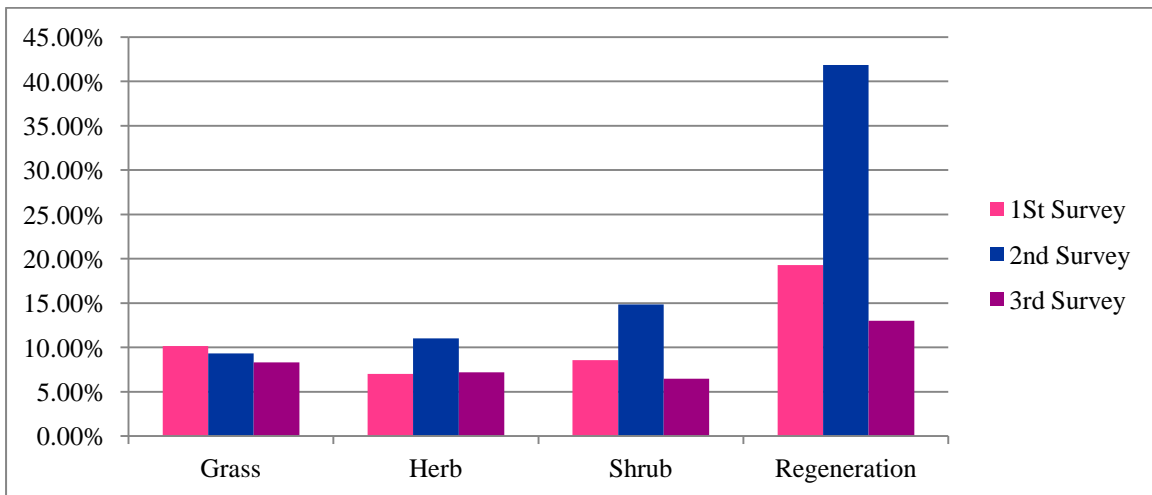
S. No.	Name of family	Number of tree species
1.	Anacardiaceae	4
2.	Apocynaceae	1
3.	Arecaceae	1
4.	Asclepiadaceae	1
5.	Burseraceae	2
6.	Combreraceae	7
7.	Dipterocarpaceae	1
8.	Ebenaceae	1
9.	Euphorbiaceae	1
10.	Fabaceae	8
11.	Lamiaceae	1
12.	Leguminosae	5
13.	Liliaceae	1
14.	Lythraceae	2
15.	Malvaceae	1
16.	Miliaceae	1
17.	Moraceae	3
18.	Myrtaceae	2
19.	Palmae	1
20.	Phyllanthaceae	1
21.	Pinaceae	1
22.	Poaceae	1
23.	Rhamnaceae	1
24.	Rubiaceae	2
25.	Rutaceae	1
26.	Sapindaceae	1
27.	Sapotaceae	1
28.	Simarubaceae	1
29.	Sterculiaceae	1
30.	Ulmaceae	1
31.	Verbenaceae	1



Graph No. 5.2 Family wise number of tree

Table no. 5.4 Seasonal vegetation covers at present in the study site

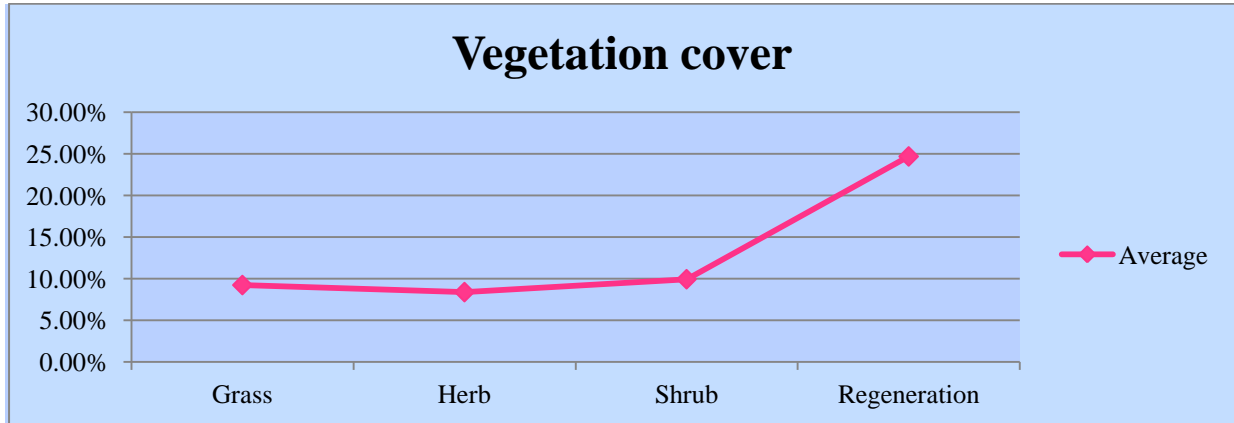
Vegetation	1st Survey	2nd Survey	3rd Survey
Grass	10.14%	9.33%	8.29%
Herb	7.00%	11.00%	7.20%
Shrub	8.57%	14.83%	6.45%
Regeneration	19.28%	41.83%	13.00%



Graph no. 5.3 Seasonal vegetation cover at present in the study site

Table no.5.5 Average vegetation at present in the study site

Vegetation	Average
Grass	9.25%
Herb	8.40%
Shrub	9.95%
Regeneration	24.70%



Graph No. 5.4 Average vegetation cover at present in the study site

## 5.2 Avifauna of OCP Chhal

According to three seasonal surveys, the avifauna populations have been recorded which are as, Summer season survey, total 405 individuals of 61 avifauna species, Winter season survey, total 776 individuals of 89 avifauna species and in Autumn season survey, 472 individuals of 50 avifauna species were recorded.

Overall from three seasonal surveys, total numbers of 1653 individual species of avifauna were recorded from 106 different species belongs to 32 families.

Table No.5.6 Checklist of availability of avifauna in the OCP Chhal

S. No.	Common Name	Local Name	Scientific Name	Family	IUCN Status
1.	Alexandrine Parakeet	Parrot, Tota	<i>Psittacula eupatria</i>	Psittacidae	NT
2.	Ashy Drongo	-----	<i>Dicrurus leucophaeus</i>	Dicruridae	LC
3.	Ashy Prinia or ashy wren-warbler	-	<i>Prinia socialis</i>	Cisticolidae	LC
4.	Asian Brown Flycatcher	--	<i>Muscicapa dauurica</i>	Muscicapidae	LC
5.	Asian Koel	Koel, Cuckoo	<i>Eudynamis scolopacea</i>	Cuculidae	LC
6.	Asian Paradise Flycatcher	-----	<i>Terpsiphone paradisi</i>	Monarchidae	LC
7.	Bank Myna	Myna	<i>Acridotheres ginginianus</i>	Sturnidae	LC
8.	Bar Headed Goose	-----	<i>Anser indicus</i>	Anatidae	LC
9.	Barn Swallow	-----	<i>Hirundo rustica</i>	Hirundinidae	LC
10.	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	Ploceidae	LC
11.	Black Drongo	Karrauna	<i>Dicrurus macrocerus</i>	Dicruridae	LC

12.	Black Headed Oriole	-----	<i>Oriolus larvatus</i>	Oriolidae	LC
13.	Black Redstart	-----	<i>Phoenicurus ochruros</i>	Muscicapidae	LC
14.	Blue-Winged Leaf Bird	-----	<i>Chloropsis cochinchinensis</i>	Chloropseidae	NT
15.	Blyth Reed Warbler	-----	<i>Acrocephalus dumetorum</i>	Acrocephalidae	LC
16.	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	Sturnidae	LC
17.	Bronze-Winged Jacana	-----	<i>Metopidius indicus</i>	Jacanidae	LC
18.	Brown Shrink	-----	<i>Lanius cristatus</i>	Laniidae	LC
19.	Cattle Egret	Gay Bagula	<i>Bubulcus ibis</i>	Ardeidae	LC
20.	Common Babbler	-----	<i>Turdoides caudate</i>	Lieothrichidae	LC
21.	Common Hawk Eagle	Cheel	<i>Hierococcyx varius</i>	Cuculidae	LC
22.	Common Hoopoe	-----	<i>Upupa epops</i>	Upupidae	LC
23.	Common Kingfisher	Kilkila	<i>Alcedo atthis</i>	Alcedinidae	LC
24.	Common Moorhen	-----	<i>Gallinula chloropus</i>	Rallidae	LC
25.	Common Myna	Salhai/ desimyna	<i>Acridotheres tristis</i>	Sturnidae	LC
26.	Common Pochard	-----	<i>Aythya ferina</i>	Anatidae	VU
27.	Common quail	Titar	<i>Coturnix coturnix</i>	Phasianidae	LC
28.	Common Sandpiper	-----	<i>Actitis hypoleucos</i>	Scolopacidae	LC
29.	Common Tailor Bird	-----	<i>Orthotomus sutorius</i>	Cisticolidae	LC
30.	Common Teal	-----	<i>Anas crecca</i>	Anatidae	LC
31.	Copper Smith Barbet	-----	<i>Psilopogon haemacephalus</i>	Megalaimidae	LC
32.	Cotton Teal	-----	<i>Nettapus coromandelianus</i>	Anatidae	LC
33.	Crimson Backed sunbird or Small Sunbird	-	<i>Leptocoma minima</i>	Nectariniidae	LC
34.	Eagle Owl	Ullu	<i>Bubo bubo</i>	Strigidae	LC
35.	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	Columbidae	LC
36.	Eurasian Coot	-----	<i>Fulica atra</i>	Rallidae	LC
37.	Eurasian Golden Oriole	-----	<i>Oriolus oriolus</i>	Oriolidae	LC
38.	European Turtle Dove	Padki	<i>Streptopelia turtur</i>	Columbidae	VU
39.	Feral Pigeon	Kabutar	<i>Columba livia domestica</i>	Columbidae	LC
40.	Gadwall	-----	<i>Mareca strepera</i>	Anatidae	LC
41.	Grater Spotted Eagle	-----	<i>Clanga clanga</i>	Accipitridae	VU
42.	Great Thick Knee	-----	<i>Esacus recurvirostris</i>	Burhinidae	NT
43.	Greater Coucal	Koyal	<i>Centropus sinensis</i>	Cuculidae	LC
44.	Greater Cormorant	-----	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LC

45.	Greater Flame Back Woodpecker	Katpodva	<i>Dryocopus martius</i>	Picidae	LC
46.	Green Bee Eater	Patinga	<i>Merops orientalis</i>	Meropidae	LC
47.	Greenish Warbler	-----	<i>Phylloscopus trochiloides</i>	Phylloscopidae	LC
48.	Grey Francolin	-----	<i>Francolinus pondicerianus</i>	Phasianidae	LC
49.	House Crow	Kauaa	<i>Corvus splendens</i>	Corvidae	LC
50.	House Sparrow	Gouriaya	<i>Passer domesticus</i>	Passeridae	LC
51.	Indian Barn Owl	-	<i>Tyto alba</i>	Tytonidae	LC
52.	Indian Courser	-----	<i>Cursorius coromandelicus</i>	Glareolidae	LC
53.	Indian Cuckoo	-----	<i>Cuculus micropterus</i>	cuculidae	LC
54.	Indian Nuthatch	-	<i>Sitta castanea</i>	Sittidae	LC
55.	Indian Pitta	-----	<i>Pitta brachyura</i>	Pittidae	LC
56.	Indian Pond Heron	Khokho bakli	<i>Ardeola grayii</i>	Ardeidae	LC
57.	Indian Pygmy Woodpecker	-	<i>Yungipicus nanus</i>	Picidae	LC
58.	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	Muscicapidae	LC
59.	Indian Roller	Nilkanth/teohra	<i>Coracias benghalensis</i>	Coraciidae	LC
60.	Indian Silver Bill	-----	<i>Euodice malabarica</i>	Estrildidae	LC
61.	Indian Spotted Dove	Padki	<i>Streptopelia chinensis suratensis</i>	Columbidae	LC
62.	Jungle Babbler	Satbhaiya	<i>Turdoides striata</i>	Leiothrichidae	LC
63.	Jungle Bush Quail	Titar	<i>Perdica asiatica</i>	Phasianidae	LC
64.	Jungle Crow	Koua	<i>Corvus culminatus</i>	Corvidae	LC
65.	Jungle Myna	Maina	<i>Acridotheres fuscus</i>	Sturnidae	LC
66.	Jungle Prinia	-----	<i>Prinia sylvatica</i>	Cisticolidae	LC
67.	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	Columbidae	LC
68.	Lesser Flame Back	-----	<i>Dinopium benghalense</i>	Picidae	LC
69.	Lesser Whistling Duck	-----	<i>Dendrocygna javanica</i>	Anatidae	LC
70.	Little Bittern	-----	<i>Ixobrychus minutus</i>	Ardeidae	LC
71.	Little Cormorant	-----	<i>Microcarbo niger</i>	Phalacrocoracidae	LC
72.	Little Egret	Kokda	<i>Egretta garzetta</i>	Ardeidae	LC
73.	Little Swift	-----	<i>Apus affinis</i>	Apodidae	LC
74.	Long tailed Minivet		<i>Pericrocotus ethologus</i>	Campephagidae	LC
75.	Long Tailed Shrink	-----	<i>Lanius schach</i>	Laniidae	LC
76.	Oriental Magpie Robin	-----	<i>Copsychus saularis</i>	Muscicapidae	LC
77.	Oriental Turtle Dove	-----	<i>Streptopelia orientalis</i>	Columbidae	LC
78.	Oriental White Eye	-----	<i>Zosterops palpebrosus</i>	Zosteropidae	LC
79.	Paddy Field Pipit	-----	<i>Anthus rufulus</i>	Motacillidae	LC
80.	Plain Prinia	-----	<i>Prinia inornata</i>	Cisticolidae	LC



81.	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	Psittacidae	LC
82.	Purple Sun Bird	-----	<i>Nectarania asiatica asiatica (Latham)</i>	Nectariniini	LC
83.	Rain Quail	Quail	<i>Coturnix coromandelica</i>	Phasianidae	LC
84.	Red Avadavat	-	<i>Amandava amandava</i>	Estrildidae	LC
85.	Red Crested Pochard	-----	<i>Netta rufina</i>	Anatidae	LC
86.	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	Pycnonotidae	LC
87.	Red Wattled Lapping	-----	<i>Vanellus indicus</i>	Charadriidae	
88.	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	Psittaculidae	LC
89.	Rufous Tree Pie	-----	<i>Dendrocitta vagabunda</i>	Corvini	LC
90.	Scaly Breasted Munia	-----	<i>Lonchura punctulata</i>	Estrildidae	LC
91.	Shikra	Cheel	<i>Accipiter badius</i>	Accipitridae	LC
92.	Singing Bush Lark	-----	<i>Miraфра javanica</i>	Alaudidae	LC
93.	Singing Bush Lark	-	<i>Miraфра javanica</i>	Alaudidae	LC
94.	Sirkeer Malkoha	-----	<i>Taccocua leschenaultii</i>	Cuculidae	LC
95.	Small Minivet	-----	<i>Pericrocotus cinnamomeus</i>	Campephagidae	LC
96.	Spot Bill Duck	-----	<i>Anas poecilorhyncha</i>	Anatidae	LC
97.	Spotted Dave	-----	<i>Streptopelia chinensis suratensis</i>	Columbidae	LC
98.	Spotted Owl	Ullu	<i>Strix occidentalis</i>	Strigidae	NT
99.	Sulphur-Bellied Warbler	-----	<i>Phylloscopus griseolus</i>	Acrocephalidae	LC
100.	Thick Billed Flower Pecker	-----	<i>Dicaeum agile</i>	Dicaeidae	LC
101.	Verditer Flycatcher	-----	<i>Eumyias thalassinus</i>	Muscicapidae	LC
102.	Vernal Hanging Parrot	-----	<i>Loriculus vernalis</i>	Psittaculidae	LC
103.	White Throated Kingfisher	Kilkila	<i>Halcyon smyrnensis</i>	Alcedinidae	LC
104.	White-Rumped Munia	-----	<i>Lonchura striata</i>	Estrildidae	LC
105.	Yellow Wattled lapwing	-	<i>Vanellus malabaricus</i>	Charadriidae	LC
106.	Yellow-Footed Green Pigeon	Kabootar	<i>Treron phoenicoptera</i>	Columbidae	LC

**Extinct (EX)** – Beyond reasonable doubt that the species is no longer extant.

**Extinct in the wild (EW)** – Survives only in captivity, cultivation and/or outside native range, as presumed after exhaustive surveys.

**Critically endangered (CR)** – In a particularly and extremely critical state.

**Endangered (EN)** – Very high risk of extinction in the wild, meets any of criteria A to E for Endangered.

**Vulnerable (VU)** – Meets one of the 5 red list criteria and thus considered to be at high risk of unnatural (human-caused) extinction without further human intervention.

**Near threatened (NT)** – Close to being at high risk of extinction in the near future.

**Least concern (LC)** – Unlikely to become extinct in the near future.

**Data deficient (DD)**

**Not evaluated (NE)**

Biodiversity is under threat worldwide and birds are the prime victim of the declining trend of biodiversity. It was observed that many of the birds recorded in OCP Chhal are enlisted in the threatened categories of IUCN as well as in the schedules of wild life (Protection) Act, 1972.

The conservation status of birds according to IUCN, and the wildlife (Protection) Act, 1972, along with their local status is presented in the table.

During field visit, total 106 bird species have been found in which 99 bird species are Least Concerned (LC), 3 birds species are Vulnerable (VU) and 4 bird species are Near threatened as per IUCN list (Table no-5.6).

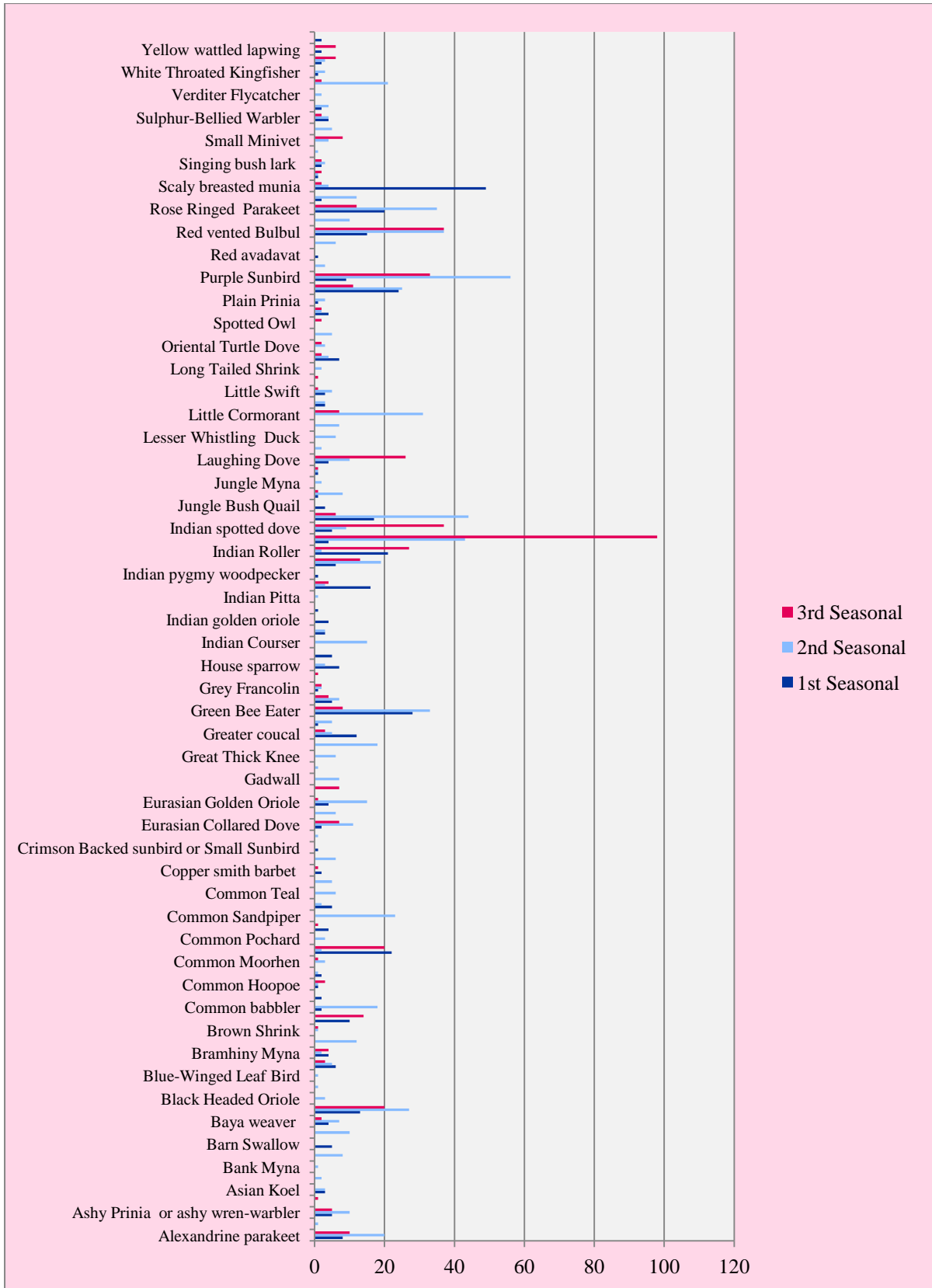
**Table No. 5.7 Checklist of total no. of birds species at present in OCP Chhal**

S.No.	Common Name	Number of birds			Total
		1 <sup>st</sup> Seasonal	2 <sup>nd</sup> Seasonal	3 <sup>rd</sup> Seasonal	
1	Alexandrine Parakeet	8	7	7	22
2	Ashy Drongo	-	1		1
3	Ashy Prinia or ashly wren-warbler	5	10	5	20
4	Asian Brown Flycatcher	-	-	1	1
5	Asian Koel	3	3	-	6
6	Asian Paradise Flycatcher	-	2	1	3
7	Bank Myna	-	1	-	1
8	Bar Headed Goose	-	8	-	8
9	Barn Swallow	5	-	-	5
10	Barn Swallow	-	10	-	10
11	Baya Weaver	4	7	4	15
12	Black Drongo	13	27	20	60

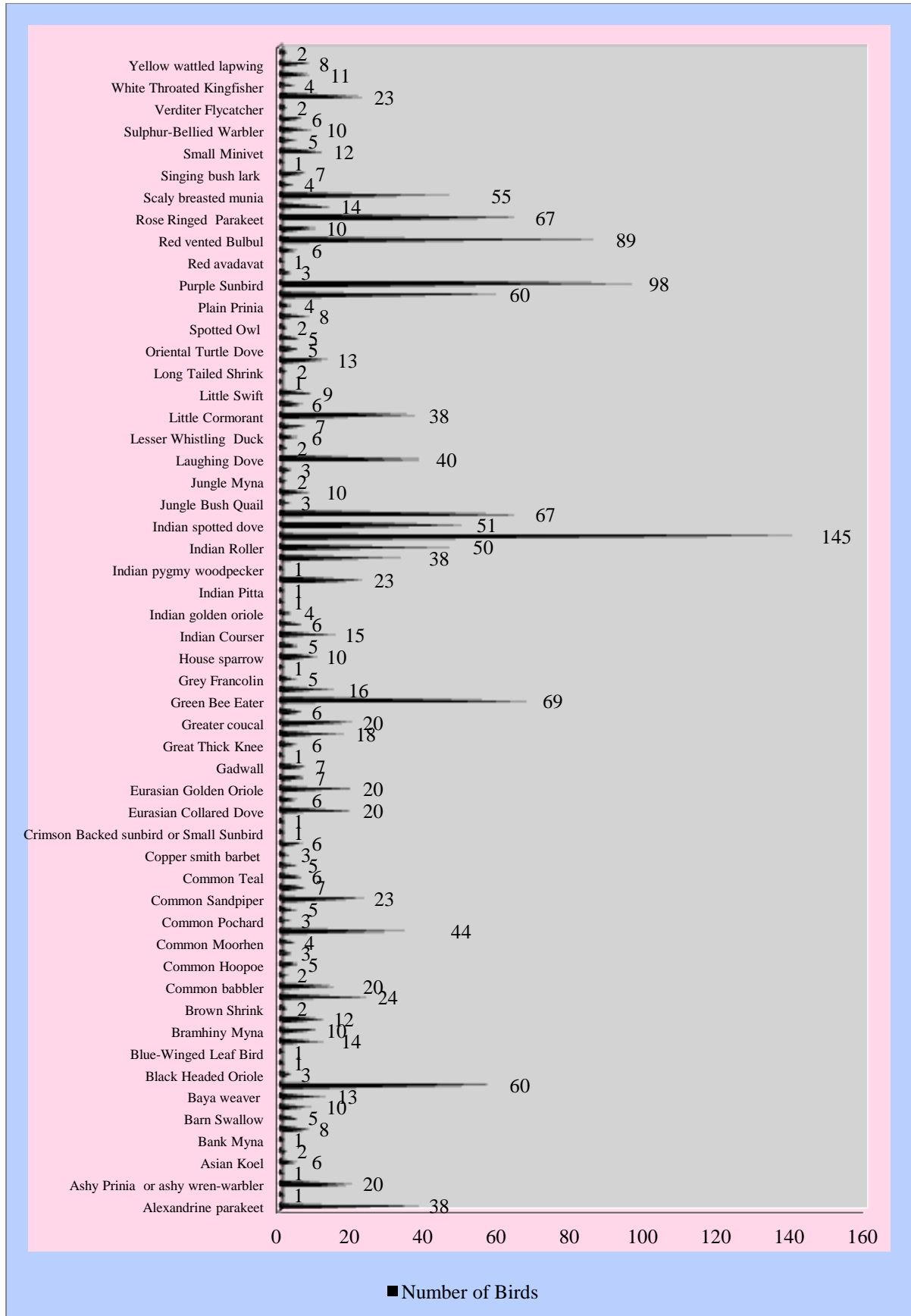
13	Black Headed Oriole	-	3	-	3
14	Black Redstart	-	1	-	1
15	Blue-Winged Leaf Bird	-	1	-	1
16	Blyth Reed Warbler	6	5	3	14
17	Bramhiny Myna	4	2	6	12
18	Bronze-Winged Jacana	-	12	-	12
19	Brown Shrink	-	1	1	2
20	Cattle Egret	10	-	0	10
21	Common Babbler	2	24	-	26
22	Common Hawk Eagle	2	-	-	2
23	Common Hoopoe	1	1	4	6
24	Common Kingfisher	2	1	-	3
25	Common Moorhen		3	1	4
26	Common Myna	22	4	20	46
27	Common Pochard	-	3	-	3
28	Common Quail	4	-	2	6
29	Common Sandpiper	-	23	-	23
30	Common Tailor Bird	5	2	-	7
31	Common Teal	-	6	-	6
32	Copper Smith Barbet	-	5		5
33	Copper Smith Barbet	2	-	1	3
34	Cotton Teal	-	6	-	6
35	Crimson Backed Sunbird or Small Sunbird	1	-	-	1
36	Eagle Owl	-	1	-	1
37	Eurasian Collared Dove	2	11	7	20
38	Eurasian Coot	-	6	-	6
39	Eurasian Golden Oriole	4	15	1	20
40	Feral Pigeon	-	-	7	7
41	Gadwall	-	7	-	7
42	Grater Spotted Eagle	-	1	-	1
43	Great Thick Knee	-	6	-	6
44	Greater Cormorant	-	18	-	18
45	Greater Coucal	12	5	3	20
46	Greater Flame Back Woodpecker	1	5	-	6
47	Green Bee Eater	28	33	8	69
48	Greenish Warbler	5	7	4	16
49	Grey Francolin	1	2	2	5
50	House Crow	-	-	1	1
51	House Sparrow	7	3	-	10
52	Indian Barn Owl	5	-	-	5
53	Indian Courser	-	15	-	15
54	Indian Cuckoo	3	3	-	6

55	Indian Golden Oriole	4	-	-	4
56	Indian Nuthatch	1	-	-	1
57	Indian Pitta	-	1	-	1
58	Indian Pond Heron	16	3	4	23
59	Indian Pygmy Woodpecker	1	-	-	1
60	Indian Robin	6	19	13	38
61	Indian Roller	21	2	26	49
62	Indian Silver Bill	4	43	98	145
63	Indian Spotted Dove	5	9	10	24
64	Jungle Babbler	17	44	28	89
65	Jungle Bush Quail	3	-	-	3
66	Jungle Crow	1	8	1	10
67	Jungle Myna	-	2	-	2
68	Jungle Prinia	1	1	1	3
69	Laughing Dove	4	10	26	40
70	Lesser Flame Back	-	2	-	2
71	Lesser Whistling Duck	-	6	-	6
72	Little Bittern	-	7	-	7
73	Little Cormorant	-	31	7	38
74	Little Egret	3	3	14	20
75	Little Swift	3	5	1	9
76	Long Tailed Minivet	-	-	1	1
77	Long Tailed Shrike	-	2	1	3
78	Oriental Magpie Robin	7	4	2	13
79	Oriental Turtle Dove	-	3	2	5
80	Oriental White Eye	-	5	-	5
81	Spotted Owl	-	-	2	2
82	Paddy Field Pipit	4	2	2	8
83	Plain Prinia	1	3	-	4
84	Plum Headed parakeet	24	25	11	60
85	Purple Sunbird	9	56	33	98
86	Rain Quail	-	3	-	3
87	Red avadavat	1	-	-	1
88	Red Crested Pochard	-	6	-	6
89	Red vented Bulbul	15	37	37	89
90	Red Wattled Lapping	-	10	-	10
91	Rose Ringed Parakeet	20	35	22	77
92	Rufous Tree Pie	2	12	-	14
93	Scaly Breasted Munia	49	4	2	55
94	Shikra	1	1	1	3
95	Singing Bush Lark	2	3	2	7
96	Sirkeer Malkoha	-	1	-	1
97	Small Minivet	-	4	4	8
	Spotted Owl			2	2

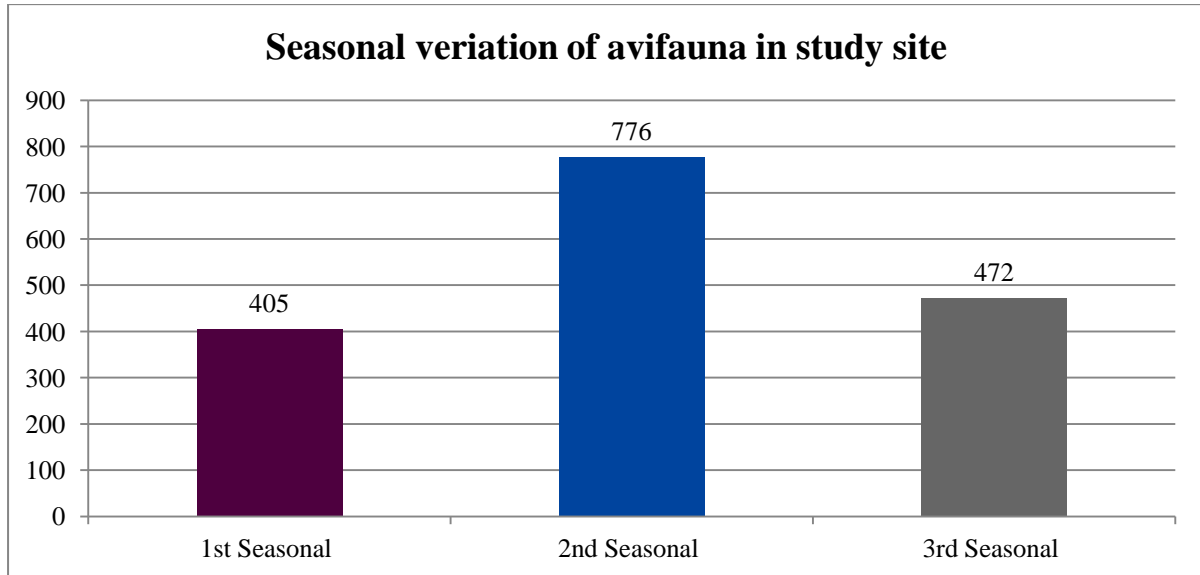
<b>98</b>	Spot Bill Duck	-	<b>5</b>	-	<b>5</b>
<b>99</b>	Sulphur-Bellied Warbler	<b>4</b>	<b>4</b>	<b>2</b>	<b>10</b>
<b>100</b>	Thick Billed Flower pecker	<b>2</b>	<b>4</b>	-	<b>6</b>
<b>101</b>	Verditer Flycatcher	-	<b>2</b>	-	<b>2</b>
<b>102</b>	Vernal Hanging Parrot	-	<b>21</b>	<b>2</b>	<b>23</b>
<b>103</b>	White Throated Kingfisher	<b>1</b>	<b>3</b>		<b>4</b>
<b>104</b>	White-Rumped Munia	<b>2</b>	<b>3</b>	<b>6</b>	<b>11</b>
<b>105</b>	Yellow Wattled Lapwing	<b>2</b>	-	<b>6</b>	<b>8</b>
<b>106</b>	Yellow-Footed Green Pigeon	<b>2</b>	-	-	<b>2</b>
<b>Total</b>		<b>405</b>	<b>776</b>	<b>472</b>	<b>1653</b>



Graph 5.5: Seasonal variation of individual birds species



Graph: 5.6 Species variation of avifauna



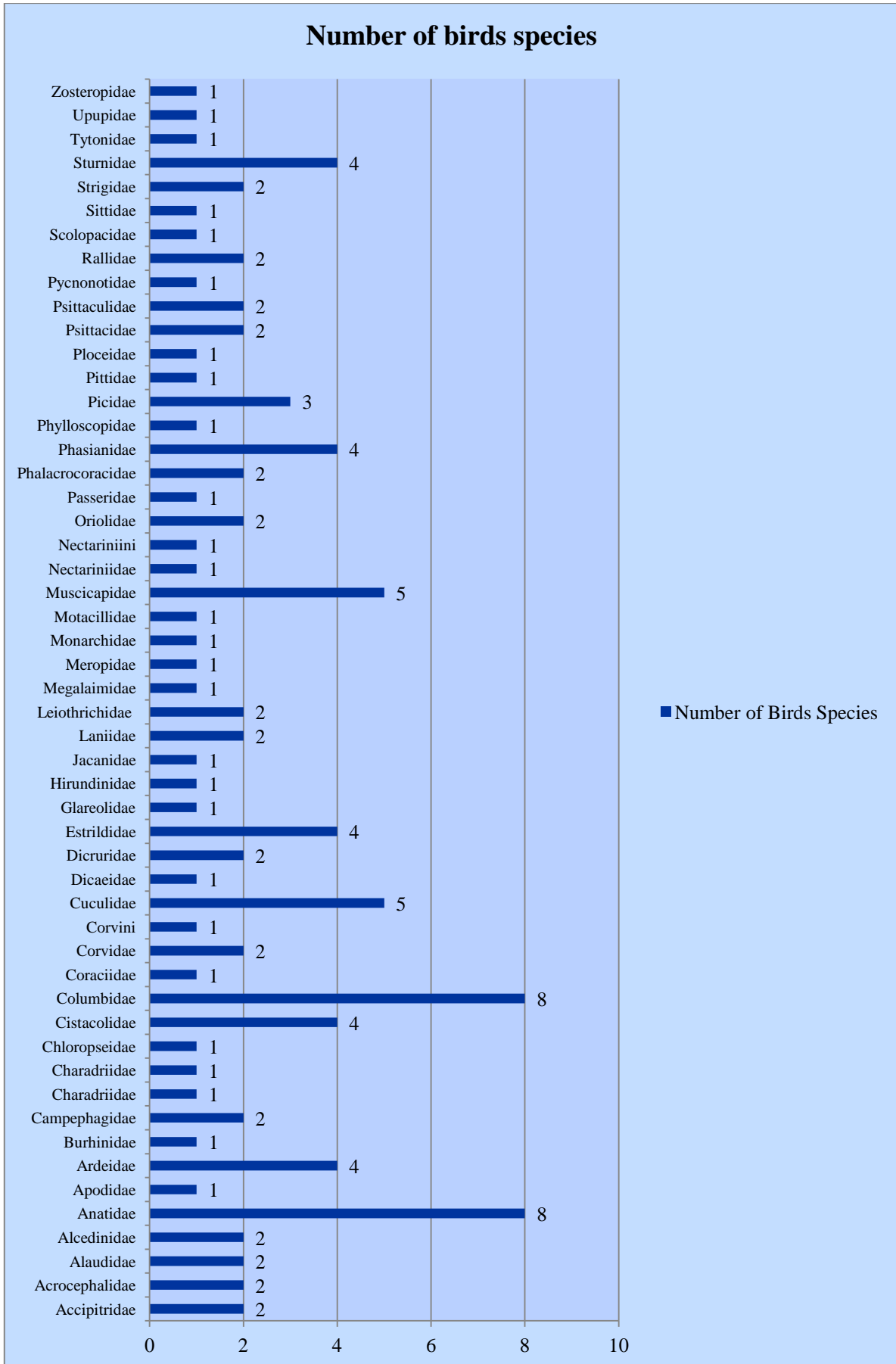
**Graph: 5.7 Seasonal variations of avifauna in study site**

**Table No. 5.8 Checklist of birds' species according to their family**

S.No.	Family name	Number of birds species
1	Accipitridae	2
2	Acrocephalidae	2
3	Alaudidae	2
4	Alcedinidae	2
5	Anatidae	8
6	Apodidae	1
7	Ardeidae	4
8	Burhinidae	1
9	Campephagidae	2
10	Charadriidae	1
11	Charadriidae	1
12	Chloropseidae	1
13	Cistacolidae	4
14	Columbidae	8
15	Coraciidae	1
16	Corvidae	2
17	Corvini	1
18	Cuculidae	5
19	Dicaeidae	1
20	Dicruridae	2
21	Estrildidae	4
22	Glareolidae	1
23	Hirundinidae	1
24	Jacaniidae	1
25	Laniidae	2
26	Leiothrichidae	2
27	Megalaimidae	1
28	Meropidae	1



29	Monarchidae	1
30	Motacillidae	1
31	Muscicapidae	5
32	Nectariniidae	1
33	Nectariniini	1
34	Oriolidae	2
35	Passeridae	1
36	Phalacrocoracidae	2
37	Phasianidae	4
38	Phylloscopidae	1
39	Picidae	3
40	Pittidae	1
41	Ploceidae	1
42	Psittacidae	2
43	Psittaculidae	2
44	Pycnonotidae	1
45	Rallidae	2
46	Scolopacidae	1
47	Sittidae	1
48	Strigidae	2
49	Sturnidae	4
50	Tytonidae	1
51	Upupidae	1
52	Zosteropidae	1



Graph: No. 5.8 Checklist of birds species according to their family

### 5.3 Discussion

During field visit, the area of Compartment number 477 (core zone) and 478 (buffer zone) have been surveyed in which total 26 transects were made to study the existing avifauna of the area and their habitat including wildlife and existing flora.

After three seasonal surveys, total 1653 individual species of avifauna were recorded from 106 different species belong to 32 families. (Table no.5.7 and graph 5.5).

According to three seasonal surveys, the avifauna populations have been recorded which are as; Summer season survey, total 405 individuals of 61 avifauna species; Winter season survey, total 776 individuals of 89 avifauna species; and in Autumn season survey, 472 individuals of 50 avifauna species were recorded.

It has been found that there are certain species of birds in the study area that have been classified under different threat categories by the IUCN status. Of these, *Clanga clanga*, *Streptopelia turtur* and *Aythya farina* was placed in the Vulnerable (VU) category, *Strix occidentalis*, *Esacus recurvirostris*, *Chloropsis cochinchinensis*, *Psittacula eupatria* were placed in the Near Threatened category and all the remaining species (n = 99) are placed in the Least concern category (Table no. 5.6)

Apart from the above survey technique, the study of working plan report of Raigarh - Dharamjaigarh Forest Division have been done in which total 86 tree species and 121 species of birds have been mentioned. Chhal Ranges under Dharamjaigarh Forest Division have been found dense forest with Sal dominated forest. During the field survey, most of the bird nests were found in Sal species followed by Char then Mahua and Saja. In each interval, observation of birds and its counting, vegetation study, dominating tree species, birds nest & its pattern were documented in this report.

The impact of noise, air and land disturbance on the study site, affecting the diversity of bird population can be understood as follows. It was observed

that the bird diversity of the core area is lesser than that of the buffer area. It was also observed that major disturbances produced by sound and noise pollution in the core area, which affect bird diversity, are caused due to blasting, vehicle movement and anthropogenic pressure. Other disturbances observed are caused due to air pollution by mining dust, and habitat degradation due to tree felling and ground digging. The above problems of noise and air pollution are directly related to mining activities and decreasing of forests, which destroy the habitat of avifauna. Buffer area is rich with agriculture land and forestland, which may provide suitable habitat for birds, and they may settle down there (*Vishwakarma, et. al 2018*).

It was also observed that vegetation cover and avifauna population were mainly occupying the buffer areas. This observation shows that the avifaunal population presence in thicker vegetative covered areas is more than the lesser ones. The direct impacts on the living organisms of the mining area include death of plants and animals due to mining activity or contact with toxic wastes and mine drainages, disturbance of wildlife habitat due to blasting and heavy machines. Indirect impacts may include changes in nutrient cycling, disruption of food chain and instability of ecosystem (*Gayatri et al 2010*). Therefore, it is accepted that biodiversity of flora and fauna needs essential amount of fresh atmosphere which is necessary for life.

Although grassland and scrub-species birds benefit from the early successive habitat development from post mining reclamation, forest-dwelling birds are adversely affected by land use change from forest to grassland, regardless of the origin of the changes. Concern has been expressed related to habitat loss for cerulean warblers in the Appalachian Mountains associated with deforestation from coal mining. (*Buechler et, al.2006, wood et al.2006, Bulluck 2007*),

Similar observations have been found in the study area, the diversity of birds, and in particular the native species, is positively correlated with increasing structural complexity of the vegetation. Also a seasonal change in

species diversity of birds occurs in forests due to their foraging behaviour (*Robertson and Hack well 1995*).

Forests attract a large number of avifauna because they provide suitable habitat for most birds, especially those birds that are associated with vegetation, and for most, the existence of tree is a vital component of their life cycle. The bird's level of interest on various forests depends on the age of the stands. The composition of bird species is highly related to the vegetation structure of forests (*Robertson and Hack well 1995*).

Accordingly, the alternative habitat development is proposed in the buffer zone for the conservation of avifauna. For better conservation measures artificial nesting trail is proposed for avifauna as per their habit, habitat, and behaviour and nesting pattern. The artificial nesting pattern and their designs are explained in the chapter 7.

The current status of avifauna as per their nesting pattern are categorized in eight parts which are Scrape nesting birds, Burrow nesting birds, Cavity nesting birds, Cup shaped nesting birds, Saucer/Plate form nesting birds, Platform nesting birds, Pendent nesting birds, Sphere shaped nesting birds found in the core zone of OCP Chhal. The data shows that the rich avifaunal diversity of OCP Chhal is good and alternative habitat is needed.

It is also observed that the vast majority of this studies conducted on wild life response have focused on birds and wildlife in part because birds are easily monitored using various count based survey. The effects of mining on avian communities occur initially by the removal of vegetation in preparation for mining. If the site is forested, vegetation removal occurs through timber harvest or clearing. Although few studies have been done specifically evaluate the changes associated with mine sites from pre-mining to post-mining land uses. (*Sallabanks et al. 2000.*)

This study also signifies that the seasonal variations in bird population were mostly found in winter season comparison to summer season and autumn seasons. The bird diversity is impacted by climate condition (Temperature)

*Waterhouse and Trapani, 2002*) According to *parsesan (2005)*, Weather conditions determine bird diversity by the spatial temporal shift of the species from one habitat to the other, seeking favourable condition. The highest diversity is in the forest due to the availability of food, water, breeding sites, breeding material and cover from predators. (*Hobson et al.2003*).

Therefore, the above discussion part shows the problems occurred in bird diversity and their habitat which were directly or indirectly affected from air, noise and land disturbance from mining activities. The whole reasonable parts should be solved from proper conservational practices attempted regarding biodiversity conservation of flora and fauna.

## CHAPTER 6

### RECOMMENDATIONS AND WILDLIFE CONSERVATION PLAN

#### 6.1 RECOMMENDATIONS

1. Green belts should be developed around the mining boundary, along the roads, lease periphery, benches and backfilled areas. The impact on the biological environment due to amount of dust generation is minimized by well-developed green belt in and around mining lease area.
2. The wastage coal dust particles in the dumping site of coal mine's should be managed properly to reduce air pollution and loss of avifaunal diversity & habitats.
3. Biological reclamation should be done to transform the degraded land and waste dump into a self - sustaining ecologically stable land form. Re-vegetation of waste dump is recommended to the slope stability, enhances the infiltration of rain water to increases the soil fertility.
4. Top soil management is needed to maintain the top soil stockpile to retain fertility. Excavated top soil can be dumped for future use such as meadow development and plantation purpose in order to further mitigation for habitat conservation of avifauna.
5. Fruit bearing and feeder tree species that are prefer by the birds available in the area, to be needed to plant in the buffer zone for plantation of avifauna conservation. Some of the tree species to be planted are: Sal (*Shorea robusta*), Char (*Buchanania lanzan*), Mahua (*Madhuca indica*), Pipal (*Ficus religiosa*), Bargad (*Ficus benghalensis*), Bhelwa (*Semecarpus anacardiam*), Gular (*Ficus glomerata*), Senha (*Lagerstoemia parviflora*), Mango (*Mangifera indica*), Baheda (*Terminalia bellerica*), Harra (*Terminalia chebula*), Tendu (*Diospyros melanoxylon*), Dhawda (*Anogeissus latifolia*) and Amaltas (*Cassia fistula*) etc.
6. Multiple water storage facilities are to be developed in the buffer boundaries to assure the water availability throughout the year. The existing ponds, river, dam and canals water resources recharge should be maintained.

7. The mining in the buffer zone along the river bank of Mand River must be avoided to insure of the river changing the path.
8. The social awareness program should be conducted among the local communities and villagers to provide information & awareness about birds and wild life their contribution in ecosystem and environment.
9. Artificial nest made up of local, light and fine wood materials. Nests will be prepared with the help of active JFM Committee and local forest staff and placed in the buffer area for the affected avifauna of core zone.
10. Assisted natural regeneration (ANR) should be done for the regeneration and reclamation, protection and preservation of natural tree seedlings in forest areas.
11. Best practices from forest department should be implemented for the prevention of forest fire.
12. Plantation and conservation efforts should be monitor regularly during various growth stages of site.
13. Establishment of artificial avifauna habitat “*Pakshi Vihar*” on dumping site.



## **6.2 CONSERVATION PLAN**

### **6.2.1 Plantation**

Plantation of the disturbed area will be undertaken simultaneously following mining. Plantation over undisturbed area including green belt will be carried out of the first five year itself. To reduce the impact of air pollution towards the habitation, forest, road etc, it has been proposed to create and maintain a green belt around the mine.

### **6.2.2 Green belt development**

A green belt of 7.5 m width will be proposed to be developed around the mining lease area. The green belt will consist mainly of the trees but will have shrubs, herbs and climbers also. The green belt vegetation, with respect to pollution, performs dual function:

1. Absorb some of the gaseous pollutants,
2. Prevent the escape of dust and noise.

So it is necessary to develop a greenbelt in and around the pollutant site with suitable, local species to combat the air pollution, effectively. The green belt function also as amalgamating the physical structures of the mines with surrounding environment greenbelt is developed primarily to absorb and to check the escape of pollutants. Although only local species will be used but the green belt may not have any relevance to biodiversity.

### **6.2.3 Plantation in the green belt**

Green belt plantation will be started with the start of the mining will be completed within the five years. Plant species will be selected with in following criteria thus tolerance to dust pollutions, evergreen trees, shad bearer fleshy leaf tree species shrubs and some herbs species combination will be planted in green belt area, Local source variety of plant species will be selected.

**List of recommended species for plantation**

S.No	Common Name	Tree (T)	Botanical Name
1.	Sal	T	<i>Shorea robusta</i>
2.	Pipal	T	<i>Ficus religiosa</i>
3.	Mahua	T	<i>Madhuca latifolia</i>
4.	Jamun	T	<i>Syzygium cumini</i>
5.	Tendu	T	<i>Diospyros melanxylon</i>
6.	Saja	T	<i>Terminalia tomentosa</i>
7.	Arjun	T	<i>Terminalia arjuna</i>
8.	Achar/Char	T	<i>Buchanania lanzan</i>
9.	Aonla	T	<i>Emblica officinatis</i>
10.	Kusum	T	<i>Schleichera oleosa</i>
11.	Khair	T	<i>Acacia catechu</i>
12.	Gular	T	<i>Ficus glomerata</i>
13.	Baheda	T	<i>Terminalia bellerica</i>
14.	Bhilwa	T	<i>Semecarpus anacardium</i>
15.	Harra	T	<i>Terminalia chebula</i>

**Shrubs (Sh) and Herbs (H)**

S.No	Common Name	Shrubs (Sh)/Herbs (H)	Botanical Name
1.	Dudhi	Sh.	<i>Wrightia tinctoria</i>
2.	Lantana	Sh.	<i>Lantana camara</i>
3.	Kaner	Sh.	<i>Nerium odoratum</i>
4.	Bhatkateya	H	<i>Solanum trilobatum</i>
5.	Chhind	Sh	<i>Phoenix acaulis</i>
6.	Kathjamun	Sh.	<i>Eugenia heyneana</i>
7.	Chhoti Lajwanti	H	<i>Hemigraphis indica</i>
8.	Katma, Amti	Sh.	<i>Antidesma ghaesembilla</i>
9.	Khirmi	Sh.	<i>Mimusops hexandra</i>
10.	Charota	H	<i>Cassia tora</i>
11.	Phetoa	Sh.	<i>Gardenia turgid</i>
12.	Marodphal	Sh.	<i>Helicteres isora</i>
13.	Gokhuru (bada)	H	<i>Acanthospermum hirsutum</i>

**Bamboo and grasses**

S.No	Common Name	Botanical Name
1	Bans Bamboo	<i>Dendrocalamus strictus</i>
2	Bhurbhusi Grass	<i>Eragostis tenella</i>
3	Doob ghas Dag grass	<i>Cynodon dactylon</i>
4	Kans Dag grass	<i>Saccharum spontaneum</i>
5	Phulbahari Dag grass	<i>Arundinella setosa</i>
6	Sukla	<i>Heteropogon contortus</i>
7	Kanta bahari Dag grass	<i>Aristida setacea</i>
8	Kanta bahiri	<i>Aristida adscensionis</i>
9	Ghas	<i>Eleusine indica</i>

10	Ghas	<i>Eragrostiell sp.</i>
11	Ghas	<i>Bothriochloa pertusa</i>
12	Ghas	<i>Themeda quadrivalvis</i>
13	Ghas	<i>Iselema laxum</i>

#### 6.2.4 Over burden dump management

The overburden soil will be first be dumped, temporarily and then later on it will be used for filling the void. The overburden consists of two type of soil

- ❖ The top lower soil about 0.5 meter average thickness. It is rich in nutrient and suitable for plant growth, and
- ❖ The lower soil, which in true sense is not a soil but is earth, because in this soil organic matter is totally absent and is generally poor in nutrients required for plant growth.
- ❖ These two types of soil will be dumped separately. After dumping the soil for 2-3 years the top soil, dumped separately, will then be used as the top layer over the lower soil.

#### 6.2.5 Backfill dump

Backfill dump will start from 3<sup>rd</sup> year. Backfill will continue till this quarry is completely worked out. For backfilling and reclamation, part of the waste will be available. Part of the OB waste will have to be dumped in outside dump.

#### 6.2.6 Top soil dump

The total top soil generated during the life of mine will be stacked separately in a soil stock pile. It will be used for growing plant along the fingers of the site roads and reclamation of external dump and back filled area. The top soil stockpile will be of low height not exceeding 6m and will be grassed to retain fertility.

#### 6.2.7 Reclamation of backfill area

The soil used for backfilling will be a better soil than the original soil because during dumping some leaf litter will be added to it and some grasses will be promoted to grow on it through seed sowing.

## 1. Bio-Reclamation

Biological reclamation will be done to transform the degraded land and waste dump into a self - sustaining ecologically stable land form. This will prevent soil erosion, dust pollution and will create aesthetic beauty. Re-vegetation of waste dump through systematic means, increases the slope stability, enhances the infiltration of rain water and its availability, increases the soil fertility and promotes natural regeneration of native plant species.

## 2. Species selection for reclamation of the area

Successful bio-reclamation would largely depend on the selection of appropriate species for re-vegetation. While selecting plant species following parameters will be considered.

- Local and native to the soil
- Nitrogen fixing leguminous species will form at least 30% of the total plantation.
- Shrubs, herbs and grasses to check soil erosion and development of fertile soil.

Apart from above top Soil management will be done to ensure the inoculation of Microorganism, seed, organic matter etc.

## 3. Tree plantation

Criteria for the selection of plants:

**Plant species selected for plantation in the backfilled, overburden soil should possess any or more of the following properties.**

- a. Have soil binding property.
- b. Be a nitrogen fixer.
- c. Be able to tolerate, at least to some extent, the crack formation in the soil.
- d. Have drought tolerance ability.
- e. Be able to grow in a slope.
- f. Be able to grow in nutrient and organic matter poor soil.
- g. Be a local species.

**Plantation of trees will be done at the rate of 1000 seedlings per ha of the area.**

Plantation of the overburden soil will be taken up in two phases.

### **Plantation in the buffer zone**

Trees will be planted in the buffer zone as well. This plantation will be done at selected places only and only local species will be used in the plantation. Some of the tree species included will be: Mahua (*Madhuca latifolia*), Sal (*Shorea robusta*), Bargad (*Ficus benghalensis*), Peepal (*Ficus religiosa*), Dhawda (*Anogeissus latifolia*), Tendu (*Diospyros melanoxylon*), Char (*Buchanania lanzan*), Khair (*Acacia catechu*), Aonla (*Phyllanthus emblica*), Arjun (*Terminalia arjuna*), Saja (*Terminalia tomentosa*), Baheda (*Terminalia bellerica*) etc.

- Care will be taken to include some fruit bearing trees like Gular (*Ficus glomerata*), Char (*Buchanania lanzan*), Aonla (*Phyllanthus emblica*) Aam (*Mangifera indica*) and such trees to provide food to the herbivores which in turn will be the food source of the carnivores.
- Water, particularly during drier seasons, becomes the most important factor to all types of wild animals including the mammals, birds and reptiles. If water is available safely, then all other factors become secondary for the presence and survival of the wild life in any forested area.
- Places suitable for mini watersheds will be identified in the core as well as in the buffer zone to store rainwater. Further, to make water available at all the times, throughout the year, some of these water holes will be recharged through artificial means. Proper slope will be given to approach these water sources so that the wild animals will be able to drink water without any difficulty.
- Proper cover through vegetation or any other type of even artificial cover will be developed near to these water sources so that the prey species will be able to hide themselves from the predators, at the time of approaching the water sources.

- To attract the birds, plants yielding food to the birds will be planted on priority basis. If water and food are available to the birds without any anthropogenic disturbances the area can become an ideal place for bird watching.
- Execution of the above works is proposed to be taken by the forest department of Chhattisgarh financed by the company.

The different species that have history of good survival and growth under similar site conditions shall be planted. The suggested species for plantation are given below:

#### **Fruit bearing trees**

- Jamun
- Mango
- Imli
- Sitaphal
- Bel
- Char
- Tendu
- Gular
- Bargad etc.

#### **Medicinal trees**

- Neem
- Karanj
- Harra
- Behara
- Aonla
- Arjun
- Shikakai
- Mahua etc.

#### **Timber value trees**

- Teak
- Shivan
- Ghamar
- Sisham
- Safed Sirus
- Bamboo
- Sal
- Bija etc.

#### **Ornamental trees**

- Amaltas
- Gulmohar
- Kapok etc.

### 6.3 CONSERVATION PLAN FOR FAUNA

Several reasons for the decline of wildlife and methods for their conservation are practiced. 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 degree of protection afforded 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:

- ❖ Habitat fragmentation and destruction
- ❖ Man-animal conflict
- ❖ Forest fire
- ❖ Poaching
- ❖ Stake holders dependence on forest resources
- ❖ Creating awareness amongst forest stake holders
- ❖ Water scarcity

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

#### 6.3.1 Habitat improvement

Some of the common trees to be planted for habitat improvement will include: *Terminalia tomentosa*, *Anogeissus latifolia*, *Madhuca latifolia*, *Buchanania lanzan*. Together with these some fruit yielding species should also be planted e.g. Mango, Tendu and Gular etc. *Ficus benghalensis* is also encountered in the forests but with a very low frequency, but is a flagship species and should be planted with similar frequency. To this it is important to add the plantation of aonla, which has almost disappeared from the area. The area vegetated with the local species will provide natural environment, food and shelter to the wild life attracting them more to the

area. Some hideouts, suitable to different wildlife species, should also be created at suitable places.

### **6.3.2 Elimination of Man-animal conflict**

Man-animal conflict is a difficult problem to be eliminated. The conflict is both deliberate as well as inadvertent. However, conflict can be minimized through employing local persons to form anti-depredation team. The conflict can be minimized also through protecting the area, preventing the entry of human beings or the cattle in the area. First aid facilities should be provided in the villages to meet exigencies in case of any conflict.

### **6.3.3 Prevention of forest fire**

Forest fire is caused both naturally as well as by the human beings. Anthropogenic causes will be minimized through forming a fire line around the forest area. To add to the 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.

### **6.3.4 Prevention of poaching**

Poaching is undoubtedly a serious problem in the conservation of wild life. 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. 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 in to waste.

### **6.3.5 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 programmers will be run with the help of Forest Officers and more importantly some national experts will be invited to deliver talk's awareness, related to wildlife conservation.

### **6.3.6 Water availability**

Rainfall in the area is about 1300 mm, sufficiently to be categorized as a wet area. However, due to lack of proper storage, severe water scarcity develops during the summer months. To make the water available throughout the year it is essential to create water storage facility. Multiple water storage places will be created in the Buffer zone through improving the existing ponds, constructing stop dams in the water channels and through creating water holes. Also, camouflage and hiding places should be created. Some wildlife species fulfill their salt requirement through licking the soil. Salt deposits will be arranged for such species adjacent to the water holes. These water holes will also be helpful in recharging the ground water and thus will be supporting good growth of the vegetation.

### **6.3.7 Restriction of grazing and creation of waterholes**

Waterholes will be constructed outside the plain area for exclusive use of wildlife. This will reduce direct conflict between the wild animals and cattle. Patrolling 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 *Lantana camara*, *Hyptis suaveolens*, *Plectranthus incanus*, and *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.

### **6.3.8 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.

### **6.3.9 Encourage local villagers to grow trees on their own on field bunds/court yards etc.**

In consultation with Forest Department the company will provide some finance, to grow saplings of tree species, having importance for wood, small timber and fuel wood to distribute to the villagers. Bamboo will be another important species with a lot of environmental and economic value. This will, no doubt, will help reduce dependence of people on RF forest; as a result the ecological condition of the area will improve so the wild life will be attracted to this area.

### **6.3.10 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 corer 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.

## 6.4 CONSERVATION PLAN FOR AVIFAUNA

India is rich in Biodiversity with two global Hotspots. The avifauna of India includes around 1301 species, (Clements & James, 2000). Birds are the indicators of the health of an ecosystem as they indicate its needs and diversity. However, detailed study, exclusively on birds of Raigarh district has been carried out. According to working plan, Raigarh forest Division shows diversity of habitat like barren, woodland, shrub land, agricultural and grassland etc. This diversity of topography and habitat offers suitable environment and opportunities for the bird population for breeding, feeding, resting and nesting. Beside this, some of natural habitats of avifauna were disturbed by mining of coal production expansion. From growth of mining, the natural habitat of birds are getting affected which results decreased population of avifauna in other manner. To conserve affected avifauna, it is most important to conserve the species of birds and their habitat.

The avifauna conservation plan should be planned in such a manner that habitat, water and food availability were naturally surrounded in newest location. The conservation plan for avifauna is detailed as below:

### 6.4.1 MAJOR STRUCTURES FOR ALTERNATE HABITAT DEVELOPMENT

Species diversity has often been the prime attribute in conservation strategies. Sites have been evaluated merely by the number of species they contain (Ranjit.R.J, Daniels; A landscape approach to conservation of birds). The major structures for alternate habitat development of avifauna conservation should be focused on food, water and shelter availability. The conservation plan consist the food, water and shelter availability considered with scientific recommendations. The avifauna conservation plan is based majorly on availability of following points:

- (i) Food availability**
- (ii) Water availability**
- (iii) Shelter availability**

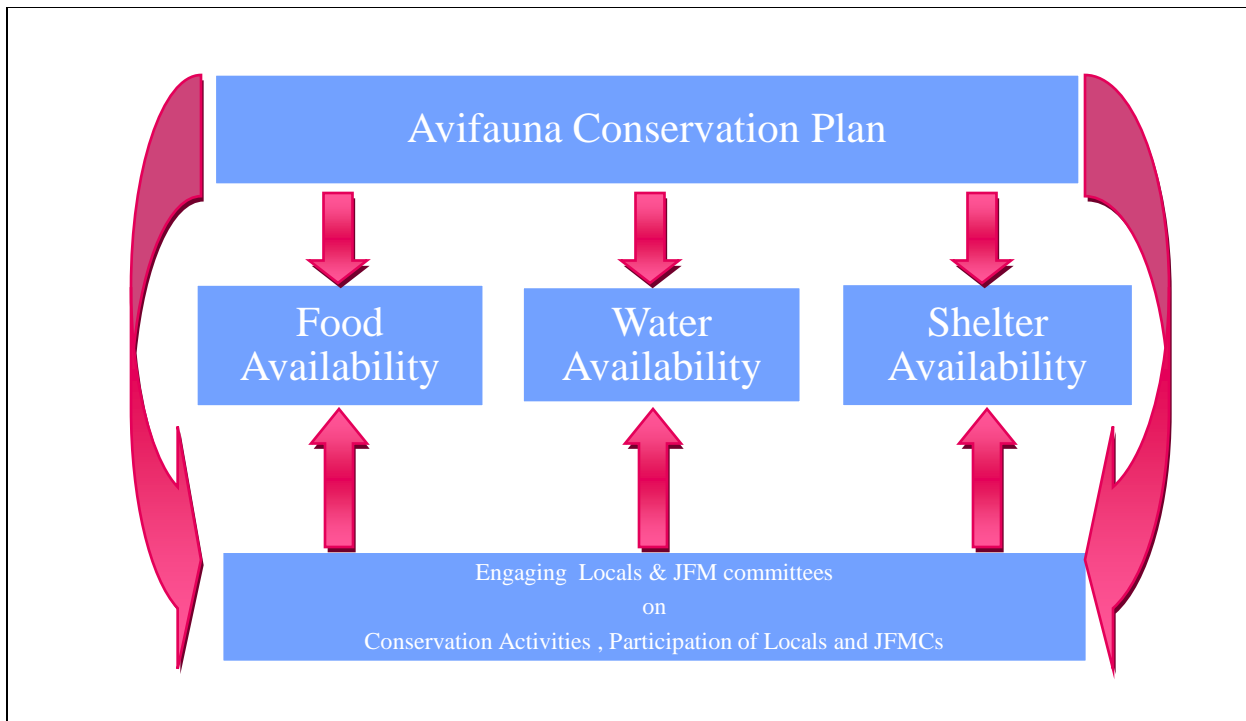


Figure 6.1: Conceptual model for improving Avifauna Conservation Plan.

### (I) Food availability

For every living creature, food is important need to survive and to live. In line with previous studies in pied flycatchers (Verhulst 1994; Siikamäki 1998), our food supplementation was successful at increasing nestling survival until fledging. In supplemented nests, the effect of breeding density on adult body mass and fledging probability was cancelled out. The decrease in provisioning rate with increasing density in control nests, independently of dispersal status, also disappeared in supplemented nests, mainly because of an increase in provisioning rate in high-density habitats. Food availability thus played a role in mediating the density-dependence of these traits and in particular the differences between dispersing and philopatric individuals in patterns of density-dependence on adult body mass and fledging probability, although the last result remains to be confirmed with more statistical power.

(a) **Bird feeder:** Bird feeders are artificial structures for feeding birds in proper medium. The structure is made such a manner that a hollow container for foods, seeds

etc and consist of holes through which grains or seeds were feed by birds. Bird feeders are available in different models such as crop feeders, seed feeders etc. These feeders can also be constructed by wood logs or bamboos. This structure can be made by local peoples by proper instructions and demonstration.

**(b) Plantation of fruit tree species:** To promote people for planting fruit yielding tree species such as jamun, ficus spps, anjeer etc.

**(c) Encouraging locals for cereal crop cultivation:** Promoting locals for cultivation of crops like bajra, kodo, kutki, tilhan etc. They are also encouraged for growing green vegetables like bitter ground (kheera), green vegetables etc.

## **(II) Water availability**

**(a) Selecting habitat in water available location:** The Annual Rainfall in Raigarh district is about 1300 mm and is sufficient to be categorized as a wet area. However, selection of alternate habitat in buffer zone for nest placement will be chosen nearby the natural water bodies like naala, ponds or rivers. Due to lack of proper storage, severe water scarcity develops during the summer months.

**(b) Construction of water structures:** Secondly, to make the water available throughout the year it is essential to create water storage facility. Multiple water storage places will be created in the Buffer zone through improving the existing ponds, constructing stop dams in the water channels and through creating water holes. Moreover, permanent water sources are important to foster bird diversity (Tilghman 1987; Jokimäki 1992).

**(c) Mud pot or ‘Sapore’ made by locals:** The next structure is ‘mud pot’ or ‘sakore’ which is also effective model for conservation of avifauna for the purpose of water and food storage. The plate like mud pots can be easily made by ‘potter’ and can be constructed by local villagers. Involving local villagers or local potter will be helpful for this purpose and for rise of their participation awareness. These mud pots can be easily placed in anywhere and also in branches of trees.

### (III) Shelter availability

Birds are generally one of the first types of wildlife to visit a mine site following reclamation due to their mobility and active search for suitable habitat (Brändle et al. 2003). The availability of different kinds of nest-boxes may increase the colonization of urban parks by a great variety of cavity-nesting birds (Jokimäki 1999). Many bird species are not restricted to a single vegetation type, but rather depend on some combination of early successional habitat, open areas, and young and mature forests to find food and shelter and raise young (Hunter et al. 2001). For providing the shelter to avifauna will be based on nesting patterns of bird species found in raigarh district. Internationally recommended artificial nests will be constructed by the help of local communities / Joint forest management. Detailed nest designs are mentioned below.

**6.4.2 Artificial nesting:** Before the artificial nesting trail we had surveyed the avifauna species of mining site and categorized them according to their habit, habitat and nesting pattern through which artificial nesting is being proposed.

Artificial nesting structures can be used to increase avifauna reproductive success in buffer zones where natural nest site are unavailable or unsuitable. While artificial nesting structure cannot replace natural nesting habitats, they can increase the number of nesting site available in an area. Many types of avifauna use artificial nesting structures including song birds, woodpecker, waterfowl, and raptors. While structures are generally designed to meet the nesting requirements of certain species, they may also be used by none target animals and provide roosting and winter cover for variety of birds. Nest boxes, nesting platform or shelves, and nesting baskets, culverts, and cylinders are some of the common types of artificial nesting structures. The most effective artificial nesting structures are those installed enclose proximity to brood-rearing habitat, adequate escape/concealment cover, a reliable source of food and water and other element of the habitat of target species. Predators, competitors and

territory sizes for individual species also influence the usefulness of nesting structures. Nest monitoring and maintenance actions can be taken to limit competing or undesirable species access reproduction success, and provide an opportunity for landowners and managers to observe avifauna. Cavity nesting birds which mainly nests in tree cavities are likely to use nest box. Primary cavity nesting species, such as members of the woodpecker family, excavate nesting cavity in live / standing dead tree (snags); Secondary cavity nesters (e.g. some passerine or perching birds, owls, and waterfowl) use cavities abandoned by primary excavators and those formed by fungus, knots, and tree subject to decay. The presence of snags in forested areas is directly related to the quality and quantity of nesting habitat for many cavities nesting species.

**6.4.3 Construction material:** structures made of wood are relatively inexpensive and easy to build. Wood seems to be the most weather resistant, insulating material, and most avifauna species prefer wood to metal or plastic structures. For most nest boxes, ¾ inch rough-cut borders are best used for construction. Since cavity nesting waterfowl do not carry nesting material to the nest, 3-4 inches of coarse sawdust or woodchips should be placed inside the nest box. Nest boxes intended for use by woodpeckers can be tightly packed with sawdust to resemble decaying woody material. Old nesting material should be removed at the start of each nesting season and replaced with fresh material. While many artificial nesting structures are designed for cavity nesters, some provide nesting sites for other avifauna. Nesting platforms, baskets and cylinders are used by waterfowl, raptors and other species. If wire mesh is used as nest support material, the weave must be tight enough to prevent eggs and young from falling.

Designs range from simple platforms to complex, multi-compartment structures some of these design are more successful than others, and most can built or acquired from a variety of suppliers. Basic nest box designs can be modified to accommodate

various species by altering dimensions or entrance hole sizes. The size of the entrance hole also influences the internal temperature of the box, predator accessibility, and use by competing non-target species.

#### 6.4.4 Basic nest box characteristic

1. Should be made of wood; Sal (*Shorea robusta*), Sisoo (*Dalbergia sisoo*), Babool (*Acacia nilotica*) etc (preferred, most weather resistant).
2. Box should open from the side or top for maintenance and cleaning.
3. Sides of nest box should enclose the floorboard (recessed ¼ inch) to prevent rain seepage.
4. Nails, woodscrews, and hinges should be rust proof.
5. Entrance hole dimensions should accommodate the desired bird species; hole should not be large enough to allow competitors and predators access.
6. A double thick entrance and extended roof to deter predators like squirrels and raccoons.
7. Ventilation holes or slits at the top of both sides, just beneath the roof of the box.
8. Drainage holes (four or five) drilled into the bottom of the nest box to allow for drainage.
9. Song bird nest box should not have a perch, which increases predator access; native song birds do not use perches.
10. Nest box should not be treated with green preservative, it is poisonous to birds.
11. Nest box should not be painted on the inside or painted bright, unnatural colours on the outside (may attract predators or exotic species) (Avifauna survey 2013).



### Artificial nest designs

#### Design I

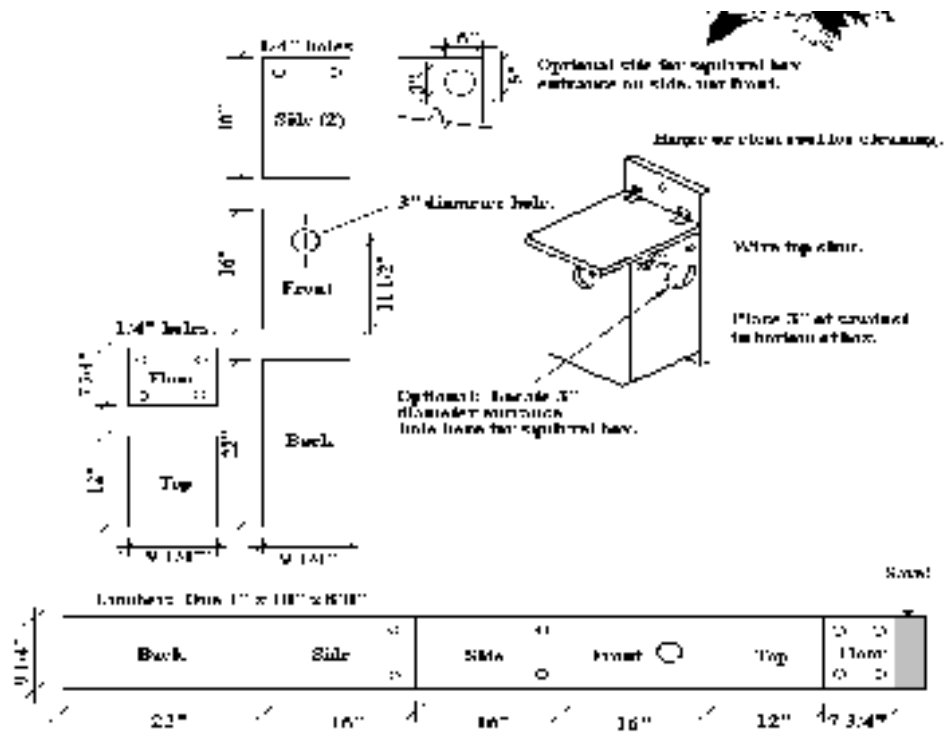


Fig 6.2: Ideal nest design for Doves, Parakeets, and Orioles

#### Design II

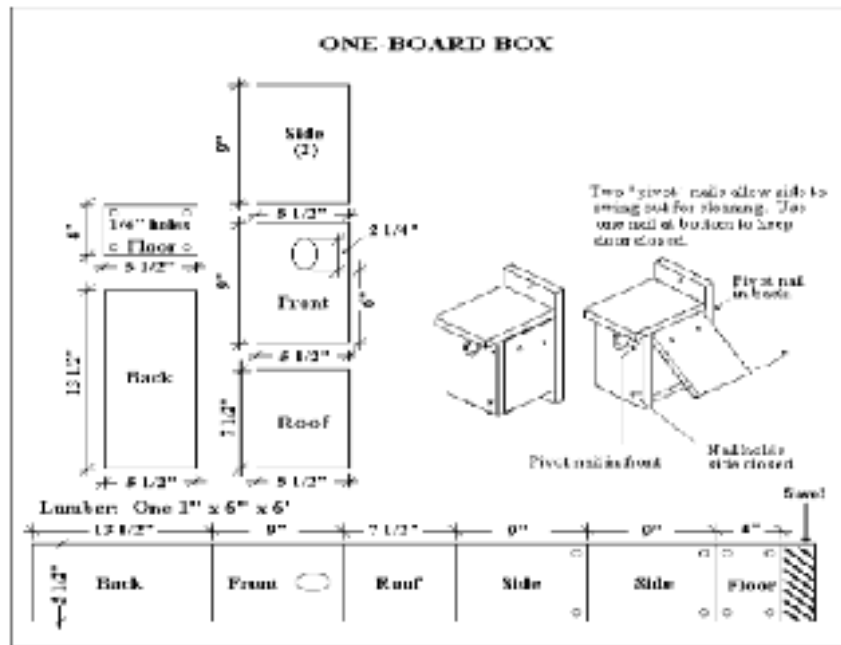


Fig 6.3: Ideal nest design for Yellow Throated Sparrow, Mynas, Parakeets, and Indian Rollers etc.

Design III

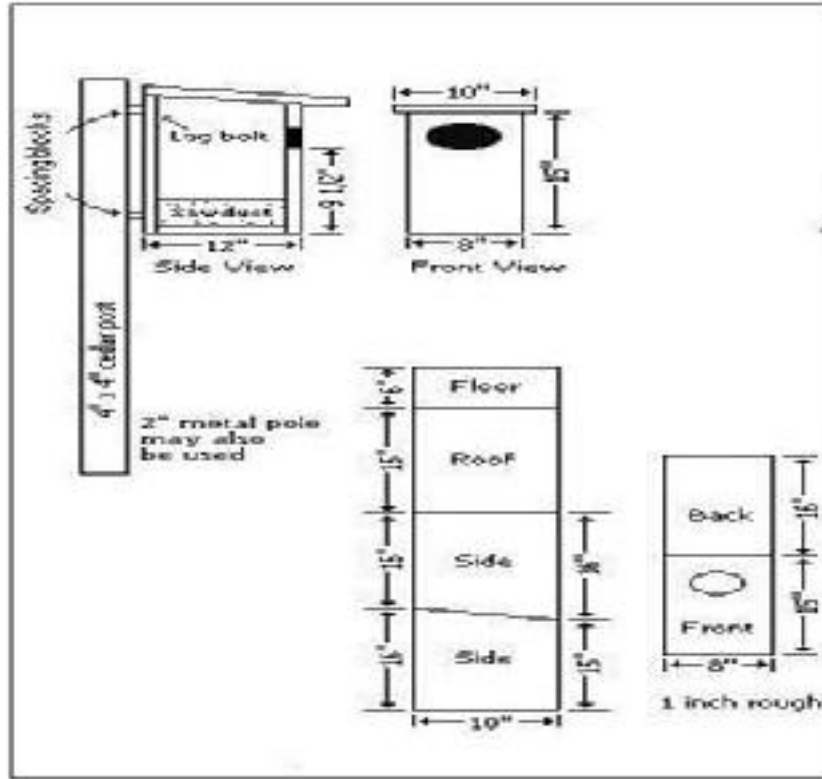


Fig 6.4: Ideal nest design for Shrikes, Indian Robin, Magpie Robin, etc.

Design IV

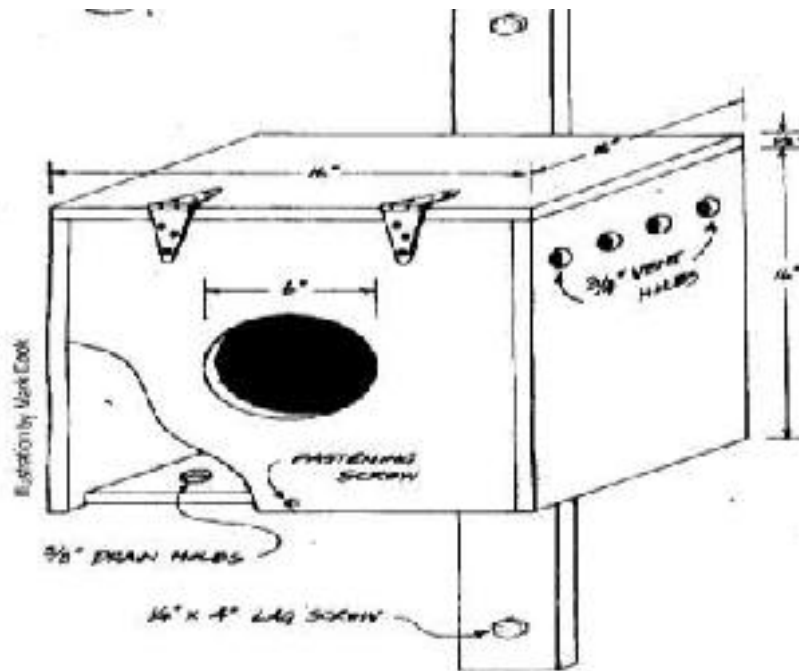


Fig 6.5: Ideal nest design for Owl and Owlets.

Design V

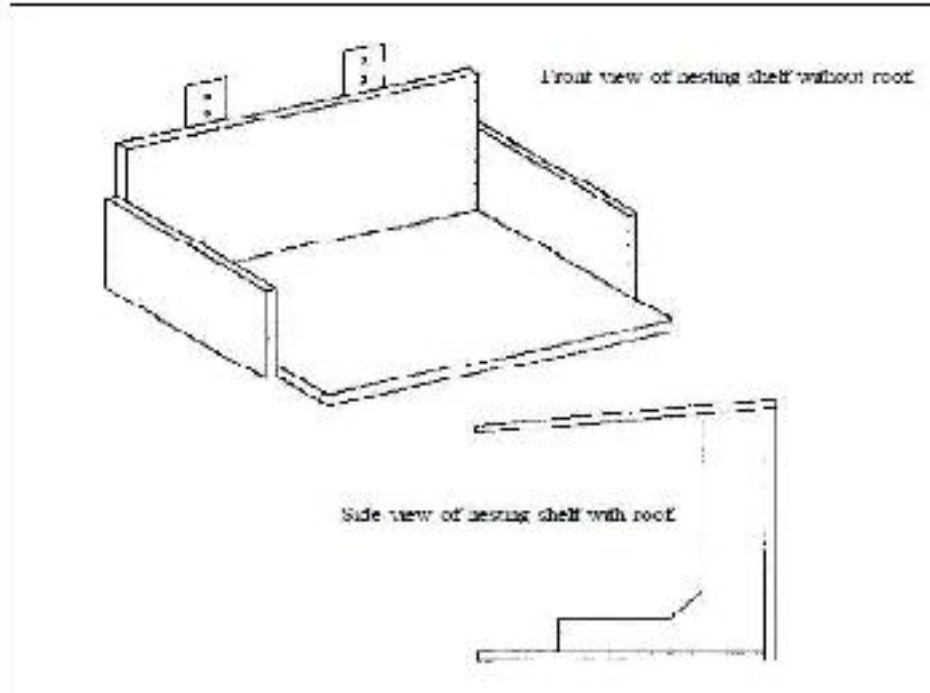


Fig-6.6: Ideal nest design for Platform and Twig nesting birds.

Design VI

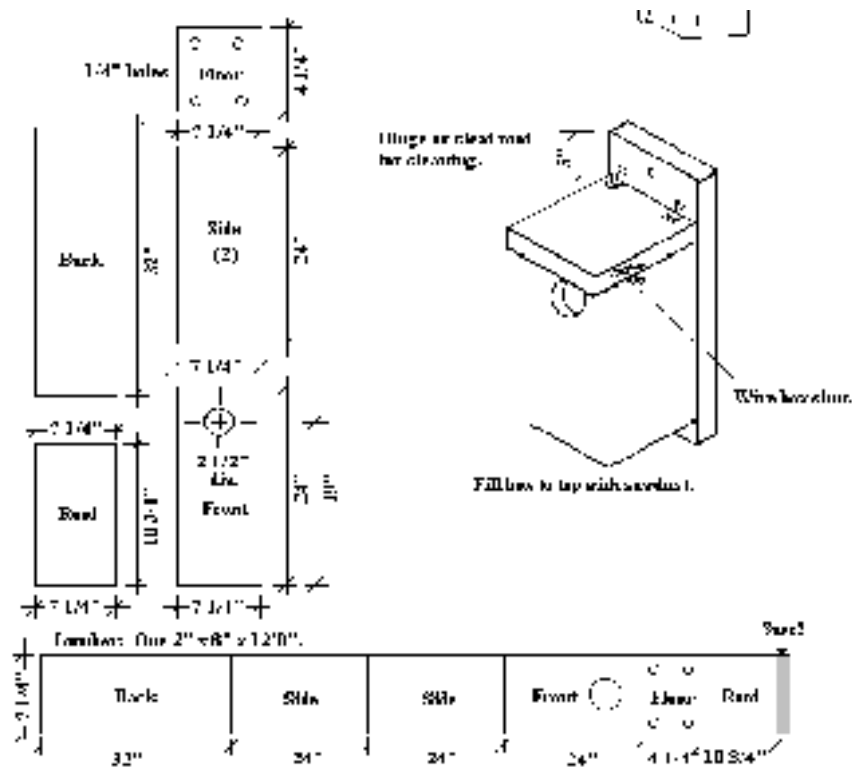


Fig 6.7: Ideal Nest design for excavators having yellow tail and red patch on the back of head and neck

### Design VII

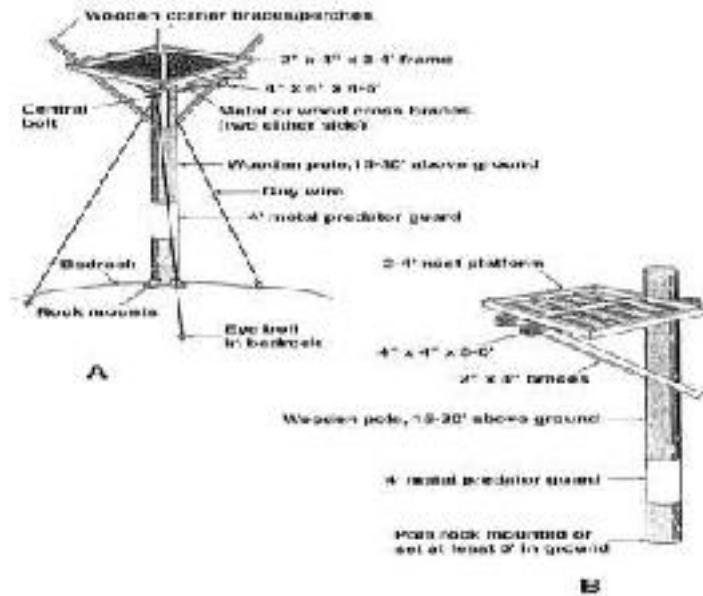


Fig 6.8: Ideal nest design for Raptors.

### Design VIII

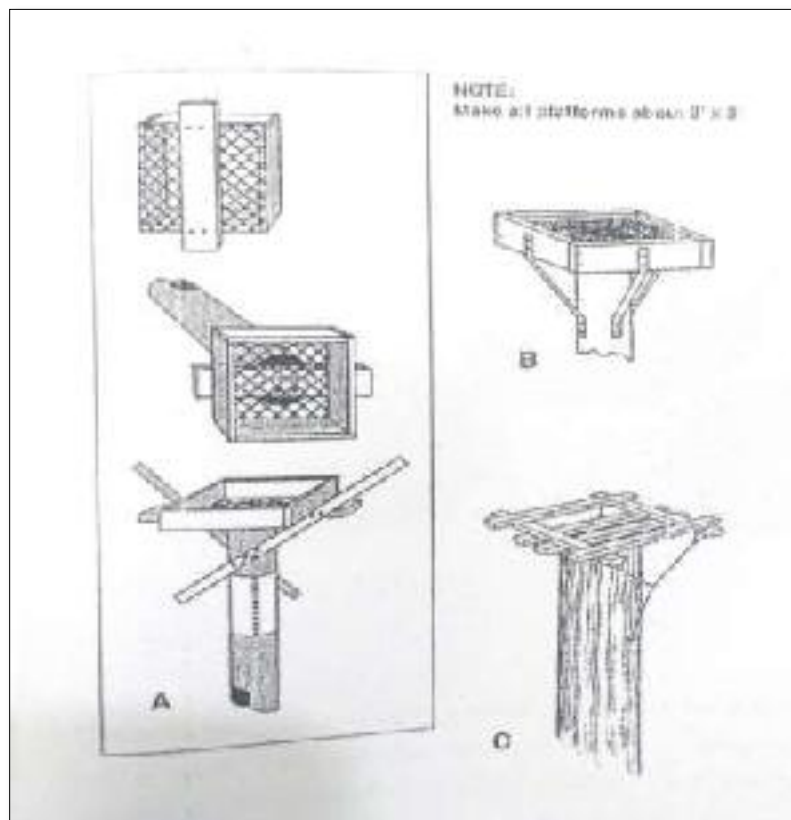


Fig 6.9: Ideal nest design for Raptors.

## Design IX



**Fig 6.10: Ideal nest design for grassland birds and Cup nesting birds.**

As per the above cited figures for all the birds found in the mining area of OCP Chhal. The artificial nesting design proposed for all birds characterized on their habit, habitat and nesting patterns (Fig 6.1- 6.8).

## 6.5 CONSERVATION PLAN FOR ELEPHANT

Elephants are major agents of change and are often indicated as those large herbivores possessing the ability of changing entire ecosystems in terms of vegetation structure and composition, thereby affecting a whole series of other ecosystem components as well. The exclusive role of elephants as agents of change could thus far not be completely isolated from the multitude of factors involved in ecosystem dynamics.

Globally, wild elephants are present in 50 countries, 13 of which are in Asia and 37 in Africa. At present the number of wild Asian elephants (*Elephas maximus*) is between 35,000 and 50,000 ([www.elephantcare.org](http://www.elephantcare.org)), while the number in captivity is around 16,000. The trend in almost all Asian range states has been a drastic decline in wild elephant numbers, due to a range of anthropogenic factors related to increasing human population, loss and degradation of forest habitat, fragmentation of breeding populations and increasing human-elephant conflict (HEC).

The Asian elephant is categorized as an ‘endangered’ species in the red list of the World Conservation Union ([www.iucnredlist.org](http://www.iucnredlist.org)) and is classified with the Convention for International Trade of Endangered Species ([www.cites.org](http://www.cites.org)). They have declined from over 5 million animals located throughout the continent 100 years ago, to the current number confined to fragmented habitats in sub-Saharan regions. Whereas poaching for ivory and meat was a major reason for the decline in the past, loss of habitat is the biggest threat to their continued survival at present. Paradoxically, though, elephant numbers are increasing in some countries and may need to be controlled in order to prevent degradation of their habitats.

India holds by far the largest number of wild Asian elephants, estimated at about 26,000 to 28,000 or nearly 60% of the population of the species (*Bist 2002*). *Elephas maximus* is placed in Schedule I and Part I of Indian Wildlife Protection Act (1972)

conferring it the highest level of protection. Wild elephants are presently distributed over an area of about 109,500 km<sup>2</sup> (*Santiapillai and Sukumar, 2006*); this is approximately 3% of India's geographical area. Adjacent to some of these areas, a segment of the elephant population killed an average of 350 people annually over the last five years (2005-2006 to 2009-2010) (Project Elephant), and damaged an average of 330 km<sup>2</sup> of crops every year for the last three years (2007-2008 to 2009-2010) (Project Elephant).

Northern Chhattisgarh in Central India has been home of Asian elephants since historical times. However, in the early part of the 20th century they became locally extinct (*Singh, 2002*). In 1988 elephants migrated from the prime elephant habitat of Jharkhand into Chhattisgarh and caused extensive damage to life and property. Since then, HEC cases have been increasing due to straying of migratory elephants in the state (*Singh, 2002*). The number of wild elephants in the year 2007-08 in the state estimated to be 122 (*Moe, 2008*). Major reason for prolonged stay of elephants in the state could be better forest cover (44 %), heavy mining, habitat degradation and deforestation in the states of Jharkhand and Orissa (*Singh, 2002; Earth Matters Foundation, 2008*). Even the state of Chhattisgarh is primarily inhabited by tribal communities dependent largely on agriculture and minor forest produce. Increasing human pressure on forested areas is resulting in increased incidences of human-elephant conflicts. This necessitated a detailed assessment of habitat suitability and dispersal corridor for elephants in the area.

### **6.5.1 Records of the Elephant's movement in Raigarh District**

During 19th century and earlier elephants were, recorded only from the northern part (Raigarh district) of the state but for unknown reasons the species left the area in the beginning of the 20th century. During this time the species was recorded from Raigarh District. However, the species re-entered the area of Chhattisgarh state, in

1980s, around the year 1986. The elephants then entered the area of Raigarh district, from Orissa state. In the beginning their entry was occasional, coming and going in to and out of the area. However, in later years their entry as well as their residence time, within the area of the state, has increased.

**At present, the study area of Chhal Range under Dharamjaigarh Forest Division has been observed the elephant movement**

**1. Important points in the conservation of elephants:** Following are some key points in the conservation of elephants:

- ❖ Require 150-250 kg of plant food every day, with preference for grasses.
- ❖ Evolved to a large size, with black color. The black color absorbs more heat.
- ❖ 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.
- ❖ 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.
- ❖ A good source of water is required also for drinking.
- ❖ Frequent dusting of the body or mud cover over the body is required to protect the body from the biting insects.
- ❖ Change in cropping pattern by introducing crops disliked by elephant or the plant which act as elephant repellent (e.g. Patchouli, (Pachouli) *Helianthus annuus* (Sunflower) *Capsicum annum* (Chilli) *Sesamum indicum* (Til) and Citrus should be promoted.

### **6.5.2 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<sup>2</sup>.

### 6.5.2 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 150-200kg 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 5.5km.

### 6.5.3 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.

### 6.5.4 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.

SN	Botanical Name	Local Name
1.	<i>Acacia catechu</i>	Khair
2.	<i>Acacia nilotica</i>	Babool
3.	<i>Aegle marmelos</i>	Bel
4.	<i>Albizia lebbek</i>	Kala siris

5.	<i>Bambusa arundinacea</i>	Bans
6.	<i>Albizia procera</i>	Safed siris
7.	<i>Bauhinia variegata</i>	Kachnar
8.	<i>Bauhinia vahlii</i>	Mahul
9.	<i>Bauhinia malabarica</i>	Khatua
10.	<i>Bombax ceiba</i>	Semal
11.	<i>Brachiaria sp.</i>	Ghas
12.	<i>Bridelia retusa</i>	Kasai
13.	<i>Careya arborea</i>	Kumhi
14.	<i>Cordia myxa</i>	Lassora
15.	<i>Cymbopogon flexuosus</i>	Ghas
16.	<i>Cynodon dactylon</i> Doob	Grass
17.	<i>Dalbergia sissoo</i>	Shisham
18.	<i>Dendrocalamus strictus</i>	Bans/ Bamboo
19.	<i>Desmostachya bipinnata</i>	Urai/Khus
20.	<i>Eleusine sp.</i>	Ghas
21.	<i>Emblica officinalis</i>	Amla
22.	<i>Eucalyptus spp</i>	Nilgiri
23.	<i>Eulaliopsis binata</i>	Bagai Ghas
24.	<i>Feronia elephantum</i>	Kaith
25.	<i>Ficus bengalensis</i>	Bargad/Bar
26.	<i>Ficus glomerata</i>	Dumar/Gular
27.	<i>Ficus religiosa</i>	Pipal
28.	<i>Ficus rumphii</i>	Duranga-hesa
29.	<i>Ficus infectoria</i>	Pakar
30.	<i>Flacourtia indica</i>	Kandai
31.	<i>Garuga pinnata</i>	Kekad
32.	<i>Grewia elastica</i>	Dhaman
33.	<i>Helicteres isora</i>	Ainthe
34.	<i>Holarrhena antidysenterica</i>	Korea
35.	<i>Ipomoea spp.</i>	Karmata
36.	<i>Imperata arundinacea</i>	Ulu
37.	<i>Kydia calycina</i>	Baranga/Pula
38.	<i>Lagerstroemia parviflora</i>	Senha/Sidha
39.	<i>Limonia acidissima</i>	Kaith
40.	<i>Mallotus philippinensis</i>	Sinduri/Rohini
41.	<i>Mimosa pudica</i>	Lajwanti
42.	<i>Mitragyna parvifolia</i>	Mudhi
43.	<i>Musa paradisiaca</i>	Banana
44.	<i>Neyraudia arundinacea</i>	Bichhloo
45.	<i>Oryza sativa</i>	Dhan
46.	<i>Ougeinia oojeinensis</i>	Tinsa
47.	<i>Phoenix humilis</i>	Buta Chhind
48.	<i>Pithecellobium dulce</i>	Jangal Jalebi

49.	<i>Randia dumetorium</i>	Mainphal
50.	<i>Saccharum munja</i>	Kandi-khar
51.	<i>Saccharum officinarum</i>	Ganna
52.	<i>Saccharum spontaneum</i>	Kans
53.	<i>Sansevieria sp.</i>	Sisal
54.	<i>Schleichera oleosa</i>	Kosam/Kusum
55.	<i>Shorea robusta</i>	Sarai/Sal
56.	<i>Syzygium cumini</i>	Jamun
57.	<i>Tamarindus indica</i>	Amlı / Imli
58.	<i>Terminalia tomentosa</i>	Saja
59.	<i>Tectona grandis</i>	Sagaun / Teak
60.	<i>Tinospora cordifolia</i>	Giloe / Gurch
61.	<i>Thysanolaena agrostis</i>	Hathi ghas / Pirlu
62.	<i>Zizyphus mauritiana</i>	Bhander
63.	<i>Zizyphus xylopyra</i>	Ghont

The most commonly consumed species belong to family *Poaceae* and *Fabaceae* (17.65%) followed by *Moraceae* (14.71%). Elephants extensively feed on *Artocarpus heterophyllus*, *Syzygium cumini*, *Acacia nilotica*, *A. catechu*, *Dalbergia sissoo*, *Zizyphus mauritiana*, *Aegle marmelos* and *Ficus* species, besides various grasses and shrubs (Bhagat et al, 2017). *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:

<i>Musa paradisiaca</i>	Kela	All the parts are edible.
<i>Oryza sativa</i>	rice	Eat very cleverly the fruiting part, only, in the barn yard they dismantle the heap of gathered rice.
<i>Saccharum officinarum</i>	Ganna	One of the most preferred food item.
<i>Dendrocalamus strictus</i>	Bamboo	All the parts are edible.
<i>Ficus benghalensis</i>	Bargad	Leaves and barks were eaten mostly.
<i>Ficus religiosa</i>	peepal	Leaves and barks were eaten mostly.
<i>Artocarpus heterophyllus</i>	Kathal	Fruits, leaves and barks were eaten mostly.
<i>Miliusa velutina</i>	Bhilwa	Leaves and barks were eaten mostly.
<i>Pterocarpus marsupium</i>	Bija	Barks were eaten mostly.
<i>Zea mays</i>	Makka	Whole plant's parts are eaten.

<i>Phoenix sylvestris</i>	Chhind	Rhizomes are edible.
<i>Phoenix acaulis</i>	Buta chhind	Rhizomes are edible.
<i>Buchanania lanzan</i>	Char	The saplings are up-rooted; the root is thrashed clean of soil and is then eaten.
<i>Goruga pinnata</i>	Kekad	Barks were eaten mostly.
<i>Carica papaya</i>	Papita	Whole plant's parts are eaten.

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

### 6.5.5 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.

### 6.5.6 Solution

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

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 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.**

Development of a corridor far beyond the OCP Chhal Dharamjaigah mining lease 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) *D. Rhedhii* (Bans), *Bambusa arundinacea* (Bans), *Ficus benghalensis* (Bargad), *F. religiosa* (peepal), *F. glomerata* (Gular), *F. rumphii* (Jangali Bargad), *F. infectoria* (Pakar), *Artocarpus heterophyllus* (Kathal), *Milium velutinum* (Bhilwa), *Pterocarpus marsupium* (Bija), *Phoenix sylvestris* (Chhind), *Phoenix acaulis* (Buta chhind), *Buchanania lanzan* (Char), *Feronia elephantum* (Kaith), *Goruga pinnata* (Kekad), *Thysanolaena agrostis* (Hathi ghas), *Cymbopogon flexuosus* (ghas), *Themeda quadrivalvis* (Ghas), *Iseilema laxum* (Ghas), *Bothriochloa pertusa* (Ghas), *Apluda mutica* (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 OCP Chhal 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.

### 6.5.7 ELEPHANT CORRIDOR

There is a need to establish an elephant corridor, combining the Tamor-Pingla and Semarsot wildlife sanctuaries in Sarguja district and Badalkhol wildlife sanctuary in Jashpur district. Corridor will be developed to join these three wildlife sanctuaries. However, still no notification has been issued so far.

### 6.5.8 SOME SUGGESTIONS TO ESCAPE ELEPHANT DAMAGE

Methods adopted to escape elephant damage may be categorized as

#### ❖ Active and passive methods

##### Active methods

- Noise-making like shouting, drum beating, bursting fire crackers, firing gun shots into the air (by forest officials only),
- Using elephant torch light
- Pelting stones and lighted fuel-woods.
- 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.

##### Passive methods

- Change in cropping pattern by introducing some elephant repellent alternative cash crops (e.g. Patchouli, *Helianthus annuus*, *Capsicum annum* and Citrus).
- Digging trenches around village area.

- Planting sisal (*Agave americana*) around village boundary.
- Solar fencing.
- Improvement of water sources.
- Raise/improve fodder resources.
- 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 presently applied mining lease area also the elephant have broken 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 Raigarh 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 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 Kamakshyanagar 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. A good amount 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. With the above, some more, methods are being suggested for affected region:

- **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.

**Some more suggestions to avoid conflicts:**

- Do not make crowd near elephant.
- Maintain at least 300 meter distance from the elephant.
- Do not wear red, white or colorful clothes.
- Day time is their resting time; do not disturb them during day time.
- Do not injure them neither they become more violent.
- Do not allow children, ladies and aged persons to go near the elephants.
- Do not prepare liquor or “handia” (country liquor) in the elephant movement area, because elephants like it and can smell it from distance. Do not go near the elephant after taking alcoholic drink.
- Elephants have good smelling power so keep in mind the direction of the wind.
- Elephant can run at a speed of 30-40km per hour, so do not run straight instead make zig-zag running.
- While running throw towel, handkerchief, cap or any other cloth so that they will get attracted to that and will get engaged with that.
- In a hilly terrain run towards the slope.
- While running away from an elephant do not hide behind a tree nor climb up a tree in the evening.



- To prevent the entry of elephants in a village burn wood and “Masal”. Collect in a group and make noise by beating drum, tin etc. Try to drive them towards non in habituated area.
- Make the payment for compensation of elephant loss, early.
- Inform loss of human life or property, within 24 hours to the Patwari or the nearest forest employee.

#### **Steps taken in Africa, to escape elephant damage**

- Elephant area is fenced with ropes. Fencing ropes are smeared with a mixture of chilli + 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.

## CHAPTER 8

### ENVIRONMENTAL MITIGATION MEASURES

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#### Environmental mitigation measures

##### 7.1 Mitigation measures of air pollution

- Dust cannot be avoided completely due to the nature of the activities during mining operation. However it can be managed by regularly water spraying (particularly during the dry season) on haul roads, transfer points of conveyors and crushers.
- A fleet of sprinkler vehicles with adequate water spray systems will be made available and would be operational at all times.
- The novel enclosures method for control of fugitive particulate emission involves the application of porous wind fences (also referred to as wind screens).
- OB dumps areas will be isolated and re-vegetated.
- Plantation along coal transportation roads, infrastructures etc.
- Stabilization of unpaved surfaces.
- Tarpaulin covers shall be used over the beds of the trucks employed for transportation of overburden and coal, which are prone to fugitive dust emission.
- Idling of delivery trucks/equipment should not be permitted.

##### 7.2 Mitigation measures of water pollution

The impact on water quality will be due to mine discharge. There will not be any impact on nearby water body as there isn't any surface water body in the vicinity of the mines. The change in the ground and surface water quality will be more pronounced mainly due to population increase by setting of new townships and influx of population from other areas.

- The surface water from the mining area will be regulated in such a manner so as to cause minimum contamination and alteration to the natural drainage system.

- The storm water will be diverted from the mining areas through a series of diversion banks intercept drains to either the natural drainage channels or to water storage reservoirs.
- All drain channels will provide with small stone/rock barriers across drain to water current and to arrest solid particles. This will also be cleaned periodically.
- Sewage treatment plan is proposed for sewage from office and colony.
- The mine water will be collected in setting tanks after sedimentation clear water will be discharged in natural stream.
- A network of drains, sedimentation control dams and sumps will be provided in the in-pit drainage so that maximum quantity of water will be reused to store in the water reservoirs.

### **7.3 Mitigation measures of noise pollution**

- Acoustic treatment of rotating equipments.
- Compulsory use of personnel protective equipment (PPE) such as ear plugs for water workers.
- All machine mountings will have in their foundations anti vibration pads / sheets for reducing the vibration and nearby noise.
- Installation of noise generating machinery, strictly in-compliance with the recommendation of the manufactures. This would ensure an installation free from vibration and exhaust leaks which are also measure contributors to increased noise levels.
- Use of dumping materials such as thin rubber sheet for wrapping the worn places of compressors, generators etc.
- Shock absorbing techniques to reduce impact.
- Use of physical barriers and green belt development around the mine to restrict the noise from going outside the proposed mine boundary during operation.

#### **7.4 Mitigation measures of land use**

- Design the mining and associated activities for the minimum possible forest land requirement.
- Design the mining activities in such a manner that the changes in the surface drainage pattern are minimum.
- In case of opencast mines plan the mine with decommissioning, closure, reclamation and rehabilitation so that the land after mining can be brought in economic uses.

#### **7.5 Mitigation measures for soil profile**

- Provisions should be made in opencast mining for separate removal and handling of top and sub-soils so that these can be re-laid at the time of reclamation for developing the land uses of the reclaimed surface.
- River bank and their stability plan for soil conservation.

#### **7.6 Mitigation measures for vegetation**

- The vegetation cover will be improved by scientific green belt development as per MoEF guidelines 2006.
- The plantation should be made 4 times the number of existing plants before the mine is started.
- The plantation will be done as per the approved mining plan and Environmental Management Plan.
- Using advanced technologies such as remote sensing and Geographic Information Systems for planning, monitoring and evaluating forest cover.

#### **7.7 Mitigation measures for wildlife**

- Development of alternate habitat for affected avifauna of core zone to buffer zone.
- Artificial nesting placement, trails and their regular monitoring by coordination with the forest department.

- Development of migratory corridors for wild animals.
- Check the natural streams to restore the water banks.

## CHAPTER 8

### PROPOSED BUDGET FOR ALTERNATIVE HABITAT MANAGEMENT PLAN OF OCP CHHAL

#### 8.1 Proposed budget for alternative habitat management plan

S. No.	Activities	Site specific activity	1 <sup>st</sup> Year		2 <sup>nd</sup> Year	3 <sup>rd</sup> Year	Total	Remark	Nodal agency
			No. of plants / Nests/ Area/	Amount in Rs.	Amount in Rs.	Amount in Rs.	Amount in Rs.		
1.	Habitat improvement	Mixed plantation in revenue forest (Refer Chapter 7.2 S. No. 1)	10 hec.	16,17,990	--	--	16,17,990	Plantation of ecosystem improvement in revenue forest of Compartment no 477 (Khedapali). First year for plantation and next 5 years for maintenance.	Forest Dept.
		RDF plantation (Refer Chapter 7.2 S. No. 2)	100 hec.	29,42,200	--	--	29,42,200		
			50 hec.	14,71,100	--	--	14,71,100		
		Big tree plantation in School /Aaganbadi/ SECL office and another govt. office (Refers to Chapter 7.2 S. No. 3)	2535 Plants	63,37,500	--	--	63,37,500	Plantation of ecosystem improvement should be done in the Schools, Aanganbadi, SECL Office and other Govt. buildings/ lands with suitable tree species. First year for plantation and next 5 years for maintenance.	Forest Dept.
		Grasslands developed on proposed sites (Refer to Chapter 7.2 S. No. 4)	5 hec.	39,27,000	--	--	39,27,000	Establishment of Grassland on Compartment no 477 Khedapali area. First year for plantation and next 5 years maintenance.	Forest Dept.
		Placement of artificial nest, bird feeder and water pot 'Sapora' (Refer to Chapter 7.2 S. No. 5)	1000 Nest, 250 Sapora, 250 Birds feeder	5,00,000	--	--	5,00,000	Artificial nest box placement and two years for monitoring and evaluation.	Forest Dept.

	<b>Biodiversity improvement</b>	<b>Establishment of artificial avifauna habitat “Pakshi Vihar” on dumping site.</b>	<b>L.S.</b>	<b>55,00,000</b>	--	--	<b>55,00,000</b>	Creation of avifauna habitat “pakshi Vihar” in dumping sites available on OCP Chhal. (Included 10% for monitoring & evaluation)	SECL/SFRTI, Raipur
	<b>River bank &amp; pond restoration/ plantation activity and maintenance</b>	<b>Pond site plantation (Refer to Chapter 7.2 S. No. 6)</b>	<b>890 Plants</b>	<b>6,20,330</b>	--	--	<b>6,20,330</b>	Plantation of ecosystem improvement should be proposed nearby river, road side and local pond’s bund with suitable tree species. First year plantation and next 5 years for maintenance.	Forest Dept.
		<b>River bank plantation (Refer to Chapter 7.2 S. No. 6)</b>	<b>5 hec.</b>	<b>9,93,980</b>			<b>9,93,980</b>		Forest Dept.
		<b>Road side plantation (Both side)</b>	<b>5 hec.</b>	<b>70,85,185</b>	--	--	<b>70,85,185</b>		Forest Dept.
		<b>Pond restoration (Refer to Chapter 7.2 S. No. 7)</b>	<b>1 Nos</b>	<b>2,50,000</b>	--	--	<b>2,50,000</b>	Pond renovation activity should be done in 1 pond	Forest Dept.
		<b>River bank restoration works in Mand river (Refer to Chapter 7.2 S. No. 8)</b>	<b>L.S.</b>	<b>10,00,000</b>	--	--	<b>10,00,000</b>	Restoration activity proposed on Mand River approx 3 km (Both side)	Forest Dept.
	<b>(SMC) Soil &amp; Moisture Conservation work</b>	<b>Soil &amp; Moisture Conservation (SMC) works (Refer to Chapter 7.2 S. No. 9)</b>	<b>50 hec.</b>	<b>1,51,250</b>	--	--	<b>1,51,250</b>	Treatment for up-gradation of degraded area to normal forest. First year for SMC activity and next 2 years for maintenance.	Forest Dept.
	<b>Training &amp; workshops / Awareness Program</b>	<b>Creation of social awareness program for conservation of avifauna and wildlife.</b>	<b>L.S.</b>	<b>2,00,000</b>	<b>2,00,000</b>	<b>2,00,000</b>	<b>6,00,000</b>	Awareness and Education Training program, empowering and sensitizing villagers should be conducted for local community on nearby villages for avifauna and wildlife conservation.	Forest Dept.

		<b>Awareness and education program for wildlife (Elephant) Conservation and management</b>	L.S.	5,00,000	5,00,000	5,00,000	15,00,000	Awareness and Education program should be conducted for affected area/villages under buffer zone of OCP Chhal.	Forest Dept.
	<b>Fire Protection</b>	<b>Fire protection and construction of watch towers</b>	L.S.	5,00,000	5,00,000	5,00,000	15,00,000	Monitoring through satellite imagery and construction of watch tower on buffer zone.	Forest Dept./ FMIS / FSI
	<b>Monitoring and Evaluation.</b>	<b>Monitoring and Evaluation.</b>	L.S.	15,00,000	--	--	15,00,000	Monitoring & Evaluation of all proposed activities will be carried out by the SFRTI, Raipur for next five years.	SFRTI, Raipur
<b>Grand total</b>				<b>3,50,96,535</b>	<b>12,00,000</b>	<b>12,00,000</b>	<b>3,74,96,535</b>		
<b>Total amount in words- - Three Crore, Seventy Four Lakhs, Ninety Six Thousand, Five hundred Thirty Five Rupees only/-</b>									

**Note:-**

- Budget for plantation of safety zone is imposed earlier under condition of EIA report by the SECL and this report only recommends the favourable plant species which provides food, shelter and alternate habitat for avifauna and wildlife.
- All the proposed activities in the budget were taken under **CAMPA norms**.
- The total cost of the proposed budget is **Rs. 3,74,96,535**. Out of this 50,00,000 will be utilized for the development of artificial bird habitat (pakshi vihar) by OCP Chhal through its own agency in the dumping area and 10% of Rs 50,00,000 i.e. Rs. 5,00,000 will be given to SFRTI, Raipur for the execution of monitoring and evaluation activity.



## 8.2 SITE SPECIFIC ACTION PLAN OF OCP CHHAL, DHARAMJAIGARH FOREST DIVISION

### Proposed activity sites with location for development of site specific plan

Sr. No.	Range	Proposed activity	Name of village	Name of activity Area/ Location/ Building/ Compartment. No.	GPS location	Area/ No. of plants/ No. of Nest	Recommended tree species	Required amount in Rs.
1.	Chhal	<b>Mixed plantation</b> (As per CAMPA Norms @1,61,799/hac.)	Khedapali	Compartment No. 477 RF	22°05'34.94''N 83°08'48.27''E	10 hec.	Plantation of ecosystem improvement with Fruit bearing and suitable tree species.	<b>16,17,990</b>
2.	Chhal	<b>RDF plantation</b> (As per CAMPA Norms @29,422/hect.)	Khedapali	Compartment No. 477 RF	--	100 hec.		<b>29,42,200</b>
			Rilo Kurru area	Compartment No. 1130 PF	22°05'08.61''N 83°05'11.45''E	50 hec.		<b>14,71,100</b>
3.	Chhal	<b>Big tree plantation in School /Aaganbadi/ SECL Office and another govt. office</b> (As per CAMPA Norms @2500/plants with tree guard)	Navapara	Primary School, Navapara	22°07'03.16''N 83°08'37.85''E	180 Plants	Shady, ornamental & Fruit bearing Tree species	<b>4,50,000</b>
			Puslada	Govt. Higher Secondary School, Pusalda	22°05'30.02''N 83°08'59.03''E	700 Plants	Shady, ornamental & Fruit bearing Tree species	<b>17,50,000</b>
				Primary School, Pusalda	22°05'24.12''N 83°08'59.10''E	180 Plants	Shady, ornamental & Fruit bearing Tree species	<b>4,50,000</b>
				Govt. High School, Pusalda	22°05'25.71''N 83°09'05.77''E	180 Plants	Shady, ornamental & Fruit bearing Tree species	<b>4,50,000</b>
	Chhal		Bojiya	Govt. High School, Bojiya	22°07'24.79''N 83°09'16.00''E	110 Plants	Shady, ornamental & Fruit bearing Tree species	<b>2,75,000</b>
				Primary School Bojiya	22°07'33.62''N 83°09'26.34''E	130 Plants	Shady, ornamental & Fruit bearing Tree species	<b>3,25,000</b>
				Gram Panchyat , Bojiya	22°07'35.47''N 83°09'20.86''E	25 Plants	Shady, ornamental & Fruit bearing Tree	<b>62,500</b>

							species	
	Chhal		Chitapalli	Primary School, Chitapalli	22 <sup>0</sup> 06'15.59''N 83 <sup>0</sup> 10'04.92''E	30 Plants	Shady, ornamental & Fruit bearing Tree species	75,000
			Chhal	SECL office	22 <sup>0</sup> 06'40.11''N 83 <sup>0</sup> 08'27.23''E	1000 Plants	Shady, ornamental & Fruit bearing Tree species	25,00,000
4.	Chhal	<b>Grass land development</b> (As per CA Norms @7,85,400/hect.)	Khedapali	Compartment No. 477 RF	--	5 hec.	Grass Species	39,27,000
5.	Chhal	<b>1000 Nest 250 Water pots 'sapora' 250 bird feeder</b>	Khedapali	Compartment No. 477 RF	22 <sup>0</sup> 05'34.94''N 83 <sup>0</sup> 08'48.27''E	500 Nest 125 Sapora 125 Birds feeder	--	2,50,000
			Pusalda	Compartment No. 479 PF	22 <sup>0</sup> 06'12.45''N 83 <sup>0</sup> 08'46.05''E	100 Nest 25 Sapora 25 Birds feeder	--	50,000
			Sarasmar	Compartment No. 510 RF	22 <sup>0</sup> 09'50.63''N 83 <sup>0</sup> 06'53.76''E	100 Nest 25 Sapora 25 Birds feeder	--	50,000
			Rilo Kurru area	Compartment No. 1130 PF	22 <sup>0</sup> 05'08.61''N 83 <sup>0</sup> 05'11.45''E	100 Nest 25 Sapora 25 Birds feeder	--	50,000
	Kharsia		Domnara	Compartment No. 1151 RF	22 <sup>0</sup> 0'40.52'' N 83 <sup>0</sup> 06'00.35''E	100 Nest 25 Sapora 25 Birds feeder	--	50,000
	Chhal		Kansbahar Aurananra	Compartment No. 506, 511	22 <sup>0</sup> 08'22.36''N 83 <sup>0</sup> 09'53.64''E	100 Nest 25 Sapora 25 Birds feeder	--	50,000

6.	Chhal	<b>River site plantation</b> (As per CAMPA Norms @1,98,796/hect.)	Kurket river	Kurket river	22°05'37.40''N 83°08'22.14''E	5 hac.	<i>Terminalia Arjuna,</i> <i>kahua, Jamun, ficus</i> <i>species and fruit bearing</i> <i>Tree species</i>	<b>9,93,980</b>
		<b>Pond site plantation</b> (As per CAMPA Norms @697/plants)	Khedapalli	Dam	22°05'37.40''N 83°08'22.14''E	200 Plants		<b>1,39,400</b>
			Pusalda	Pond	22°05'22.93''N 83°09'14.05''E	50 Plants		<b>34,850</b>
			Sarasmar	Pond	22°08'52.45''N 83°07'15.78''E	200 Plants		<b>1,39,400</b>
			Bokramuda Pond	Pond	22°08'52.73''N 83°07'15.78''E	200 Plants		<b>1,39,400</b>
	Sokhiya Nala, Chitaplli		Nala	22°06'00.37''N 83°10'10.69''E	200 Plants	<b>1,39,400</b>		
	Kharsia		Domnara	Pond	22°04'40.49''N 83°06'00.34''E	20 Plants		<b>13,940</b>
	Chhal		Kurru	Pond	22°08'48.39''N 83°05'30.39''E	20 Plants		<b>13,940</b>
7.		<b>Pond renovation</b>	Pusalda	Pond	22°05'22.93''N 83°09'14.05''E	1Pond	--	<b>2,50,000</b>
8.	Chhal	<b>River bank restoration work</b>	Mand river	River	--	L.S	--	<b>10,00,000</b>
9.		<b>Soil &amp; Moisture Conservation</b> (As per CAMPA Norms @3025/hac.)	Sarasmar	Compartment No. 510 RF	22°09'50.63''N 83°06'53.76''E	50 hac.	--	<b>1,51,250</b>
<b>Total amount</b>								<b>1,98,11,350</b>



Fig 7.1 Site specific plan for OCP Chhal

## PHOTO PLATES



*Cup Shaped Nest*



*Cup Shaped Nest*



*Platform Nest*



*Platform Nest*



*Sphere Shaped Nest*



*Pendent Nest*

### Glimpses of birds nest found in study area during the transect line



*Sphere Shaped Nest*



*Sphere Shaped Nest*



*Cup shaped nest*



*Platform Nest*



*Saucer Plate Nest*



*Platform Nest*

### Glimpses of birds nest found in study area during the transect line



*Platform Nest*



*Platform Nest*



*Cup Shape Nest*



*Platform Nest*



*Sphere Shaped nest*



*Pendent Nest*

Glimpses of birds nest found in study area during the transect lines



*Cavity Shaped Nest*



*Cavity Shaped Nest*



*Cup Shaped Nest*



*Pendulum Shaped Nest*



*Cup Shaped Nest*



*Platform Shaped Nest*



## Glimpses of avifauna species found in study area during the transect line



*Indian Pond Heron*



*Cattle egret*



*Indian Roller*



*House Sparrow*



*Black Drongo*



*Yellow Wattled Lapwing*



*Pond Heron*



*Rose Ringed Parakeet*



*Scaly Brested Munia*



*Eurasian Collared Dove & Plum Headed Parakeet*



*Baya Weaver*



*Spotted Dove*



*Greater Coucal*



*Red Vented Bulbul*



*Jungle Prinia*



*Indian Robin*



*Common Myna*



*Pond Heron*



*House Sparrow*



*Green Bee Eater*



*Purple Sun Bird*



*Purple Sun Bird female*



*Asian Koel*



*Indian Pond Heron*



*Common Pigeon*



*Jungle Bush Quail*



*Indian Roller*



*Cattle Egret*

## ARTIFICIAL NEST IMAGES



*Design for Sparrow, Myna etc*



*Design for Indian Robin, Roller etc*



*Design for Doves, Parakeets etc*



*Design for Cavity Nesters*



*Design for Owls & Owlets*



*Design for Platform Nesters*

## BIRD FEEDER



*Construction of bamboo based bird feeder in SFRTI*

## CHAPTER 9

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## ANNEXURE I (SUMMAR SEASON)

## Datasheet for Bird status survey

Cell-ID T1 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal and Kamesh Kumar Sahu. Trail-length:  
1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°05'38.24"	83°06'49.07"	Common Myna	03	-	-	-	By Flying
			Greater Coucal	01	-	-	-	Noted Through Chirping
			Indian Robin	01	-	-	-	Noted Through Chirping
300 M	22°05'28.83"	83°06'47.56"	Plum Headed Parakeet	02	-	-	-	Noted Through Chirping
			Common Myna	04	-	-	-	Noted Through Chirping
600 M	22°05'18.80"	83°06'49.30"	Common Myna	02	-	-	-	Noted Through Chirping
			Plum Headed Parakeet	01	-	-	-	By flying
			Indian Robin	01	-	-	-	By flying
			Red Vented Bulbul	01	13.71m	31°	340°	Perching
900 M	22°05'09.17"	83°06'51.36"	Common Hawk Eagle	02	-	-	-	By flying
			Rose Ringed Parakeet	01	-	-	-	Noted Through Chirping
			Indian Roller	01	29.26m	340°	340°	Perching
1200 M	22°04'59.19"	83°06'50.07"	Red Vented Bulbul	01	18.28m	90°	20°	Perching
			Common Myna	02	-	-	-	Noted Through Chirping
			Indian Roller	02	-	-	-	By flying

## Datasheet for Bird status survey

Cell-ID: T2 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal And Kamesh Kumar Sahu. Trail-length:  
1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°05'18.92"	83°07'36.25"	Indian Roller	01	-	-	-	Noted Through Chirping
			Greenish Warbler	01	7.31m	145°	90°	Perching
			Blyth's Reed Warbler	01	-	-	-	Noted Through Chirping
300 M	22°05'16.54"	83°07'25.64"	Little Swift	01	-	-	-	Noted Through Chirping
			Indian Pygmy Woodpecker	01	-	-	-	Noted Through Chirping



600 M	22°05'17.94"	83°07'16.54"	Indian Pond Heron	01	-	-	-	By flying
			Indian Roller	01	5.48m	170	90	Perching
			Purple Sun Bird	01	9.14m	170	90	Perching
			Spotted Dove	01	10.05m	60 <sup>0</sup>	90 <sup>0</sup>	Perching
			Plum Headed	06	10.05m	125 <sup>0</sup>	90 <sup>0</sup>	Perching
			Greater Coucal	02	-	-	-	Noted Through Chirping
			Eurasian collared	02	10.05m	125 <sup>0</sup>	90 <sup>0</sup>	Perching
			Yellow Footed	02	10.05m	125 <sup>0</sup>	90 <sup>0</sup>	Perching
			Jungle Babbler	05	53.94m	350 <sup>0</sup>	90 <sup>0</sup>	Perching
			Baya Weaver	01	8.22m	160 <sup>0</sup>	90 <sup>0</sup>	Perching
900 M	22°05'19.20"	83°07'07.46"	Rufous Tree Pie	01	-	-	-	By flying
			Rose Ringed	06	-	-	-	By flying
			Green Bee Eater	05	-	-	-	By flying
			Jungle Babbler	01	-	-	-	Noted Through Chirping
			Indian Roller	02	-	-	-	Noted Through Chirping
1200 M	22°05'20.01"	83°06'59.10"	Red Vented Bulbul	01	-	-	-	Noted Through Chirping
			Southern Coucal	06	-	-	-	By flying
			Greater Coucal	05	-	-	-	Noted Through Chirping
			Oriental Magpie Robin	04	-	-	-	Noted Through Chirping
			Purple Sun Bird	01	-	-	-	Noted Through Chirping
			Baya Weaver	01	-	-	-	Noted Through Chirping

### Datasheet for Bird status survey

Cell-ID: T3 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal And Kamesh Kumar Sahu. Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°05'05.16"	83°07'08.53"	Blyth's Reed Warbler	01	21.94	200 <sup>0</sup>	270 <sup>0</sup>	Perching
			Indian Roller	02	38.40	200 <sup>0</sup>	270 <sup>0</sup>	Perching
			Common Myna	02	-	-	-	By flying
			Purple Sun Bird	01	-	-	-	By flying
			Black Drongo	02	-	-	-	By flying
300 M	22°05'04.57"	83°07'11.89"	Green Bee Eater	01	-	-	-	By flying
			Indian Pond Heron	07	-	-	-	By flying
			Red Vented Bulbul	01	7.31m	301 <sup>0</sup>	240 <sup>0</sup>	Perching
			Aisy Prinia	01	-	-	-	By flying
			Laughing Dove	01	-	-	-	By flying
600	22°05'08.17"	83°07'22.21"	Indian Roller	01	-	-	-	By flying

<b>M</b>			Common Myna	01	-	-	-	Noted Through Chirping
			Aisy Prinia	01	-	-	-	By flying
			Green Bee Eater	01	-	-	-	Noted Through Chirping
			Laughing Dove	01	-	-	-	By flying
			Plum Headed Parakeet	02	-	-	-	By flying
			Indian Robin	01	-	-	-	By flying
			Greenish Warbler	01	-	-	-	Perching
			Oriental Magpie Robin	01	-	-	-	By flying
			Red Avadavat	01	-	-	-	By flying
			Indian Silverbill	01	20.11	210 <sup>0</sup>	270 <sup>0</sup>	Perching
<b>900 M</b>	22 <sup>0</sup> 05' 11.84"	83 <sup>0</sup> 07' 28.60"	Rufuos Tree Pie	01	-	-	-	By flying
			Green Bee Eater	01	-	-	-	By flying
			Black Drongo	01	-	-	-	By flying
			Cattle Egret	04	-	-	-	By flying
			Rose Ringed Parakeet	02	-	-	-	By flying
			Indian Roller	01	-	-	-	By flying
<b>1100 M</b>	22 <sup>0</sup> 05' 12.80"	83 <sup>0</sup> 07' 39.29"	Common Myna	01	-	-	-	By flying

### Datasheet for Bird status survey

Cell-ID: T4 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal And Kamesh Kumar Sahu. Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
<b>0 M</b>	22 <sup>0</sup> 05' 00.42"	83 <sup>0</sup> 07' 10.85"	Red Vented Bulbul	01	-	-	-	By Flying
			Ashy Prinia	01	-	-	-	By Flying
			Scaly Breasted Prinia	01	-	-	-	By Flying
			Indian Roller	01	-	-	-	Noted Through Chirping
			Indian Cuckoo	01	-	-	-	Noted Through Chirping
			Black Drongo	01	-	-	-	By flying
			Asian Koel	01	-	-	-	Noted Through Chirping
<b>300 M</b>	22 <sup>0</sup> 05' 00.29"	83 <sup>0</sup> 07' 00.28"	Red Vented Bulbul	01	-	-	-	Noted Through Chirping
			Plain Prinia	01	-	-	-	By flying
			Indian Cuckoo	01	-	-	-	Noted Through Chirping
			Black Drongo	01	-	-	-	Noted Through Chirping
			White Rumped Munia	01	20.12m	330 <sup>0</sup>	370 <sup>0</sup>	Perching
<b>600 M</b>	22 <sup>0</sup> 04' 56.87"	83 <sup>0</sup> 04' 49.85"	Rose Ringed Parakeet	02	-	-	-	By flying
			Indian Pond Heron	03	-	-	-	By flying

900 M	22°04'55.99"	83°06'42.75"	Indian Roller	01	-	-	-	By flying
			Common Kingfisher	01	-	-	-	By flying
			Greater Coucal	02	-	-	-	By flying
			Cattle Egret	02	-	-	-	By flying
			Indian Roller	01	-	-	-	Noted Through Chirping
			Purple Sun Bird	01	22.86m	340 <sup>0</sup>	340 <sup>0</sup>	Perching
			Red Vented Bulbul	01	22.86m	340 <sup>0</sup>	340 <sup>0</sup>	Perching
			Plum Headed Parakeet	02	-	-	-	By flying
1200 M	22°04'53.75"	83°06'34.19"	Scaly Brested Munia	04	18.28m	90 <sup>0</sup>	75 <sup>0</sup>	Perching
			Red Vented Bulbul	02	-	-	-	By flying
			Indian Roller	01	-	-	-	By calling
			Jungle Bush Quail	01	9.14m	345 <sup>0</sup>	75 <sup>0</sup>	Perching
			Yellow Wattled	01	10.97m	310 <sup>0</sup>	75 <sup>0</sup>	Perching
			Jungle Crow	01	-	-	-	By flying
			Green Bee Eater	01	19.20m	210 <sup>0</sup>	75 <sup>0</sup>	Perching
			Black Drongo	02	15.54m	222 <sup>0</sup>	75 <sup>0</sup>	Perching
			Paddy Field Pipit	02	10.97m	140 <sup>0</sup>	75 <sup>0</sup>	Perching
			Singing Bush Lark	02	12.80m	145 <sup>0</sup>	75 <sup>0</sup>	Perching
			Thick Bellied Flower	01	-	-	-	By flying
			Common Tailor Bird	05	20.11m	163 <sup>0</sup>	75 <sup>0</sup>	Perching

### Datasheet for Bird status survey

Cell-ID: T5 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal And Kamesh Kumar Sahu. Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0 M	22°05'38.90"	83°07'41.06"	Red Vented	02	13.71m	80 <sup>0</sup>	150 <sup>0</sup>	Perching
			Indian Robin	02	19.20m	110 <sup>0</sup>	150 <sup>0</sup>	Perching
			Green Bee	03	-	-	-	By flying
			Indian Cuckoo	01	-	-	-	By flying
			Black Drongo	01	-	-	-	Noted Through Chirping
			Indian hawk	01	20.11m	115 <sup>0</sup>	150 <sup>0</sup>	Perching
			Shikara	01	20.11m	115 <sup>0</sup>	150 <sup>0</sup>	Perching
			Blyth reed	01	-	-	-	Noted Through Chirping
300 M	22°05'40.52"	83°07'30.65"	Oriental	01	13.72m	80 <sup>0</sup>	80 <sup>0</sup>	Perching
			Black drongo	01	9.14m	190 <sup>0</sup>	80 <sup>0</sup>	Perching
			Common quail	01	-	-	-	Noted Through Chirping
			Bramhiny	02	-	-	-	By flying
			Bayar weaver	02	32.01m	35 <sup>0</sup>	80 <sup>0</sup>	Perching
			Indian silver	01	19.20m	72 <sup>0</sup>	80 <sup>0</sup>	Perching
			Thick bellied	01	-	-	-	By flying
600 M	22°05'34.53"	83°07'20.50"	Indian nuthatch	01	14.63m	310 <sup>0</sup>	50 <sup>0</sup>	Perching
			sulphur-bellied	02	15.54m	215 <sup>0</sup>	50 <sup>0</sup>	Perching

			Blyth reed	01	15.54m	170 <sup>0</sup>	50 <sup>0</sup>	Perching
			Red Vented	01	-	-	-	By flying
			Alexandrine	04	31.09m	237 <sup>0</sup>	50 <sup>0</sup>	Perching
			Plum headed	03	31.09m	237 <sup>0</sup>	50 <sup>0</sup>	Perching
			Jungle prinia	01	-	-	-	By flying
			Jungle babbler	01	28.35m	256 <sup>0</sup>	50 <sup>0</sup>	Perching
			Common	02	28.35m	256 <sup>0</sup>	50 <sup>0</sup>	Perching
<b>900 M</b>	22 <sup>0</sup> 05'26.03"	83 <sup>0</sup> 07'12.54"	Red Vented	01	24.68m	310 <sup>0</sup>	60 <sup>0</sup>	Perching
			Common myna	04	-	-	-	By flying
			Bramhiny	02	-	-	-	By flying
			Cattle egret	06	15.54m	117 <sup>0</sup>	60 <sup>0</sup>	Perching
			Indian pond	02	13.71m	215 <sup>0</sup>	60 <sup>0</sup>	Perching
			Ashy Prinia	01	20.11m	220 <sup>0</sup>	60 <sup>0</sup>	Perching
			Paddy Field	02	6.40m	290 <sup>0</sup>	60 <sup>0</sup>	Perching
Shikra	01	24.68m	275 <sup>0</sup>	60 <sup>0</sup>	Perching			
<b>1200 M</b>	22 <sup>0</sup> 05'26.54"	83 <sup>0</sup> 06'00.64"	Indian Roller	01	-	-	-	Noted Through Chirping
			Indian robin	01	-	-	-	Noted Through Chirping
			Purple sun bird	02	10.97m	215 <sup>0</sup>	90 <sup>0</sup>	Perching
			Greater flame back	01	-	-	-	Noted Through Chirping
			Common	01	9.14m	210 <sup>0</sup>	90 <sup>0</sup>	Perching
			Alexandrine	03	15.54m	310 <sup>0</sup>	90 <sup>0</sup>	Perching

### Datasheet for Bird status survey

Cell-ID: T6 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal And Kamesh Kumar Sahu. Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
<b>0 M</b>	22 <sup>0</sup> 05'48.12"	83 <sup>0</sup> 07'29.38"	Jungle babbler	02	19.20m	135 <sup>0</sup>	190 <sup>0</sup>	Perching
			Sulphur-bellied warbler	01	22.86m	264 <sup>0</sup>	190 <sup>0</sup>	Perching
			Crimson backed sun bird	01	22.86m	264 <sup>0</sup>	190 <sup>0</sup>	Perching
			Asian koel	02	-	-	-	By flying
			Spotted dove	02	15.54m	111 <sup>0</sup>	190 <sup>0</sup>	Perching
			Green bee eater	04	-	-	-	By flying
			Red vented bulbul	01	-	-	-	Noted Through Chirping
<b>300 M</b>	22 <sup>0</sup> 05'57.00"	83 <sup>0</sup> 07'37.40"	Ashy prinia	01	19.21m	112 <sup>0</sup>	195 <sup>0</sup>	Perching
			Indian silverbill	01	16.45m	136 <sup>0</sup>	195 <sup>0</sup>	Perching
			Blyth reed warbler	02	16.45m	136 <sup>0</sup>	195 <sup>0</sup>	Perching
			Green bee eater	08	-	-	-	By flying
			White rumped munia	01	10.05m	290 <sup>0</sup>	195 <sup>0</sup>	Perching
			Cattle egret	04	-	-	-	By flying
<b>600 M</b>	22 <sup>0</sup> 06'06.30"	83 <sup>0</sup> 07'36.63"	Black drongo	01	65.83m	270 <sup>0</sup>	195 <sup>0</sup>	Perching
			Green bee eater	04	-	-	-	By flying
			Spotted dove	02	55.77m	97 <sup>0</sup>	195 <sup>0</sup>	Perching

			Loughing dove	01	55.77m	97 <sup>0</sup>	195 <sup>0</sup>	Perching
			Greater coucal	01	20.11m	111 <sup>0</sup>	195 <sup>0</sup>	Perching
			Purple sun bird	01	20.11m	111 <sup>0</sup>	195 <sup>0</sup>	Perching
			Indian pond heron	01	-	-	-	By flying
			Rose ringed parakeet	04	11.88m	250 <sup>0</sup>	195 <sup>0</sup>	Perching
<b>900 M</b>	22 <sup>0</sup> 06' 11.93"	83 <sup>0</sup> 07' 34.57"	Indian silverbill	01	10.97m	134 <sup>0</sup>	170 <sup>0</sup>	Perching
			Black drongo	01	-	-	-	Noted Through Chirping
			Jangle babbler	01	-	-	-	By flying
			Rose ringed parakeet	02	19.20m	117 <sup>0</sup>	170 <sup>0</sup>	Perching
			Jungle Bush Quail	02	23.77m	210 <sup>0</sup>	170 <sup>0</sup>	Perching
			Green bee eater	01	-	-	-	By flying
			Indian roller	01	-	-	-	Noted Through Chirping
			Indian pond heron	01	-	-	-	By flying
<b>1200 M</b>	22 <sup>0</sup> 06' 26.83"	83 <sup>0</sup> 07' 31.12"	Plum headed parakeet	02	-	-	-	Noted Through Chirping
			Golden oriole	01	-	-	-	Noted Through Chirping
			Cattle egret	01	-	-	-	By flying
			Scaly Bressted Munia	01	9.14m	95 <sup>0</sup>	160 <sup>0</sup>	Perching
			Common quail	01	32.91m	217 <sup>0</sup>	160 <sup>0</sup>	Perching
			Purple sun bird	01	-	-	-	By flying
			Green bee eater	25	-	-	-	By flying
			Indian robin	01	-	-	-	By flying
			Oriental magpie robin	01	10.97m	123 <sup>0</sup>	160 <sup>0</sup>	Perching
			Alexandrian parakeet	01	24.68m	136 <sup>0</sup>	160 <sup>0</sup>	Perching
			Laughing dove	01	6.40m	90 <sup>0</sup>	160 <sup>0</sup>	Perching

### Datasheet for Bird status survey

Cell-ID: T7 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal And Kamesh Kumar Sahu. Trail-length: 1.2 (Km)

GPS at every 300 m			Sighting information					
S.N.	Latitude	Longitude	Species	Num ber	Perp. Dist.	Bearing		Observation
						A	T	
<b>0 M</b>	22 <sup>0</sup> 04' 44.28"	83 <sup>0</sup> 07' 37.23"	Common myna	03	13.76m	10 <sup>0</sup>	277 <sup>0</sup>	Perching
			Rose ringed parakeet	02	12.80m	0 <sup>0</sup>	277 <sup>0</sup>	Perching
			Indian roller	01	-	-	-	Noted Through Chirping
			White throated kingfisher	01	10.05m	180 <sup>0</sup>	277 <sup>0</sup>	Perching
			Sulphur bellied warbler	01	-	-	-	By flying
			Red vented bulbul	01	6.40m	0 <sup>0</sup>	277 <sup>0</sup>	Perching
			Little swift	01	-	-	-	By flying
			Indian pond heron	01	-	-	-	By flying
			Scaly breasted munia	>45	10.97m	315 <sup>0</sup>	277 <sup>0</sup>	Perching
<b>300 M</b>	22 <sup>0</sup> 04' 45.09"	83 <sup>0</sup> 07' 47.78"	Red vented bulbul	01	-	-	-	By flying
			Purple sunbird	01	-	-	-	Noted Through

								Chirping
			Green bee eater	01	-	-	-	By flying
			Indian roller	01	15.54m	351 <sup>0</sup>	268 <sup>0</sup>	Perching
			Greater coucal	01	-	-	-	Noted Through Chirping
			Plum headed parakeet	02	29.26m	295 <sup>0</sup>	268 <sup>0</sup>	Perching
<b>600 M</b>	22 <sup>0</sup> 04'44.50" <sup>N</sup>	83 <sup>0</sup> 07'57.25" <sup>E</sup>	Eurasian golden oriole	03	9.14m	170 <sup>0</sup>	250 <sup>0</sup>	Perching
			Greenish warbler	02	9.14m	170 <sup>0</sup>	250 <sup>0</sup>	Perching
			Indian roller	01	11.88m	340 <sup>0</sup>	250 <sup>0</sup>	Perching
			Plum headed parakeet	04	15.54m	348 <sup>0</sup>	250 <sup>0</sup>	Perching
			Black drongo	01	-	-	-	By flying
			Jungle babbler	03	-	-	-	By flying
<b>900 M</b>	22 <sup>0</sup> 04'40.40" <sup>N</sup>	83 <sup>0</sup> 08'08.70" <sup>E</sup>	Barn swallow	05	9.14m	165 <sup>0</sup>	262 <sup>0</sup>	Perching
			Little swift	01	-	-	-	By flying
			Rose ringed parakeet	01	-	-	-	Noted Through Chirping
			Alexandrine parakeet	02	10.97m	365 <sup>0</sup>	262 <sup>0</sup>	Perching
			Ashy prinia	01	10.97m	365 <sup>0</sup>	262 <sup>0</sup>	Perching
			Jungle babbler	>12	-	-	-	By flying
<b>1200 M</b>	22 <sup>0</sup> 04'48.24" <sup>N</sup>	83 <sup>0</sup> 08'18.80" <sup>E</sup>	Green bee eater	02	-	-	-	By flying
			Indian roller	01	-	-	-	By flying
			Greenish warbler	01	-	-	-	Noted Through Chirping
			Gray Francolin	01	21.94m	190 <sup>0</sup>	260 <sup>0</sup>	Perching
			Common kingfisher	01	12.80m	201 <sup>0</sup>	260 <sup>0</sup>	Perching
			Blyth's reed warbler	01	4.57m	330 <sup>0</sup>	260 <sup>0</sup>	Perching

### ANNEXURE I (WINTER SEASON)

#### Datasheet for Bird status survey

Cell-ID: T1 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 6:00 AM

GPS at every 300 m			Sighting information						
S.N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
<b>0 M</b>	22 <sup>0</sup> 05'35.19" <sup>N</sup>	83 <sup>0</sup> 06'45.69" <sup>E</sup>	6:32 AM	Ashy Wren Warbler	02	-	-	-	By Flying
<b>300 M</b>	22 <sup>0</sup> 05'27.50" <sup>N</sup>	83 <sup>0</sup> 06'53.18" <sup>E</sup>	6:40 AM	Indian Silverbil	01	-	-	-	Noted Through chirping
				Purple Sun Bird	01	-	-	-	Noted Through chirping
				Green Bee Eater	05	12M	230 <sup>0</sup>	231 <sup>0</sup>	Perching
				Ashy Prinia	02	-	-	-	By Flying
				Greenish Warbler	01				By Flying
<b>600 M</b>	22 <sup>0</sup> 05'22.51" <sup>N</sup>	83 <sup>0</sup> 07'00.80" <sup>E</sup>	6:55 AM	Small Parakeet	01	-	-	-	Noted Through chirping
				Purple Sun Bird	01	-	-	-	Noted Through chirping
				Sulphur-Bellied	01	-	-	-	By flying

				Warbler					
				Rose Ringed Parakeet	02	-	-	-	Noted Through chirping
				Ashy Drongo	01	-	-	-	By flying
<b>900 M</b>	22°05' 19.45"	83°07' 05.06"	7:05 AM	Jungle Prinia	01	-	-	-	By flying
				Common Myna	01	-	-	-	Noted Through chirping
				Jungle Babbler	01	-	-	-	Noted Through chirping
				White-Rumped Munia	01	-	-	-	By flying
				Indian Robin	01	-	-	-	By flying
<b>1200 M</b>	22°05' 14.34"	83°07' 11.52"	7:13 AM	Alexandrine Parakeet	01	-	-	-	By flying
				Asian Koel	01	-	-	-	Noted Through chirping
				Jungle Babbler	03	-	-	-	Noted Through chirping
				Purple Sun Bird	02	-	-	-	By flying
				Rufous Tree Pie	02	-	-	-	By flying
				Black Drongo	01	-	-	-	By flying
				Green Bee Eater	01	-	-	-	Noted Through chirping
				Eurasian Golden Oriole	01	-	-	-	By flying

### Datasheet for Bird status survey

Cell-ID: T2 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.0 (Km). Season: winter. Time: 7:30 AM

GPS at every 300 m			Sighting information						
S.N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
<b>0 M</b>	22°05' 15.17"	83°07' 21.33"	7:35 AM	Laughing Dove	02	-	-	-	Noted Through chirping
				Jungle Crow	07	-	-	-	By Flying
				Purple Sun Bird	01	-	-	-	By Flying
				Red Vented Bulbul	01	-	-	-	Noted Through chirping
<b>300 M</b>	22°05' 24.71"	83°07' 20.42"	7:47 AM	Rose Ringed Parakeet	01	-	-	-	Noted Through chirping
				Purple Sun Bird	01	-	-	-	Noted Through chirping
				Indian Robin	01	-	-	-	Preaching
				Indian Roller	01	-	-	-	By Flying

				Black Drongo	01	-	-	-	By Flying
				Asian Koel	01	-	-	-	By Flying
				Eurasian Collared Dove	01	-	-	-	By Flying
				Red Vented Bulbul	01	-	-	-	Noted Through chirping
<b>600 M</b>	22°05'32.45"	83°07'22.60"	8:00 AM	Plum Headed Parakeet	03	-	-	-	By Flying
				Small Parakeet	03	-	-	-	By Flying
				Purple Sun Bird	01	-	-	-	Noted Through chirping
				Green Bee Eater	01	-	-	-	Noted Through chirping
				Red Vented Bulbul	01	-	-	-	Noted Through chirping
				Eurasian Collared Dove	02	-	-	-	By Flying
				Grater Spotted Eagle	01	-	-	-	By Flying
<b>900 M</b>	22°05'40.75"	83°07'26.24"	8:10 AM	Black Drongo	01	-	-	-	By flying
				Rufous Tree Pie	01	15 M	170°	200°	Preaching
				Eurasian Collared Dove	01	17 M	170°	200°	Preaching
				Red Vented Bulbul	01	15 M	160°	200°	Noted Through chirping
				Alexandrine Parakeet	01	-	-	-	Noted Through chirping
				Spotted Dove	02	12 M	160°	200°	Preaching

**Datasheet for Bird status survey**

**Cell-ID: T3 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 9:00 AM**

GPS at every 300 m			Sighting information						
S.N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
<b>0 M</b>	22°05'17.18"	83°07'34.30"	9:00 AM	Indian Silverbil	01	-	-	-	Noted Through chirping
				Purple Sunbird	01	-	-	-	Noted Through chirping
				Red Vented Bulbul	01	-	-	-	By Flying
<b>300 M</b>	22°05'13.21"	83°07'25.26"	9:15 AM	Green Bee Eater	01	-	-	-	By Flying
				Rufous Tree Pie	01	-	-	-	By Flying
				Plum Headed Parakeet	02	20 M	70°	70°	Perching
				Red Vented Bulbul	05	13 M	140°	70°	Perching
				Indian Robin	01	-	-	-	By Flying



600 M	22°05'09.38"	83°07'16.70"	9:22 AM	Green Bee Eater	01	-	-	-	By Flying
				Black Drongo	01	-	-	-	By Flying
				Laughing Dove	02	-	-	-	Noted Through chirping
				Indian Cuckoo	01	-	-	-	Noted Through chirping
				Capper Smith Babbler	01	-	-	-	By flying
				Spotted Dave	01	-	-	-	Noted Through chirping
900 M	22°05'04.08"	83°07'08.54"	9:33 AM	Red Vented Bulbul	01	-	-	-	Noted Through chirping
				Purple Sunbird	01	-	-	-	Noted Through chirping
				Ashy Prinia	01	-	-	-	By flying
				Scaly Breasted Munia	01	-	-	-	Noted Through chirping
				White Rumped Munia	01	-	-	-	By flying
				Common Tailorbird	01	11 M	330°	50°	Perching
1200 M	22°05'00.12"	83°07'01.95"	9:45 AM	Rose Ringed Parakeet	02	-	-	-	By flying
				Small Parakeet	01	-	-	-	By flying
				Eurasian Collared Dove	02	15 M	130°	70°	Perching
				Red Vented Bulbul	01	-	-	-	By flying
				Sirkeer Malkoha	01	17 M	150°	70°	Perching
				Green Bee Eater	01	-	-	-	By flying
				Black Drongo	01	-	-	-	By flying
				Scaly Breasted Munia	01	19 M	1350°	70°	Perching
				Little Swift	01	-	-	-	By flying

**Datasheet for Bird status survey**

Cell-ID: T4 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 10:05 AM

GPS at every 300 m			Sighting information						
S.N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
0 M	22°05'03.40"	83°06'54.64"	10:05AM	Jungle Babbler	07	10 M	180°	90°	Perching
				Greenish Warbler	02	-	-	-	By Flying
				Asian Koel	01	-	-	-	By Flying
				Laughing Dove	01	-	-	-	Noted Through chirping
				Indian Roller	01	-	-	-	By Flying
300 M	22°05'58.77"	83°07'45.39"	10:20AM	Red Vented Bulbul	01	-	-	-	By Flying
				Sulphur-	01	-	-	-	By Flying

				Bellied Warbler					
				Laughing Dove	01	-	-	-	Noted Through chirping
				Indian Roller	01	-	-	-	Noted Through chirping
				Purple Sunbird	01	-	-	-	Noted Through chirping
				Oriental Magpie Robin	01	17 M	135 <sup>0</sup>	90 <sup>0</sup>	Perching
<b>600 M</b>	22 <sup>0</sup> 05'01.01	83 <sup>0</sup> 06'33.82	10:30AM	Barn Swallow	09	27 M	40 <sup>0</sup>	120 <sup>0</sup>	Perching
				Golden Oriole	01	12 M	70 <sup>0</sup>	120 <sup>0</sup>	Perching
				Laughing Dove	01	-	-	-	By flying
				Little Swift	01	-	-	-	By flying
				Small Parakeet	01	-	-	-	By flying
				Greater Coucal	01	18 M	90 <sup>0</sup>	120 <sup>0</sup>	Perching
<b>900 M</b>	22 <sup>0</sup> 05'06.29	83 <sup>0</sup> 06'28.92	10:40AM	Laughing Dove	01	-	-	-	Noted Through chirping
				Purple Sunbird	01	-	-	-	Noted Through chirping
				Indian Robin	01	-	-	-	By flying
				Green Bee Eater	02	11 M	330 <sup>0</sup>	50 <sup>0</sup>	Perching
				Plum Headed Parakeet	01	-	-	-	By flying
				Plum Headed Parakeet	01	-	-	-	By flying
				Black Drongo	01	11 M	330 <sup>0</sup>	50 <sup>0</sup>	Perching
				Copper Smith Barbet	01	-	-	-	By flying
				Little Swift	01	-	-	-	By flying
				Red Vented Bulbul	01	-	-	-	Noted Through chirping
Little Cormorant	01	-	-	-	By flying				
<b>1200 M</b>	22 <sup>0</sup> 05'09.56	83 <sup>0</sup> 06'24.12	10:55AM	Purple Sunbird	01	-	-	-	Noted Through chirping
				Indian Robin	02	-	-	-	Noted Through chirping
				Little Egret	03	-	-	-	By flying
				Little Swift	01	-	-	-	By flying
				Barn Swallow	01	-	-	-	By flying
				Pond Heron	03	15 M	130 <sup>0</sup>	70 <sup>0</sup>	Perching

**Datasheet for Bird status survey**

**Cell-ID: T5 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 0.9 (Km). Season: winter. Time: 3:25PM**

GPS at every 300 m			Sighting information						
S.N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
<b>0 M</b>	22 <sup>0</sup> 05'48.32"	83 <sup>0</sup> 07'28.90"	3:25PM	Red Vented Bulbul	01	-	-	-	By Flying
				Jungle Babbler	04	-	-	-	By Flying
				Indian Roller	01	-	-	-	By Flying
				Indian Silver Bill	01	10 M	180 <sup>0</sup>	180 <sup>0</sup>	Perching
<b>300 M</b>	22 <sup>0</sup> 05'57.68"	83 <sup>0</sup> 07'31.08"	3:37PM	Laughing Dove	01	35 M	290 <sup>0</sup>	200 <sup>0</sup>	Perching
				Red Vented Bulbul	01	-	-	-	By Flying
				Ashy Prinia	01	-	-	-	By Flying
				Plain Prinia	01	-	-	-	By Flying
				Sulphur-Bellied Warbler	01	-	-	-	By Flying
				Blyth Reed Warbler	01	-	-	-	By Flying
<b>600 M</b>	22 <sup>0</sup> 06'05.21"	83 <sup>0</sup> 07'34.13"	3:45PM	Greater Coucal	01	-	-	-	By Flying
				Grey Francolin	01	-	-	-	By Flying
				Raqin Quail	03	-	-	-	By flying
				Purple Sunbird	01	-	-	-	Noted Through chirping
				Red Vented Bulbul	02	-	-	-	By flying
				Spotted Dave	01	35 M	190 <sup>0</sup>	190 <sup>0</sup>	Perching
<b>900 M</b>	22 <sup>0</sup> 06'13.27"	83 <sup>0</sup> 07'38.04"	3:55PM	European Turtle Dove	01	35 M	190 <sup>0</sup>	190 <sup>0</sup>	Perching

**Datasheet for Bird status survey**

**Cell-ID: T6 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 0.9 (Km). Season: winter. Time: 4:25 PM**

GPS at every 300 m			Sighting information						
S.N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
<b>0 M</b>	22 <sup>0</sup> 05'33.17"	83 <sup>0</sup> 08'13.63"	4:25 PM	Spotted Dave	01	20 M	0 <sup>0</sup>	320 <sup>0</sup>	Perching
				Long Tailed Shrink	01	17M	120 <sup>0</sup>	320 <sup>0</sup>	Perching
				Rose Ringed Parakeet	01	-	-	-	By Flying
				Little Swift	01	-	-	-	By Flying
				Common	01	-	-	-	By Flying

300 M	22°05'26.51"	83°08'18.95"	4:33PM	Myna					
				Baya Weaver	01	-	-	-	By Flying
				Red Vented Bulbul	03	-	-	-	Noted Through chirping
				Blyth Reed Warbler	01	-	-	-	By Flying
				Oriental Magpie Robin	01	-	-	-	By Flying
Golden Oriole	01	-	-	-	Noted Through chirping				
600 M	22°05'18.32"	83°08'22.65"	4:42PM	Black Leaded Oriole	01	22 M	180°	320°	Perching
				Alexandrine Parakeet	04				
				Europium Turtle Dave	01	15 M	30°	320°	Perching
				Red Vented Bulbul	01	-	-	-	By flying
				Long Tailed Shrink	01	-	-	-	By flying
				Indian Cuckoo	02	25 M	40°	320°	Perching
				Jungle Babbler	07	-	-	-	By flying
900 M	22°05'11.03"	83°08'26.36"	4:52PM	Jungle Babbler	01	-	-	-	Noted Through chirping
				Small Parakeet	01	-	-	-	Noted Through chirping
				Verditer Flycatcher	01	5 M	210°	320°	Perching

### Datasheet for Bird status survey

Cell-ID: T7 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 6:53 AM

GPS at every 300 m			Sighting information						
S. N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
0 M	22°05'42.72"	83°08'26.85"	6:53 AM	Indian Roller	01	-	-	-	Noted Through chirping
				Common Moorhen	03	-	-	-	By Flying
				Lesser Whistling Duck	01	-	-	-	By Flying
				Shikra	01	30M	140°	250°	Perching
				Indian Robin	01	15M	140°	250°	Perching
300 M	22°05'43.35"	83°08'36.54"	7:05 AM	Greenish Warbler	01	-	-	-	By Flying
				Indian Silver Bill	02	-	-	-	By Flying
				Scaly Breasted Munia	02	12M	290°	260°	Perching
				Asian Paradise Flycatcher	02	17M	320°	260°	Perching
				Baya Weaver	01	12M	290°	260°	Perching
600 M	22°05'42.84"	83°08'46.12"	7:15 AM	Grey Francolin	01	13M	180°	280°	Perching
				Plum Headed Parakeet	01	-	-	-	By flying

				Red Vented Bulbul	02	-	-	-	Noted Through chirping
				Green Bee Eater	16	-	-	-	By flying
				Oriental Turtle Dove	01	-	-	-	By flying
				Blyth Reed Warbler	02	27M	160 <sup>0</sup>	280 <sup>0</sup>	Perching
				Jungle Babbler	06	-	-	-	By flying
900 M	22 <sup>0</sup> 05'42.58"	83 <sup>0</sup> 08'55.34"	7:27 AM	Jungle Crow	01	-	-	-	By flying
				Sulphur-Bellied Warbler	01	-	-	-	By flying
				Spotted Dave	02	-	-	-	Noted Through chirping
				Red Vented Bulbul	01	-	-	-	Noted Through chirping
				Paddy Field Pipit	02	-	-	-	By flying
				Black Drongo	01	-	-	-	By flying
1200 M	22 <sup>0</sup> 05'42.33"	83 <sup>0</sup> 09'03.88"	7:41 AM	Red Vented Bulbul	02	-	-	-	By flying
				Laughing Dove	01	-	-	-	Noted Through chirping
				Indian Roller	01	-	-	-	Noted Through chirping
				Indian Silver Bill	02	-	-	-	By flying
				Purple Sunbird	01	24 M	0 <sup>0</sup>	280 <sup>0</sup>	Perching
				Common Babbler	04	12 M	190 <sup>0</sup>	280 <sup>0</sup>	Perching
Verditer Flycatcher	01	32 M	190 <sup>0</sup>	280 <sup>0</sup>	Perching				

### Datasheet for Bird status survey

Cell-ID: T8 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 8:02 AM

GPS at every 300 M			Sighting Information						
S. N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
00 M	22 <sup>0</sup> 05'58.62"	83 <sup>0</sup> 09'13.18"	8:02 AM	Indian Roller	01	-	-	-	Noted Through Chirping
				Golden Oriole	01	25M	150 <sup>0</sup>	100 <sup>0</sup>	Perching
				Purple Sunbird	01	-	-	-	By Flying
				Indian Robin	01	-	-	-	By Flying
				Indian Silver Bill	02	-	-	-	By Flying
300 M	22 <sup>0</sup> 06'00.55"	83 <sup>0</sup> 09'03.81"	8:12 AM	Purple Sunbird	01	-	-	-	By Flying
				Red Vented Bulbul	02	-	-	-	Noted Through Chirping
				Spotted Dave	02	-	-	-	Noted Through Chirping
600 M	22 <sup>0</sup> 06'00.19"	83 <sup>0</sup> 08'55.28"	8:20 AM	Common Tailor Bird	01	7 M	30 <sup>0</sup>	80 <sup>0</sup>	Perching
				Common Babbler	01	-	-	-	By Flying
				Purple Sunbird	02	-	-	-	Noted Through Chirping
				Indian Silver Bill	16	-	-	-	By Flying
				Greenish Warbler	01	-	-	-	By Flying
Green Bee Eater	02	12 M	40 <sup>0</sup>	80 <sup>0</sup>	Perching				

90 0 M	22 <sup>0</sup> 06'01. 42"	83 <sup>0</sup> 08'45. 36"	8:32 AM	Alexandrine Parakeet	01	-	-	-	By Flying
				Eurasian Collared Dove	01	-	-	-	Noted Through Chirping
				Indian Silver Bill	01	-	-	-	By Flying
				Plum Headed Parakeet	01	-	-	-	By Flying
				Blue-Winged Leaf Bird	01	12 M	20 <sup>0</sup>	90 <sup>0</sup>	Perching
				Black Redstart	01	25 M	180 <sup>0</sup>	90 <sup>0</sup>	Perching
12 00 M	22 <sup>0</sup> 05'42. 33"	83 <sup>0</sup> 09'03. 88"	8:40 AM	Eagle Owl	01	-	-	-	By Flying
				Indian Roller	01	-	-	-	By Flying
				Black Drongo	06	25 M	200 <sup>0</sup>	90 <sup>0</sup>	Perching
				Little Cormorant	30	35 M	90 <sup>0</sup>	90 <sup>0</sup>	Perching
				Eurasian Collared Dove	02	12 M	210 <sup>0</sup>	90 <sup>0</sup>	Perching
				Common Kingfisher	01	24 M	80 <sup>0</sup>	90 <sup>0</sup>	Perching
				White Throated Kingfisher	02	24 M	70 <sup>0</sup>	90 <sup>0</sup>	Perching
				Bronze-Winged Jacana	12	45 M	130 <sup>0</sup>	90 <sup>0</sup>	Perching
				Indian Courser	15	14 M	130 <sup>0</sup>	90 <sup>0</sup>	Perching
				Great Thick Knee	06	32M	110 <sup>0</sup>	90 <sup>0</sup>	Perching
				Gadwall	07	30 M	40 <sup>0</sup>	90 <sup>0</sup>	Perching
				Spot Bill Duck	05	15 M	90 <sup>0</sup>	90 <sup>0</sup>	Perching
				Cotton Teal	06	20 M	80 <sup>0</sup>	90 <sup>0</sup>	Perching
				Common Teal	06	24 M	80 <sup>0</sup>	90 <sup>0</sup>	Perching
				Red Wattled Lapping	10	30M	60 <sup>0</sup>	90 <sup>0</sup>	Perching
				Common Sandpiper	23	24 M	70 <sup>0</sup>	90 <sup>0</sup>	Perching
				Singing Bush Lark	3	13 M	100 <sup>0</sup>	90 <sup>0</sup>	Perching
				Greater Cormorant	18	18 M	120 <sup>0</sup>	90 <sup>0</sup>	Perching
				Lesser Whistling Duck	05	20 M	190 <sup>0</sup>	90 <sup>0</sup>	Perching
				Little Bittern	07	19 M	130 <sup>0</sup>	90 <sup>0</sup>	Perching
Eurasian Coot	06	11 M	160 <sup>0</sup>	90 <sup>0</sup>	Perching				
Red Crested Pochard	06	21 M	90 <sup>0</sup>	90 <sup>0</sup>	Perching				
Common Pochard	03	22 M	140 <sup>0</sup>	90 <sup>0</sup>	Perching				
Bar Headed Goose	08	32 M	90 <sup>0</sup>	90 <sup>0</sup>	Perching				

### Datasheet for Bird status survey

Cell-ID: T9 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 8:00 AM

GPS at every 300 M			Sighting Information						
S. N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
0	22 <sup>0</sup> 09'44.	83 <sup>0</sup> 10'02	8:00	Jungle Babbler	02	-	-	-	By Flying

M	00"	.25"	AM	Rufous tree pie	01	25M	0 <sup>0</sup>	290 <sup>0</sup>	Perching
				Plum headed parakeet	01	-	-	-	By Flying
				Indian Silver Bill	01	-	-	-	By Flying
				Small Parakeet	02	-	-	-	By Flying
30 0 M	22 <sup>0</sup> 09'44. 02"	83 <sup>0</sup> 10'08 .74"	8:25 AM	Indian Pitta	01	21 M	200 <sup>0</sup>	290 <sup>0</sup>	Perching
				Brown Shrink	01	18 M	200 <sup>0</sup>	290 <sup>0</sup>	Perching
				Small Parakeet	01	-	-	-	By Flying
				Indian Silver Bill	01	-	-	-	By Flying
				Black Drongo	01	-	-	-	Noted Through Chirping
				Lesser Flame Back	01	-	-	-	Noted Through Chirping
60 0 M	22 <sup>0</sup> 09'44. 56"	83 <sup>0</sup> 10'17 .23"	8:35 AM	Indian Silver Bill	01	-	-	-	By Flying
				Purple Sunbird	01	-	-	-	Noted Through Chirping
				Red vented Bulbul	01	-	-	-	Noted Through Chirping
				Rose ringed Parakeet	04	-	-	-	By Flying
90 0 M	22 <sup>0</sup> 09'44. 86"	83 <sup>0</sup> 10'25 .67"	8:45 AM	Rose ringed Parakeet	01	-	-	-	Noted Through Chirping
				Eurasian Collared Dove	01	-	-	-	Noted Through Chirping
				Purple Sunbird	01	-	-	-	Noted Through Chirping
				Common Babbler	03	-	-	-	By Flying
12 00 M	22 <sup>0</sup> 09'46. 54"	83 <sup>0</sup> 10'35 .42"	9:00 AM	Alexandrine Parakeet	01	-	-	-	By Flying
				Indian Robin	01	-	-	-	By Flying
				Rufous tree pie	06	-	-	-	Noted Through Chirping
				Purple Sunbird	30	-	-	-	Noted Through Chirping
				Eurasian Collared Dove	01	-	-	-	By Flying
				House Sparrow	03	-	-	-	By Flying
				Small Parakeet	01	-	-	-	Noted Through Chirping
				Eurasian golden oriole	04	-	-	-	By Flying
				Rose ringed Parakeet	02	-	-	-	By Flying

### Datasheet for Bird status survey

Cell-ID: T10 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 9:27 AM

GPS at every 300 M			Sighting Information						
S. N.	Latitude	Longitude	Time	Species	Number	Perp. Dist.	Bearing		Observation
							A	T	
0 M	22 <sup>0</sup> 09'59. 09"	83 <sup>0</sup> 10'35 .11"	9:27 AM	Plum headed parakeet	06	-	-	-	By Flying

				Rose ringed Parakeet	03	-	-	-	By Flying
				Alexandrine Parakeet	03	-	-	-	By Flying
				Black Drongo	02	-	-	-	By Flying
				Greater Flame Back	02	-	-	-	Noted Through Chirping
300 M	22°09'58.18"	83°10'24.76"	9:35 AM	Rose ringed Parakeet	01	22 M	160°	80°	Perching
				Black Drongo	02	-	-	-	Noted Through Chirping
				Black Headed Oriole	01	-	-	-	By Flying
				Green Bee Eater	01	-	-	-	By Flying
				Greater Coucal	01	-	-	-	By Flying
600 M	22°09'57.36"	83°10'15.20"	9:45 AM	Jungle Babbler	03	-	-	-	By Flying
				Ashy Prinia	02	-	-	-	By Flying
				Black Drongo	02	-	-	-	By Flying
				Blyth Reed Warbler	01	-	-	-	By Flying
				Rose ringed Parakeet	02	-	-	-	By Flying
				Small Parakeet	02	12 M	20°	80°	Perching
				Common Hoopoe	01	20 M	120°	80°	Perching
Indian Roller	01	-	-	-	By Flying				
900 M	22°09'57.62"	83°10'05.26"	9:50 AM	Indian Silver Bill	01	-	-	-	By Flying
				Plain Prinia	02	-	-	-	By Flying
				Common Babbler	04	-	-	-	By Flying
				Rose ringed Parakeet	02	-	-	-	By Flying
				Purple Sunbird	01	-	-	-	By Flying
				White-throated kingfisher	01	20 M	120°	80°	Perching
				Greater Coucal	01	-	-	-	By Flying

### Datasheet for Bird status survey

Cell-ID: T11 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 9:27 AM

GPS At Every 300 M			Sighting Information					
S.N.	Latitude	Longitude	Species	Number	Perp. Dist.	Bearing		Observation
						A	T	
0m	22°09'57.59"	83°10'47.98"	Greater Flameback	01	-	-	-	Noted Through Chirping
			Jungle Myna	02	-	-	-	Flying
			Black Drongo	01	-	-	-	Flying
			Indian Roller	01	-	-	-	Noted Through Chirping
300 m	22°09'54.40"	83°10'39.14"	Alexandrine Parakeet	03	-	-	-	Flying
			Rose Ringed Parakeet	05	12	340°	50°	Perching



			Plum Headed Parakeet	04	-	-	-	Noted Through Chirping
			Small Parakeet	06	-	-	-	Flying
			Golden Oriole	02	-	-	-	Noted Through Chirping
			Jungle Babbler	08	17	120°	50°	Perching
600 m	22°09'51.67	83°10'30.07	Rose Ringed Parakeet	05	-	-	-	Flying
			Copper Smith Barbet	03	10	350°	50°	Perching
			Rufus Tree Pie	01	14	110°	50°	Perching
			Black Drongo	02	-	-	-	Flying
900 m	22°09'47.40	83°10'21.18	Indian Silverbil	05	22	130°	50°	Perching
			Black Myna	01	-	-	-	Flying
			Golden Oriole	01	-	-	-	Noted Through Chirping
1200 m	22°09'44.08	83°10'13.70	Alexandrine Parakeet	02	-	-	-	Flying
			Plumheaded Parakeet	02	-	-	-	Flying
			Purple Sunbird	01	-	-	-	Noted Through Chirping
			Black Hooded Oriole	01	17	140°	70°	Perching

**Datasheet for Bird status survey**

Cell-ID: T12 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 9:27 AM

GPS At Every 300 M			Sighting Information					
S.N.	Latitude	Longitude	Species	Number	Per p. Dist.	Bearing		Observation
						A	T	
0m	22°09'12.70	83°10'37.34	Greater Flameback	2	-	-	-	Flying
			Greater Cauca	1	-	-	-	Flying
			Rose Ringed Parakeet	3	-	-	-	Flying
			Indian Silverbil	2	-	-	-	Noted Through Chirping
300 m	22°09'12.70	83°10'26.53	Thick Blid Flower Peacker	2	35	170°	90°	Perching
			White Rumped Munia	1	30	40°	90°	Perching
			Alexandrine Parakeet	4	-	-	-	Flying
			Black Drongo	2	-	-	-	Flying
600 m	22°09'12.45	83°10'16.57	Oriental White Eye	2	32	10°	90°	Perching
			Indian Silverbil	4	-	-	-	Flying
			Green Bee Eater	12	-	-	-	Flying
			Ashy Prinia	2	29	160°	90°	Perching
			Purple Sunbird	2	-	-	-	Flying
900 m	22°09'12.54	83°10'07.44	Red Vented Bulbul	5	25	20°	90°	Perching
			Baya Weaver	2	35	150°	90°	Perching
			Golden Oriole	2	-	-	-	Noted Through

								Chirping
			Lesser Flamback	1	-	-	-	Noted Through Chirping
			Common Babbler	6	-	-	-	Flying
			Greenish Warbler	2	-	-	-	Flying
			Oriental Magpie Robin	2	35	120°	90°	Perching
			Small Minivet	2	40	40°	90°	Perching
1200 m	22°09'12. 59	83°10'01 .34	Small Minivet	2	32	130°	90°	Perching
			Plum Headed Parakeet	3	-	-	-	Flying
			Jungle Babbler	6	-	-	-	Flying
			Purple Sunbird	1	-	-	-	Noted Through Chirping
			Small Parakeet	2	-	-	-	Noted Through Chirping
			Thick Billed Flower Pecker	2	12	107°	90°	Perching
			Golden Oriole	2	17	30°	90°	Perching
			Oriental White Eye	3	28	50°	90°	Perching
			Black Drongo	2	-	-	-	Noted Through Chirping
			Red Vented Bulbul	2	-	-	-	Noted Through Chirping
			Indian Silverbil	3	-	-	-	Flying
			Baya Weaver	3	-	-	-	Flying

**ANNEXURE II (SUMMER SEASON)**

**Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T1 Team:** Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)		
				B / A / G / W / S	Tree species	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub		Regeneration	S/H/R/E/W/P
<b>0 M</b>	22 <sup>0</sup> 05' 38.24"	83 <sup>0</sup> 06' 49.07"	W/S	Sal	G 0.20 m	4	2%	1%	5 %	30 %	Nil		
			Char	G 0.18 m									
<b>300 M</b>	22 <sup>0</sup> 05' 28.83"	83 <sup>0</sup> 06' 47.56"	W/S	Sal	G 0.35m	1,4	1%	2%	3%	25%	Nil		
			Char	G 0.15m									
			Mahua	G 0.19m									
<b>600 M</b>	22 <sup>0</sup> 05' 18.80"	83 <sup>0</sup> 06' 49.30"	W/S	Jamun	G 0.10m	1,4	2%	3%	4%	35%	Nil		
			Sal	G 0.22m									
			Char	G 0.20m									
<b>900 M</b>	22 <sup>0</sup> 05' 09.17"	83 <sup>0</sup> 06' 51.36"	W/S	Sal	G 0.35m	1,4	3%	1%	5%	20%	Nil		
			Char	G 0.20m									
<b>1200 M</b>	22 <sup>0</sup> 04' 59.19"	83 <sup>0</sup> 06' 50.07"	W/A	Mango	G 0.95m	1,4	1%	2 %	5 %	15%	Nil		
			Amaltash	G 0.20 m									
			Mahua	G 0.65m									

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T2 Team:** Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)		
				B / A / G / W / S	Tree species	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub		Regeneration	S/H/R/E/W/P

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<b>0 M</b>	22°05'18.92"	83°07'36.25"	W	Sal	G 0.65 m	1,4	1%	1%	1%	15%	R/E/S
				Char	G 0.15 m						
				Mahua	G 0.90m						
<b>300 M</b>	22°05'16.54"	83°07'25.64"	W	Sal	G 0.35m	1,4	1%	1%	2%	30%	Nil
				Char	G 0.22m						
				Mahua	G 0.18m						
<b>600 M</b>	22°05'17.94"	83°07'16.54"	W	Neem	G 0.20m	1,4	1%	2%	5%	35%	Nil
				Sal	G 0.50m						
				Char	G 0.20m						
<b>900 M</b>	22°05'19.20"	83°07'07.46"	W	Sal	G 0.35m	1,4	2%	3%	5%	40%	Nil
				Char	G 0.18m						
				Mahua	G 0.36m						
<b>1200 M</b>	22°05'20.01"	83°06'59.10"	W	Sal	G 0.30m	1,4	2%	1%	5%	35%	Nil
				Char	G 0.20 m						
				Dhawda	G 0.15m						

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Datasheet for habitat characterization at every 300 m along transect route**

Cell-ID: T3 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)	
					B / A / G / W / S	Tree species	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub		Regeneration
<b>0 M</b>	22°05'05.16"	83°07'08.53"		W/A	Kusum (01)	G 3.00 m	1,4	1%	2%	7%	30%	E/S/P	
					Jamun (02)	G 0.50m							
					Char (02)	G 0.60 m							
<b>300 M</b>	22°05'04.57"	83°07'11.89"		W	Sal (35)	G 0.22m	1,4	1%	2%	5%	50%	Nil	
					Char (06)	G 0.40m							
					Kekat (01)	G 0.40m							
<b>600 M</b>	22°05'08.17"	83°07'22.21"		W	Senha (02)	G 0.16m	1,4	1%	1%	5%	50%	Nil	
					Sal (10)	G 0.80m							

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900 M	22°05'11.84"	83°07'28.60"	W	Char (5)	G 0.15m	1,4	2%	3%	3%	40%	Nil
				Sal (15)	G 0.50m						
				Char (03) Dhawda (03)	G 0.20m G 0.35m						
1100 M	22°05'12.80"	83°07'39.29"	W	Sal (15)	G 0.50m	1,4	1%	2%	2%	20%	E/S/R/W
				Char (12)	G 0.17m						
				Senha (3)	G 0.15m						

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T4 Team:** Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
				B / A / G / W / S	Tree species	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub	
			0 M	22°05'00.42"	83°07'10.85"	W/A	Mahua (01)	G 0.60m	1,4	1%	1%
			Char (02)	G 0.55m							
300 M	22°05'00.29"	83°07'00.28"	W/S	Mahua (02)	G 0.75m	1,4	1%	1%	1%	2%	S/W
				Char(04)	G 0.75m						
				Mango (02)	G 0.60m						
600 M	22°04'56.87"	83°04'49.85"	A/S	Jamun(02)	G 1.30m	1,4	0%	1%	1%	2%	E
				Mango(02)	G 2.10m						
				Palash (02)	G 2.30m						
900 M	22°04'55.99"	83°06'42.75"	A/S	Jamun(02)	G 2.30m	1,4	3%	1%	1%	5%	Nil
				Mango(03)	G 2.10m						
				Bahera (01)	G 1.20m						
1200 M	22°04'53.75"	83°06'34.19"	A/W/S	Palash (05)	G 0.67m	1,4	1%	1%	2%	6%	E/P
				Jamun (03)	G 0.74 m						
				Mahua (04)	G 0.55m						

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Datasheet for habitat characterization at every 300 m along transect route**

Cell-ID: T5 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
				B / A / G / W / S	Tree species	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub	
			S/H/R/E/W/P								
0 M	22°05'38.90"	83°07'41.06"	W/S	Sal (02)	G 0.80 m	1,4	2%	3%	5 %	20 %	Nil
				Mahua (02)	G 0.60m						
				Char (03)	G 0.35 m						
300 M	22°05'40.52"	83°07'30.65"	W/S	Tendu(02)	G 0.50m	1,4	1%	2%	3%	25%	Nil
				Saja (02)	G 0.60m						
				Dhawda (3)	G 0.65m						
600 M	22°05'34.53"	83°07'20.50"	W	Mahua (03)	G 0.65m	1,4	2%	3%	5%	30%	Nil
				Sal (05)	G 0.45m						
				Char(05)	G 0.40m						
900 M	22°05'26.03"	83°07'12.54"	W/A	Tendu (02)	G 0.90m	1,4	1%	2%	3%	40%	Nil
				Sal(03)	G 0.90m						
				Char (05)	G 0.50m						
1200 M	22°05'26.54"	83°06'00.64"	W/A	Char (03)	G 0.55m	1,4	1%	3%	2%	20%	Nil
				Sal (02)	G 0.75 m						
				Mahua (02)	G 0.95m						

Abbreviation: Land cover – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Datasheet for habitat characterization at every 300 m along transect route**

Cell-ID: T6 Team: Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
				B / A / G / W / S	Tree species	Parameter s	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub	
			S/H/R/E/W/P								

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<b>0 M</b>	22°05'48.12"	83°07'29.38"	W/S	Sal (25)	G 0.55 m	1,4	1%	1%	2 %	20 %	R/E
				Char (02)	G 0.12 m						
<b>300 M</b>	22°05'57.00"	83°07'37.40"	W/S	Tendu(06)	G 0.25m	1,4	>1%	>1%	1 %	20 %	R/E
				Sal (35)	G 0.26m						
				Dhawda (4)	G 0.10m						
<b>600 M</b>	22°06'06.30"	83°07'36.63"	S/G	Tendu (04)	G >0.10m	1,4	10%	1%	1%	35%	Nil
				Sal (10)	G >0.10m						
				Neem(01)	G 0.60m						
<b>900 M</b>	22°06'11.93"	83°07'34.57"	B/A	Nil	Nil	-	20%	0%	0%	0%	Nil
<b>1200 M</b>	22°06'26.83"	83°07'31.12"	W	Palash(06)	G 0.40m	1,4	5%	1%	1%	20%	E/P/S
				Neem (05)	G 0.70 m						
				Mahua (02)	G 1.20m						

Abbreviation: **Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T7 Team:** Ashutosh Pandey, Vijay Kumar Bhagat, Ashish Rawal, Kamesh Kumar Sahu.

S.N.	Latitude	Longitude	Land-cover (100m radius)	Vegetation (3 dominant species)			Vegetation composition				Human structure (500m radius)
				B / A / G / W / S	Tree species	Parameters	Observation 1 / 2 / 3 / 4 / 5	Grass	Herb	Shrub	
			S/H/R/E/W/P								
<b>0 M</b>	22°04'44.28"	83°07'37.23"	A	Mahua (02)	G 1.55 m	1,4	2%	1%	2 %	25 %	Nil
				Char (02)	G 0.75 m						
				Semul (01)	G 1.19 m						
<b>300 M</b>	22°04'45.09"	83°07'47.78"	W/A	Char(04)	G 0.80m	1,4	1%	2%	3 %	15 %	Nil
				Sal (7)	G 0.80m						
				Neem (1)	G 0.55m						
<b>600 M</b>	22°04'44.50"	83°07'57.25"	W/S	dhawda (02)	G 0.90m	1,4	2%	2%	3%	20%	Nil
				Kusum(01)	G 0.60m						
				kekat(02)	G 0.45m						

**PROJECT REPORT ON WILDLIFE AND AVI-FAUNA CONSERVATION PLAN FOR THE OCP CHAAL, DHARAMJAIGARH AREA**

<b>900 M</b>	22°04'40.40"	83°08'08.70"	W/S	Dhawda (3)	G 1.20m	1,4	1%	3%	5%	35%	Nil
				Sal (04)	G 1.30m						
				Saja (02)	G 0.60m						
<b>1200 M</b>	22°04'48.24"	83°08'18.80"	W/A	kusum(02)	G 2.10m	1,4	2%	3%	6%	5%	Nil
				Char (01)	G 0.80 m						
				Mahua (07)	G 1.80m						

Abbreviation: **Land cover** – **B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

**Human structure** – **S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**ANNEXURE II (WINTER SEASON)**

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T1 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 6:00 AM**

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)				Vegetation composition				Human structure (500m radius)		
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb		Shrub	Regeneration
								H	G						
<b>0 M</b>	22°05'35.19"	83°06'45.69"	6:32 AM	S/G	Mahua	06	7m	0.33m	4	5%	5%	10 %	10 %	E,W,H	
					Char	04	3m	0.25m							
					Mango	01	12m	1.12m							
<b>300 M</b>	22°05'27.50"	83°06'53.18"	6:40 AM	W/S	Sal	07	11m	0.47m	4,5	5%	3%	5%	10%	Nil	
					Senha	03	5m	0.28m							
					Char	03	7m	0.45m							
<b>600 M</b>	22°05'22.51"	83°07'00.80"	6:55 AM	W/S	Char	05	11m	0.32m	4,5	2%	4%	5%	20%	Nil	
					Sal	04	6m	0.27m							
					Dhaoda	23	8m	0.45m							
<b>900 M</b>	22°05'19.45"	83°07'05.06"	7:05 AM	W	Char	09	7m	0.25m	4,5	2%	5%	5%	10%	Nil	
					Mahua	02	9m	0.45m							
					Sal	15	10m	0.35m							
<b>1200 M</b>	22°05'14.34"	83°07'11.52"	7:13 AM	W/A	Mango	02	12m	3.00m	4	2%	2%	2%	5%	Nil	
					Mahua	04	3m	0.35m							
					Koria	09	3m	0.42m							



**Abbreviation: Land cover – B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

**Human structure – S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

**Observation – 1.** Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T2 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.0 (Km). Season: winter. Time: 7:35 AM**

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)					Vegetation composition				Human structure (500m radius)	
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb	Shrub		Regeneration
								H	G						
0 M	22°05'15.17"	83°07'21.33"	7:35 AM	W	Sal	06	10m	0.90m	4	2%	5%	5%	10 %	E,W,H	
					Baheda	05	3m	0.35m							
					Koriya	06	4m	0.28m							
300 M	22°05'24.71"	83°07'20.42"	7:47 AM	G/S	Sal	06	10m	0.45m	4	2%	2%	2%	10%	Nil	
					Mahua	06	5m	0.26m							
					Chironji	03	3m	0.28m							
600 M	22°05'32.45"	83°07'22.60"	8:00 AM	W	Sal	17	7m	0.42m	4	2%	5%	2%	20%	Nil	
					Char	04	5m	0.35m							
					Dhaoda	04	3m	0.35m							
900 M	22°05'40.75"	83°07'26.24"	8:10 AM	W	Sal	17	3m	0.25m	4	2%	5%	5%	5%	Nil	
					Senha	04	3m	0.25m							
					Dhaoda	02	5m	0.35m							

**Abbreviation: Land cover – B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

**Human structure – S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

**Observation – 1.** Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**ANNEXURE II (WINTER SEASON)**

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T3 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 9:00 AM**

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)				Vegetation composition	Human structure (500m radius)
					B / A / G /	Tree	Number	Parameters		

PROJECT REPORT ON WILDLIFE AND AVI-FAUNA CONSERVATION PLAN FOR THE OCP CHAAL, DHARAMJAIGARH AREA

				W / S	species	of Tree	H	G	n 1/2/3/4/5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
0 M	22°05'17.18"	83°07'34.30"	9:00 AM	W	Sal	17	10m	0.95m	4	2%	2%	3%	10 %	R,H,E
					Saja	06	6m	0.35m						
					Dhaoda	03	5m	0.40m						
300 M	22°05'13.21"	83°07'25.26"	9:15 AM	W	Sal	05	8m	0.65m	4	2%	3%	5%	10%	Nil
					Baheda	03	5m	0.45m						
					Char	03	4m	0.42m						
600 M	22°05'09.38"	83°07'16.70"	9:22 AM	W	Sal	07	10m	0.60m	1,4	3%	2%	5%	20%	Nil
					Mahua	03	10m	1.50m						
					Char	05	8m	0.35m						
900 M	22°05'04.08"	83°07'08.54"	9:33 AM	W, S	Mahua	02	5m	0.25m	1,4	2%	2%	5%	10%	Nil
					Char	05	5m	0.35m						
					Sal	06	7m	0.45m						
22°05'00.12"	83°07'01.95"	22°05'00.12"	9:45 AM	W/G	Mahua	01	8m	1.20m	1,4	3%	3%	2%	5%	Nil
					Char	01	6m	0.42m						
					Baheda	02	12m	1.00m						

Abbreviation: Land cover – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

ANNEXURE II

Appendix 2: Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T4 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 10:05 AM

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)					Vegetation composition				Human structure (500m radius)	
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb	Shrub		Regeneration
								H	G						
0 M	22°05'03.40"	83°06'54.64"	10:05 AM	W	Mahua	02	10m	2.60m	1,4	2%	2%	2%	3 %	S,E	
					Mango	03	11m	0.75m							
					Char	01	7m	0.45m							
300	22°05'58.77"	83°07'45.39"	10:20	W	Mahua	05	12m	1.25m	1,4	3%	2%	2%	5%	E	

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M			AM		Palash	04	7m	0.40m						
					Char	02	3m	0.20m						
600 M	22°05'01.01"	83°06'33.82"	10:30 AM	W	Char	02	10m	0.95m	1,4	2%	3%	2%	5%	E
					Mango	03	10m	2.20m						
					Mahua	01	8m	1.65m						
900 M	22°05'06.29"	83°06'28.92"	10:40 AM	W/S	Mahua	04	10m	1.25m	1,4	2%	2%	2%	5%	S,E
					Baheda	01	9m	1.70m						
					Chhar	04	7m	0.35m						
1200 M	22°05'09.56"	83°06'24.12"	10:55 AM	W/G	Mahua	05	12m	0.55m	1,4	2%	2%	2%	2%	P,S,E
					Baheda	01	10m	0.42m						
					Semal	02	16m	0.75m						

**Abbreviation: Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

### ANNEXURE II

#### Appendix 2: Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T5 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.0 (Km). Season: winter. Time: 3:25 PM

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)					Vegetation composition				Human structure (500m radius)	
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
								H	G						
0 M	22°05'48.32"	83°07'28.90"	3:25PM	S	Sal	15	9m	1.20m	1,4	0%	1%	2%	3%	S,R,E	
					Chilho	02	3m	0.25m							
					Char	06	3m	0.30m							
300 M	22°05'57.68"	83°07'31.08"	3:37PM	S,W	Sal	17	3m	0.20m	4	5%	2%	10%	25%	E	
					Koria	20	7m	0.40m							
					Tendu	08	6m	0.60m							
600 M	22°06'05.21"	83°07'34.13"	3:45PM	S,G	Baheda	01	11m	0.35m	2,4	2%	4%	5%	10%	E	
					Mahaneem	02	4m	0.35m							
					Sal	01	15m	0.95m							

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<b>900 M</b>	22°06'13.27"	83°07'38.04"	3:55PM	B	Mango	02	8m	0.65m	4	1%	1%	1%	2%	R,E,S
					Mahaneem	01	10m	1.70m						
					Mahua	03	10m	0.98m						

**Abbreviation: Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**ANNEXURE II**

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T6 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.0 (Km). Season: winter. Time: 10:05 AM**

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)					Vegetation composition				Human structure (500m radius)	
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb	Shrub		Regeneration
								H	G						
<b>0 M</b>	22°05'33.17"	83°08'13.63"	4:25 PM	W	Bargad	01	5m	0.75m	4	2%	1%	2%	20 %	R,E	
					Sal	25	5m	0.35m							
					Char	06	3m	0.30m							
<b>300 M</b>	22°05'26.51"	83°08'18.95"	4:33PM	S,W	Sal	26	6m	0.50m	1,2,4	5%	3%	2%	20 %	Nil	
					Saja	03	4m	0.45m							
					Char	04	4m	0.35m							
<b>600 M</b>	22°05'18.32"	83°08'22.65"	4:42PM	W	Sal	35	6m	0.40m	1,2,4	3%	2%	2%	10%	Nil	
					Char	08	5m	0.55m							
					Baheda	02	4m	0.25m							
<b>900 M</b>	22°05'11.03"	83°08'26.36"	4:52PM	W	Sal	11	5m	0.80m	1,4	2%	2%	2%	10%	Nil	
					Char	05	4m	0.45m							
					Mahua	03	5m	0.75m							

**Abbreviation: Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**ANNEXURE II**

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T7 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 6:53 AM**

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S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)				Vegetation composition				Human structure (500m radius)		
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb		Shrub	Regeneration
								H	G						
0 M	22°05'42.72"	83°08'26.85"	6:53AM	W	Sal	16	7m	0.45m	1,4	5%	2%	10%	15%	P,S,R,E	
					Char	06	5m	0.55m							
					Mahua	03	4m	0.35m							
300 M	22°05'43.35"	83°08'36.54"	7:05AM	W,S	Sal	21	5m	0.60m	1,2,4	2%	5%	5%	5%	P	
					Mahua	03	3m	0.35m							
					Char	04	3m	0.25m							
600 M	22°05'42.84"	83°08'46.12"	7:15AM	W,S	Sal	08	5m	0.40m	1,2,4	5%	10%	15%	25%	Nil	
					Char	10	4m	0.25m							
					Baheda	03	5m	0.45m							
900 M	22°05'42.58"	83°08'55.34"	7:27AM	A,W	Chhar	05	5m	0.50m	2,4	2%	10%	2%	10%	Nil	
					Mahua	07	7m	0.70m							
1200 M	22°05'42.33"	83°09'03.88"	7:41AM	A,W	Mango	01	8m	0.90m	1,4	1%	1%	2%	5%	Nil	
					Sal	06	6m	0.95m							
					Mahua	01	5m	0.70m							

**Abbreviation: Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

**ANNEXURE II**

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

Cell-ID: T8 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 8:02 AM

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)				Vegetation composition				Human structure (500m radius)		
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb		Shrub	Regeneration
								H	G						
0 M	22°05'58.62"	83°09'13.18"	8:02AM	A,W	Mahua	08	7m	0.85m	1,4	1%	2%	2%	5%	Nil	
					Char	07	6m	0.65m							

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300 M	22°06'00.55"	83°09'03.81"	8:12AM	W	Sal	15	6m	0.55m	1,4	1%	1%	2%	3%	Nil
					Sal	35	7m	0.55m						
					Saja	03	3m	0.30m						
					Senha	02	4m	0.35m						
600 M	22°06'00.19"	83°08'55.28"	8:20AM	W	Mahua	06	8m	0.75m	4	1%	1%	1%	2%	Nil
					Sal	07	9m	0.80m						
					Chhar	05	4m	0.55m						
900 M	22°06'01.42"	83°08'45.36"	8:32AM	W	Harra	01	9m	1.20m	4	1%	1%	1%	1%	P
					Mahua	03	12m	1.45m						
					Chhar	04	4m	0.45m						
1200 M	22°05'42.33"	83°09'03.88"	8:40AM	B,P	Harra	01	8m	1.20m	4	1%	1%	1%	1%	Wetland
					Mahua	02	15m	1.55m						
					Bargad	01	10m	1.35m						

**Abbreviation: Land cover** – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

**Human structure** – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

**Observation** – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

### ANNEXURE II

#### Appendix 2: Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T9 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 8:00 AM

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)					Vegetation composition				Human structure (500m radius)	
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb	Shrub	Regeneration	S/H/R/E/W/P
								H	G						
0 M	22°09'44.00"	83°10'02.25"	8:00AM	W	Sal	18	30m	1.55m	4	1%	2%	2%	10%	H,S	
					Char	03	12m	1.35m							
					Saja	01	22m	1.44m							
300 M	22°09'44.02"	83°10'08.74"	8:25AM	W	Sal	13	30m	130m	4	1%	1%	2%	10%	Nil	
					Char	04	25m	110m							
					Saliya	06	30m	130m							
600 M	22°09'44.56"	83°10'17.23"	8:35AM	W	Sal	29	32m	1.65m	4	2%	1%	5%	75%	Nil	
					Dhawda	05	25m	1.40m							
					Saja	03	22m	0.95m							

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<b>900 M</b>	22°09'44.86"	83°10'25.67"	8:45AM	W	Sal	08	33m	1.20m	4	2%	1%	2%	70%	Nil
					Dhawda	04	35m	1.10m						
					Chhar	02	30m	1.09m						
<b>1200 M</b>	22°09'46.54"	83°10'35.42"	9:00AM	W	Sal	19	35m	1.45m	4	2%	1%	5%	25%	Nil
					Saliya	08	25m	0.80m						
					Saja	05	28m	1.20m						

**Abbreviation: Land cover – B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

**Human structure – S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

**Observation – 1.** Illicit felling **2.** Girdling **3.** Dead tree **4.** Living / Healthy **5.** Diseased

**ANNEXURE II**

**Appendix 2: Datasheet for habitat characterization at every 300 m along transect route**

**Cell-ID: T10 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.0 (Km). Season: winter. Time: 8:00 AM**

S.N.	Latitude	Longitude	Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)				Vegetation composition				Human structure (500m radius)		
					B / A / G / W / S	Tree species	Number of Tree	Parameters		Observation 1/2/3/4/5	Grass	Herb		Shrub	Regeneration
								H	G						
<b>0 M</b>	22°09'59.09"	83°10'35.11"	9:27AM	W	Sal	15	30m	1.55m	4	1%	2%	2%	10%	H,S	
					Saja	04	12m	1.35m							
					Tilisa	02	22m	1.44m							
<b>300 M</b>	22°09'58.18"	83°10'24.76"	9:35AM	W	Sal	16	30m	130m	4	1%	1%	2%	10%	Nil	
					Dhawda	02	25m	110m							
					Anjan	03	30m	130m							
<b>600 M</b>	22°09'57.36"	83°10'15.20"	9:45AM	W	Sal	08	32m	1.65m	4	2%	1%	5%	75%	Nil	
					Dhawda	06	25m	1.40m							
					Saja	03	22m	0.95m							
<b>900 M</b>	22°09'57.62"	83°10'05.26"	9:50AM	W	Teak	19	33m	1.20m	4	2%	1%	2%	70%	Nil	
					Harra	01	35m	1.10m							
					Mahua	07	30m	1.09m							

**Abbreviation: Land cover – B** (barren) / **A** (Agriculture) / **G** (Grassland) / **W** (Woodland) / **S** (Scrubland)

**Human structure – S** (Settlement) / **R** (Metal road) / **E** (Electricity) / **P** (Pond) / **W** (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

ANNEXURE II

Appendix 2: Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T11 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 8:45 AM

S.N.	GPS Location		Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)				Vegetation composition				Human structure (500m radius)	
	Lat.	Long.			B / A / G / W / S	Tree spp.	Number of tree	Parameters		Observation 1 / 2 / 3 / 4 / 5	Grass (%)	Herb (%)		Shrub (%)
								H	G				S/H/R/E/W/P	
0m	22°09'57.59	83°10'47.98	11:35 am	W	Sal	08	25m	1.40m	4	1%	2%	2%	5%	E
					Mahua	05	30m	1.70m						
					Char	02	35m	1.65m						
300m	22°09'54.40	83°10'39.14	11:55 am	W	Sal	12	17m	0.95m	4,5	1%	1%	3%	5%	E
					Char	04	40m	1.55m						
					Saja	04	30m	1.35m						
600m	22°09'51.67	83°10'30.07	12:03 am	W	Sal	08	17m	0.70m	4,5	1%	2%	2%	15%	E
					Char	08	17m	0.75m						
					Mahua	03	30m	1.35m						
900m	22°09'47.40	83°10'21.18	12:16 am	W	Sal	08	28m	1.25m	3,4,5	2%	3%	2%	10%	E
					Saja	04	26m	1.10m						
					Saliha	02	26m	1.15m						
1200m	22°09'44.08	83°10'13.70	12:27 am	W	Sal	08	35m	1.65m	4	1%	1%	2%	10%	E
					Saliha	03	28m	1.40m						
					char	06	25m	1.10m						

Abbreviation: Land cover – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased



ANNEXURE II

Appendix 2: Datasheet for habitat characterization at every 300 m along transect route

Cell-ID: T12 Team: Ashutosh Pandey, Vijay Kumar Bhagat & Amit Baghel. Trail-length: 1.2 (Km). Season: winter. Time: 8:00 AM

S.N.	GPS Location		Time (hrs.)	Land-cover (100m radius)	Vegetation (3 dominant species)					Vegetation composition				Human structure (500m radius)	
	Lat.	Long.			B / A / G / W / S	Tree spp.	Number of tree	Parameters		Observation 1 / 2 / 3/ 4/ 5	Grass (%)	Herb (%)	Shrub (%)		Regeneration (%)
								H	G						
0m	22 <sup>0</sup> 09'12.70	83 <sup>0</sup> 10'37.34	7:45am	W	Dhawda	08	35m	0.85m	4	1%	1%	2%	5%	R	
					Sal	11	35m	1.55m							
					Saja	07	25m	1.10m							
300m	22 <sup>0</sup> 09'12.70	83 <sup>0</sup> 10'26.53	7:50 am	W	Dhawda	06	40m	1.40m	1,4	1%	1%	3%	5%	R	
					Sal	12	40m	1.20m							
					Tinsa	04	30m	1.25m							
600m	22 <sup>0</sup> 09'12.45	83 <sup>0</sup> 10'16.57	8:02 am	W	Sal	10	40m	1.55m	1,4	1%	1%	2%	15%	R	
					Tinsa	05	35m	1.35m							
					dhawda	06	32m	1.25m							
900m	22 <sup>0</sup> 09'12.54	83 <sup>0</sup> 10'07.44	8:17 am	W	sal	08	45m	1.65m	1,4	1%	1%	2%	10%	R	
					Kekat	02	15m	0.95m							
					Saja	04	28m	1.20m							
1200m	22 <sup>0</sup> 09'12.59	83 <sup>0</sup> 10'01.34	8:25 am	W	Sal	11	50m	2.10m	1,4	1%	1%	2%	10%	R	
					Saja	04	32m	1.20m							
					Kekat	04	25m	1.10m							

Abbreviation: Land cover – B (barren) / A (Agriculture) / G (Grassland) / W (Woodland) / S (Scrubland)

Human structure – S (Settlement) / R (Metal road) / E (Electricity) / P (Pond) / W (Well / tube well)

Observation – 1. Illicit felling 2. Girdling 3. Dead tree 4. Living / Healthy 5. Diseased

## ANNEXURE 3

## Avifauna checklist of seasonal survey 2018 of OCP Chhal by SFRTI

S. No.	Common Name	Local Name	Scientific Name	Family	IUCN Status
1.	Alexandrine Parakeet	Parrot, Tota	<i>Psittacula eupatria</i>	Psittacidae	NT
2.	Ashy Drongo	-----	<i>Dicrurus leucophaeus</i>	Dicruridae	LC
3.	Ashy Prinia or ashy wren-warbler	-	<i>Prinia socialis</i>	Cisticolidae	LC
4.	Asian Brown Flycatcher	--	<i>Muscicapa dauurica</i>	Muscicapidae	LC
5.	Asian Koel	Koel, Cuckoo	<i>Eudynamis scolopacea</i>	Cuculidae	LC
6.	Asian Paradise Flycatcher	-----	<i>Terpsiphone paradisi</i>	Monarchidae	LC
7.	Bank Myna	Myna	<i>Acridotheres ginginianus</i>	Sturnidae	LC
8.	Bar Headed Goose	-----	<i>Anser indicus</i>	Anatidae	LC
9.	Barn Swallow	-----	<i>Hirundo rustica</i>	Hirundinidae	LC
10.	Baya Weaver	Gauraiya	<i>Ploceus philippinus</i>	Ploceidae	LC
11.	Black Drongo	Karrauna	<i>Dicrurus macrocercus</i>	Dicruridae	LC
12.	Black Headed Oriole	-----	<i>Oriolus larvatus</i>	Oriolidae	LC
13.	Black Redstart	-----	<i>Phoenicurus ochruros</i>	Muscicapidae	LC
14.	Blue-Winged Leaf Bird	-----	<i>Chloropsis cochinchinensis</i>	Chloropseidae	NT
15.	Blyth Reed Warbler	-----	<i>Acrocephalus dumetorum</i>	Acrocephalidae	LC
16.	Bramhiny Myna	Maina	<i>Sturnia pagodarum</i>	Sturnidae	LC
17.	Bronze-Winged Jacana	-----	<i>Metopidius indicus</i>	Jacanidae	LC
18.	Brown Shrike	-----	<i>Lanius cristatus</i>	Laniidae	LC
19.	Cattle Egret	Gay Bagula	<i>Bubulcus ibis</i>	Ardeidae	LC
20.	Common Babbler	-----	<i>Turdoides caudate</i>	Lieothrachidae	LC
21.	Common Hawk Eagle	Cheel	<i>Hierococyx varius</i>	Cuculidae	LC
22.	Common Hoopoe	-----	<i>Upupa epops</i>	Upupidae	LC
23.	Common Kingfisher	Kilkila	<i>Alcedo atthis</i>	Alcedinidae	LC
24.	Common Moorhen	-----	<i>Gallinula chloropus</i>	Rallidae	LC
25.	Common Myna	Salhai/ desimyna	<i>Acridotheres tristis</i>	Sturnidae	LC
26.	Common Pochard	-----	<i>Aythya ferina</i>	Anatidae	VU
27.	Common quail	Titar	<i>Coturnix coturnix</i>	Phasianidae	LC
28.	Common	-----	<i>Actitis hypoleucos</i>	Scolopacidae	LC

	Sandpiper				
29.	Common Tailor Bird	-----	<i>Orthotomus sutorius</i>	Cisticolidae	LC
30.	Common Teal	-----	<i>Anas crecca</i>	Anatidae	LC
31.	Copper Smith Barbet	-----	<i>Psilopogon haemacephalus</i>	Megalaimidae	LC
32.	Cotton Teal	-----	<i>Nettapus coromandelianus</i>	Anatidae	LC
33.	Crimson Backed sunbird or Small Sunbird	-	<i>Leptocoma minima</i>	Nectariniidae	LC
34.	Eagle Owl	Ullu	<i>Bubo bubo</i>	Strigidae	LC
35.	Eurasian Collared Dove	Padki	<i>Streptopelia decaocto</i>	Columbidae	LC
36.	Eurasian Coot	-----	<i>Fulica atra</i>	Rallidae	LC
37.	Eurasian Golden Oriole	-----	<i>Oriolus oriolus</i>	Oriolidae	LC
38.	European Turtle Dove	Padki	<i>Streptopelia turtur</i>	Columbidae	VU
39.	Feral Pigeon	Kabutar	<i>Columba livia domestica</i>	Columbidae	LC
40.	Gadwall	-----	<i>Mareca strepera</i>	Anatidae	LC
41.	Grater Spotted Eagle	-----	<i>Clanga clanga</i>	Accipitridae	VU
42.	Great Thick Knee	-----	<i>Esacus recurvirostris</i>	Burhinidae	NT
43.	Greater Coucal	Koyal	<i>Centropus sinensis</i>	Cuculidae	LC
44.	Greater Cormorant	-----	<i>Phalacrocorax carbo</i>	Phalacrocoracidae	LC
45.	Greater flame back Woodpecker	Katpodva	<i>Dryocopus martius</i>	Picidae	LC
46.	Green Bee Eater	Patinga	<i>Merops orientalis</i>	Meropidae	LC
47.	Greenish Warbler	-----	<i>Phylloscopus trochiloides</i>	Phylloscopidae	LC
48.	Grey Francolin	-----	<i>Francolinus pondicerianus</i>	Phasianidae	LC
49.	House Crow	Kauaa	<i>Corvus splendens</i>	Corvidae	LC
50.	House Sparrow	Gouriaya	<i>Passer domesticus</i>	Passeridae	LC
51.	Indian barn owl	-	<i>Tyto alba</i>	Tytonidae	LC
52.	Indian Courser	-----	<i>Cursorius coromandelicus</i>	Glareolidae	LC
53.	Indian Cuckoo	-----	<i>Cuculus micropterus</i>	cuculidae	LC
54.	Indian nuthatch	-	<i>Sitta castanea</i>	Sittidae	LC
55.	Indian Pitta	-----	<i>Pitta brachyura</i>	Pittidae	LC
56.	Indian pond heron	Khokho bakli	<i>Ardeola grayii</i>	Ardeidae	LC
57.	Indian pygmy woodpecker	-	<i>Yungipicus nanus</i>	Picidae	LC
58.	Indian Robin	Chirak	<i>Saxicoloides fulicatus</i>	Muscicapidae	LC
59.	Indian Roller	Nilkanth/teohra	<i>Coracias benghalensis</i>	Coraciidae	LC

60.	Indian Silver Bill	-----	<i>Euodice malabarica</i>	Estrildidae	LC
61.	Indian spotted dove	Padki	<i>Streptopelia chinensis suratensis</i>	Columbidae	LC
62.	Jungle Babbler	Satbhaiya	<i>Turdoides striata</i>	Leiothrichidae	LC
63.	Jungle Bush Quail	Titar	<i>Perdica asiatica</i>	Phasianidae	LC
64.	Jungle Crow	Koua	<i>Corvus culminatus</i>	Corvidae	LC
65.	Jungle Myna	Maina	<i>Acridotheres fuscus</i>	Sturnidae	LC
66.	Jungle Prinia	-----	<i>Prinia sylvatica</i>	Cistacolidae	LC
67.	Laughing Dove	Padki	<i>Spilopelia senegalensis</i>	Columbidae	LC
68.	Lesser Flame back	-----	<i>Dinopium benghalense</i>	Picidae	LC
69.	Lesser Whistling Duck	-----	<i>Dendrocygna javanica</i>	Anatidae	LC
70.	Little Bittern	-----	<i>Ixobrychus minutus</i>	Ardeidae	LC
71.	Little Cormorant	-----	<i>Microcarbo niger</i>	Phalacrocoracidae	LC
72.	Little Egret	Kokda	<i>Egretta garzetta</i>	Ardeidae	LC
73.	Little Swift	-----	<i>Apus affinis</i>	Apodidae	LC
74.	Long tailed Minivet		<i>Pericrocotus ethologus</i>	Campephagidae	LC
75.	Long Tailed Shrink	-----	<i>Lanius schach</i>	Laniidae	LC
76.	Oriental Magpie Robin	-----	<i>Copsychus saularis</i>	Muscicapidae	LC
77.	Oriental Turtle Dove	-----	<i>Streptopelia orientalis</i>	Columbidae	LC
78.	Oriental White Eye	-----	<i>Zosterops palpebrosus</i>	Zosteropidae	LC
79.	Paddy Field Pipit	-----	<i>Anthus rufulus</i>	Motacillidae	LC
80.	Plain Prinia	-----	<i>Prinia inornata</i>	Cisticolidae	LC
81.	Plum Headed Parakeet	Tota/Sua	<i>Psittacula cyanocephala</i>	Psittacidae	LC
82.	Purple Sun Bird	-----	<i>Nectarania asiatica asiatica (Latham)</i>	Nectariniini	LC
83.	Rain Quail	Quail	<i>Coturnix coromandelica</i>	Phasianidae	LC
84.	Red avadavat	-	<i>Amandava amandava</i>	Estrildidae	LC
85.	Red Crested Pochard	-----	<i>Netta rufina</i>	Anatidae	LC
86.	Red Vented Bulbul	Fikkadlow	<i>Pycnonotus cafer</i>	Pycnonotidae	LC
87.	Red Wattled Lapping	-----	<i>Vanellus indicus</i>	Charadriidae	
88.	Rose Ringed Parakeet	Tota/Sua	<i>Psittacula krameri</i>	Psittaculidae	LC
89.	Rufous Tree Pie	-----	<i>Dendrocitta vagabunda</i>	Corvini	LC
90.	Scaly Breasted Munia	-----	<i>Lonchura punctulata</i>	Estrildidae	LC
91.	Shikra	Cheel	<i>Accipiter badius</i>	Accipitridae	LC

92.	Singing Bush Lark	-----	<i>Mirafra javanica</i>	Alaudidae	LC
93.	Singing bush lark	-	<i>Mirafra javanica</i>	Alaudidae	LC
94.	Sirkeer Malkoha	-----	<i>Taccocua leschenaultii</i>	Cuculidae	LC
95.	Small Minivet	-----	<i>Pericrocotus cinnamomeus</i>	Campephagidae	LC
96.	Spot Bill Duck	-----	<i>Anas poecilorhyncha</i>	Anatidae	LC
97.	Spotted Dave	-----	<i>Streptopelia chinensis suratensis</i>	Columbidae	LC
98.	Spotted Owl	Ullu	<i>Strix occidentalis</i>	Strigidae	NT
99.	Sulphur-Bellied Warbler	-----	<i>Phylloscopus griseolus</i>	Acrocephalidae	LC
100.	Thick Billed Flower Pecker	-----	<i>Dicaeum agile</i>	Dicaeidae	LC
101.	Verditer Flycatcher	-----	<i>Eumyias thalassinus</i>	Muscicapidae	LC
102.	Vernal Hanging Parrot	-----	<i>Loriculus vernalis</i>	Psittaculidae	LC
103.	White Throated Kingfisher	Kilkila	<i>Halcyon smyrnensis</i>	Alcedinidae	LC
104.	White-Rumped Munia	-----	<i>Lonchura striata</i>	Estrildidae	LC
105.	Yellow wattled lapwing	-	<i>Vanellus malabaricus</i>	Charadriidae	LC
106.	Yellow-footed Green Pigeon	Kabootar	<i>Treron phoenicoptera</i>	Columbidae	LC

### Characterization of bird species according to their nesting pattern

1. **Scrape nesting birds:** - The simplest nest construction is the Scrape, which merely a shallow depression in soil or vegetation.

#### **Bird species found in OCP Chhal area:**

- a) Common Quail
  - b) Rain Quail
  - c) Jungle Bush Quail
  - d) Gray Francolin
  - e) Yellow Wattled Lapwing
2. **Burrow nesting birds:** - Soil plays a different role in the burrow nest: the eggs and young in most cases the incubating parent birds are sheltered under the earth.

#### **Bird species found in OCP Chhal area:**

- a) Little Swift
- b) Barn Swallow

- c) Green Bee Eater
  - d) White Throated Kingfisher
3. **Cavity nesting birds:** - The cavity nest is a chamber, typically in living or dead wood, but sometimes in the trunks of tree ferns or large cacti, including saguaro. In tropical areas, cavities are sometimes excavated in arboreal insect nests.

**Bird species found in OCP Chhal area:**

- a) Common Myna (Secondary cavity nester)
  - b) Copper Smith Barbet (Primary cavity nester)
  - c) House Sparrow (Secondary cavity nester)
  - d) Bramhiny Myna (Secondary cavity nester)
  - e) Indian Robin (Secondary cavity nester)
  - f) Indian Roller (Secondary cavity nester)
  - g) Oriental Magpie Robin (Secondary cavity nester)
  - h) Rose Ringed Parakeet (Secondary cavity nester)
  - i) Indian Nuthatch Barbet (Primary cavity nester)
  - j) Plum Headed Parakeet (Secondary cavity nester)
  - k) Alexandrine Parakeet (Secondary cavity nester)
  - l) Indian Barn Owl (Secondary cavity nester)
  - m) Lesser Golden Backed Woodpecker (Primary cavity nester)
4. **Cup shaped nesting birds:** - The cup nest is smoothly hemispherical inside, with a deep depression to house the eggs. Most are made of pliable materials including grasses though a small number are made of mud or saliva.

**Bird species found in OCP Chhal area:**

- a) Sulphur Bellied Warbler
- b) Indian Spotted Dove
- c) Black Drongo
- d) Common Hawk Cuckoo
- e) Common Tailor Bird
- f) White Rumped Munia
- g) Ashy Prinia or Ashy Wren Warbler
- h) Blyth Reed Warbler
- i) Greenish Warbler
- j) Jungle Babbler

- k) Laughing Dove
- l) Indian Cuckoo (Mostly use a nest of crows and drongos House Crow)
- m) Eurasian Collared Dove
- n) Asian Koel (Brood parasite lays egg on different birds nest)
- o) Eurasian Golden oriole
- p) Paddy Field Pipit
- q) Singing Bush lark

5. **Saucer or plate form nest:** - The saucer or plate nest, though superficially similar to a cup nest, has at most only a shallow depression to house the eggs.

**Bird species found in OCP Chhal area:**

- a) Greater Coucal

6. **Platform nesting birds:** - The platform nest is a large structure, often many times the size of the (typically large) bird which has built it. Depending on the species, these nests can be on the ground or elevated.

**Bird species found in OCP Chhal area:**

- a) Indian Pond Heron
- b) Cattle Egret
- c) Little Egret
- d) Rufous Tree pie
- e) Shikra
- f) Yellow Footed Green Pigeon
- g) Jungle Crow
- h) Little Cormorant
- i) Buzzard
- j) Great Egret

7. **Pendant nesting birds:** - The pendant nest is an elongated sac woven of pliable materials such as grasses and plant fibers and suspended from a branch.

**Bird species found in OCP Chhal area:**

- a) Common Kingfisher
- b) Purple Sunbird
- c) Indian Golden Oriole
- d) Crimson Backed Sunbird
- e) Thick Billed Flower-pecker
- f) Baya Weaver

g) Indian Silverbill

8. **Sphere shaped nesting birds:** - The Sphere nest is roundish structure; it is completely enclosed, except for a small opening which allows access.

**Bird species found in OCP Chhal area:**

- a) Red Vented Bulbul
- b) Scaly Breasted Munia
- c) Jungle Prinia
- d) Plain Prinia
- e) Red Avadavat

**Detailed description of birds including habit habitat and nesting pattern**

**1. Scrape nesting bird species found in OCP Chhal area:**

**a) Common Name: Common Quail**

**Zoological Name:** *Coturnix coturnix coturnix (Linnaeus)*

**Family:** Phasianidae

**Conservation Status:** Least Concern

**Voice Call:** The only indication of its presence is the distinctive "wet-my- lips" repetitive song of the male. The call is uttered mostly in the mornings, evenings and sometimes at night.

**Habitat:** Grassland, cropped fields, and scrubs

**Feeding:** The rain quail feeds on seeds of grasses and other plants, insect Larvae and small invertebrates.

**Breeding Season:** Breeding takes place between March and October.

**Nesting Pattern:** 6-12 eggs in a ground nest.

**Economic Importance:** Common Quail and their eggs provide food for humans. They are also common, well-liked birds of aviaries.



**Nesting of Common Quail**



**Male Bird**



**Female Bird**

**b) Common Name: Jungle Bush Quail**

**Zoological Name:** *Perdicula asiatica*

**Family:** Phasianidae

**Conservation Status:** Least Concern



**Voice Call:** Advertising call is a rhythmic, harsh, slightly grating “chee- chee-chuck, chee-chee-chuck

**Habitat:** Dry scrub and brush habitats, often stony, ranging from thin grass to fairly dense deciduous.

**Feeding:** The diet of the jungle bush quail consists mainly of seeds. Particularly of grasses, although it also takes insects.

**Breeding Season:** Breeding takes place after the rains and lasts until the onset of colder weather.

**Nesting Pattern:** their housing is, they need to be provided with plenty of green branches to provide sheltered and a place for the hens to lay.

**Economic Importance:** Sometimes, these quail are kept in aviaries. They have a pet trade.



Nesting of Rain Quail



Male Bird



Female Bird

### c) Common Name: Gray Francolin

**Zoological Name:** *Francolinus pondicerianus*

**Family:** Phasianidae

**Conservation Status:** Least Concern

**Voice Call:** loud and repeated *Ka-tee-tar... tee-tar*. The female call is *a tee... tee... tee* repeated and sometimes a *kila.. kila.. kila* and the challenge call *kateela.. kateela.. kateela* is a duet.

**Habitat:** They are found in open cultivated lands as well as scrub forest and their local name of teetar.

**Feeding:** Food includes seeds, grains as well as insects, particularly termites and Beetels.

**Breeding Season:** April to September

**Nesting Pattern:** The nest is a hidden scrape on the ground.

**Economic Status:** They are hunted illegally in much of their range using low nets and easily caught using calling decoy birds.



Male Bird



Female Bird

**D) Common Name: Yellow-wattled Lapwing**

**Zoological Name:** *Vanellus malabaricus*

**Family:** Charadriidae

**Conservation Status:** Least Concern

**Voice Call:** The call is a sharp tchee-it call

**Habitat:** This species is common in much of India, being seen in a variety of open lowland habitats. It tends to be seen in drier habitats than the red-wattled lapwing, *Vanellus indicus*.

**Feeding:** The food of the yellow-wattled lapwing is beetles, termites and other invertebrates, which are picked from the ground

**Breeding Season:** These lapwings breed in the dry season with peak breeding in March to May ahead of the monsoons.

**Nesting Pattern:** A nest in a clump of grass has been noted as exceptional.



Nesting of Yellow-wattled Lapwing



Male female birds is alike

**E) Common Name: Rain Quail**

**Zoological Name:** *Coturnix coromandelica* (Gmelin)

**Family:** Phasianidae

**Conservation Status:** Least Concern

**Voice Call:** The call is a metallic chrink-chrink, constantly repeated mornings and evenings, and in the breeding season also during the night.

**Habitat:** Grassland, cropped fields, and scrubs

**Feeding:** The rain quail feeds on seeds of grasses and other plants, insect Larvae and small invertebrates.

**Breeding Season:** Breeding occurs during the wet season and depends on local rainfall patterns. Generally, rain quail breed from March to October. Their nests are constructed in standing crops or thin grasses in the ground and are sometimes hidden in scrub, low bush or grass.

**Nesting Pattern:** The quail nest usually on the ground contains six to eight eggs and the female incubate the eggs.

**Economic Importance:** Sometimes, these quail are kept in aviaries. They have a pet trade.



**Nesting of Rain Quail**



**Male Bird**



**Female Bird**

**F) Common Name:** Common Teal

**Zoological Name:** *Anas crecca*

**Family:** Anatidae

**Conservation Status:** Least Concern

**Voice Call:** The female has a feeble *keh* or *neeh*

**Habitat:** Common inhabitant of sheltered freshwater wetlands with some tall vegetation, such as taiga bogs or small lakes and ponds with extensive reed beds.

**Feeding:** Feeding on seeds of aquatic plants and grasses, including sedges and grains.

**Breeding Season:** Starts Mar/May

**Nesting Pattern:** The nest is a scrape or a natural depression on the ground.



**Nesting of Common Teal**



**Male female birds a like**

**G) Common Name: Red-wattled Lapwing**

**Zoological Name:** *Vanellus indicus*

**Family:** Charadriidae

**Conservation Status:** Least Concern

**Voice Call:** The call is a sharp “did he do it or pity to do it”

**Habitat:** It usually keeps in pairs or trios in well-watered open country, ploughed fields, grazing land, and margins and dry beds of tanks and puddles. They occasionally form large flocks, ranging from 26 to 200 birds. It is also found in forest clearings around rain-filled depressions. It runs about in short spurts and dips forward obliquely (with unflexed legs) to pick up food in a typical plover manner.

**Feeding:** The diet of the lapwing includes a range of insects, snails and other invertebrates, mostly picked from the ground. They may also feed on some grains. They feed mainly during the day but they may also feed at night. They may sometimes make use of the legs to disturb insect prey from soft soil.

**Breeding Season:** The breeding season is mainly March to August.

**Nesting Pattern:** Nests are difficult to find since the eggs are cryptically coloured and usually matches the ground pattern.



Nesting of Red- wattled lapwing



Male female birds is alike

**2. Burrow nesting bird species found in OCP Chhal area:**

**a) Common Name: Little Swift**

**Zoological Name:** *Apus affinis*

**Family:** Apodidae

**Conservation Status:** Least Concern

**Voice Call:** Tirr-Tirr

**Habitat:** Occurs over a wide range of habitats and latitudes, though less frequently in truly arid regions. Little swifts spend most of their lives in the air, living on the insects they catch in their beaks.

**Feeding:** Flies, termites, ants, beetles, grasshoppers and a dragonfly. They drink on the wing, but roost on vertical cliffs or walls.

**Breeding Season:** Winter

**Nesting Pattern:** Little swifts build their nests in hole in buildings or sometimes on cliffs, laying 1-4 eggs

**Predators:** Common buzzards (*Buteo buteo*)



Nesting of Little Swift



Male Female bird is alike



**b) Common Name: Barn Swallow**

**Zoological Name:** *Hirundo rustica*

**Family:** Hirundinidae

**Conservation Status:** Least Concern

**Voice Call:** The song of the barn swallow is a cheerful warble, often ending with su-seer with the second note higher than the first but falling in pitch. Calls include witt or witt-witt and a loud splee-plink when excited.

**Habitat:** Low vegetation, such as pasture, meadows and farmland, preferably with nearby water. The presence of accessible open structures such as barns, stables, or culverts to provide nesting sites, and exposed locations such as wires, roof ridges or bare branches for perching, are also important in the bird's selection of its breeding range.

**Feeding:** The barn swallow typically feeds 7–8 m (23–26 ft) above Shallow water or the ground, often following animals, humans or farm machinery to catch disturbed insects, but it will occasionally pick prey items from the water surface, walls and plants.

**Breeding Season:** November- February

**Nesting Pattern:** It builds a cup nest from mud pellets in barns or similar structures and feeds on insects caught in flight.

**Predators:** Hawks, owls, Rats, Squirrels, Racoons, Domestic Cats, Snakes etc are predators of Barn Swallow. Barn swallows usually give alarm calls when predators come near. Most predators of barn swallows attack the nestlings, but hawks, falcons, and owls tend to hunt adults.



**Nesting of Barn Swallow**



**Male Bird**



**Female Bird**

**c) Common Name: Green Bee Eater**

**Zoological Name:** *Merops orientalis*

**Family:** Meropidae

**Conservation Status:** Least Concern

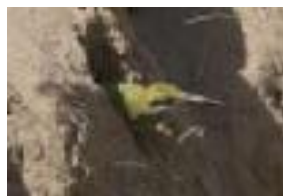
**Voice Call:** The calls are a nasal trill tree-tree-tree-tree, usually given in flight. Commonest call is a rolling or burry “trrrr...trrrr...” or a similar “trip..trip..trrrrr...trrrrr.”

**Habitat:** They are mainly insect eaters and they are found in grassland, thin scrub and forest often quite far from water.

**Feeding:** bee-eaters pre-dominantly eat insects, especially bees, wasps and ants, which are caught in the air by sorties from an open perch

**Breeding Season:** The breeding season is from March to June.

**Nesting Pattern:** These are often solitary nesters, making a tunnel in a sandy bank. They nest in hollows in vertical mud banks.



**Nesting of Green Bee Eater**



**Male female bird is alike**

**d) Common Name: White Throated Kingfisher**

**Zoological Name:** *Halcyon smyrnensis*

**Family:** Alcedinidae

**Conservation Status:** Least Concern

**Voice Call:** chake-ake-ake-ake-ake

**Habitat:** White-throated kingfisher is a common species of a variety of habitats, mostly in the trees, wires or other perches.

**Feeding:** This species mainly hunts large crustaceans, insects, earth-worms, rodents, snakes, fish and frogs. Predation of small birds such as the Oriental white-eye, chick of a Red-wattled Lapwing, sparrows and Munias have been reported.

**Breeding Season:** Monsoon

**Nesting Pattern:** The nest is a tunnel (50 cm long, but a nest with a 3-foot tunnel has been noted) in an earth bank.

**Predators:** With a powerful bill and rapid flight, these kingfishers have few predators when healthy and rare cases of predation by a black kite and a jungle crow may be of sick or injured birds.

**Economic Importance:** White-throated kingfishers eat domestic and agricultural pests, including both mammalian and insect pests. Like many generalists, these birds help to control the populations of small vertebrates and invertebrates that might otherwise do costly damage to human works and food supplies. (Ali and Ripley, 1983)



Nesting of White Throated Kingfisher      Male female bird is alike

### 3. Cavity nesting bird species found in OCP Chhal area:

#### a) Common Name: Common Myna

**Zoological Name:** *Acridotheres tristis*

**Family:** Sturnidae

**Conservation Status:** Least Concern

**Voice Call:** The calls includes croaks, squawks, chirps, clicks, whistles and 'growls', and the bird often fluffs its feathers and bobs its head in singing.

**Habitat:** Common Myna nests in commercial, Residential and bushland habitats.

**Feeding:** Like most starlings, the common myna is omnivorous. It feeds on insects, crustaceans, reptiles, small mammals, seeds, grain and fruits and discarded waste from human habitation.

**Breeding Season:** Depending on geographical location, common mynas have been reported to breed anywhere from 1-3 times yearly. In their native range, common mynas begin nesting in March and breeding lasts through September.

**Nesting Pattern:** Nest in a hole in a tree or wall

**Predators:** Common nest predators of common mynas are house crows (*Corvus splendens*) and house cats (*Felis silvestris*). Javan mongooses (*Herpestes javanicus*) raid nests to take nestlings and eggs. Common mynas roost together for predator defense and often mob predators in flocks.

**Economic Importance:** Common mynas may be helpful in reducing insect populations in agricultural areas. Common mynas also pollinate and disperse the seeds of economically important trees. Common mynas are often sold as pets for their intelligence and ability to mimic human speech.



Nesting of Common Myna      Male female birds is alike

#### b) Common Name: Copper Smith Barbet

**Zoological Name:** *Psilopogon haemacephalus*

**Family:** Megalaimidae

**Conservation Status:** Least Concern

**Voice Call:** tuk...tuk...tuk

**Habitat:** Throughout their wide range they are found in gardens, groves and sparse woodland. Habitats with trees having dead wood suitable for excavation is said to be important.

**Feeding:** Prefers Banyan, Peepal, and etc and the occasional insect, caught in aerial sallies. Flower petals may also be included in their diet.

**Breeding Season:** The breeding season is mainly February to April in India.

**Nesting Pattern:** Birds nest and roost in cavities.



**Mortality Factor:** Adult birds are sometimes taken by predatory species. In urban areas, there are records of collisions with structures including white walls. Pesticide poisoning has also been noted.



Nesting of Copper Smith Barbet



Male Bird



Female Bird

c) **Common Name: House Sparrow**

**Zoological Name:** *Passer domesticus*

**Family:** Passeridae

**Conservation Status:** Least Concern

**Voice Call:** chirr up, tschilp, or Philip, "chur-chur-r-r-it-it-it-it", House sparrows give a nasal alarm call, the basic sound of which is transcribed as quer, and a shrill chree call in great distress.

**Habitat:** The house sparrow is closely associated with human habitation and cultivation. Primarily associated with man, living around buildings from isolated farms to urban centres.

**Feeding:** As an adult, the house sparrow mostly feeds on the seeds of grains and weeds, but it is opportunistic and adaptable, and eats whatever foods are available.

**Breeding Season:** Feb–Sept, varying with latitude, but can be interrupted by high temperature and monsoon rains; up to three broods.

**Nesting Pattern:** Holes in cliffs and banks, or tree hollows, are also used. A sparrow sometimes excavates its own nests in sandy banks or rotten branches, but more frequently uses the nests of other birds such as those of swallows in banks and cliffs, and old tree cavity nests.

**Predators:** Many hawks and owls hunt and feed on house sparrows. Known predators of nesting young or eggs include cats, domestic dogs, raccoons, and many snakes. House sparrows avoid predation by foraging in small flocks so that there are many eyes watching out for potential predators.

**Parasite and Disease:** The commonly recorded bacterial pathogens of the house sparrow are often those common in humans, and include *Salmonella* and *Escherichia coli*.



Nesting of House Sparrow



Male bird



Female bird

**d) Common Name: Bramhiny Starling**

**Zoological Name:** *Sturnia pagodarum*

**Family:** Sturnidae

**Conservation Status:** Least Concern

**Voice Call:** They have musical call notes that are long made up of a series of slurred notes that ends abruptly.

**Habitat:** found in dry forest, scrub jungle and cultivation and is often found close to human habitations. The especially favour areas with waterlogged or marshy lands.

**Feeding:** The brahmyny starling is omnivorous, eating fruit and insects.

**Breeding Season:** March to September

**Nesting Pattern:** It builds its nest in tree holes or artificial cavities. The nest is lined with grass, feathers and rags.



Nesting of Bramhiny Myna



Male bird



Female bird

**e) Common Name: Indian Robin**

**Zoological Name:** *Saxicoloides fulicatus*

**Family:** Muscicapidae

**Conservation Status:** Least Concern

**Voice Call:** Song a very short, high-pitched, creaky squeaky jumble of 4–5 notes in minor key.

**Habitat:** This bird is found in open stony, grassy and scrub forest habitats. They are mainly found in dry habitats and are mostly absent from the thicker forest regions and high rainfall areas. The species is often found close to human habitation and will frequently perch on rooftops.

**Feeding:** They feed mostly on insects but are known to take frogs and lizards especially when feeding young at the nest. Individuals may forage late in the evening to capture insects attracted to lights.

**Breeding Season:** December to September

**Nesting Pattern:** Nests are built between rocks, in holes in walls or in a tree hollow. Nests are lined with animal hair and it has been noted that many nests have pieces of snake sloughs.

**Predators:** Nestlings may be preyed on by the Rufous treepie.



**Nesting of Indian Robin**



**Male Bird**



**Female Bird**

**f) Common Name: Indian Roller**

**Zoological Name:** *Coracias benghalensis*

**Family:** Coraciidae

**Conservation Status:** Least Concern

**Voice Call:** The call of the Indian roller is a harsh crow-like chack sound. It also makes a variety of other sounds, including metallic boink calls.

**Habitat:** They are very commonly seen perched along roadside trees and wires and are commonly seen in open grassland and scrub forest

**Feeding:** They descend to the ground to capture their prey which may include insects, arachnids, small reptiles (including *Calotes versicolor* (changeable lizard) ) and small snakes and amphibians.

**Breeding Season:** March to June

**Nesting Pattern:** Holes created by woodpeckers or wood boring insects in trees such as Sal favored for nesting. Nest cavities may also be made by tearing open rotten tree trunks or in cavities in building.



**Nesting of Indian Roller**



**Male bird**



**Female bird**

**g) Common Name: Oriental Magpie Robin**

**Zoological Name:** *Copsychus saularis*

**Family:** Muscicapidae

**Conservation Status:** Least Concern

**Voice Call:** Harsh hissing krshhh

**Habitat:** They are common birds in urban gardens as well as forests. The oriental magpie-robin is found in open woodland and cultivated areas often close to human habitations.

**Feeding:** The diet of magpie robins includes mainly insects and other invertebrates. Although mainly insectivorous, they are known to occasionally take flower nectar, leeches, centipedes and even fish.

**Breeding Season:** March to July

**Nesting Pattern:** They nest in tree hollows or niches in walls or building, often adopting nest boxes.



Nesting of Oriental Magpie Robin



Male bird



Female bird

**h) Common Name: Rose Ringed Parakeet**

**Zoological Name:** *Psittacula krameri*

**Family:** Psittaculidae

**Conservation Status:** Least Concern

**Voice Call:** “kii-a” or “kii-ak”

**Habitat:** Rose-ringed Parakeet is common in cultivated areas, urban parks and gardens, dry and open forests.

**Feeding:** In the wild, rose-ringed parakeets usually feed on buds, fruits, vegetables, nuts, berries, and seeds.

**Breeding Season:** September to December

**Nesting Pattern:** They built nest in the hollow of trees.

**Aviculture:** Rose-ringed parakeets are popular as pets and they had a long History in aviculture.

**Economic Status:** Populations of these birds are decreasing due to trapping for the pet trade. Despite some people's attempts to revive their population by freeing these birds from local markets, the rose-ringed parakeet's population has dropped drastically in many areas of the Indian subcontinent.



**Nesting of Rose Ringed Parakeet**



**Male bird**



**Female bird**

**i) Common Name: Indian Nuthatch**

**Zoological Name:** *Sitta castanea*

**Family:** Sittace

**Conservation Status:** Least Concern

**Voice Call:** Nuthatch calls and sounds and behavior around a forest suet feeding location consist of aggressive displays of flared wings sometimes with a rattle-snake like rattle or Brrrr.... and a lot of calls that might be called "quank" or "yank" or "hit" calls that a pair of Nuthatches might use to keep in contact or let their other forest mates - mostly Chickadees and Titmice know that they are coming or in the area and maybe get out of the way.

**Habitat:** Indian nuthatch (*Sitta castanea*) is a species of bird in the Sittidae family. It is found in Bangladesh, India and Nepal. Its natural habitats are subtropical or tropical dry forests, subtropical or tropical moist lowland forests, and subtropical or tropical moist montane forests

**Feeding:** Nuthatches forage along tree trunks and branches and are members of the same feeding guild as woodpeckers

**Breeding Season:** Late Feb to May.

**Nesting Pattern:** Tree holes.



**Nesting pattern**



**Female birds**



**Male birds**

**J) Common Name: Plum Headed Parakeet**

**Zoological Name:** *Psittacula cyanocephala*

**Family:** Psittacidae

**Conservation Status:** Least Concern

**Voice Call:** The usual flight and contact call is tuink

**Habitat:** The plum-headed parakeet is a bird of forest and open woodland, even in city gardens

**Feeding:** They feed on grains, fruits, the fleshy petals of flowers (*Salmalia*, *Butea*) and sometimes raid agricultural fields and orchards.

**Breeding Season:** The breeding season in India is mainly from December to April and July to August in Sri Lanka.

**Nesting Pattern:** Nests in tree holes.



Nesting of Plum Headed Parakeet

Male female birds is alike

**K) Common Name: Alexandrine Parakeet**

**Zoological Name:** *Psittacula eupatria*

**Family:** Psittacidae

**Conservation Status:** Near Threatened

**Voice Call:** The usual flight and contact call is tuink.

**Habitat:** The Alexandrine Parakeet lives in forests, woodlands, agricultural lands and mangrove forests at elevations of up to 900 m (3000 ft).

**Feeding:** It eats a variety of wild and cultivated seeds, buds, flowers, fruits and nuts.

**Breeding Season:** November to April.

**Nesting Pattern:** They usually nest in tree hollows.



Nesting of Alexandrine Parakeet

Male female birds is alike

**L) Common Name: Indian Barn Owl**

**Zoological Name:** *Tyto alba*

**Family:** Tytonidae

**Conservation Status:** Least Concern

**Voice Call:** Their calls include screeches, wheeze, purrs and snoring sounds.

**Habitat:** The barn owl is a bird of open country such as farmland or grassland with some interspersed woodland, this owl prefers to hunt along the edges of woods or in rough grass strips adjoining pasture.

**Feeding:** The common barn owl ecosystem includes tropical and temperate deciduous or evergreen forests, taiga, arid and semi arid deserts and grasslands. They inhabit riparian woodlands, swamp forests, deciduous jungles, light secondary forest, thick scrub jungle urban areas of cities savanna and prairies.

**Breeding Season:** Barn owls living in tropical regions can breed at any time of year, but some seasonality in nesting is still evident. Where there are distinct wet and dry seasons, egg-laying usually takes place during the dry season, with increased rodent prey becoming available to the birds as the vegetation dies off.

**Nesting Pattern:** Barn Owls put their nests in holes in trees, cliff ledges and crevices, caves, burrows in river banks, and in many kinds of human structures, including barn lofts, church steeples, houses, nest boxes, haystacks, and even drive-in movie screens.



Nesting of Indian Barn Owl



Male female birds is alike

**j) Common Name: Lesser Golden Backed Woodpecker**

**Zoological Name:** *Dinopium benghalense* (Linnaeus)

**Family:** Picidae

**Conservation Status:** Least Concern

**Voice Call:** Klikir-r-r-r

**Habitat:** 1. it is associated with open forest and cultivation lands.  
2. They are often seen in urban areas with wooded avenues.  
3. It is somewhat rare in the Kutch and desert region of Rajasthan

**Feeding:** They feed on insects mainly beetle larvae from under the bark, Visit Termite mounds and sometimes feed on nectar.

**Breeding Season:** February and July

**Nesting Pattern:** The nest hole is usually excavated by the birds and has a horizontal entrance and descends into a cavity. Nests have also been noted in

mud embankments. They adapt well in human-modified habitats making use of artificial constructions.



Nesting of Lesser Golden Back



Male Bbird



Female bird

**k) Common Name:** Jungle Myna

**Zoological Name:** *Acridotheres fuscus*

**Family:** Sturnidae

**Conservation Status:** Least Concern

**Voice Call:** Song a loud, hoarse "screeow" repeated in short series.

**Habitat:** This common passerine is typically found in forest and cultivation and often close to open water. They may disperse outside their range particularly after the breeding season.

**Feeding:** Diet includes insects, fruit, seeds and nectar. Insect food comprises grasshoppers, mole-crickets and crickets (Orthoptera), termites Etc.

**Breeding Season:** Season Jan–Jul; in India.

**Nesting Pattern:** The Jungle Myna, one nest was in a tree hole.



Nesting of Jungle Myna



Male Female Birds are alike

**l) Common Name:** Bank Myna

**Zoological Name:** *Acridotheres ginginianus*

**Family:** Sturnidae

**Conservation Status:** Least Concern

**Voice Call:** Song of male includes low croaks, high-pitched whistles and warbles, also some mimicry.



**Distribution:** The distribution was formerly noted to be restricted north roughly of a line between Bombay and Balasore in Orissa, but the species may be expanding its range.

**Habitat:** They are found mainly in the vicinity of open water and their usual habitat is cultivated farmland and open country but flocks will often live within cities, in markets and railway stations.

**Feeding:** Diet includes insects, fruit, seeds and nectar. Insect food comprises grasshoppers, mole-crickets and crickets (Orthoptera), termites Etc.

**Breeding Season:** Season Mar–Aug, primarily Apr–Jun.

**Nesting Pattern:** the Jungle Myna, one nest was in a tree hole.



Nesting of Bank Myna



Male female birds is alike

M) **Common Name:** Common Hoopoe

**Zoological Name:** *Upupa epops*

**Family:** Upupidae

**Conservation Status:** Least Concern

**Voice Call:** pleasant, mellow hoo...po... po..., sometimes only first two notes; calls have a slightly ventriloquistic quality; calls frequently when breeding.

**Habitat:** These requirements can be provided in a wide range of ecosystems, and as a consequence the hoopoe inhabits a wide range of habitats such as heath land, wooded steppes, savannas and grasslands, as well as forest glades.

**Feeding:** The diet of the hoopoe is mostly composed of insects, although small reptiles, frogs and plant matter such as seeds and berries are sometimes taken as well.

**Breeding Season:** The breeding season in India is spread from March to September.

**Nesting Pattern:** Vertical surfaces with cavities (such as trees, cliffs or even walls, nest boxes, haystacks, and abandoned burrows) in which to nest.



Nest and adult



Male female alike

#### 4. Cup shaped nesting bird species found in OCP Chhal area:

##### a) Common Name: Sulphur Bellied Warbler

**Zoological Name:** *Phylloscopus griseolus*

**Family:** Phylloscopidae

**Conservation Status:** Least Concern

**Voice Call:** They have a single note cheep call.

**Habitat:** They are found on rocky hill and scrub forest habitats.

**Feeding:** Like other leaf-warblers it gleans insects from small branches and leaves.

**Breeding Season:** End-April to early August

**Nesting Pattern:** Nest, built entirely by female over 4–10 days, a ball of dry grasses.



Nesting of Sulphur Bellied Warbler Male female birds is alike

##### b) Common Name: Indian Spotted Dove

**Zoological Name:** *Streptopelia chinensis suratensis*

**Family:** Columbidae

**Conservation Status:** Least Concern

**Voice Call:** Krookruk-krukroo... kroo kroo kroo

**Habitat:** Woodland, scrub, farmland and ground.

**Feeding:** They forage on the ground for grass seeds, grains, fallen fruits and seeds of other plants.

**Breeding Season:** Summer

**Nesting Pattern:** They nest mainly in low vegetation, building a flimsy cup of twigs in which two whitish eggs are laid. Nests are sometimes placed on the ground or on buildings and other structures.



Nesting of Indian Spotted Dove



Male bird



Female bird

c) **Common Name: Black Drongo**

**Zoological Name:** *Dicrurus macrocercus*

**Family:** Dicruridae

**Conservation Status:** Least Concern

**Voice Call:** It is said that they imitate the call of the Shikra so as to put mynas to flight and then to steal prey. False alarm calls has also been noted.

**Habitat:** The black drongo is found predominantly in open forests and usually perches and hunts close to the ground. They are mostly aerial predators of insects but also glean from the ground or off vegetation. The black drongo can be found in savannas, fields, and urban habitats.

**Feeding:** They feed mainly on insects such as grasshoppers, cicadas, termites, wasps, bees, ants, moths, beetles and dragonflies.

**Breeding Season:** Black drongos breed mainly in February and March in southern India and until August in other parts of the country.

**Nesting Pattern:** The nest is a cup made with a thin layer of sticks placed in the fork of branch, and is built in a week by both the male and female. The usual clutch is three or rarely four eggs laid in a cup nest placed in the fork of an outer branch of tree. Large leafy tree such as the jackfruit are preferred.

**Predators:** Some predators such as the Javan hawk-eagle but the black eagle, a nest predator are mobbed with equal intensity in all seasons.

**Mobbing:** Their habit of driving away predators from near their nests is believed to encourage other birds such as orioles, doves, pigeons, babblers, and especially bulbuls, to nest in the vicinity.



Nesting of Black Drongo      Male female birds is alike

**d) Common Name: Common Hawk Cuckoo**

**Zoological Name:** *Hierococcyx varius*

**Family:** Cuculidae

**Conservation Status:** Least Concern

**Voice Call:** The call "Pee kahan" or "Papeeha" When moving with a flock of babblers the chick makes a grating kee-kee call to beg for food

**Habitat:** Wooded country, in deciduous and semi-evergreen forests, gardens, groves of cultivated trees.

**Feeding:** Common hawk-cuckoos feed mainly on insects and are specialized feeders that can handle hairy caterpillars.

**Breeding Season:** Breeds Mar–Jul in India, Jan–Apr in Sri Lanka.

**Nesting Pattern:** Nesting at top of tree using grass and sticks to make cup shaped nest.



Nesting of Common Hawk Cuckoo      Male female birds is alike

**e) Common Name: Common Tailor Bird**

**Zoological Name:** *Orthotomus sutorius*

**Family:** Cisticolidae

**Conservation Status:** Least Concern

**Voice Call:** The song is a loud cheeup-cheeup-cheeup with variations across the populations.

**Habitat:** Favours bushy cover by villages, gardens, parks and also in forest areas.

**Feeding:** They forage for insects and have been known to feed on a range of beetles and bugs. They are attracted to insects at flowers and are known to favour the inflorescences of mango.

**Breeding Season:** March to December peaking from June to August in India

**Nesting Pattern:** The nest is a deep cup, lined with soft materials and placed in thick foliage and the leaves holding the nest have the upper surfaces outwards making it difficult to spot.

**Predators:** Mortality of eggs and chicks is high due to predation by rodents, cats, crow-pheasants, lizards and other predators.



Nesting of Common Tailor Bird



Male bird



Female bird

**f) Common Name: White Rumped Munia**

**Zoological Name:** *Lonchura striata*

**Family:** Estrildidae

**Conservation Status:** Least Concern

**Voice Call:** Loud call or distance call of male a single "peep!", female gives double or churring.

**Habitat:** It frequents open woodland, grassland and scrub, and is well able to adapt to agricultural land use

**Feeding:** It is a gregarious bird which feeds mainly on seeds

**Breeding Season:** Summer to pre monsoon

**Nesting Pattern:** The nest is a large domed grass structure in a tree, bush or grass into which three to eight white eggs are laid.



Nesting of White Rumped Munia



Male female birds is alike

**g) Common Name: Ashy Prinia**

**Zoological Name:** *Prinia socialis*

**Family:** Cisticolidae

**Conservation Status:** Least Concern

**Voice Call:** The song is a repetitive tchup, tchup, tchup or zeet-zeet-zeet. Another call is a nasal tee-tee-tee. It also makes a sound like "electric sparks" during the fluttery flight which is thought to be produced by the wings.

**Habitat:** Found in dry open grassland, open woodland, scrub and in home gardens in the cities.

**Feeding:** The ashy prinia is insectivorous.

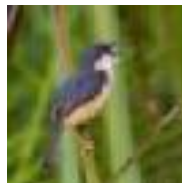
**Breeding Season:** The breeding season varies with locality and has been recorded Breeding around the year but mostly after the monsoons.

**Nesting Pattern:** The ashy prinia builds its nest close to the ground in a shrub or tall grass and lays 3–5 eggs. Several types of nests have been described including a flimsy cup made by sewing several large leaves; an oblong purse like structure with grass stems in the structure; and a flimsy ball of grass.

**Predators:** When the nest is threatened by predators such as cats, adults have been observed feigning injury.



Nesting of Ashy prinia



Male bird



Female bird

#### h) Common Name: Blyth Reed Warbler

**Zoological Name:** *Acrocephalus dumetorum*

**Family:** Acrocephalidae

**Conservation Status:** Least Concern

**Voice Call:** Song, given chiefly at night, characteristic, very varied mix of notes, some harsh tchar, some clear.

**Habitat:** Adapted to varied habitats, not necessarily close to water. This small passerine bird is a species found in scrub or clearings, often near water, but it is not found in marshes.

**Feeding:** Blyth's reed warbler is insectivorous, but will take other small food items, including berries.

**Breeding Season:** Season end of May to Jul; one brood per season. Monogamous, with facultative polygyny; pair formation takes place on breeding grounds.

**Nesting Pattern:** 4-6 eggs are laid in a nest in a bush.



Nesting of Blyth Reed Warbler



Male female bird is alike

**i) Common Name: Greenish Warbler**

**Zoological Name:** *Phylloscopus trochiloides*

**Family:** Phylloscopidae

**Conservation Status:** Least Concern

**Voice Call:** Call of nominate, given throughout year, a sharp, shrill and penetrating disyllabic “chee-wee.

**Habitat:** It breeds in lowland deciduous or mixed forest; non-breeding birds in the warmer parts of its range may move to mountain habitat in summer.

**Feeding:** This small passerine is insectivorous.

**Breeding Season:** May to mid-Aug

**Nesting Pattern:** The nest is on the ground in low shrub.



Nesting of Greenish Warbler      Male female bird is alike

**j) Common Name: Jungle Babbler**

**Zoological Name:** *Turdoides striata*

**Family:** Leiothrichidae

**Conservation Status:** Least Concern

**Voice Call:** The jungle babbler has harsh nasal calls. Harsh mewing calls, continual chattering, squeaking and chirping produced by its members.

**Habitat:** The jungle babbler's habitat is forest and cultivation.

**Feeding:** They feed mainly on insects, but also eat grains, nectar and berries.

**Breeding Season:** They breed throughout the year; peak breeding in northern India has been noted between March–April and July–September.

**Nesting Pattern:** The nest is built halfway in a tree, concealed in dense masses of foliage.

**Predator:** They are known to gather and mob potential predators such as snakes.



Nesting of Jungle Babbler      Male female bird is alike

**k) Common Name: Laughing Dove**

**Zoological Name:** *Spilopelia senegalensis*

**Family:** Columbidae

**Conservation Status:** Least Concern

**Voice Call:** The chuckling call is a low rolling croo-doo-doo-doo-doo with rising and falling amplitude.

**Habitat:** It is a common and widespread species in scrub, dry farmland and habitation over a good deal of its range, often becoming very tame.

**Feeding:** Laughing doves eat the fallen seeds, mainly of grasses, other vegetable matter and small ground insects such as termites and beetles.

**Breeding Season:** The breeding season varies by location.

**Nesting Pattern:** The nest is a very flimsy platform of twigs built in a low bush and sometimes in crevices or under the eaves of houses.

**Predators:** Southern grey Shrike have been observed preying on an adult laughing dove in northwestern India while the lizard buzzard is a predator of the species in Africa.



**Nesting of Laughing Dove**



**Male bird**



**Female bird**

**l) Common Name: Indian cuckoo**

**Zoological Name:** *Cuculus micropterus*

**Family:** Cuculidae

**Conservation Status:** Least Concern

**Voice Call:** Indian Cuckoos have a loud call which mainly consists of four notes described as a 'bo-ko-ta-ko'. The male's song, goo-ko, is usually given from an open perch

**Habitat:** The preferred habitat is deciduous and evergreen forests but also occur in garden lands and thick scrub.

**Feeding:** Indian Cuckoos feed up on hairy caterpillars and other insects. They will also sometimes eat fruit. Indian Cuckoos tend to feed in the upper canopy of forests where they air-feed on flying termites.



**Breeding Season:** The breeding season varies from May to July in northern China, March to August in India, January to June in Burma and January to August in the Malay Peninsula.

**Nesting Pattern:** The male diverts the attention of hosts from their nest giving time for the female to lay her egg. It lays its single egg mostly in the nests of drongos and crows.



Nesting of Indian cuckoo



female



Male

m) **Common Name:** Eurasian Collared Dove

**Zoological Name:** *Streptopelia decaocto*

**Family:** Columbidae

**Conservation Status:** Least Concern

**Voice Call:** The song is a coo-coo-coo, sound is a hah-hah.

**Habitat:** In its original range in India, Sri Lanka and other parts of Asia inhabits semi-desert and arid.

**Feeding:** Takes seed, cereal grain, fruits of herbs and grasses and some green parts of plants.

**Breeding Season:** Season prolonged but mainly Mar–Oct in cooler parts of range.

**Nesting Pattern:** Collared doves typically breed close to human habitation wherever food resources are abundant and there are trees for nesting; almost all nests are within 1 km (0.62 mi) of inhabited buildings. The female lays two white eggs in a stick nest, which she incubates during the night and which the male incubates during the day



Nesting of Eurasian Collared Dove



Male female birds is alike

**n) Common Name: Asian Koel**

**Zoological Name:** *Eudynamys scolopacea*

**Family:** Cuculidae

**Conservation Status:** Least Concern

**Voice Call:** The familiar song of the male is a repeated koo-Ooo. The female makes a shrill kik-kik-kik... call. Calls vary across populations.

**Habitat:** The Asian koel is a bird of light woodland and cultivation land.

**Feeding:** It is insectivorous, but will also take berries and other soft fruit.

**Breeding Season:** March to August

**Nesting Pattern:** Brood parasite lays its single egg in the nests of a variety of birds, including the jungle crow.



**Male bird**



**Female bird**

**O) Common Name: Eurasian Golden Oriole**

**Zoological Name:** *Oriolus oriolus*

**Family:** Oriolidae

**Conservation Status:** Least Concern

**Voice Call:** The song is a beautiful fluting weela-wee-ooo or or-iii-ole, unmistakable once heard.

**Habitat:** The Eurasian golden oriole inhabits a range of habitats. In Western Europe they prefer open broadleaf forests and plantations, copses, riverine forest, orchards, large gardens; in Eastern Europe they may inhabit more continuous forest as well as mixed or coniferous forests. They generally avoid treeless habitats but may forage there. In their wintering habitat they are found in semi-arid to humid woodland, tall forests, riverine forest, woodland/savanna mosaic and savanna

**Feeding:** They feed on insects and fruit, using their bills to pick insects out of crevices.

**Breeding Season:** Eurasian golden orioles may delay breeding until they are 2 or 3 years of age. Males usually arrive at breeding area several days before the

females. The fidelity to a territory or even to a specific nest site suggests that the pair-bond may continue from one breeding season to the next

**Nesting Pattern:** The nest is placed high in a tree towards the edge of the crown. The deep cup-shaped nest is suspended below a horizontal fork of thin branches.



**Nesting of Eurasian Golden Oriole Male female birds is alike**

**P) Common Name: Paddy Field Pipit**

**Zoological Name:** *Anthus rufulus*

**Family:** Motacillidae

**Conservation Status:** Least Concern

**Voice Call:** The birds flutter nearby with weak tsip-tsip-tsip calls.

**Habitat:** A wide spread species found in open habitats, especially short grassland and cultivation with open bare ground.

**Feeding:** It feeds principally on small insects but consumes larger beetles, tiny snails; worms etc. while walking on the ground, and may pursue insects like mosquitoes or termites in the air.

**Breeding Season:** The paddy field pipit breeds throughout the year but mainly in the dry season

**Nesting Pattern:** The nests are woven out of grass and leaves and are normally cup shaped.



**Nesting of Paddy Field Pipit**

**Female**

**Q) Common Name: Singing bush lark**

**Zoological Name:** *Mirafra javanica*

**Family:** Alaudidae

**Conservation Status:** Least Concern

**Voice Call:** Song, either from perch (usually not high) or in towering song flight.

**Habitat:** The Horsfield's Bushlark occurs in tropical and temperate grasslands, open woodlands, cereal crops and sparse sugar cane fields.

**Feeding:** The Horsfield's Bushlark feeds on grasses, seeds and insects. It often forages alone, but sometimes is found in small parties, foraging on the ground.

**Breeding Season:** The Horsfield's Bushlark will breed following significant rainfall in arid areas.

**Nesting Pattern:** It builds a deep, cup-shaped nest in a natural depression or a hollow scrape in the ground.



Nesting of Singing Bush Lark



Male female birds is alike

## R) Common Name: Common Sandpiper

**Zoological Name:** *Actitis hypoleucos*

**Family:** Scolopacidae

**Conservation Status:** Least Concern

**Voice Call:** This species is usually called *tiritavoi*.

**Habitat:** The common sandpiper forages by sight on the ground or in shallow water.

**Feeding:** Adult and larval insects (e.g. beetles, Diptera), spiders, molluscs, crustaceans and annelids, sometimes frogs, tadpoles or small fish etc.

**Breeding Season:** Mainly May–Jun,

**Nesting Pattern:** The nests can vary from an open shallow nest to a complex nest filled with leaves and grass and is often hidden in thick vegetation.



Nesting of Common Sandpiper



Male female birds is alike

**P) Saucer or Plate form nesting bird species found in OCP Chhal area:**

- **Common Name: Greater coucal or crow pheasant**

**Zoological Name:** *Centropus sinensis* (Stephens)

**Family:** Cuculidae

**Conservation Status:** Least Concern

**Voice Call:** The calls are a booming low **coop-coop-coops** repeated and with variations and some duets between individuals. Other calls include a rapid rattling "**lotok, lotok ...**" and a harsh scolding "**skeeaaw**" and a hissing threat call.

**Habitat:** Found in wide range of habitats from jungle to cultivation and urban gardens.

**Feeding:** The greater coucal is a large bird which takes a wide range of insects, caterpillars and small vertebrates such as the Saw-scaled vipers. They are also known to eat bird eggs, nestlings, fruits and seeds.

**Breeding Season:** June to September

**Nesting Pattern:** The nest is a deep cup with a dome in dense vegetation inside tangles of creepers, bamboo clump or Pandanus crowns.

**Interesting Fact:** It is highly destructive to the eggs and young of other birds.



Nesting of Greater Coucal



Male bird



Female bird

- **Common Name: Indian Pond Heron**

**Zoological Name:** *Ardeola grayii* (Skyles)

**Family:** Ardeidae

**Conservation Status:** Least Concern

**Voice Call:** They are usually silent but may give a harsh croak when flushed or near their nests.

**Habitat:** The water body needs to be either shallow enough, or have a shelving margin in which it can wade. Although most common in the lowlands it also occurs in mountain tarns, lakes, reservoirs, large and small rivers, marshes, ponds, ditches, flooded areas, coastal lagoons, estuaries and the sea shore.

**Feeding:** The Indian pond heron's feeding habitat is marshy wetlands. They usually feed at the edge of ponds but make extensive use of floating vegetation such as water hyacinth to access deeper water.

**Breeding Season:** The breeding season begins with the onset of the monsoons.

**Nesting Pattern:** They nest in small colonies, often with other wading birds, usually on platforms of sticks in trees or shrubs. Most nests are built at a height of about 9 to 10 m in large leafy trees.



**Nesting of Indian Pond Heron**



**Male bird**



**Female bird**

- **Common Name:** Cattle Egret  
**Zoological Name:** *Bubulcus ibis*

**Family:** Ardeidae

**Conservation Status:** Least Concern

**Voice Call:** This species gives a quiet, throaty rick-rack call at the breeding colony, but is otherwise largely silent.

**Habitat:** Cattle Egret sometimes feeds in shallow water, unlike most herons it is typically found in fields and dry grassy habitats, reflecting its greater dietary reliance on terrestrial insects rather than aquatic prey.

**Feeding:** The cattle egret feeds on a wide range of prey, particularly insects, especially grasshoppers, crickets, flies (adults and maggots), and moths, as well as spiders, frogs, and earthworms. In a rare instance they have been observed foraging along the branches of a banyan tree for ripe figs.

**Breeding Season:** Onset of monsoons in May.

**Nesting Pattern:** The cattle egret nests in colonies, which are often, but not always, found around bodies of water.



**Nesting of Cattle Egret**



**Male female bird is alike**

- **Common Name:** Little Egret  
**Zoological Name:** *Egretta garzetta*

**Family:** Ardeidae

**Conservation Status:** Least Concern

**Voice Call:** Rather vocal: gives “kre, kre, kre” or “kark, kark, kark” in aggression and flight, with an “aaah”

**Habitat:** The little egret's habitat varies widely, and includes the shores of lakes, rivers, canals, ponds, lagoons, marshes and flooded land, the bird preferring open locations to dense cover.

**Feeding:** Their diet is mainly fish, but amphibian, small reptiles, mammals and birds are also eaten as well as crustaceans, molluscs, insects, spiders and worms.

**Breeding Season:** Monsoon

**Nesting Pattern:** Little egrets nest in colonies on trees, often with other wading birds.



Nesting of Little Egret



Male female birds is alike

- **Common Name:** Rufous Treepie

**Zoological Name:** *Dendrocitta vagabunda*

**Family:** Corvini

**Conservation Status:** Least Concern

**Voice Call:** bob-o-link or ko-tree

**Habitat:** Open forest consisting of scrub, plantations and gardens.

**Feeding:** Like other curved it is very adaptable, omnivorous and opportunistic in feeding.

**Breeding Season:** April to June

**Nesting Pattern:** The nest is built in trees and bushes and is usually a shallow platform.



Nesting of Rufous Treepie



Male female birds is alike

- **Common Name:** Shikra

**Zoological Name:** *Accipiter badius*

**Family:** Accipitridae

**Conservation Status:** Least Concern

**Voice Call:** Pee-wee and kik-ki ... kik-ki

**Habitat:** The shikra is found in a range of habitats including forests, farmland and urban areas.

**Feeding:** They feed on rodents, squirrels, small birds, small reptiles (mainly lizards but sometimes small snakes) and insects.

**Breeding Season:** March to June

**Nesting Pattern:** The nest is a platform similar to that of crows lined with grass.



**Nesting of Shikra**



**Male bird**



**Female bird**

- **Common Name: Yellow-footed Green Pigeon**

**Zoological Name:** *Treron phoenicoptera*

**Family:** Columbidae

**Conservation Status:** Least Concern

**Voice Call:** They have pleasant, soft and mellow whistling calls which usually give the first indication of their presence in a locality.

**Habitat:** Forest, scrubland, parks and gardens in lowlands and foothills; avoids high mountains.

**Feeding:** The birds deftly climb about the twigs of fruit-bearing trees, often clinging upside down to get at some fig or berry, they keep in flocks of from 10 to 50 birds, and sometimes collect in enormous numbers on banyan or Peepal trees to gorge themselves on the ripe figs, in association with Mynas, Hornbills, Bulbuls and other frugivorous species.

**Breeding Season:** March to April

**Nesting Pattern:** Nest is a relatively slight platform of twigs in a tree or shrub.



**Nesting of Yellow-footed Green Pigeon**



**Male bird**



**Female bird**

- **Common Name: Jungle Crow**

**Zoological Name:** *Corvus macrorhynchos*

**Family:** Corvidae

**Conservation Status:** Least Concern



**Voice Call:** The voice is a harsh kaaw-kaaw.

**Habitat:** In the New World, a small population of house crows is established in the area around it is associated with human settlements throughout its range, from small villages to large cities.

**Feeding:** House crows feed largely on refuse around human habitations, small reptiles and mammals, and other animals such as insects and other small invertebrates, eggs, nestlings, grain and fruits.

**Breeding Season:** The breeding season is mainly March–April in northern India and earlier in south India.

**Nesting Pattern:** The nest is a platform of twigs placed in a large tree and very rarely on buildings.



Nesting of Jungle Crow



Male



Female

- **Common Name: Little Cormorant**

**Zoological Name:** *Microcarbo niger*

**Family:** Phalacrocoracidae

**Conservation Status:** Least Concern

**Voice Call:** They also produce grunts and groans, a low pitched ah-ah-ah and kok-kok-kok calls.

**Habitat:** It inhabits wetlands, ranging from small village ponds to large lakes, and sometimes tidal estuaries.

**Feeding:** Little cormorants tend to forage mainly in small loose groups and are often seen foraging alone. They swim underwater to capture their prey, mainly fish.

**Breeding Season:** November to February

**Nesting Pattern:** They may nest beside Indian pond herons and little egrets in Colonies. The nest is built in about two weeks. The whitish eggs turn muddy with age and incubation begins when the first egg is laid.

**Predator:** predators on eggs and hatchlings include gulls and crows, fledging taken by bald eagles and white tailed eagles. The presence of humans or large predators will cause adults to leave nests, leaving them vulnerable to predation. (Hatch, et al., 2000)



Nesting of Little Cormorant



Male female birds is alike

- **Common Name: Common Buzzard**

**Zoological Name:** *Buteo buteo*

**Family:** Accipitridae

**Conservation Status:** Least Concern

**Voice Call:** The call is a plaintive pee-a-ay, similar to a cat's meow.

**Habitat:** Buzzards do not normally form flocks, but several may be seen together on migration or in good habitat. The Victorian writer on Dartmoor, William Crossing, noted he had on occasions seen flocks of 15 or more at some places.

**Feeding:** The common buzzard breeds in woodlands, usually on the fringes, but favours hunting over open land. It eats mainly small mammals, and will come to carrion.

**Breeding Season:** March to July

**Nesting Pattern:** The nest, built by both birds, is usually in a tree, rocky crag or cliff. It is a substantial structure of branches, twigs, heather and other available material. The average size of a newly built nest is 1 m in diameter and 60cm deep. Re-used nests can be 1.5 m across. The shallow cup in the nest is lined with green material immediately prior to egg laying, with further material added gradually until the young fledge.



Common Buzzard

- **Common Name: Great Egret**

**Zoological Name:** *Ardea alba*

**Family:** Ardeidae

**Conservation Status:** Least Concern

**Voice Call:** Rather vocal: gives “kre, kre, kre” or “kark, kark, kark” in aggression and flight, with an “aaah”

**Habitat:** The little egret's habitat varies widely, and includes the shores of lakes, rivers, canals, ponds, lagoons, marshes and flooded land, the bird preferring open locations to dense cover.

**Feeding:** Their diet is mainly fish, but amphibian, small reptiles, mammals and birds are also eaten as well as crustaceans, molluscs, insects, spiders and worms.

**Breeding Season:** Monsoon

**Nesting Pattern:** Little egrets nest in colonies on trees, often with other wading birds.



**Great Egret**



**Nesting of Great Egret**

**a) Common Name: Little Bittern**

**Zoological Name:** *Ixobrychus minutus minutus* (Linnaeus)

**Family:** Ardeidae

**Conservation Status:** Least Concern

**Voice Call:** It is variously rendered as “kohr, kohr, kohr, kohr,” “hork, hork, hork,” “Cor, orr, orr, orr,” or “gogh, gogh, gogh, gogh” and also “hogh”, “rru” and “woof.” The “Kwer” call is a flight call. It is rendered as “kuk-kuk, kuk-kak,” cuck, cuck, cuck cuck,” Cra, a, a, a, k,” “quer” or “ker-ack.”

**Habitat:** Most typically it uses freshwater wetlands having thick herbaceous vegetation with trees or bushes interspersed nearby. These habitats include peat bogs, reed swamps, edges of lakes, pools, reservoirs, oases, swamps, wooded and marshy edges of streams and rivers, wet grasslands, mangroves, salt marshes, lagoons.

**Feeding:** The diet is varied, fish, frogs and tadpoles, reptiles, eggs and youngbirds, shrimp, crayfish, worms, insects such as crickets, grasshoppers, caterpillars, water bugs, beetles, beetle larvae, dragonflies, spiders.

**Breeding Season:** Winter

**Nesting Pattern:** It nests on platforms of reeds in shrubs; and four to eight eggs are laid.



Nesting of Little Bittern



Male Bird



Female Bird

**Q) Pendant Nesting Bird species found in OCP Chhal area:**

**a) Common Name: Common Kingfisher**

**Zoological Name:** *Alcedo atthisp*

**Family:** Alcedinidae

**Conservation Status:** Least Concern

**Voice Call:** Uttering a sharp chi-chcc, chi-chec, shrut-it-it and nestlings call for food with a churring noise.

**Habitat:** Common kingfishers are found on the shores of lakes, ponds, streams, and in wetlands.

**Feeding:** Its diet consists of small fish, tadpoles, water beetles and their larva, and other aquatic insects.

**Breeding Season:** Common Kingfisher have 2-3 clutches yearly one in April, another by July and sometimes a final clutch in early October.

**Nesting Pattern:** Scrubs and bushes with overhanging branches close to shallow open water.

**Predators:** Common kingfishers have few natural predators as adults. Nestlings may be preyed on by snakes and other ground-dwelling predators, but kingfishers are aggressive birds and do defend their young against predators.



Nesting of Common Kingfisher



Male Bird



Female Bird

**b) Common Name: Purple Sunbird**

**Zoological Name:** *Cinnyris asiaticus*

**Family:** Nectariniidae

**Conservation Status:** Least Concern

**Voice Call:** The song is rapid rattle followed by ringing, metallic notes. "chwit" or "chwing!"

**Habitat:** Thin forest and garden land, including those in dense urban areas.

**Feeding:** They rarely hover at flowers and usually perch to forage for nectar. They are important pollinators of some plant species such as *Butea monosperma*, *Acacia* spp.

**Breeding Season:** The primary breeding season is before the Monsoons, April to June in northern India and January to June in Sri Lanka.

**Nesting Pattern:** The nest is a pouch made of cobwebs, thin strips of vegetation, lichens and bark. The entrance hole on the side is often shaded by an overhanging projection.

**Predators:** Owls are main predators.



Nesting of Purple Sunbird



Male bird



Female bird

### c) **Common Name: Indian Golden Oriole**

**Zoological Name:** *Oriolus kundoo*

**Family:** Oriolidae

**Conservation Status:** Least Concern

**Voice Call:** Song a fluty melodious "pee-lo" or "pee-lo-lo", "who-he-heer" or "weela whee-oh".

**Habitat:** Habitats including open deciduous forests, semi-evergreen forests, woodland, forest edge, mangroves, open country with scattered trees, parks, gardens orchards and plantations.

**Feeding:** Orioles feed on fruits, nectar and insects. They are capable of dispersing the seeds of many berry-bearing plants including the invasive *Lantana camera*.

**Breeding Season:** April to August

**Nesting Pattern:** The nest being a small cup placed in a fork near the end of a branch. Nests are often built in the vicinity of the nest of a black drongo.

**Predators:** Shikras and Crows.



Nesting of Golden Oriole



Male bird



Female bird

**d) Common Name: Crimson Backed Sunbird**

**Zoological Name:** *Leptocoma minima*

**Family:** Nectariniidae

**Conservation Status:** Least Concern

**Voice Call:** The calls include short chik calls and longer chee-chee-which-chee. Squeaky song “see-see-whi-see-see-siwee...” lasting 5–10 seconds, frequently repeated.

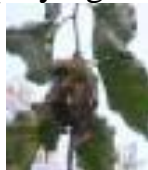
**Habitat:** They are tiny birds that are resident and are found in forests but are particularly attracted to gardens at the edge of the forest where people grow suitable flower-bearing plants. They usually perch while taking nectar.

**Feeding:** Insects, spiders (Araneae) and nectar. Forages singly, in pairs or in small groups.

**Breeding Season:** December to March.

**Nesting Pattern:** Two eggs are laid in a suspended nest on a thin drooping branch of low tree, fern frond or shrub.

**Predators:** Being small birds they may be preyed on by a number of predators including praying mantises and arachnids.



Nesting of Crimson Backed Sunbird



Male bird



Female bird

**e) Common Name: Thick Billed Flower Pecker**

**Zoological Name:** *Dicaeum agile*

**Family:** Dicaeidae

**Conservation Status:** Least Concern

**Voice Call:** Loud “chik-chik-chik-chik”, rattling “tititiitili”, and very high-pitched.

**Habitat:** They feed predominantly on fruits and are active birds that are mainly seen in the tops of trees in forests.

**Feeding:** They feed mainly on berries, nectar but sometimes take insects, Feeds on fruits, including those of mistletoes, lantana (*Lantana* spp), figs (*Ficus* spp).

**Breeding Season:** December to March.

**Nesting Pattern:** The nest has been described as appearing camouflaged like a dry leaf. It is a pendant purse like structure made of cobwebs or fine plant fibers and is located from 3 to 15 meters high suspended from a thin horizontal branch.



Nesting of Thick Billed Flower Pecker      Male female birds is alike

f) **Common Name:** Baya Weaver

**Zoological Name:** *Ploceus philippinus*

**Family:** Ploceidae

**Conservation Status:** Least Concern

**Voice Call:** Their calls are a continuous chit-chit... sometimes ending in a wheezy cheee-eee-ee that is produced by males in a chorus.

**Habitat:** Grassland, scrub with scattered trees, mangroves and cultivated areas.

**Feeding:** They forage in flocks for seeds, both on the plants and on the ground.

**Breeding Season:** The breeding season of the baya weavers is during the monsoons.

**Nesting Pattern:** These pendulous nests are retort-shaped, with a central nesting chamber and a long vertical tube that leads to a side entrance to the chamber.

**Predators:** They also feed on insects (including butterflies), sometimes taking small frogs, geckos and mollusks, especially to feed their young.



Nesting of Baya Weaver      Male female birds is alike

g) **Common Name:** Indian Silver bill

**Zoological Name:** *Euodice malabarica*

**Family:** Estrildidae

**Conservation Status:** Least Concern

**Voice Call:** The call of the Indian silverbill is a swift trill, and other vocalizations include a high-pitched ‘chirrup’ flight call and a harsh ‘tch wit’ alarm call.

**Habitat:** Indian silver bill inhabits dry, open, cultivated as well as sparse scrub-and-bush country, and avoids humid forest.

**Feeding:** They feed on the ground or on low shrubs and grass stalks.

**Breeding Season:** Breeds throughout year, varying locally, generally beginning with onset of rains; mainly in winter months in Indian Subcontinent;

**Nesting Pattern:** Nests have been found in a variety of locations, such as in low thorny bushes, up to 3-4 meters from the ground in trees, and even among the lower sticks of eagle nests.



Nest Material



Male



Female

#### h) Common Name: Indian Golden Oriole

**Zoological Name:** *Oriolus kundoo*

**Family:** Oriolidae

**Conservation Status:** Least Concern

**Voice Call:** Song a fluty melodious "pee-lo" or "pee-lo-lo", "who-he-heer" or "weela whee-oh".

**Habitat:** Habitats including open deciduous forests, semi-evergreen forests, woodland, forest edge, mangroves, open country with scattered trees, parks, gardens orchards and plantations.

**Feeding:** Orioles feed on fruits, nectar and insects. They are capable of dispersing the seeds of many berry-bearing plants including the invasive Lantana camara.

**Breeding Season:** April to August

**Nesting Pattern:** The nest being a small cup placed in a fork near the end of a branch. Nests are often built in the vicinity of the nest of a black drongo.

**Predators:** Shikras and Crows.





Nesting of Golden Oriole



Male bird



Female bird

**i) Common Name: Black Hooded Oriole**

**Zoological Name:** *Oriolus xanthornus*

**Family:** Oriolidae

**Conservation Status:** Least Concern

**Voice Call:** Song of liquid fluty whistles, very varied and differing among races, “tu-u-u-liu”

**Habitat:** It is a bird of open woodland and cultivation. The black hooded oriole lives in common contact with humans in rural and urban India.

**Feeding:** Its food is insects and fruit, especially figs, found in the tree canopies where they spend much of their time.

**Breeding Season:** Breeding throughout year, with local variations; two or more broods per season.

**Nesting Pattern:** The nest is built in a tree, and contains two eggs.

**Predators:** Shikras and Crows.



Nesting of Black Hooded Oriole



Male bird



Female bird

**R) Sphere Shaped nesting bird species found in OCP Chhal area:**

**S) Common Name: Red Vented Bulbul**

**Zoological Name:** *Pycnonotus cafer*

**Family:** Pycnonotidae

**Conservation Status:** Least Concern

**Voice Call:** The typical call has been transcribed as ginger beer but a number of sharp single note calls likened as pick are also produced.

**Habitat:** This is a bird of dry scrub, open forest, plains and cultivated lands.

**Feeding:** They consume leaves, flowers, buds, nectar, pollen, fruits, berries, and figs. Animal matter mainly includes insects and spiders. They were also found to prey on garden lizards and geckos.

**Breeding Season:** June to September

**Nesting Pattern:** Red-vented bulbuls build their nests in bushes at a height of around 2–3 m.

**Predators:** Predation cats, the small Indian mongoose and the Rat were also found to prey on eggs, nestlings and adult birds.



**Nesting of Red Vented Bulbul      Male female birds is alike**

**T) Common Name: Scaly Breasted Munia**

**Zoological Name:** *Lonchura punctulata*

**Family:** Estrildidae

**Conservation Status:** Least Concern

**Voice Call:** Soft contact call a repeated "tit-ti, tit-ti"; loud contact call "kit-tee, kit-tee.

**Habitat:** Scaly-breasted munias are found in a range of habitats but are usually close to water and grassland.

**Feeding:** They are especially common in paddy fields where they are considered a minor pest on account of their feeding on grain

**Breeding Season:** The breeding season is during the summer rainy season (mainly June to August in India) but can vary

**Nesting Pattern:** The nest is a large domed structure loosely woven from blades of grass, bamboo or other leaves with a side entrance and is placed in a tree or under the eaves of a house.



**Nesting Pattern**

**Male female birds is alike**

**U) Common Name: Jungle Prinia**

**Zoological Name:** *Prinia sylvatica*

**Family:** Cisticolidae

**Conservation Status:** Least Concern

**Voice Call:** The song is a repetitive pit-pretty, pit-pretty, pit-pretty.

**Habitat:** Favours dry scrubby bush-jungle, with boulders and grassland intermixed.

**Feeding:** Takes variety of small invertebrates, chiefly insects and their larvae.

**Breeding Season:** Season Mar–Oct, chiefly during Jun–Sept monsoon.

**Nesting Pattern:** It builds its nest in a shrub or tall grass.



Nesting of Jungle prinia



Male female birds is alike

V) **Common Name: Plain Prinia**

**Zoological Name:** *Prinia inornata*

**Family:** Cisticolidae

**Conservation Status:** Least Concern

**Voice Call:** The song is a repetitive tlee-tlee-tlee.

**Habitat:** This skulking passerine bird is typically found in wet lowland grassland, open woodland, scrub and sometimes gardens.

**Feeding:** Takes variety of small invertebrates, chiefly insects and their larvae.

**Breeding Season:** In India, chiefly during Jun–Oct monsoon in North and Mar–Jul in South.

**Nesting Pattern:** The plain prinia builds its nest in a shrub or tall grass and lays three to six eggs.



Nesting of Plain Prinia



Male female birds is alike

W) **Common Name: Red avadavat**

**Zoological Name:** *Amandava amandava*

**Family:** Estrildidae.

**Conservation Status:** Least Concern

**Voice Call:** Call a high "teei" or "tsi", also high-pitched chirps.

**Habitat:** Red avadavats are found mainly on flat plains, in places with tall grasses or crops, often near water.

**Feeding:** They feed mainly on grass seeds but will also take insects such as termites when they are available.

**Breeding Season:** Breeding can occur from January to April, varying regionally.

**Nesting Pattern:** They build a globular nest made of grass blades.



**Nesting material**



**Female**



**Male**

## ANNEXURE 4

### REPTILES

**Common Name:** Indian Python

**Zoological Name:** *Python molurus*

**Family:** Pythonidae

**Conservation Status:** Near Threatened

**Description:** In India, the nominate subspecies grows to 3 metres (9.8 ft) on average. This value is supported by a 1990 study in Keoladeo National Park, where the biggest 25% of the python population was 2.7–3.3 metres (8.9–10.8 ft) long. Only two specimens even measured nearly 3.6 metres (11.8 ft). Because of confusion with the Burmese Python, exaggerations and stretched skins in the past, the maximum length of this subspecies is hard to tell.

**Habitat:** Occurs in a wide range of habitats, including grasslands, swamps, marshes, rocky foothills, woodlands, "open" jungle and river valleys. They depend on a permanent source of water. Sometimes they can be found in abandoned mammal burrows, hollow trees, dense water reeds and mangrove thickets.

**Feeding:** Like all snakes, Indian Pythons are strict carnivores and feed on mammals, birds and reptiles indiscriminately, but seem to prefer mammals.

**Reproduction:** Oviparous, up to 100 eggs are laid by the animal, which are protected and incubated by the female. Towards this end, it has been shown that

they are capable of raising their body temperature above the ambient level through muscular contractions. The



hatchlings are 45–60 cm (18–24 in) in length and grow quickly.

**Common Name:** Russell's Viper

**Zoological Name:** *Daboia russelii*

**Family:** Viperidae

**Description:** *D. russelii* can grow to a maximum total length (body + tail) of 166 cm (5.5 ft) and averages about 120 cm (4 ft) on mainland Asian populations, although island populations may be slightly smaller on average. It is more slenderly built than most other vipers.

**Habitat:** *D. russelii* is not restricted to any particular habitat, but does tend to avoid dense forests. The snake is mostly found in open, grassy or bushy areas, but may also be found in second growth forests (scrub jungles), on forested plantations and farmland. It is most common in plains, coastal lowlands, and hills of suitable habitat.

**Feeding:** *D. russelii* feeds primarily on rodents, especially murid species. However, it will eat just about anything; including rats, mice, shrews, squirrels, lizards, land crabs, scorpions, and other arthropods. Juveniles are crepuscular, feeding on lizards and foraging actively.

**Reproduction:** *D. russelii* is ovoviparous. Mating generally occurs early in the year, although gravid females may be found at any time. The gestation period is more than six months. Young are produced from May to November, but mostly in June and July.



**Common Name:** Common Krait

**Zoological Name:** *Bungarus caeruleus*

**Family:** Elapidae

**Description:** The average length is 0.9 m (3.0 ft), but they can grow to 1.75 m (5 ft 9 in). Males are longer, with proportionately longer tails. The head is flat and the neck hardly evident. The body is cylindrical, tapering towards the tail. The tail is short and rounded. The eyes are rather small, with rounded pupils, indistinguishable in life. The head shields are normal, with no loreals; four shields occur along the margin of the lower lip; the third and fourth supraoculars touch the eye. The scales are highly polished, in 15-17 rows; the vertebral row is distinctly enlarged and hexagonal. Ventrals number 185-225 and caudals 37-50, entire.

**Habitat:** Its range comprises a wide variety of habitats. It is found in fields and low scrub jungle, as well as inhabited areas. It is known to take up residence in termite mounds, brick piles, rat holes, even inside houses. It is frequently found in water or in proximity to a water source.

**Feeding:** The Common Krait feeds primarily on other snakes, including: "blind worms" (snakes of the genus Typhlops); and cannibalizes on other kraits, including the young. It also feeds on small mammals (such as rats, and mice), lizards and frogs.

The young are known to eat arthropods.

**Reproduction:**  
oviparousk



**Common Name:** Banded Krait

**Zoological Name:** *Bungarus fasciatus*

**Family:** Elapidae

**Conservation Status:** Least Concern

**Description:** The Banded Krait is easily identified by its alternate black and yellow crossbands, its triangular body cross section, and the marked vertebral ridge consisting of enlarged vertebral shields along its body. The head is broad and depressed. The eyes are black. It has arrowhead-like yellow markings on its otherwise black head and has yellow lips, lores, chin, and throat. The longest banded Krait measured was 2.25 m (7 ft 5 in) long, but normally the length encountered is 1.8 m (5 ft 11 in).

**Habitat:** Banded kraits may be seen in a variety of habitats, ranging from forests to agricultural lands. They inhabit termite mounds and rodent holes close to water, and often live near human settlement, especially villages, because of their supply of rodents and water.

**Feeding:** The Banded Krait feeds mainly on other snakes, but is also known to



eat fish, frogs, skinks, and snake eggs.

**Reproduction:** Little is known of its breeding habits. In Myanmar, a female has been dug out while incubating a clutch of eight eggs, four of which hatched in May. Young have been recorded to measure 298 to 311 mm on hatching. The snake is believed to become adult in the third year of its life, at an approximate length of 914 mm.

**Common Name:** Chameleons or Chamaeleons

**Zoological Name:** *Chamaeleo zeylanicus*

**Family:** Chamaeleonidae

**Description:** Chameleons vary greatly in size and body structure, with maximum total lengths varying from 15 mm (0.59 in) in male *Brookesia micra* (one of the world's smallest reptiles) to 68.5 cm (27.0 in) in the male *Furcifer oustaleti*.

**Habitat:** Chameleons inhabit all kinds of tropical and mountain rain forests, savannas, and sometimes deserts and steppes. The typical chameleons from the subfamily Chamaeleoninae are arboreal, usually living in trees or bushes, although a few (notably the Namaqua chameleon) are partially or largely terrestrial.

**Feeding:** All chameleons are primarily insectivores that feed by ballistically projecting their long tongues from their mouths to capture prey located some distance away.

**Reproduction:** Chameleons are mostly oviparous, with some being ovoviviparous. The oviparous species lay eggs three to six weeks after copulation. The female will dig a hole — from 10–30 cm (4–12 in), deep depending on the species — and deposit her eggs.

**Common Name:**

Monitor Lizards

**Zoological Name:** *Varanus varius*

**Family:** Varanidae





**Conservation Status:** According to IUCN Red List of threatened species, most of the Monitor lizard's species fall in the categories of least concern but the population is decreasing globally.

**Description:** The various species cover a vast area, occurring through Africa, the Indian Subcontinent, to China, down Southeast Asia to Brunei, Indonesia, the Philippines, New Guinea, Australia and islands of the Indian Ocean, and the South China Sea.

**Habitat:** Monitor lizards are, as a rule, almost entirely carnivorous, consuming prey as varied as insects, crustaceans, arachnids, myriapods, mollusks, fish, amphibians, reptiles, birds, and mammals. Most species feed on invertebrates as juveniles and shift to feeding on vertebrates as adults.

**Feeding:** The meat of monitor lizards is eaten by some tribes in India, Thailand, and Australia and in



West Africa as a supplemental meat source. The meat of monitor lizards is used in Nepal for medicinal and food purpose.

**Common Name:** Common House Gecko

**Zoological Name:** *Hemidactylus frenatus*

**Family:** Gekkonidae

**Conservation Status:** Least Concern

**Description:** Like many geckos, this species can lose its tail when alarmed. Its call or chirp rather resembles the sound "gecko, gecko". However, this is an interpretation, and the sound may also be described as "tchak tchak tchak" (often sounded three times in sequence).

**Habitat:** Most geckos are nocturnal, hiding during the day and foraging for insects at night. They can be seen



climbing walls of houses and other buildings in search of insects attracted to porch lights, hence their name "house gecko".

**Common Name:** Lizards

**Zoological Name:** *Hemidactylus flaviviridis*

**Family:** Gekkonidae

**Description:** Aside from legless lizards, most lizards are quadrupedal and move using gaits with alternating movement of the right and left limbs with substantial body bending. This body bending prevents significant respiration during movement, limiting their endurance, in a mechanism called Carrier's constraint. Several small species such as those in the genus *Draco* can glide: some can attain a distance of 60 metres (200 feet), losing 10 metres (33 feet) in height.

**Habitat:** Lizards are found worldwide, excluding the far north and Antarctica, and some islands. They can be found in elevations from sea level to 5,000 m (16,000 ft). They prefer warmer, tropical climates but are adaptable and can live in all but the most extreme environments.

**Feeding:** The majority of lizard species are predatory and the most common prey items are small, terrestrial invertebrates, particularly insects.

**Reproduction:** Most social interactions among lizards are between breeding individuals. Territoriality is common and is correlated with species that use sit-and-wait hunting strategies.

Males establish and maintain territories that contain resources which attract females and which they defend from other males.



## ANNEXURE 5

### MAMMALS

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**Common Name: Greater Short-nosed fruit Bat**

**Zoological Name:** *Cynopterus sphinx*

**Family:** Pteropodidae

**Conservation Status:** Least Concern

**Description:** These bats have a relatively long snout. Their upper parts are brown to grey-brown with paler under parts. The fur is very fine and silky. The ears and wing bones of *C. sphinx* are edged in white. Lower cheek teeth rounded without accessory cusps. The wing span of the adult is about 48 cm. Juveniles are lighter than adults. Average forearm length 70.2mm (64-79mm).

**Habitat:** The greater short-nosed fruit bat is found from Pakistan to Vietnam. It is common in tropical forests and areas where fruit crops are cultivated.

**Feeding:** These bats are frugivorous, locate their preferred food items by scent. They have been described as voracious feeders, eating more than their body weight in food in one sitting. Some preferred fruits include ripe guava, banana, chikoo, dates and lychees. Short-nosed fruit bats inflict serious damage on many fruit crops, and are considered pests.

**Reproduction:** The adult sex ratio is very female biased. Researchers attribute this to the relatively rapid maturation of females compared to males.



**Common Name: Black-bearded Tomb Bat**

**Zoological Name:** *Taphozous melanopogon*

**Family:** Emballonuridae

**Conservation Status:** Least Concern

**Description:** Head and body length is 9–10 cm. Forearm 6 cm. Wingspan 37–40 cm. Tip of the tail is conspicuous and free. Grayish brown above with a grizzled appearance. Lighter on the shoulders, hind neck, and underside. Fur short and dense. Body appears rather flattened above and below. Hairy chin. In older males, at about 5–6 months, a blackish beard can be seen. Claws purplish with whitish tip. Young are grayer and darker. No gular sacs as in *Taphozous longimanus*. It has only small pores.

**Habitat:** Black-bearded tomb bats are found in habitats including rainforests, woodlands, tombs, deserted buildings, rock formations, caverns, cliffs, and arid country plains. They prefer densely sheltered areas.

**Feeding:** *Taphozous melanopogon* feeds primarily on flying insects, although it also sometimes feeds on small fruits. It hunts by echolocation emitting a "click" or "tic" that can be faintly audible, to humans. (Boonsong and McNeely, 1988)  
Primary Diet, carnivore, insectivore Animal Foods insects, Plants foods Fruits

**Reproduction:** Information on mating systems is not available. The mating season lasts for only a few weeks in the winter. The female gives birth to one live infant sometime in early spring. (Hill and Smith, 1986; Kunz and Pierson, 1994; Lekagul and McNeely, 1988).



**Common Name:** Field Rat

**Zoological Name:** *Bandicota bengalensis*

**Family:** Muridae

**Conservation Status:** Least Concern

**Description:** The lesser bandicoot and two other species are nocturnal or most active at twilight. They construct burrows to nest and bear their litters. The number of bandicoot babies can range from two to 18. Their staple diet is grains, fruit, and invertebrates. They are prone to destroying cultivated crops in fields. Of all the three species, the lesser bandicoot is an especially aggressive burrower and has been reported to make tunnels in concrete cellars.

**Habitat:** These rats are also known to inhabit houses in villages and are particularly aggressive when threatened. The controls are done by mechanical (mouse trap etc.), rodenticides and biological control (by introducing rodent diseases etc.)

**Reproduction:** Female can have up to 10



litters. Young (10-12 per litter) are born blind and naked. Young reach sexual maturity around 60 days after birth. Lifespan of adults is about 8–9 months.

**Common Name:** Indain Bush Rat

**Zoological Name:** *Golunda ellioti*

**Family:** Muridae

**Conservation Status:** Least Concern

**Description:** Head and body length is 12–14 cm. Tail is 9-11. Yellowish brown upperparts are speckled with black and reddish yellow. Ventral surface grayish with a yellowish speckle, Orange-yellow incisor teeth, Tail, dark above and yellowish below, Body fur spiny, Rounded head with a blunt nose, with small eyes mark, Relatively short bill.

**Habitat:** It is a partially diurnal, fossorial also terrestrial, semi-arboreal, not particularly gregarious, herbivorous species. It is found in varied habitat conditions from tropical dry deciduous, dry wood, shrub, tropical thorn forests and grassy clumps, may venture in to cultivated lands, bushes, orchards, scrublands, grasslands close to streams, tropical dry deciduous, except cold deserts. Also found near granite hills with sandy loam and silty soil. It has been found to occupy rocky and hilly tracts, burrows, grassland close to streams, build nests on thick bush, shrubs (Molur *et al.* 2005). This can be a serious agricultural pest species (Corbet and Hill 1992).



**Common Name:** Black Rat

**Zoological Name:** *Rattus rattus*

**Family:** Muridae

**Conservation Status:** Least Concern

**Description:** The black rat originated in India and Southeast Asia, and spread to the Near East and Egypt, and then throughout the Roman Empire, reaching Great Britain as early as the 1st century. Europeans subsequently spread it throughout the world. The black rat is again largely confined to warmer areas, having been supplanted by the brown rat (*Rattus norvegicus*) in cooler regions and urban areas. In addition to being larger and more aggressive, the change

from wooden structures and thatched roofs to bricked and tiled buildings favored the burrowing brown rats over the arboreal black rats.

**Habitat:** Black rats adapt to a wide range of habitats. In urban areas they are found around warehouses, residential buildings, and other human settlements. They are also found in agricultural areas, such as in barns and crop fields. In urban areas, they prefer to live in dry upper levels of buildings, so they are commonly found in wall cavities and false ceilings.



**Reproduction:** They often meet and forage together in close proximity within and between sexes. Rats tend to forage after sunset.

**Common Name:** Indian House Screw

**Zoological Name:** *Suncus murinus*

**Family:** Soricidae

**Conservation Status:** Least Concern

**Description:** The house shrew has a uniform, short, dense fur of mid-grey to brownish-grey color. The tail is thick at the base and a bit narrower at the tip, and is covered with a few long, bristle-like hairs that are thinly scattered. They have short legs with five clawed toes. They have small external ears and an elongated snout. They also emit a strong odor of musk, derived from musk glands that are sometimes visible on each side of the body. The odor is especially noticeable during the breeding season.



**Habitat:** It is widespread and found in all habitats, including deserts and human habitations. The habitat of this species is normally near human settlement, specifically near the house.

**Common Name:** Jungle Cat

**Zoological Name:** *Felis chaus*

**Family:** Felidae

**Conservation Status:** Least Concern

**Description:** The distribution of jungle cat is largely oriental; it occurs in the Middle East, the Indian



subcontinent, central and Southeast Asia, Sri Lanka and in southern China. It is the most common small wild cat in India

**Habitat:** The distribution of jungle cat is largely oriental; it occurs in the Middle East, the Indian subcontinent, central and Southeast Asia, Sri Lanka and in southern China. It is the most common small wild cat in India.

**Reproduction:** Both sexes become sexually mature by the time they are one year old. Females enter oestrus lasting for about five days, from January to March. In males, spermatogenesis occurs mainly in February and March.

**Common Name:** Indian Wildboar

**Zoological Name:** *Sus scrofa cristatus*

**Family:** Suidae

**Conservation Status:** Least Concern

**Description:** The Indian boar differs from its European counterpart by its large mane which runs in a crest along its back from its head to lower body, larger, more sharply featured and straighter skull, its smaller, sharper ears and overall lighter build. It is taller and more sparsely haired than the European form, though its back bristles are much more developed.

**Habitat:** The animal's primary habitat consists of well developed, broad-leaved and mixed forests, along with marshy mixed forests, with coniferous forests and undergrowths being of secondary importance. Forests made up entirely of oak groves and beeches are used only during the fruit-bearing season.

**Reproduction:** The breeding period in most areas lasts from November to January, though most mating only lasts a month and a half. Prior to mating, the males develop their subcutaneous armor, in preparation for confronting rivals.



**Common Name:** Common Mongoose

**Zoological Name:** *Herpestes edwardsi*

**Family:** Herpestidae

**Conservation Status:** Least Concern

**Description:** The Indian grey mongoose or common grey mongoose (*Herpestes edwardsi*) is a mongoose species mainly found in West Asia and on the Indian subcontinent. In North Indian languages (Hindi/Punjabi) it is called Nevlaa.



**Habitat:** They appear to be able to occupy a wide variety of habitats but preferring open types. These include grasslands, open areas, rocky patches, scrub, semi-desert, cultivated fields and other disturbed areas, areas of thickets, bushy vegetation, dry secondary forest, thorn forest, forest edges, and also near human settlement.

**Reproduction:** The Indian grey mongoose mates between March and October, it breeding two to three times each year. The gestation period lasts for 60 to 65 days; the female gives birth to two to four offsprings.



**Common Name:** Rhesus Macaque

**Zoological Name:** *Herpestes edwardsi*

**Family:** Herpestidae

**Conservation Status:** Least Concern

**Description:** The rhesus macaque is brown or grey in color and has a pink face, which is bereft of fur. Its tail is of medium length and averages between 20.7 and 22.9 cm (8.1 and 9.0 in). Adult males measure about 53 cm (21 in) on average and weigh about 7.7 kg (17 lb). Females are smaller, averaging 47 cm (19 in) in length and 5.3 kg (12 lb) in weight. Rhesus macaques have, on average, 50 vertebrae.

**Habitat:** Rhesus macaques are native to India, Bangladesh, Pakistan, Nepal, Burma, Thailand, Afghanistan, Vietnam, southern, China, and some neighboring areas. Inhabiting arid, open areas, rhesus macaques may be found in grasslands, woodlands, and in mountainous regions up to 2,500 m (8,200 ft) in elevation.

**Reproduction:** Adult male macaques try to maximize their reproductive success by entering into sex with females, both in and outside the breeding period. Females prefer to mate with males that will increase the survival of their young. Thus, a consort male provides resources for his female and protects her from predators. Larger, more dominant males are more likely to provide for the females. The breeding period can last up to 11 days, and a female usually mates with four males during that time.



**Common Name- Common Indian Hare**

**Zoological Name-** *Lepus nigricollis ruficaudates*

**Family-** Liporadae

**Conservation Status-** Least Concern



**Habitat-** *Lepus nigricollis* are generally found in areas where large tracts of bush and jungle alternate with farm land. They are also commonly sighted in coastal herb communities. Hilly areas, particularly the depressions at the base of hills, are preferred habitats for *Lepus nigricollis*.

**Physical Description-** *Lepus nigricollis* are also called black-naped hares due to the patch of black fur that runs along the nape of the neck. The top of the tail is also black and the back and face are brown with black hairs scattered throughout. The under parts are white. Total length ranges from 40 to 70 cm and weight ranges from 1.35 to 7 kg.

**Reproduction-** During mating season, male *Lepus nigricollis* become aggressive, spar ring with other males using their forepaws and "boxing" with their hind feet. Males will attempt to mate with as many females as they can.

**Common Name- The Three Striped Palm Squirrel**

**Zoological Name-** *Funambulus palmarum*

**Family-** Sciuridae

**Conservation Status-** Least Concern

**Habitat-** This is a very adaptable species. It is a diurnal and semi-arboreal. This species occurs in tropical and subtropical dry deciduous forest, mangrove forest, grasslands, scrublands, plantations, rural gardens and urban areas. In Sri Lanka, found throughout the island except in deep jungles.

**Physical Description-** The palm squirrel is about the size of a large chipmunk, with a bushy tail slightly shorter than its body. The back is a grizzled, grey-brown colour with three conspicuous white stripes which run from head to tail. The two outer stripes run from the forelegs to the hind legs only. It has a creamy-white belly and a tail covered with interspersed, long, black and white hair. The ears are small and triangular. Juvenile squirrels have significantly lighter coloration, which gets progressively darker as they age. Albinism is rare, but exists in this species.



**Reproduction-** Naturally active, their activity reaches levels of frenzy during the mating season. They tend to be very protective of their food sources, often guarding and defending them from birds and other squirrels. Unlike some other species of squirrel, the Indian palm squirrel does not hibernate.

**Common Name- Timber Wolf****Zoological Name-** *Canis lupus pallipes***Family-** Canidae**Conservation Status -** Least Concern**Habitat -** The gray wolf is a habitat generalist, and can occur in deserts, grasslands, forests and arctic tundras.

Habitat use by gray wolves is strongly correlated with the abundance of prey, snow

conditions, absence or low livestock densities, road densities, human presence and topography. In cold climates, the gray wolf can reduce the flow of blood near its skin to conserve body heat.

**Physical Description-** A small wolf with pelage shorter than that of northern wolves. Fur color ranges from greyish-red to reddish-white with black tips. The dark V shaped stripe over the shoulders is much more pronounced than in northern wolves. The under parts and legs are more or less white. Generally, wolves have a high heart weight of 0.93%-1.07% total body mass compared to the average mammal at 0.59% total body mass.**Reproduction-** The gray wolf is generally monogamous with mated pairs usually remaining together for life. Upon the death of one mated wolf, pairs are quickly re-established. Since males often predominate in any given wolf population, unpaired females is a rarity.**Common Name- Striped Hyena****Zoological Name-** *Hyaena hyaena***Family-** Hyaenidae**Conservation Status-** Near- Threatened**Habitat-** The Striped Hyena typically inhabits deserts, semi deserts, scrub forests, woodlands, grasslands, acacia bushlands, rocky terrain and

tropical savannas. Family groups live in dens which are usually caves with narrow entrances and are concealed with large boulders. Dens can extend over a distance of 4 – 5 metres.

**Physical Description-** Male and female striped hyenas are very similar in appearance, although males are slightly larger. Striped hyenas generally measure

between 1 – 1.15 metres in length excluding the tail (which measures 12.5 inches), and stand 0.66 – 0.75 metres at the shoulder. Males weigh between 26 – 41 kilograms (57 – 90 pounds) and females weigh 26 – 34 kilograms (57 – 75 pounds). Their coats are generally light grey to beige in colour and they have a black patch on their throat.

**Reproduction-** There is no specific breeding season for the Striped Hyena. After a gestation period of 90 – 92 days a litter of 2 – 4 helpless cubs are born in nesting dens. Hyena cubs are born blind and their ear canals are closed. Their coats are white to grey with clear black stripes. After 7 – 8 days, the cubs are able to open their eyes and their teeth develop after 3 weeks.

**Common Name- Indian Fox**

**Zoological Name** *Vulpes bengalensis*

**Family-** Canidae

**Conservation Status-** Least Concern

**Habitat-** The Indian Fox prefers semi-arid, flat to undulating terrain, scrub and grassland habitats where it is easy to hunt and dig dens. It avoids dense forests, steep terrain, tall grasslands and true deserts (Johnsingh and Jhala 2004).



**Physical Description-** The Bengal Fox is a medium-sized fox with an elongated muzzle with black hair in small patches on the upper part of the muzzle. Its large, bushy, black-tipped tail is its most prominent feature, accounting for as much as 60% of the length of its body.

**Reproduction-** Bengal foxes are usually monogamous and form pair bonds that may last for their lifetime. The breeding season is from December to January, announced by digging a new den or re-excavating an old one. Pups are born from January to March. The gestation period is 50–60 days, and between 3 to 6 pups are born within a den. Both mother and father help to raise the pups, which are weaned at about 1 month old. Pups are sometimes nursed by a number of females. In the daytime they are likely to rest under bushes, but in summer they rest in dens. Independence is reached at 4 - 5 months old and sexual maturity by 1 - 2 years old.



*Maharatna Company*



REHABILITATION & RESETTLEMENT POLICY  
COAL INDIA LIMITED

श्रीप्रकाश जायसवाल  
SRIPRAKASH JAISWAL



राज्यमंत्री  
कोयला विभाग  
आर.डी. भवन, 40, लोहा रोड, कोयला  
MINISTER OF COAL  
GOVERNMENT OF INDIA  
SHASTRI BHAVAN, NEW DELHI 110001

26<sup>th</sup> March, 2012

MESSAGE

Land acquisition has been identified as a major bottleneck coming in the way of Coal India's plans for augmenting coal production. I am of the firm view that Coal India has to have a generous relief and rehabilitation policy which can earn the confidence and goodwill of the project affected people to enable it to meet its ambitious production targets.

I have been deeply concerned about the issue and therefore constituted a Committee at Government level to take the process forward quickly. I am glad that the Committee could meet under the Chairmanship of Shri Alok Perti, Secretary (Coal) and Smt. Zohra Chatterji, Additional Secretary & CMD, Coal India Ltd and decided the broad principles of the policy.

I congratulate the Board of Coal India for approving a progressive Rehabilitation & Resettlement Policy 2012 and look forward to its successful implementation.

( SRIPRAKASH JAISWAL )

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भारत सरकार  
कोयला मंत्रालय  
GOVERNMENT OF INDIA  
MINISTRY OF COAL  
शास्त्री भवन/ SHASTRI BHAWAN

MESSAGE

I am very happy to learn that Coal India Ltd. has revised its Rehabilitation & Resettlement Policy and come up with a liberal policy which enables the land loser to choose between various options and adopt the package which best suits his needs. The focus on development of community facilities and skill development is also a positive feature.

The Ministry has held several meetings on the subject in view of the criticality of getting more land quickly for enhancing coal production. I am glad that the Policy has now been finalized and approved by the Coal India Board. I look forward to seeing much better progress in Coal India's efforts to acquire land as a result of this policy and wish them every success.

(Alok Perti)

New Delhi  
26<sup>th</sup> March, 2012

Dy.G.M.(M)/Sub Area Manager  
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Raigarh Area

जोहरा चटर्जी

Zohra Chatterji, IAS

Additional Secretary to Govt

Ministry of Coal

&

Chairman-cum-Managing Director



कोल इण्डिया लिमिटेड

COAL INDIA LIMITED

(A Maharatna Company)

(A Govt of India Enterprise)

"COAL BHAWAN"

10, NETAJI SUBHAS ROAD,

KOLKATA - 700 001



MESSAGE

I feel privileged to present the Rehabilitation and Resettlement Policy 2012 of Coal India Limited which has been approved by the Board of Directors in its 279<sup>th</sup> Meeting held on 12<sup>th</sup> March, 2012.


I could well appreciate the urgent need to liberalize the policy and after chairing a meeting of the Committee constituted for the purpose by the Ministry of Coal, I seized upon the opportunity to fast track it when I was given additional charge of CMD, Coal India on 1<sup>st</sup> February, 2012.

I must appreciate the painstaking efforts of Director (P&IR), Shri R. Mohan Das and his team including Shri Bhagwan Pandey, General Manager (MP&IR) and Shri T.B. Raju, Chief Manager (IR) for drafting and redrafting the policy after extensive deliberations at the level of the Functional Directors and the CMDs of subsidiary companies and the Board of Coal India.

I am hopeful that the R&R Policy 2012 which incorporates the collective wisdom of all levels from the Ministry to the field and provides sufficient flexibility to the subsidiary companies will prove to be a well conceived one which will facilitate land acquisition by Coal India in the years to come.

  
(Zohra Chatterji)

Kolkata  
26<sup>th</sup> March, 2012

  
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आर मोहन दास

निदेशक (व्यक्तिगत एवं ई.आर.)

R Mohan Das

Director (Personnel & IR)



कोल इण्डिया लिमिटेड

COAL INDIA LIMITED

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10, NETAJI SUBHAS ROAD

KOLKATA - 700 001




MESSAGE



I feel proud to place the liberalized new redrafted "R&R policy of Coal India-2012" before the 279<sup>th</sup> meeting of the Board of Directors of Coal India Limited held on 12<sup>th</sup> and 13<sup>th</sup> March 2012 at New Delhi and got approval of the Board.

Though there was an existing R&R policy of CIL-2008, but there was an urgent need of redrafting the new policy in view of changing aspirations of the project affected persons in the competitive market and to redress the unique problems of the subsidiary companies of Coal India Limited for fast acquiring of land.

I would like to extend my personal congratulations to the tireless effort of Sri Bhagwan Pandey, General Manager (MP&IR), CIL and Sri T.B.Raju, Chief Manager (MP&IR), CIL and their team for their fast and prompt action in drafting the modification of the existing policy keeping in view the aspirations of the people and the difficulties encountered by the subsidiaries in acquiring land. They are of great value to the company.

I am very much hopeful that after implementation of this new policy of Coal India Limited, the subsidiary companies will feel relaxed with greater flexibility in redressing the R&R issues and this will help in faster acquisition of land at all level.

  
(R Mohan Das)  
Director (P&IR)

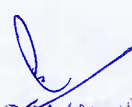
  
  
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Raigarh Area



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# REHABILITATION AND RESETTLEMENT POLICY OF COAL INDIA LTD 2012.

## Preamble

The location and quality of coal reserves, and their distance from major consumers determines to a great extent the selection of mine sites. For reserves that are close to the surface, opencast mining has proven to be the most efficient mining method. Opencast mines require relatively large areas of land. Population growth, particularly in India's eastern region, has made it increasingly difficult for the subsidiary coal companies to acquire the land they need for expanding their operations under the present Resettlement and Rehabilitation policy, 2008 of Coal India.

The resettlement and rehabilitation policies followed by the subsidiary companies have evolved over time and undergone numerous changes in response to changing circumstances. As and when the Central or State Governments enact amendments to the Land Acquisition Act, issue new guidelines for resettlement and rehabilitation, as per its requirement Coal India reviews and modifies its resettlement and rehabilitation policy taking into account the changing conditions in coal producing areas.

In addition to compensation for land coal companies provide Rehabilitation and Resettlement (R&R) package for project affected persons to compensate for loss of livelihood. Apart from compensation for house site, house, trees, cow shed, cost of shifting etc., employment is also provided to land oustees. In addition to this, efforts are made to rehabilitate them by construction of houses, building roads, streets, schools, providing water etc. wherever feasible. However, demand for both more land compensation and better R&R package has been raised by project affected persons and has been highlighted in various Parliamentary Committees. Coal Companies often have to face representations and agitations by these land oustees who obstruct the smooth working of existing mines and come in the way of expansion of new projects.

In the past, subsidiaries found it relatively easy to acquire land, if they were able to offer employment. Partly because of this practice, subsidiaries have built up a largely unskilled labour force beyond their needs. This has contributed to the heavy losses and many mines are incurring and has also affected their efficiency and viability. The subsidiaries may still need to hire people in selected locations and continue to give preference to those whose livelihood will be affected by coal mining operations. However, increasingly subsidiaries will need to develop other ways and means to compensate land owners and others adversely affected by their projects and give them the option to choose which method of compensation best suits their needs. Greater emphasis will also need to be given to community requirements like schools, hospitals etc. Only proper resettlement and rehabilitation will elicit the required cooperation of project affected people, and make it possible for Coal India to acquire the land it needs to fulfill the ever increasing demand of coal for the economic development of the Country.

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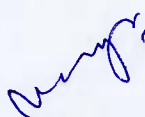
The purpose of the Resettlement and Rehabilitation Policy 2012 is to revise and provide greater flexibility to the basic principles for the resettlement and rehabilitation of people affected by coal mining projects i.e. Project Affect People (PAPs). It attempts to consolidate the different resettlement and rehabilitation practices that are being followed by subsidiaries as per the different State land Acquisition Acts and various decisions of the Coal India Board and to modify the Policy of 2008 so as to give the Board of the subsidiary Companies greater flexibility to deal more effectively with resettlement and rehabilitation issues and determine the rehabilitation packages best suited to local needs in line with this policy. The provisions of the National Rehabilitation and Resettlement Policy, 2007 and the Land Acquisition, Rehabilitation & Resettlement Bill, 2011 have also been kept in mind while framing the policy.

While Coal India's basic philosophy for compensating land-losers and other project-affected people remains substantially unchanged, the revised policy emphasizes the need to cultivate and maintain good relationships with the people affected by Coal India's projects starting as early as possible; it also underscores that the subsidiaries have a responsibility towards the land oustees whose livelihood is often taken away. On the other hand, subsidiaries need to protect themselves more effectively against unjustified claims, redundant manpower and swelling Wage Bills. To this end, the statement proposes that subsidiaries prepare detailed resettlement and rehabilitation action plans (RAPs) that clearly identify, at an early stage, the entitlements of the people affected by coal projects and enables them to exercise a choice between various options. The concept of Annuity in lieu of compensation/employment is also being introduced to mitigate, if not eliminate the ever dependence of Project Affected Families (PAFs) on CIL for provision of employment.

(1) The revised Resettlement & Rehabilitation Policy, 2012 is based on the deliberations of the inter Ministerial Committee set up vide O.M. 490191/2011-PRIW-I dated 01-07-2011 of Ministry of Coal, deliberations of the CMDs meet held on 05/03/2012 at New Delhi and has been approved by the CIL Board in its 279<sup>th</sup> meeting held on 12<sup>th</sup> and 13<sup>th</sup> March, 2012.

(2) **Objectives and general principles of Coal India's Resettlement and Rehabilitation Policy- 2012**

- A. To re-visit CIL's existing R&R policy 2008 and evolve a PAP friendly policy by incorporating such provisions of the National Policy and The Draft Land Acquisition, Rehabilitation and Resettlement Bill-2011 as considered suitable in light of the growing difficulties many subsidiaries face in land acquisition.
- B. To accord the highest priority for avoiding or minimizing disturbance of the local population while taking decisions to open new mines or expand existing ones too (exploring alternative sites and project designs) and to ensure that wherever people are likely to be adversely affected by a project, the subsidiaries will prepare resettlement and rehabilitation action plans for the project.
- C. To ensure a humane, participatory, informed consultative and transparent process for land acquisition for coal mining and allied activities with the least disturbance to the owners of the land and other affected families.
- D. To provide just and fair compensation to the affected families whose land has been acquired or proposed to be acquired or are affected by such acquisition and make

  
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adequate provisions for loss of livelihood of such affected persons including their rehabilitation and resettlement

- E. To ensure that the cumulative outcome of compulsory acquisition should be that the affected persons become partners in development leading to an improvement in their post acquisition social and economic status and matters connected therewith or incidental thereto.
- F. Through the preparation of resettlement and rehabilitation action plans, subsidiaries will safeguard that project-affected people improve or at least regain their former standard of living and earning capacity after a reasonable transition period. The transition period is to be kept to a minimum. However, the involvement of subsidiaries in resettlement and rehabilitation activities may continue until all the actions specified in the rehabilitation plan have been completed.
- G. Involuntary resettlement is conceived and executed as a development programme with project-affected people being provided sufficient resources and opportunities to share in a project's benefits. The efforts of subsidiaries are complementary to the Government's schemes in rural development and the concurrence, approvals and support from concerned Government authorities will be sought.
- H. In parallel, subsidiaries will work closely with non-governmental organizations of proven repute which are legally constituted and recognized and also have the confidence of the project-affected people, in the preparation and implementation of rehabilitation plans.
- I. Corporate Social Responsibility (CSR) : Activities shall be intensified in and around the villages where land is being acquired in accordance with the CSR Policy of Coal India.
- J. Actual implementation of R&R package must follow a detailed survey of the project-affected villages to formulate the list of persons/families affected by the project, nature of the affect, the likely loss of income, etc. For this purpose, if necessary, the services of a reputed NGO with an impressive record of integrity and performance may be engaged.

### 3. SCOPE:


This Policy may be called "Rehabilitation and Resettlement Policy of Coal India Limited-2012". It extends to the Coal India Limited and its subsidiary companies in India. It shall come into force from the date of its approval by the CIL Board and is applicable to all cases in which land is taken after the date of approval by the CIL Board. While implementing the policy it is to be ensured that the provisions of the concerned Acts applicable and Rules mentioned there under shall not be violated.

### 4. Definitions

(a) "affected family" means:

- (i) a family whose primary place of residence or other property or source of livelihood is adversely affected by the acquisition of land (including direct negotiation) for a project or involuntary displacement for any other reason, or

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Raigarh Area

- (ii) any tenure holder, tenant, lessee or owner of other property, who on account of acquisition of land (including plot in the *abadli* or other property) in the affected area or other wise, has been involuntarily displaced from such land or other property; or
- (iii) any agricultural or non-agricultural labourer, landless person (not having homestead land, agricultural land, or either homestead or agricultural land), rural artisan, small trader or self-employed person, who has been residing or engaged in any trade, business, occupation or vocation continuously for a period of not less than three years preceding the date of declaration of the affected area, and who has been deprived of earning his livelihood or alienated wholly or substantially from the main source of his trade, business, occupation or vocation because of the acquisition of land in the affected area or being involuntarily displaced for any other reason.

(b) "**family**" includes a person, his/her spouse, son including minor sons, dependant daughters, minor brothers, unmarried sisters, father, mother residing with him or her and dependent on him/her for their livelihood; and includes "**nuclear family**" consisting of a person, his/her spouse and minor children. Provided that where there are no male dependants, the benefit due to a land loser may devolve on dependent daughter nominated by the land loser.

(c) "**land owner**" includes any person—

- (i) whose name is recorded as the owner of the land or part thereof, in the records of the concerned authority; or
- (ii) who is entitled to be granted Patta rights on the land under any law of the State including assigned lands; or
- (iii) who has been declared as such by an order of the court or District Collector;


(d) **Displaced person** - means and includes any person who is deprived of his homestead on account of acquisition. Provided that the person/family who does not ordinarily reside in the homestead land acquired for the project can be termed "Displaced" but he will be eligible for compensation only for homestead and not for livelihood.

(e) **Ordinarily resides** shall mean residing in the homestead / acquired land for a period more than 6 months every year for at least the preceding 5 years.

#### 5. **Socio-economic Survey and preparation of RAP.**

A baseline socioeconomic survey will be carried out to identify the PAPs who are enlisted to receive benefits in line with Coal India's Resettlement and Rehabilitation Policy. This survey will be conducted within two months of notification under the relevant land acquisition Acts by the subsidiaries with the help of reputed independent institutional agencies, who are well versed with the social matrix of the area.



  
Dy.G.M.(M)/Sub Area Mana,  
Chhal Sub Area, SECI  
Raigarh Area

The basic objective of the socio-economic study will be to generate baseline data on the social and economic status of the population who are likely to lose their means of livelihood or homestead due to the acquisition of the land for the project. The data base will be used to formulate a viable and practical Rehabilitation Action Plan (RAP) for the affected persons in line with their entitlements. Digital Satellite Maps would also be prepared of the project Area freezing the dwelling units and habitations existing at the time of negotiation for Land Acquisition wherever feasible. The RAP will also address the following-

**(A) Implementation, Monitoring and Evaluation, Dispute Mechanism**

The rehabilitation action plan will address the following:

- i) The project design, including an analysis of alternative designs aimed at avoiding or minimizing resettlement;
- ii) Socio-economic survey and activities to ensure restoration of incomes of PAPs in line with Coal India's Resettlement and Rehabilitation Policy;
- iii) Description of the institutional and other mechanisms for provision of entitlements;
- iv) Time table for the acquisition and preparation of the resettlement site(s);
- v) The cost and budgets for the resettlement and rehabilitation of PAFs;
- vi) Project-specific arrangements to deal with grievances of PAFs; and
- vii) Time tables, benchmarks and arrangements for monitoring the resettlement and rehabilitation effort.

The RAP will be formulated in consultation with PAPs and State government.

**(B). Environment Impact Assessment (EIA)** will be conducted as per any law, rule and regulation of the locality in which the land has been acquired.

**6. Eligibility Criteria -**

**(A) Eligibility Criteria for Economic Rehabilitation Benefits**

This benefit shall accrue only to Entitled Project Affected Person. Entitled Project Affected Person shall be one from the following categories.

- (i) Persons from whom land is acquired including tribals cultivating land under traditional rights.
- (ii) Persons whose homestead is acquired.
- (iii) Sharecroppers, land lessees, tenants & day labourers.
- (iv) Tribal dependent on forest produce as certified by the District Forest Officer/Revenue Authorities.

**(B) Eligibility Criteria for Resettlement Benefits**

1. Only a 'Displaced' family / person shall be eligible for resettlement benefits.


2. A family/person shall be termed 'displaced' and hence eligible for resettlement benefits if such family/person has been a permanent resident and ordinarily residing in the project area on the date of publication of notification U/S 9 of CBA(A&D) 1957 / U/S 11 of LA Act, 1894/ Or both/ on the date of the land vested with the State/ Central government as the case may be.

and

(a) on account of acquisition of his/her homestead land / structure is displaced from such areas

or

(b) He/she is a homesteadless or landless family/person who has been/is required to be displaced.

  
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Bhilai Area

### 7. Census & Identification of displaced families:

1. Within two months of publication of notice U/S 4(1) of the Land Acquisition Act or U/S 7(1) of CBA (A.D) Act 1957 for acquisition of land for the project a census would be undertaken in the manner to be decided by the Collector / project authority for identification of displaced families and for preparing their socio-economic profile and list of eligible persons for the purpose of receiving Rehabilitation & Resettlement Benefits.

2. A photo identity card to each Entitled Project Affected Person shall be issued under the signature of the Collector / project authority concerned indicating the following particulars:

- (a) Name of the village/GP/PS :
- (b) Name, Father's name and address of the head of the family :
- (c) Category of entitlement :
- (d) Whether S.C./S.T./O.B.C./General :
- (e) Age, Sex, educational qualification of the members of the family :

### 8. Types of Compensation and Rehabilitation Entitlement

**Option to the land losers regarding Rehabilitation & Resettlement Benefit** - The land losers shall have the option for Rehabilitation and Resettlement benefits in accordance with the awards for each affected family in terms of the entitlements passed by the Concerned Collector of the State or as per this Policy with the consent of the concerned Collector.

#### **8.1 Eligibility and Compensation**

The table below shows the compensation and rehabilitation benefits will be offered by the subsidiaries for each Project Affected Person or family, affected by one of their projects. Evidence to the effect that a person is a legitimate PAP will need to be provided in the form of a written legal document, or reference to a record, such as a revenue officer certificate, electoral roll, ration card or school record.

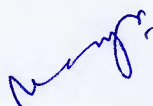

<b>Category of Persons affected by the Project</b>	<b>Compensation and Rehabilitation entitlement option</b>
	<b>Provisions</b>
(i) Persons (including tribals cultivating land under traditional rights) from whom land is acquired.	All land owners with titles will receive monetary compensation for the land acquired from them. The value of the land is determined on the basis of prevailing legal norms. <i>In respect of tribals cultivating land under traditional rights, authentication of land held under traditional rights by state authorities will be necessary.</i> In addition to above the following shall apply.

Category of Persons affected by the Project	<b>Compensation and Rehabilitation entitlement option</b>
	<p><b>Provisions</b></p> <p><b>A). Land Compensation</b> - Land compensation shall be paid as per the provisions of the concerned Act or State Govt. notification. Where no notification of the State Govt. is available the concerned subsidiary Board may decide on the rate of compensation keeping in view the compensation provided by the neighboring states. Authentication of land held under traditional rights by state authorities will be necessary.</p> <p>In addition to above Solatium will be paid as per provisions of the concerned Act / as imposed by the Concerned State Govt.</p> <p>Escalation of land compensation – Escalation will be paid as per provisions of the concerned Act / as imposed by the Concerned State Govt. or Escalation at the rate of 12% per anum for a maximum period of three years.</p> <p><b>(B): Employment provision:</b> Apart from payment of the land compensation, employment may be given in the following manner –</p> <ol style="list-style-type: none"> <li>1) The maximum total number of employments that may be provided to the land losers would be limited to the total no. of acres of land acquired divided by two. However employments will be released in proportion to the land possessed.</li> <li>2) For every two acres of land one employment can be considered.</li> <li>3) Subsidiaries of CIL may give an option to the Land losers having less than two acres of land to club together their land to the extent of two acres and nominate one of the land losers among the groups or their dependent for employment under package deal or employment under Descending order system by preparing the list of eligible land oustees in the descending order of land lost subject to the cut off equivalent to the total number of permissible employments or any other method with the approval of the respective Board of the subsidiary.</li> <li>4) The land loser must be a domiciled resident/Mool Niwasi and the certificate to this effect shall be issued by the concerned State Authority</li> <li>5) The modalities for offering employment shall be such as may be approved by the Board of the Subsidiary companies as per the unique conditions of the subsidiary provided that -       <ol style="list-style-type: none"> <li>a) The initial employment shall be given with pay of Category-I pay scale of NCWA, with training period of 6 months.</li> <li>b) In the seniority list, the seniority of the appointee should be reflected in appropriate manner in order to keep the senior most as senior.</li> <li>c) The land loser trainees shall be posted as per requirement, including underground duties.</li> </ol> </li> </ol>


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Raigarh Area



Category of Persons affected by the Project	Compensation and Rehabilitation entitlement option
	Provisions
	<p><b>(C) : Lumpsum Monetary Compensation –</b></p> <p>1. All the land losers who are not eligible for employment as above shall be entitled to receive monetary compensation in lieu of employment at the rate of Rs.5,00,000/- (Five Lakhs) for each acre of land on pro-rata basis .</p> <p>2. Land losers who are offered employment as per principle specified in point No ( 8.(i)B ) above will have the option either to opt for employment or to forego employment and opt for monetary compensation at the rate of Rs.5,00,000/- (Five lakhs) for each acre of land on pro-rata basis with minimum of Rs. 50,000 ( Fifty thousands) provided that the employment thus surrendered shall not be available for offer to any other person and will stand lapsed from the total sanctioned number of employments as specified in point No.( 8.(i)B1).</p> <p>3. The Land losers who have clubbed their land in Package Deal can claim employment for only one land loser of the clubbed two acres of land and remaining land losers of the package cannot claim either employment or lump sum monetary compensation in lieu of the land contributed by them.</p> <p>4. Annuity – All land losers who are entitled to get lump sum monetary compensation may opt for payment of compensation amount in the form of annuity made payable to the land losers monthly, annually or at such intervals (not less than one year) as may be opted for by him. The annuity be paid for a maximum period extending to 60 years of age or the life of the project for which the land has been acquired, whichever is earlier.</p> <p><b>Note:</b> A person receiving a job forgoes all claims to above compensation and a person receiving above compensation forgoes all claims to employment.</p>
(ii) Person whose homestead is acquired	<p>I. Compensation for homestead shall be paid as per the standard valuation method of the L.A Act, of the concerned State Govt.</p> <p>II. One time lump sum payment of Rs.3,00,000/- (three lakhs), shall be paid in lieu of alternate House site, Assistance in designing Shifting Allowance, compensation for construction of cattle shed , Monetary compensation for construction of work shed etc. The compensation shall be paid to displaced persons only after vacation and demolition of the homestead/ work shed etc.</p> <p>III Subsistence allowance :Each affected displaced family will get subsistence allowance at the rate of 25 days (Minimum Agricultural Wage) per month for one year.</p>

  
  
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 Chhal Sub Area, SECI  
 Raigarh Area

Category of Persons affected by the Project	Compensation and Rehabilitation entitlement option
	Provisions
(iii) Sharecroppers, land lessees, tenants and day labourers	<p>The subsidiary will assist PAP to take-up non farm self employment through petty contracts or formation of cooperatives. If such co-operatives will not be entitled for awarding work as per Manual for lack of experience, the said co-operative will be facilitated by awarding small jobs to acquire experience after relaxation of the provisions of the Manual pertaining to experience with approval of the Subsidiary Boards. Subsequent jobs may be awarded after getting report of the timely completion / quality / of the awarded jobs from the concerned Department or contractors.</p> <p>Contractors will also be persuaded to give job to eligible PAPs on a preferential basis, where feasible as per terms of contract.</p>
(iv) Landless tribals, Tribal dependent on forest produce	<p>The subsidiary will assist PAP to establish non farm self employment through the provision of infrastructure, petty contracts or formation of cooperatives and encourage provisions of Jobs with contractors. Contractors will be persuaded to give jobs to eligible PAPs on preferential basis, where feasible.</p> <ul style="list-style-type: none"> <li>- In addition, the subsidiaries will shift the tribal community as a unit and provide facilities to meet the specific needs of the tribal community that will allow them to maintain their unique cultural identity.</li> <li>- Tribal affected family will be given one time financial assistance of 500 days of MAW for loss of customary right or usages of forest produce. Loss of customary rights needs to be authenticated by the district authority.</li> <li>- Tribal affected families resettled out of the district shall be given 25% higher rehabilitation and resettlement benefit.</li> </ul>

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Raigarh Area

**9. Resettlement & Rehabilitation Committee** - A Committee will be constituted at project Level under the chairmanship of the Collector to be called the Rehabilitation and Resettlement Committee with the following objectives to monitor and review the progress of implementation of the Rehabilitation and Resettlement scheme and to carry out post-implementation social audits in consultation with the village panchayat in rural areas and municipality in urban areas in the manner will be decided by the concerned State Govt.

- I. To approve the list of land losers and other PAPs;
- II. To approve the list of persons eligible to be offered employment as per R&R Policy;
- III. To approve the detailed Rehabilitation Plan for the project in consultation with the displaced persons and Gram Sabhas.
- IV. To expedite issue of domicile certificates and other necessary documentation required for State Authorities;
- V. To monitor and review the progress of the Rehabilitation Scheme, grant of benefits and handing over of possession of land in a smooth manner;
- VI. To facilitate the land acquisition process in any other manner as may be required including resolution of disputes.
- VII. To carry out post implementation social audit in consultation with the authorities.

**10. Community facilities** - The subsidiary will provide at the resettlement site a school, road with street light, pucca drain, pond, dugwell and/or tubewell for drinking water supply, community center, place of worship, dispensary, grazing land for cattle and play ground. Similar infrastructural facility, if necessary, will be extended to the host locality. The community facilities and services would be available to all residents of the area, including PAPs and the host population.

The approach for operation of community facilities would be flexible and all efforts will be made to involve the State and local self Government / Panchayat for operating the facilities. To achieve this, subsidiaries will pursue with these agencies to ensure the same. The planning of the community facilities and their construction should be undertaken in consultation with the affected community.

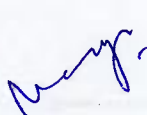
**11. Corporate Social Responsibilities** - This should be as per Company's Corporate Social Responsibility (CSR) Policy.


**12. Monitoring and Evaluation Mechanism.**

The RAP will be monitored and evaluated periodically after the completion of the land acquisition process

- I. The resettlement and rehabilitation activities are the responsibility of a separate group, both at the projects and corporate level, which will be constituted for planning, implementation, monitoring and evaluation of the Rehabilitation Action Plan. At the corporate level the group will be headed by a senior manager, whereas at the project, an executive of the rank of manager will head the group. The project group should have at least one member with social science qualification / experience and skills.

- 10 -



  
Dy.G.M.(M)/Sub Area Mc  
Chhal Sub Area, SEC.  
Raigarh Area

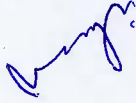
- II. The project group will closely interact with the state authorities during the implementation of the RAP. Although the subsidiaries will develop the plots and infrastructural facilities in the resettlement colony and actively implement the RAP, assistance of State authorities will be taken for administrative services such as allotment of land. Implementation will be planned, monitored and corrective measures will be incorporated in the RAP, if needed. In addition to the State Government, the PAPs, the village leaders including the Pradhans and NGOs will be consulted and associated with the implementation of the RAP.
- III. The Resettlement and Rehabilitation Cell at the corporate level will evaluate the implementation of the RAP after its completion.


**13. Flexibility to the Subsidiary Companies** – The Subsidiary Companies Boards have been authorised to approve necessary modifications in the R&R Policy with reference to unique conditions prevailing at the concerned Subsidiaries as the policy is not exhaustive.

(The above list is only indicative and not exhaustive)

- 11 -

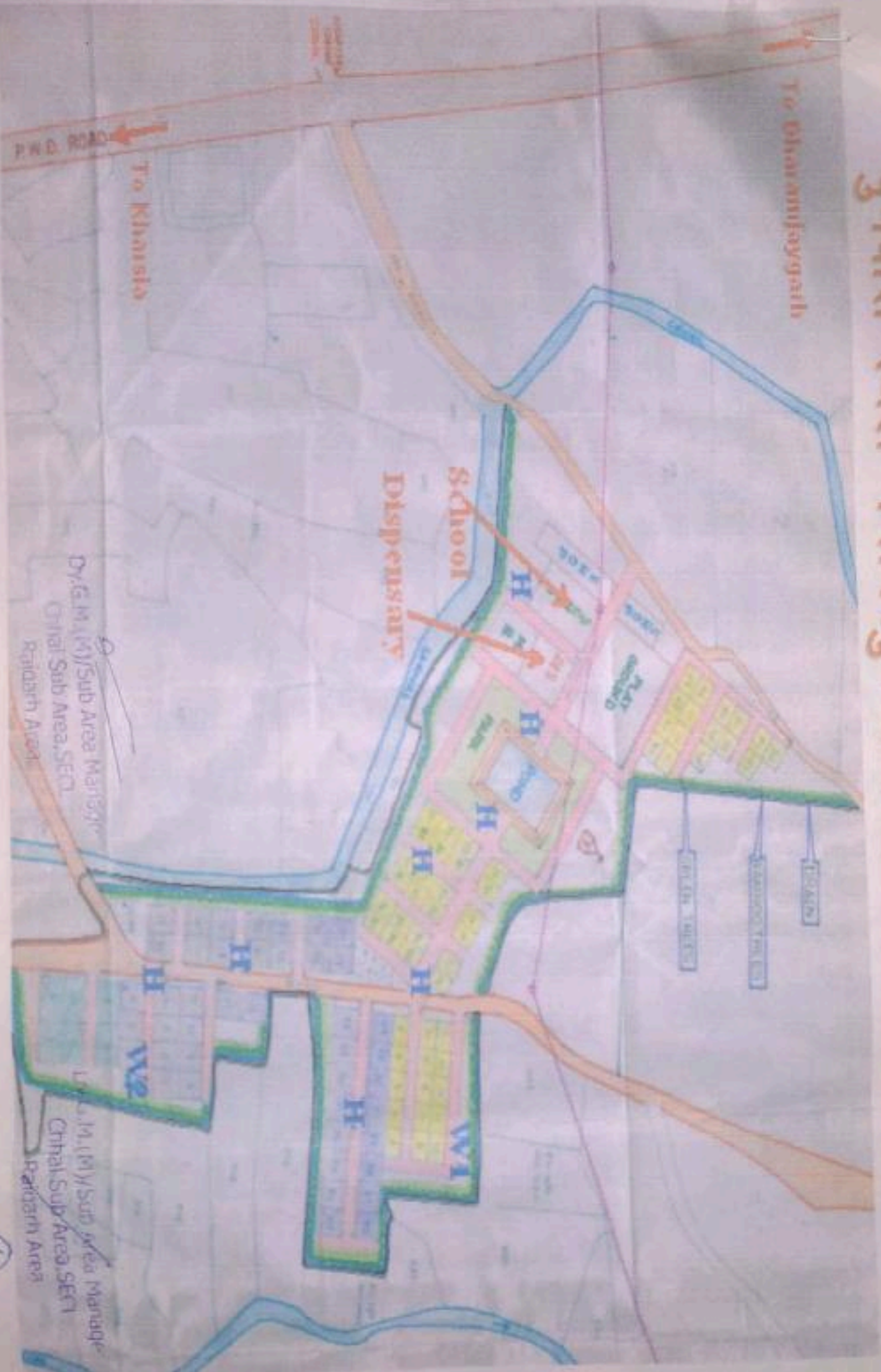
  
महाप्रबंधक  
**General Manager**  
एस.ई.सी.एल. रायगढ़ क्षेत्र  
SECL, Raigarh Area



  
Dy.G.M.(M)/Sub Area Manar  
Chhal Sub Area,SECL  
Raigarh Area



# पुनर्वसि स्थल गंगाधरपुर लात का बसाहट नक्शा



(2)

**DETAILS OF AMENITIES AND INFRASTRUCTURAL FACILITIES  
PROVIDED AT LAT (GANGADHARPUR)  
REHABILITATION SITE.**









**TOTAL LAND ACQUIRED FOR REHABILITATION SITE - 13,490 HA.**

Works at Rehabilitation site. Expenditure in Rs.

- Road 18 Lakhs
- Power supply 21 Lakhs
- School Building 6.54 Lakhs  
( Building 15m x 8m )
- Health Center 3.15 Lakhs  
( Building 15m x 10m )
- Hand pumps for water supply 4.64 Lakhs  
( Building 16m x 10m )
- Community hall 3.92 Lakhs  
( Building 16m x 10m )
- Wells 1.78 Lakhs  
- 2 Nos. - 10 mtres deep.
- Pond 4.62 Lakhs  
- 2 nos. 80 x 60 sqr. Mtrs.
- Play ground 0.50 Lakhs  
- 100 x 60 sqr. Mtrs.
- Extra land for shops 1.00 Lakhs  
- 100 x 20 sqr. Mtrs.
- Boundary trenching, drainage and tree plantation. 0.10 Lakhs



# पुनर्वास स्थल 13.490 हेक्टर पर का विवरण

S.NO.	ACTIVITY	APPRX. AREA (M <sup>2</sup> /H)	REMARKS
01	DISPENSARY	40x40=1600M <sup>2</sup>	-
02	COMMUNITY HALL	40x40=1600M <sup>2</sup>	-
03	SCHOOL	40x50=2000M <sup>2</sup>	-
04	PLAY GROUND	20x75=1500M <sup>2</sup>	-
05	LAND ALLO. FOR PRIVATE SHOP	100x20=2000M <sup>2</sup>	25 NOS.
06	GARDEN	70x50=3500M <sup>2</sup>	-
07	POND	80x60=4800M <sup>2</sup>	-
08	WELL	200M <sup>2</sup> (2 NOS.)	
09	HAND PUMP	100M <sup>2</sup> (8 NOS)	
10	LIGHTING TOWER	100M <sup>2</sup> (10 NOS)	
11	COLONY ROAD & KACHHA DRAIN	2KM/10000M <sup>2</sup>	
12	TRANSFORMER	20M <sup>2</sup> (1 NOS)	
13	FOREST BOUNDARY	-	
14	APPLIED DEMARCATED LAND	13.490 Ha.	
15	FORESTRATION DRAIN AT BOUNDARY ETC	35000 M <sup>2</sup>	

16 रीक्षण व योजना  
 16 ST  
 Central Sub Area, SECI  
 Rajdarth Area



300 वर्गमीटर की भूमि (खेत) आवंटित

① ① ④

नाम पिता/पति का नाम	खेत नं.	
1. विनोद च. कार्तिकेय राव	01 ✓	
2. चैतराम च पुनडु	02 ✓	
3. ब्रह्मदास च तिलकधु	03 ✓	
4. बालुधन च रामधरण	04 ✓	
5. बिरजू प्रसाद च जोधराम	05 ✓	
6. बिल्ली दास च निर्मलराम	06 ✓	
7. संतोष च चरवराम	07 ✓	
8. भागीराथी च ब्रह्मराम	08 ✓	
9. अमीदास च निर्मलराम	09 ✓	
10. बालीराम च गोपीराम	10 ✓	
11. मनीष सिंह च सुब्बा सिंह	11 ✓	
12. राजकुमार च चनकशम सिंह	12 ✓	
13. जगदीश च सुब्बा सिंह	13 ✓	
14. हरिदास च देवत सिंह	14 ✓	
15. नेहरूराम च चमराम	15 ✓	ST
16. रामधन च जग साय	16 ✓	ST
17. धनबाई पति सु. सिंह नन्ददास च तेजराज	17 ✓	ST
18. स्वैर सिंह च पुन सिंह	18 ✓	ST
19. गनपत च ब्रह्मदास	19 ✓	
20. ब्रह्मर च तेजराज	20 ✓	ST
21. गुडाब सिंह च दुब्राम	21 ✓	
22. त्रिदोश च जगसिंह	22 ✓	ST

ST Dy.G.M.(M)/Sub Area Manage  
Chhal Sub Area, SECI  
Raigarh Area

(5)

300 वर्गमीटर की भूमि (जब) आवंटित

क्र.सं.	नाम पिता/पति का नाम	प्लॉट नं.	
23	जोगी राम व पताप	23 ✓	ST
24	देवकर शास्त्र व राम शास्त्र	24 ✓	ST
25	कन्हैया सिंह व नरकर सिंह	25 ✓	
26	वाड्डे नाम व देवराज	26 ✓	ST
27	गंगेशकर व देवराज	27 ✓	ST
28	मिठ्ठुराम व पद्मराम	28 ✓	ST
29	ननबख्श व वादुराम	29 ✓	ST
30	हेमल कुमार व रानीराम	30 ✓	ST
31	नाम सिंह व सुदगश्याम	31 ✓	ST
32	कमल सिंह व वसुधारा	32 ✓	ST
33	अश्वीन व नरेश सिंह	33 ✓	ST
34	महेन्द्र व नरेश सिंह	34 ✓	ST
35	दिनेश्वर व महेन्द्र	35 ✓	ST
36	गुंडाव व स्वच्छराम	36 ✓	ST
37	तीजराम व समरश्याम	37 ✓	ST
38	अश्वीन व देवराज सावित्री व देवराज	38 ✓	
39	लक्ष्मी प्रसाद व तेजराज	39 ✓	
40	रमणा कर्क व तेजराज	40 ✓	
41	अश्वीन व मोतराज	41 ✓	
42	कार्तिकेश्वर व तटसीव	42 ✓	
43	विमलाचारी पति नारायण विश्वरूप व नारायण	43 ✓	
44	अश्वीन व देवराज व. मोतराज	44 ✓	
45	अश्वीन व. मोतराज	45 ✓	

U/G.M.(M)/Sub Area Manager  
 Chhisi Sub Area, SECT  
 Raigarh Area

450 ~~450~~ वर्गमीटर की भूमि (छाट) आवंटित 4

6

क्र.सं.	नाम पिता/पति का नाम	छाट नं.
44	विदेही काठ - व देवी काठ	01 ✓
45	रतन काठ - व माणीरथी	02 ✓
46	जलधुराम - व रानीराम	03 ✓
47	छोटे काठ - व <sup>माणीरथी</sup> <del>कोठाराम</del>	04 ✓
48	मणवतिया - व राजबकस	05 ✓
49	टेकराम - व रामबक्स	06 ✓
50	रयाम चर्खी - व विद्याराम नेतराम - व विद्याराम	07 ✓
51	लखन - व लखाराम	08 ✓
52	माखन - व लखाराम	09 ✓
53	इन्डीराम - व मुनुराम	10 ✓
54	नटवर सिंह - व धनसिंह	11 ✓
55	कृष्णा सिंह - व धनसिंह	12 ✓
56	सपुतन सिंह - व धनसिंह	13 ✓
57	दानबखश सिंह - व धनसिंह	14 ✓
58	टंकेवर सिंह - व हरि सिंह	15 ✓
59	नट्टु सिंह - व हरि सिंह	16 ✓
60	ओणन सिंह - व हरि सिंह	17 ✓
61	मुनु सिंह - व गण्डकाठ	18 ✓
62	जोत राम - व चेंगा राम समाठ - व चेंगा राम	19 ✓
63	भुरील राम - व परसु राम	20 ✓
64	सुमनिका कर्षी - व देवसिंह	21 ✓
65	सनत राम - व पाफा राम	22 ✓
66	तीन राम - व लोधी राम	23 ✓
67	फिरोज राम - व गणेश	24 ✓

G.M.(M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area

41:6 सर्गमिटर की धरमि (लघु) आवंति

(7)

नाम	पिता / पत्नी का नाम	नारं.	
68	बिद्यासो बर्ड व कृष्ण राम	25 ✓	ST 34, चौधराम व धनीराम की पत्नी
69	जोह सिंह व बहरेन	26 ✓	ST
70	जोधन सिंह व चम्पलाल	27 ✓	ST
71	कमंत राम व प्रेम सिंह	28 ✓	ST
72	कमलेश व श्रीवनाथ	29 ✓	ST
73	मोहन सिंह व राम दयाल	30 ✓	ST
74	श्रीवना बर्ड पति गजराज सिंह	31 ✓	ST
75	गंगा राम व गजराज सिंह	32 ✓	ST
76	दिधीप व इन्द्रजीत	33 ✓	ST
77	सुखरा बर्ड व दिधीप सिंह	34 ✓	ST
78	मनिराम व जंजली बाल	35 ✓	ST
79	गजबल्ल व जनपत	36 ✓	ST
80	नगदेव व लेख सिंह	37 ✓	ST
81	चन्दर सिंह व चन्दर सिंह	38 ✓	ST
82	कुटेरी बर्ड पति चन्दर सिंह	39 ✓	ST
83	दादू राम व जगन्नाथ	40 ✓	ST
84	दुरधानी व दादू राम	41 ✓	ST
85	भदत ठाक व जनपत	42 ✓	ST
86	अमर सिंह व चन्दर सिंह	43 ✓	ST
87	विद्या राम व पुन्ना	44 ✓	ST
88	बाबू राम व धोबी राम	45 ✓	ST

600 सर्गमिटर की धरमि (लघु) आवंति

85	जगमोहन व लेखनाथ	01 ✓	
86	गजेराम व गंभीर लाल	02 ✓	ST
87	गणेश राम व धरम सिंह	03 ✓	ST
88	पेक्षाराम व लालू राम	04 ✓	ST
89	बल्लू सिंह व जुरन सिंह	05 ✓	ST
90	नाथेशराम व पुरन सिंह	06 ✓	ST
91	भानुप्रताप व देव राम	07 ✓	ST

M/Sun Area Manager  
Chhal Sub Area, SEQ  
Rajmari Area

अनुसंलग्नक-20

133

प्रस्तावित खाल स्थलों खंडान से प्रभावित परिवारों  
को इसी के अंतर्गत 30,000/- का नगद सुधार  
मुहलाने!

मि. *[Signature]*

मुहलाने किया  
PAID

प्रस्तावित खाल स्थलों खंडान से प्रभावित परिवारों  
को इसी के अंतर्गत 30,000/- का नगद सुधार  
मुहलाने!

Dy.G.M.(M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raiqarh Area

स्थापित जल खुसी होयला कारण से पंचायत क्षेत्र वाले परिवारों की सूची  
 जो बराहट हेतु जमीन के एका में रु 500000 / मुआवजी मुकदान प्राप्त कर रहे हैं।

क्र.सं.	पट्टा या सूची क्र.	एकड़ सी. मा. मकान नं.	नाम	पिता/पति का नाम	जाति	लिंग	उम्र	सं. क्रमांक / दिनांक	हस्ताक्षर
1	2	3	4	5	6	7	8	9	
1	3	3	धनराम	मथाराम	कुवैर	पु	70	065265 09-3-06	X
2	8	8.39	उर्मिलाबाई अनेतकुमार	मरा 18 नरशिंह	कुवैर	म. पु	40 23	065866 09-3-06	
3	9		मोहनसिंह	चैतनसिंह	कु		40	065267 09-3-06	श्री ए.
4	10	10	रेशमलाता	पाराराम	कुवैर		3	065268 09-3-06	श्री ए. / श्री ए.
5	11		पचुराम	उदय मुकान फिखा FAID	कुवैर			065869 09-3-06	श्री ए. / श्री ए.
6	13		अशोकसिंह	अशोकसिंह	कु		50	065870 09-3-06	श्री ए.
7	14		अशोकसिंह	अशोकसिंह	कु		50	065871 09-3-06	श्री ए.
8	15		अशोकसिंह	अशोकसिंह	कु		50	065872 09-3-06	श्री ए.
9	18		लालाराम	लालाराम	कुवैर			065873 09-3-06	श्री ए.
10	19	19	बुद्धीबाई सिंह	लालाराम लुलीराम	कुवैर			065874 09-3-06	श्री ए.
11	21	21	अशोकसिंह	हनुमंतसिंह	कुवैर		50	065265 09-3-06	श्री ए.

D.V.G.M. (M) Sub Area Manager:  
 Chhal Sub Area, SECL  
 Raigarh Area

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	4	6	8	7	8	10	
22	पुनाई गाई सुरोधी खाल	दुखीराम दुखीराम	काचर	पु	50	0658716 09-3-06	
23	गौरीशकर	गौरीशराम	काचर	पु	20	0658717 09-3-06	गौरीशकर
24/1	तेजराम	नेगीराम	काचर	पु	53	0658718 09-3-06	
25	नावमोती	जठराम	काचर	पु		0658719 09-3-06	
27	परमानन्द	सगाराम	काचर	पु		0658780 09-3-06	परमानंद
28	त्रिभुवन	सुन्दरसाय	काचर	पु		0658781 09-3-06	
29	संताराम	मुकंदराव	काचर	पु	55	0658782 09-3-06	
30	फुलसिंह	भुगदेव	काचर	पु	38	0658783 09-3-06	
31	रतनासिंह भुगाराम	विठ्ठल	काचर	पु	32	0658784 09-3-06	रतनासिंह
32	संताराम	संताराम	काचर	पु		0658785 09-3-06	
33	अंतराम	अंतराम	काचर	पु		0658786 09-3-06	अंतराम
34	34/1	भारतलाल	अंतराम	काचर		0658787 09-3-06	भारतलाल
35	35	महेन्द्रानार	फुलसिंह	काचर		0658788 09-3-06	महेन्द्रानार
36	36	दुखीराम	दुखीराम	काचर		0658789 09-3-06	
37	37/1	दुखीराम	दुखीराम	काचर		0658790 09-3-06	
38/2	हरिहर सिंह	हरिहर सिंह	काचर	पु		0658791 09-3-06	
38/3	हेमसिंह	हरिसिंह	काचर	पु		0658792 09-3-06	

By G.M.(M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area

40	जयसिंह	पंच	41	065895	09-3-06	
42/1	सतीश	विद्यार्थि	43	065896	09-3-06	सुवि-26
43	विद्यार्थि	विद्यार्थि	44	065897	09-3-06	सुवि-26
44	विद्यार्थि	विद्यार्थि	45	065898	09-3-06	सुवि-26
45	विद्यार्थि	विद्यार्थि	46	065899	09-3-06	सुवि-26
46	विद्यार्थि	विद्यार्थि	47	065900	09-3-06	सुवि-26
47	विद्यार्थि	विद्यार्थि	48	065901	09-3-06	सुवि-26
48	विद्यार्थि	विद्यार्थि	49	065902	09-3-06	सुवि-26
49	विद्यार्थि	विद्यार्थि	50	065903	09-3-06	सुवि-26
50	विद्यार्थि	विद्यार्थि	51	065904	09-3-06	सुवि-26
51	विद्यार्थि	विद्यार्थि	52	065905	09-3-06	सुवि-26
52	विद्यार्थि	विद्यार्थि	53	065906	09-3-06	सुवि-26
53	विद्यार्थि	विद्यार्थि	54	065907	09-3-06	सुवि-26
54	विद्यार्थि	विद्यार्थि	55	065908	09-3-06	सुवि-26
55	विद्यार्थि	विद्यार्थि	56	065909	09-3-06	सुवि-26
56	विद्यार्थि	विद्यार्थि	57	065910	09-3-06	सुवि-26
57	विद्यार्थि	विद्यार्थि	58	065911	09-3-06	सुवि-26
58	विद्यार्थि	विद्यार्थि	59	065912	09-3-06	सुवि-26
59	विद्यार्थि	विद्यार्थि	60	065913	09-3-06	सुवि-26
60	विद्यार्थि	विद्यार्थि	61	065914	09-3-06	सुवि-26
61	विद्यार्थि	विद्यार्थि	62	065915	09-3-06	सुवि-26
62	विद्यार्थि	विद्यार्थि	63	065916	09-3-06	सुवि-26
63	विद्यार्थि	विद्यार्थि	64	065917	09-3-06	सुवि-26
64	विद्यार्थि	विद्यार्थि	65	065918	09-3-06	सुवि-26
65	विद्यार्थि	विद्यार्थि	66	065919	09-3-06	सुवि-26
66	विद्यार्थि	विद्यार्थि	67	065920	09-3-06	सुवि-26
67	विद्यार्थि	विद्यार्थि	68	065921	09-3-06	सुवि-26
68	विद्यार्थि	विद्यार्थि	69	065922	09-3-06	सुवि-26
69	विद्यार्थि	विद्यार्थि	70	065923	09-3-06	सुवि-26
70	विद्यार्थि	विद्यार्थि	71	065924	09-3-06	सुवि-26
71	विद्यार्थि	विद्यार्थि	72	065925	09-3-06	सुवि-26
72	विद्यार्थि	विद्यार्थि	73	065926	09-3-06	सुवि-26
73	विद्यार्थि	विद्यार्थि	74	065927	09-3-06	सुवि-26
74	विद्यार्थि	विद्यार्थि	75	065928	09-3-06	सुवि-26
75	विद्यार्थि	विद्यार्थि	76	065929	09-3-06	सुवि-26
76	विद्यार्थि	विद्यार्थि	77	065930	09-3-06	सुवि-26
77	विद्यार्थि	विद्यार्थि	78	065931	09-3-06	सुवि-26
78	विद्यार्थि	विद्यार्थि	79	065932	09-3-06	सुवि-26
79	विद्यार्थि	विद्यार्थि	80	065933	09-3-06	सुवि-26

MAN/ Sub Area Manager  
 Chhat Sub Area, SEC  
 Gurgaon Area



No.	Sl. No.	Name	Address	Category	Sex	Age	Phone No.	Date
	73	प्रताप	देवसिंह	कवर	पु	41	0691106	
	74/1	जराधन	हीरासिंह	कवर	पु	37	0691112	
74	74/2	हीरासिंह	रायटोकरा	कवर	पु	65	0691113	09-3-06
76	76/1	बहारसिंह	जोतराम	कवर	पु	22	0691114	09-3-06
76	76/2	जोतराम	हीरासिंह	कवर	पु	40	0691115	
74	74/3	लक्ष्मणसिंह	र.पत्राकर	कवर	पु	44	0691116	09-3-06
77	77	मोहनसिंह	सदाराम	कवर	पु	22	0691117	09-3-06
78	78/1	रामसिंह	हीरासिंह	कवर	पु	37	0691118	09-3-06
78	78/2	जयसिंह	जयलाल भुगतान	कवर	पु	75	0691119	09-3-06
79	79/1	नरेश	नमोशरण	कवर	पु	18	0691120	09-3-06
79	79/2	भवनीलाल	नमोशरण	कवर	पु	22	0691121	09-3-06
88	88	पानुराम	जयशंकर	कवर	पु	39	0691122	09-3-06
88	88	श्यामशंकरप्रसाद	पानुराम	कवर	पु	19	0691123	09-3-06
87	87/1	श्यामशंकर	पानुराम	कवर	पु	39	0691124	09-3-06
88	88/1	श्यामशंकर	पानुराम	कवर	पु	39	0691125	09-3-06
88	88/1	केशु नुनार	श्रीकृष्णलाल	कवर	पु	37	0691126	09-3-06
88	88/3	दशरथ	श्रीकृष्णलाल	कवर	पु	37	0691127	09-3-06

Dy.G.M.(M)/Sub Area Manage  
Chhal Sub Area, SEC1  
Raigarh Area

Sub Area Manager  
SEC1, RAIGARH AREA

Sl. No.	Plot No.	Area	Owner Name	Address	Category	Sex	Age	Phone No.	Remarks
	01		समारी	बलीधर	तेली	पु	40	069127 09-3-06	
	01		पुराइनबाट	छेदीलाल	तेली	पु	40	069129 09-3-06	
65	02	02	परदेशी	छेदीलाल	तेली	पु	41	069130 09-3-06	
66	05	94,95,96	भागिरथी वरुणसिंह	बालकराम भागिरथी	ताली	पु पु	74 54	069131 09-3-06	
	05	94,95,96	इशवरीलाल	वरुणसिंह	तेली	पु	26	069132 09-3-06	
66	04	94,95,96	भवानीलाल	वरुणसिंह	तेली	पु	32	069133 09-3-06	
67	08	98, 99	कार्तिकराम	भागिरथी	तेली	पु	45	069134 09-3-06	
70	102	102/2	जात्रा बाई	मनीराम	तेली	पु	55	069135 09-3-06	
71	101	105	सुशीला शुभदा	रामचरण रामचरण	तेली	म पु	46 39	069136 09-3-06	
72	102	106/2	शंकराम मंगलदास वि. गा.	आरुलक्ष्मी मंगलदास वि. गा.	तेली	पु	43	069137 09-3-06	
73	106	106/2	सोनसा	सतरा	तेली	पु	18	069138 09-3-06	
74	107	107	मालिकराम	भगवतिया	तेली	पु	41	069139 09-3-06	
75	108	107	बलिराम	रामचरण	तेली	पु	54	069140 09-3-06	
76	109	108/2	रुद्र	विजयलक्ष्मी	तेली	पु	18	069141 09-3-06	
77	110	110/1	शिवरतन	शंकराम	तेली	पु	20	069142 09-3-06	
78	110	110/2	नवरतन	रामचरण	तेली	पु	67	069143 09-3-06	
79	111	111	प्रणमिता	विजयलक्ष्मी	तेली	पु	16	069144 09-3-06	

By G. M. (M)/Sub Area Manage  
Chhal Sub Area, SECI  
Raigarh Area

STATE OF CHHATTISGARH  
REG. RA. GARRH AREA

112	दिलचम्बु	आनंद राम	तेली	पु	40	069146	09-3-06
113	सुन्दर लाल	दिलचम्बु	तेली	पु	40	069147	09-3-06
114	बाबुलाल	दिलचम्बु	तेली	पु	34	069148	09-3-06
118	118/1	हरालाल काशीराम	तेली	पु	28	069149	09-3-06
118	118/2	इश्वरलाल काशीराम	तेली	पु	20	069150	09-3-06
117	117	गोटीराम पहरसिंह	तेली	पु	39	069151	09-3-06
118	118	मोतीराम पहरसिंह	तेली	पु	65	069152	09-3-06
119	119/1	गोपीराम पहरसिंह	तेली	पु	84	069153	09-3-06
119	119/2	रामलाल अजीराम भगवान विद्या FAID	तेली	पु	29	069154	09-3-06
120	120/1	काशीराम भागीराम	तेली	पु	41	069155	09-3-06
120	120/2	विठ्ठलचर हरिहरण	तेली	पु	39	069156	09-3-06
121	121/1	सरजूलाल काशीराम	तेली	पु	20	069157	09-3-06
121	121/2	जनपद गोपीराम	तेली	पु	35	069158	09-3-06
123	123/1	राजिजा शशीराम	तेली	पु	27	069159	09-3-06
124	124	उमाबाई इन्दोराम	तेली	पु	11	069160	09-3-06
125	125	जतिन्दर मन्मथ	तेली	पु	19	069161	09-3-06

By G.M.(M)/Sub Area Manager  
Chhal Sub Area SECL  
Raigarh Area

6/2/2022  
Sub Area Manager  
Raigarh SECL

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Sl. No.	House No.	Name	Address	Gender	Age	Phone No.	
127	127/1	ललित	अकिरण	पु	30	069163	
90	127	127/2	श्यामकुमार	अशाराम	पु	30	069164
100	129	129	गिरधारी	गिरीराम	पु	40	069165
101	132	132	छन्नुलाल	निर्मयराम	पु	30	069166
102	135	135	सेतराम	विद्याराम	पु	22	069167
103	138	138/1	रुन्दयालाल	हीछाराम	पु	51	069168
104	138	138/2	लालकी	वैतराम	म	30	069169
105	139	139/1	समरथ	भुजबल	पु	57	069170
106	140	140	रुद्रमिन	जोधिराम	म	65	069171
107	141	141/1	हंसतराम	भुजबल	पु	55	069172
108	142	142/1	रोहितकुमार	लक्ष्मीराम	पु	35	069173
109	143	143	सोनकुवर महेंद्र	जुगलाल जुगलाल	म, पु	60, 30	069174
110	145	145/2	बुद्धदेवर	हरिसिंह	पु	58	069175
111	147	147/1	सुकलाल	गतराम	पु	18	069176
112	147	147/2	बुल्लोलाल	मगर	पु	20	069177
113	148	148/1	रामकुमार	बुद्ध	पु	30	069178

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UyS.M.(M)/Sub Area Manage  
 Chhal Sub Area, SECL  
 Raigarh Area

SECL RAIGARH AREA

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3	4	5	6	7	8	9	10
148/2	बुदचंद	कुजराम	कवर	पु	21	069181 09-3-06	
148/3	रामशवर	बुदचंद	कवर	पु	22	069180 09-3-06	अभिलेख ✓
149/2	धुनाल	पुरषोत्तम	कवर	पु	27	069181 09-3-06	अभिलेख
150/1	तेजराम	बुदुगसिंह	कवर	पु	41	069182 09-3-06	
150/1	सुरेन्द्र	तेजराम	कवर	पु	20	069183 09-3-06	
150/2	बुदुगसिंह	मकुन्दराम	कवर	पु	64	069184 09-3-06	
150/2	नरेन्द्र	तेजराम	कवर	पु	20	069185 09-3-06	
150/3	मनशकुमार	तेजराम	कवर	पु	22	069186 09-3-06	
151	रामलाल	बुदुगसिंह	कवर	पु	54	069187 09-3-06	
		PAID					
153	मुशोराम	सोहन	कवर	पु	80	069188 09-3-06	
153	रमेश कुमार	मुशोराम	कवर	पु	22	069189 09-3-06	
154	श्यामलाल	बाधुराम	कवर	पु	28	069190 09-3-06	
155/2	मंगलाबाई	दुरगज	कवर	पु	29	069191 09-3-06	
156/1	लालकुमार	मुशोराम	कवर	पु	26	069192 09-3-06	
156/2	लालकुमार	मुशोराम	कवर	पु	29	069193 09-3-06	
156/3	रमेश कुमार	मुशोराम	कवर	पु	25	069194 09-3-06	
157/1	शोभित	मनशकुमार	कवर	पु	45	069195 09-3-06	

By G.M. (M)/Sub Area Manage  
Chhal Sub Area, SEC 1

03/04/2006  
SEC 1/11/06

	3	4	5	6	7	8	9	10
	187/1	शेटलाल	मोहितराव	कवर	पु	27	069196 09-3-06	
157	157/2	प्रभात	मोहितराव	कवर	पु	28	069197 09-3-06	प्रभात काट-
133	158	कमलाबाई	पंचराव	कवर	पु	45	069198 09-3-06	
134	160/1	सनिराबाई	माधुराव	कवर	म	61	069199 09-3-06	
135	160/2	जगलाल	कुधवाल	कवर	पु	23	069200 09-3-06	
136	161/1	जैठकुवर	देवसिंह	कवर	म	50	069201 09-3-06	
137	161/2	सुलसिंह	साधुराव	कवर	पु	48	069202 09-3-06	
139	162/1	पंचराव	मंगलसिंह	कवर	पु	33	069203 09-3-06	
138	162/2	किरतीकुमार भुजलाम मिश्र FAID	मंगलसिंह	कवर	पु	31	069204 09-3-06	
140	163	तंडाराम	शिंपलाल	कवर	पु	49	069205 09-3-06	
141	164/1	राहसराम	राधुराम	कवर	पु	52	069206 09-3-06	
142	164/2	समारी बाई	साधुराम	कवर	म	51	069207 09-3-06	
143	165/1	हंससिंह	कवुतरसिंह	कवर	म	65	069208 09-3-06	
							069209 09-3-06	
145	168	भाणूकाम	गिरि	कवर	म	20	069210 09-3-06	
146	169/1	सुन्दर साहू	बंजारा	कवर	पु	55	069211 09-3-06	
147	169/1	वसंत	मंगलसिंह	कवर	पु	55	069212 09-3-06	

JwG M.(M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area

SECL RAIGARH AREA

1	2	3	4	5	6	7	8	9	10
169	170	170/2	जगसाय	चैतन	कवर	पु	34	069213	09-3-06
170	170		हीरासिंह	घेतन	कवर	पु	50	069214	09-3-06
180	170	170	सतोष	हीरासिंह	कवर	पु	28	069215	09-3-06
181	171	171/1	भूषणसिंह	दिलीप सिंह	कवर	पु	36	069216	09-3-06
182	171	171/2	मोहनसिंह	दिलीपसिंह	कवर	पु	33	069217	09-3-06
183	173	173/1	दिलबन्धु	विमल सिंह	कवर	पु	22	069218	09-3-06
184		173/2	विमला सिंह	पुनीराम	कवर	पु	47	069219	09-3-06
185		173/3	विमलसिंह	विमलसिंह	कवर	पु	22	069220	09-3-06
186		174/1	सुकलाल	जगसाय	कवर	पु	34	069221	09-3-06
187	174	174/1	रामकुमार	सुकलाल	कवर	पु	34	069222	09-3-06
188	174	174/2	रामकुमार	सुकलाल	कवर	पु	20	069223	09-3-06
189	174	174/3	छविलाल	जगसाय	कवर	पु	38	069224	09-3-06
190	174	174/4	आनंदकुमार	छविलाल	कवर	पु	18	069225	09-3-06
191	178	178/2	हेतराम	पुरज राम	कवर	पु	55	069226	09-3-06
192	170	170	जगसाय	जगसाय	कवर	पु	34	069227	09-3-06
193	181	181	मनिकराम	मनिकराम	कवर	पु	38	069228	09-3-06
194	183	183/2	मनीराम	मनीराम	कवर	पु	38	069229	09-3-06

By G.M.(M)/Sub Area Manager  
 Chhal Sub Area, SEC I  
 Raigarh Area

1	2	3	4	5	6	7	8	9	10	11	12
186	186		छवि सिंह	धन सिंह	कवर	पु				0692230	कपीत
188	188	196/1	ठाकुरराम	उज्ज्वल	कवर	पु				0692231	
187	198	196/2	सालिकराम कन्हैया	ठाकुरराम सालिकराम	कवर	पु	48	19		0692232	कपीत
188	198	197	धनकुमार	मंगलश्री	कवर	पु		28		0692233	कपीत
189	198	198	घासीराम	बुद्धवारण	कवर	पु		22		0692234	कपीत
170	199	199	बुद्धवारण	नान्हीराम	कवर	पु		5		0692235	
171	202	202/2	कीर्तन	गाडाराम	कवर	पु		24		0692236	कपीत
172	202	202/3	सालिकराम	गिरीशराम	कवर	पु		31		0692237	कपीत
173	204	204/1	फूलसिंह	धनाराम	कवर	पु		32		0692238	कपीत
174	204	204/2	सुखसिंह गुणलाल PAID	सुखसिंह	कवर	पु		47		0692239	कपीत
175	205	205	धनसिंह	गोहराम	कवर	पु		17		0692240	कपीत
176	205	205/1	गोहराम	गोहराम	कवर	पु		30		0692241	कपीत
177	205	205/2	गोहराम	गोहराम	कवर	पु		38		0692242	कपीत
178	205	205/3	गोहराम	गोहराम	कवर	पु		50		0692243	कपीत
179	208	208/2	इमराम	कवर	कवर	पु		18		0692244	कपीत
180	209	209	गोहराम	गोहराम	कवर	पु		30		0692245	कपीत
181	210	210	कमलसिंह	कमलसिंह	कवर	पु				0692246	कपीत

By G.M.(M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area



210	210	सुपुराम	पारसनाथ	बखर	म	18	069251 09-3-06	सुपुराम
211	211	श्यामकुमार	धनराम	बखर	प	20	069252 09-3-06	
212	212	कांतिसुराम	इ. न. तं. ति.	बखर	प	39	069253 09-3-06	इ. न. तं. ति.
215	215/1	कुटेलीबाई	धनराम	बखर	म	40	069250 09-3-06	
215	215/2	उत्तरसिंह	धनराम	बखर	प	40	069251 09-3-06	
218	218	राधुराम	बालाजी	बखर	पु	13	069252 09-3-06	
219	219	मोहित	परसुराम	बखर	प	58	069253 09-3-06	मोहित
221	221	गोविन्द	मोहित	बखर	प	35	069254 09-3-06	
224	224	नीशिल्या	पं. द. स.	बखर	प	40	069255 09-3-06	
227	227/1	जीवनसिंह	न. म. ति.	बखर	प	26	069256 09-3-06	
230	230	मंडासिंह	पारसनाथ	बखर	प	24	069257 09-3-06	
232	232	धर्मसिंह	परसुराम	बखर	प	27	069258 09-3-06	धर्मसिंह
233	233	फुलीबाई	शिधलाल	बखर	म	56	069259 09-3-06	
234	234	मोहित	पारसनाथ	बखर	प	26	069260 09-3-06	
235	235	परसुराम	पारसनाथ	बखर	प	27	069261 09-3-06	
236	236/1	मोहित	पारसनाथ	बखर	प	26	069262 09-3-06	
238	238	परसुराम	पारसनाथ	बखर	प	27	069263 09-3-06	

W.G.M. (M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area

W.G.M. (M)/Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area

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2	3	4	5	6	7	8	9	10
240	240	तारासिंह	राजेश	गोबर	1	11	069214	09-3-06
200	241	241	परदेशी	नेमो राम	गोबर	3	069215	09-3-06
201	242	242/2	रामप्रसाद	सुभाष	गोबर	37	069216	09-3-06
202	245	249	सखाराम	भाग्यराम	गोबर	50	069217	09-3-06
203	250	250	दुष्यंतकुमार	उसतराम	तेली	20	069218	09-3-06
204	252	253	पंचराम	गोपीराम	तेली	50	069219	09-3-06
205	253	253	शिवकुमार	पद्मराम	तेली	32	069220	09-3-06
206	255	255	शिवकुमार	भाग्यराम	गोबर	11	069221	09-3-06
207	258	258	बल्लोराम	सुनुराम	तेली	57	069222	09-3-06
208	259	259	अमिता	घासीदास	गोबर	36	069223	09-3-06
209	259	259/1	रामकुमार मुजुलकुमार	धोतराम किशोर	गोबर	43	069224	09-3-06
210	259	259/1	श्यामराई	बनमाली	गोबर	32	069225	09-3-06
211	259	259/1	मुनीलकुमार	रामराम	गोबर	25	069226	09-3-06
212	259	259/1	मुनील कुमार	रामकुमार	गोबर	25	069227	09-3-06
213	259	259/1	मुनील कुमार	रामकुमार	गोबर	25	069228	09-3-06
214	260	260/2	गोविंद	इंद्र	गोबर	17	069229	09-3-06
215	260	260	गोविंद	इंद्र	गोबर	50	069230	09-3-06
216	261	261	श्रवण कुमार	अनंतराम	गोबर	21	069231	09-3-06
217	262	262	दातर	रामराम	गोबर	21	069232	09-3-06

By G. M. (M) Sub Area Manager:  
Chhal Sub Area, SECL  
Rainadh Area

SECL  
RAINDH AREA

Sl. No.	Age	Name	Spouse Name	Sex	Religion	Age	Phone No.	Remarks
220	265	पुनी राम	मागीरवी	महिला	पु	43	0692285 09-3-06	सोला
221	267	पुनीराम	फिरतराम	महिला	पु	47	0692300 09-3-06	
222	268	विश्राम	मनवोला	अघरिय	पु	35	0692286 09-3-06	
223	269	धनराम	गिरता	कवर	पु	50	0692287 09-3-06	कुजरा
224	273	सुखराज सुखराज	सुखी सुखी	कवर	पु	40 32	0692288 09-3-06	सोला
225	274	पानकराम	सुखराम	कवर	पु	50	0692289 09-3-06	पुनिकर
226	275	सुंदरसाय	मनवोला	कवर	पु	50	0692290 09-3-06	सुखराज
227	276	नारायणसिंह	रत्नासिंह मि. वि. रत्ना	कवर	पु	40	0692291 09-3-06	
228	277	गजराज	सदास	कवर	पु	30	0692292 09-3-06	
229	278	देवसिंह	सुखराज	कवर	पु	60	0692293 09-3-06	
230	279	कवर	सुखराजसिंह	कवर	पु	71	0692294 09-3-06	
231	280	सोनी कुमा	सुखराज	कवर	पु	25	0692295 09-3-06	सोनी कुमा
232	281	सुखकराम	विमा	कवर	पु	70	0692296 09-3-06	
233	282	मरजार	सुखराज	कवर	पु	30	0692297 09-3-06	सोला
234	283	विमल	सुखराज	कवर	पु	30	0692298 09-3-06	
235	284	सुखराज	सुखराज	कवर	पु	30	0692299 09-3-06	

Dr. G. M. (M) / Sub Area Manager  
 Chhal Sub Area, SECL  
 Raigarh Area

Signature  
 31/03/2016  
 SECL, RAIGARH AREA

## CHAPTER-XVIII

### MINE CLOSURE PLAN

#### 18.1 Closure Planning details of mine

Chhal OC (Seam III) (6.0Mty) is an extension/recasting project of three existing projects. The project comprises mostly (i.e. 981.288Ha, 73.07 % tenancy land. The block area is involved with industrial and mining activities for which regular environmental monitoring/audit are being done. The core & Buffer zone environmental data for Chhal OC (Seam III) Expansion Project in respect of air quality, water quality, noise level, flora fauna, socio economical data etc. are available for preparation of this Chapter.

CMPDI on behalf of SECL carried out environmental base line data generation by Govt. approved labs at different locations in core & buffer zone of Chhal OC (Seam III) Project.

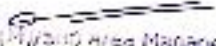
The project has been planned for a target capacity of 6.0 Mty for 30 years life, to meet power grade coal. Beyond this life, the mine will be closed if no further expansion towards the above adjoining blocks is considered. The closure details are described below.

##### 18.1.1 Mined out Land & proposed final land use:--

Present and conceptual post mining land use is given in tables 18.1 & 18.2 below respectively.

Table – 18.1

SL NO	REQUIREMENT OF LAND	TENANCY / AGRICULTURE LAND			FORGET LAND			GOVT. LAND			TOTAL LAND		
		ALREADY ACQUIRED	TO BE ACQUIRED	TOTAL	ALREADY ACQUIRED	TO BE ACQUIRED	TOTAL	ALREADY ACQUIRED	TO BE ACQUIRED	TOTAL	ALREADY ACQUIRED	TO BE ACQUIRED	TOTAL
1	LAND FOR QUARRY	218.75	15.65	15.563	0	102.105	102.105	3.00	122.417	106.417	0	131.215	675.04
2	FOR EXTERNAL DUMP	0	110.73	110.73	0	0	0	0	0	20	0	120.73	120.73
3	SURFACE INDUSTRIAL DEVELOPMENT PLY, DRAINING COLONY APPROACH, ROAD, ETC.	0	50	50	0	0	0	0	0	10	0	60	50
4	RESIDENTIAL COLONY	0	0	0	0	0	0	0	0	0	0	0	0
5	LAND FOR HOUSING FAMILY	0	50	50	0	0	0	0	0	0	0	50	50
6	SAFETY ZONE	0	144.67	144.67	0	0	0	0	0	50	0	144.67	144.67
7	LAND REQUIRED FOR ENVIRONMENT AND SAFETY	0	92.55	92.55	0	0	0	0	0	0	0	92.55	92.55
	TOTAL LAND	218.75	404.423	404.423	0	102.105	102.105	0	172.417	172.417	0	626.353	1343.655
	TOTAL LAND TO BE ACQUIRED	0	404.423	404.423	0	102.105	102.105	0	172.417	172.417	0	626.353	1343.655

  
 Mr. M. Jyoti, Area Manager  
 Chhal Sub Area, SEQ  
 Raigarh Area

B.V. OMPD

LN No. 504024

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Table 18.2 Post- Mining Land Use Figures in Ha.

Sl. No.	Particulars	Quarry Area (After backfilling & reclamation)	External Dump (After Reclamation)	Safety zone as green belt	Infrastructure, Explosive magazines etc.	R&R site	Others	Grand Total
1.	Afforested area	794.01	130.73	144.47	5.00	0.00	0.00	1074.21
2.	Cultivable land	0.00	0.00	0.00	0.00	0.00	92.65	92.65
3.	Final Void / Water Body	81.00	0.00	0.00	0.00	0.00	0.00	81.00
4.	Suit-Up Area	0.00	0.00	0.00	45.00	50	0.00	95.00
<b>Total Land for the project</b>		<b>875.01</b>	<b>130.73</b>	<b>144.47</b>	<b>50.00</b>	<b>50</b>	<b>92.65</b>	<b>1342.855</b>

## 18.2 Water quality management:

### a) Physiography and drainage

The general topography of the block is plain. The elevation above MSL varies from 231m to 267m in the north-eastern part of the block. The elevation of the ground varies between 255m to 267m along a linear patch running NE-SW in the central part of the property. The ground has general slope towards NW, SE and SW. Except a few outcrops of sandstone occurring along the banks of Mand River, the area is covered by soil and cultivated land. The south-eastern part of the block is covered by Lath protected forest and Edu reserve forest.

The southerly flowing Mand River and westerly flowing Kurket River with their tributaries form the main drainage of the Block. A small earthen dam has been constructed for the purpose of irrigation near Khedapali village in the eastern part of the block.

**b) Details of Locations:** For base line environmental data generation, following locations were selected in the core and buffer zone of the project covering mine effluent, surface water, and ground water of the area. The details of locations are given below in table – 18.3(a).


  
 LV G.M.(N)/Site Area Manager  
 Chhal Sub Area, SEC  
 Raigarh Area

Table-18.3(a)

Sl. No.	Location	Direction (w.r.t. centre of core zone)	Distance (km)	Reasons for selection
1.0	Bore well , Lat village (CW1)	East	0.5	To assess the well water quality within mine area
2.0	Mand river water U/S (CW2)	North	1.0	To assess the river water quality before contamination with mine discharge
3.0	Mand river water D/S (CW3)	South west	1.0	To assess the river water quality after contamination with mine discharge
4.0	Mine water (CW4)	West	0.5	To assess the mine water quality

- c) **Water quality status;** The summarised water quality data generated for the period Apr. – June 2012 is given below in tables 18.3(b), 18.3(c), 18.3(d) & 18.3(e) respectively. The water quality data of different locations are found to be within the permissible limit of CPCB.

**SUMMARISED WATER QUALITY DATA**  
Table 18.3(b) Period-Apr. 12 to June.12

Location	Parameters	Result	Permissible as per IS 10500
Bore well water , Lat village (CW1)	pH	6.40 – 6.52	6.5 to 8.5
	Fluoride (mg / l)	0.34 - 0.39	1.0
	Dissolved solids (mg / l)	230 - 250	500
	Nitrates (mg / l)	5.65 – 5.81	45
	Iron(mg / l)	0.22 – 0.24	0.0
	Chlorides (mg / l)	22 - 26	250
	Sulphates (mg / l)	38 - 47	200

Table 18.3(c) Period-Apr. 12 to June.12

Location	Parameters As per GSR 742(E) dated 25.9.2000	Result	Permissible limit as per GSR 422(E) (Inland surface water)
River water U/S ( CW 2)	pH	7.127- 7.37	5.5-9.0
	Total suspended solids (mg/l)	47 - 52	100
	COD(mg/l)	50 - 67	250
	Oil & Grease (mg/l)	Nil	10

Table 18.3(d) Period-Apr. 12 to June.12

Location	Parameters As per GSR 742(E) dated 25.9.2000	Result	Permissible limit as per GSR 422(E) (Inland surface water)
River water D/S ( CW 3)	pH	7.56 - 7.65	5.5-9.0
	Total suspended solids (mg/l)	50 - 63	100
	COD(mg/l)	105 - 115	250
	Oil & Grease trap(mg/l)	Nil	10

Table 18.3(e) Period-Apr. 12 to June.12

Location	Parameters As per GSR 742(E) dated 25.9.2000	Result	Permissible limit As per GSR 742(E) dated 25.9.2000
Mine water ( CW 4)	pH	7. 18 - 7.25	5.5-9.0
	Total suspended solids (mg/l)	34 - 45	100
	COD(mg/l)	35 - 58	250
	Oil & Grease trap(mg/l)	Nil	10

Ground water quality in all the two locations found to be conforming drinking water standard as per IS 10500 and the quality of river water which receives treated mine discharge water through nearby local streams satisfies the standards as per GSR 742(E).

#### d) Measures for control of pollution

##### Management of surface water drainage:-

Garland drainage will be made around the periphery of the quarry. These drains will be connected to local nala which are not likely to be disturbed by mining operation. In the workings, heavy duty pumps will be deployed in rainy season which after passing through settling ponds will throw the accumulated water from the working face into these garland drains.

##### Mine Water Discharge

The collected water at the floor of mine sump (351551cum capacity) will be pumped to the settling tank where suspended solids will get settled. The clear water after sedimentation & treatment will be reused for water sprinkling, plantation & agriculture purpose, ground water recharge & for use by the local villagers etc. Workshop effluents will be discharged through Oil and Grease trap and sedimentation tank.

##### Domestic Effluent Treatment: -



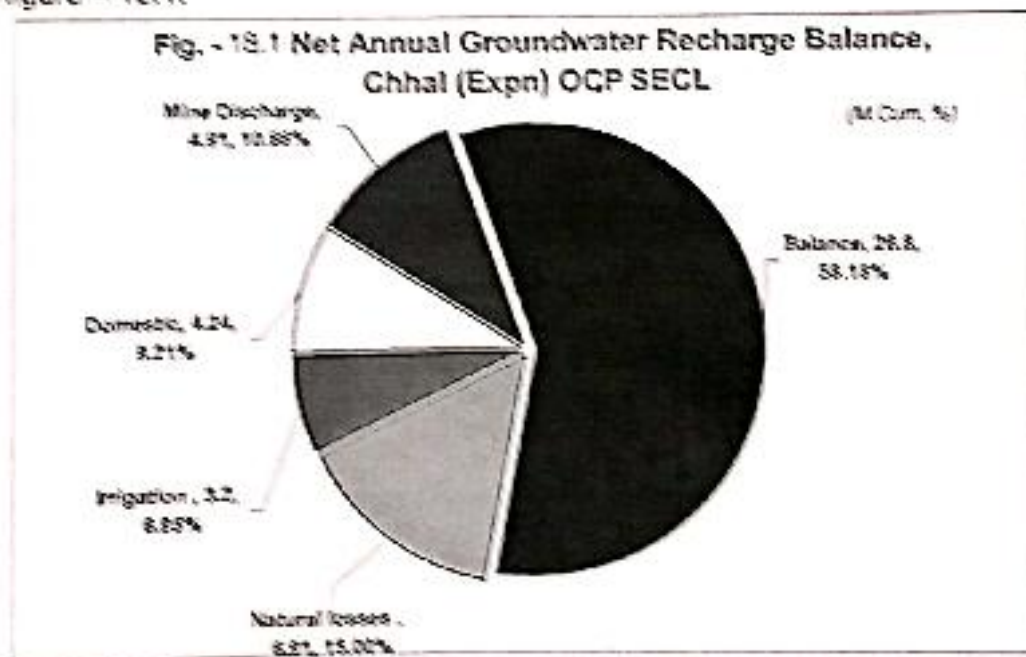
Domestic effluent from the colony will be treated in a conventional septic tank and soak pit arrangement.

**Water Conservation:** -

The waste water recycling after due treatment for the purpose mentioned above will enable conservation of water. Storage of conserved water in mine pits will be given due emphasis to provide water round the year and quality of water will be maintained.

**e) Water balance of the area (from EMP)**

**Groundwater Recharge Balance:** The net groundwater recharge and draft for the buffer zone were estimated as 39.15 M.Cum and 12.35 M.Cum respectively. Thus, about 26.80 M.Cum groundwater recharge would be available annually in the area to meet any future demand. The detailed groundwater balance is shown in the following pie diagram in figure – 18.1.



**f) Acid mine drainage source (if any), the existing practice of control and future plan.**

The existing mine water quality of the nearby mines are not acidic and it is expected the acid mine drainage problem will not arise in this project also. If however acid mine drainage problem arises suitable measures will be taken as per standard prevailing practice.

- g) **Underground water/ quarry water management after closure (specify its usage like domestic water supply, irrigation, pisciculture or stabilizing the ground water regime).**

- Already discussed in para 18.1.1 d above.

- h) **Water quality monitoring for three years after closure (specify the monitoring sampling station and frequency). The sampling stations shall be one no. mine water with quarterly frequency and two numbers ground water samples in core and buffer zone with quarterly frequency.**

Regular monitoring is being done in & around the mine on the following monitoring stations and will continue up to 3 years after closure of the mine. Presently, water quality monitoring is being done on six locations. These locations were selected in the core and buffer zone of the project covering mine effluent, surface water, and ground water of the area. The details of locations are given below in table – 18.4.

Table – 18.4

Sl. No.	Details of Location
1	Mine Discharge water
2	Jamunia Nala (Up-stream)
3	Jamunia Nala (Down-stream)
4	Drinking water of Chhal GH
5	WTP Water of Dharam UG
6	Bhari Village Hand pump water

Three sampling points will be utilized for water quality monitoring for three years after closure of the mine. Frequency will be as per guide line.

### 18.3 Air quality management:-

- a) **Air quality (Monitored data) Monitoring for next three years will be done. 3 samples at quarterly frequency for 3 years. One sample will be at core zone and one sample each in upwind and downwind directions of the project.**

Regular environment monitoring is being done in & around the mine on the above monitoring stations and will continue up to 3 years after closure of the mine.

Presently, the following six monitoring stations are fixed on the basis of physiography of the area, meteorological parameters like predominant wind direction, wind speed etc.

Table – 18.5

Sl. No.	Details of Location
1	Manager's Office, Chhal OC
2	Primary School at Lat village
3	Loading point at Chhal OC
4	Manager's Office, Chhal UG
5	Near tippler, Chhal UG
6	Nawapara Village

On the above, three sampling points will be utilized for air quality monitoring for three years after closure of the mine. Frequency will be as per guide line.

#### b) Ambient Air quality in core and buffer zone

Base line environmental data generated for the period April, 12 to June, 12 in respect of SPM, RPM, SO<sub>2</sub>, & NO<sub>x</sub> for different locations are shown in the following tables 18.6 (a) & 18.6 (b). The locations were selected on the basis of physiography of the area, meteorological parameters like predominant wind direction, wind speed etc. This data will enable to obtain a comprehensive idea of air quality in and around the mining area. The data under different category are within the permissible limit of CPCB.

Table 18.6 (a)

Sl. No.	Location	Distance (km)	Direction	Reasons for selection
		(W.r.t. centre of core zone)		
1.0	Mine office (CA <sub>1</sub> )	-	Core zone	To assess pollution levels in the mining area.
2.0	Chhal village (CA <sub>2</sub> )	3.5	North-northeast	To assess pollution levels in the village area
3.0	Khedapali village (CA <sub>3</sub> )	2.5	East - south east	To assess the pollution levels in the village area.
4.0	Eidu village (CA <sub>4</sub> )	3.5	South - south east	To assess the pollution levels in the village area in the down-wind direction.
5.0	Lat village (CA <sub>5</sub> )	0.5	Within mine area	To assess pollution levels in the village within mining area.
6.0	Nandgaon village (CA <sub>6</sub> )	2.0	North west	To assess the pollution levels in the village area in the up-wind direction as control station.

Table 18.6(b) Summserised Air Quality Data

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U. G. M. (M) / SUD Area Manager  
Chhal Sub Area, SEQ  
Raigarh Area

Period: Oct, 12 – Dec, 12 (Values are in  $\mu\text{g}/\text{m}^3$ )

Name of monitoring equipment used			SPM Respirable Dust Sampler			RPM Respirable Dust Sampler			SO <sub>2</sub> Respirable Dust Sampler			NO <sub>x</sub> Respirable Dust Sampler			Pb**		
Equipment sensitivity																	
Permissible AAQ standard (CPCB)																	
		R		200			100			80			80				
		I		500			250			120			120				
		S		100			75			30			30				
Monitoring Location	No. of samples Drawn	Category* (R, I, S)	Min	Max	98 % tile	Min	Max	98 % tile	Min	Max	98% tile	Min	Max	98 % tile	Min	Max	98 % tile
Core zone																	
(1)CA1	***	I	245	269	268	107	115	114	17	24	23	18	25	24	-	-	-
Buffer Zone																	
(2)CA2	***	R	157	160	168	72	79	78	15	19	19	17	20	20	-	-	-
(3)CA3	***	R	160	169	169	78	87	75	16	19	18	15	20	19	-	-	-
(4)CA4	***	R	162	169	169	78	85	82	17	20	19	17	22	22	-	-	-
(5)CA5	***	R	158	167	167	76	85	82	16	19	18	15	20	19	-	-	-
(6)CA6	***	R	152	163	163	64	76	78	13	17	17	15	19	19	-	-	-

\*\*\* 24 samples for SPM / RPM and 72 samples for SO<sub>2</sub> / NO<sub>x</sub>.

\*R = Residential; I = industrial;

In general, all SPM, RPM SO<sub>2</sub> and NO<sub>x</sub> values are found to be well within the prescribed limits of CPCB for Residential and rural area.

### c) Proposed Air Quality Management (if needed)

Following air pollution control measures will be practiced within the mining area and at coal handling plants and railway siding site.

1. Water spraying will be done regularly on approach roads within the mining area to minimise the dust generation.
2. Water sprinkling arrangement will be provided at the transfer point of coal.
3. Intensive plantation of adequate width all along the haul road and other road will be raised to minimise transport generated pollutants.
4. CHP will be provided with dust extraction arrangements.
5. Minimising the transport of coal from the crusher house to silo loading system, belt conveyor has been provided.
6. Coal transportation to railway siding will be done in covered trucks.
7. Exposed overburden dumps will be covered through an appropriate plantation
8. Optimum blast hole geometry will be followed to reduce the dust during blasting.
9. Regular monitoring of ambient air quality of project area.

**18.4 Waste disposal :-**

- n) **External OB dump & Internal backfilling details (specify the reclaimed backfilled area, area of voids for water reservoir and also the OB dump area height and volume) prior to closure of mine or during progressive mine closure (as the case be).**

The total volume of OB has been estimated as 849.50 MCum, out of which 780.55 MCum is planned to place in internal dump and 71.52 MCum in external dump. The external and internal dumps involve 130.73Ha and 677.82Ha. of land. The balance left out mine area will be 81.00 Ha. which will act as water reservoir and will be utilised as water resource by the local population after mine closure.

Maximum height of internal dump will be upto 90m (above ground level)

Slope of waste bench of internal dump	-	37 degrees
Height of individual bench	-	30 m
Width of berm.	-	30 m

- b) **Stabilization of external O.B. dumps and backfilled area (Technical Reclamation)**

Technical reclamation would involve breaking and levelling the top of OB dumps, filling of gulleys and terracing etc. The maximum depth of the project will be 300 m. (initially, upto 6<sup>th</sup> year OB (71.52MCum) will be dumped externally in 130.73 Ha. land. Internal dumping will continue from 6<sup>th</sup> year onwards. The technical reclamation of backfilled dump will start from 4<sup>th</sup> year onwards. It involves levelling of backfilled dump by means of dozers keeping a mild slope of about 1 in 200 for surface water drainage for plantation and other recreational purposes.

Initially, to the extent possible, top soil will be removed and stored separately. Subsequently this soil will be directly spread over the leveled graded backfilled spoil for reclamation of the quarried out land. Biological reclamation work will follow in next progressive year.

The estimated life of the mine is 30 years. Maximum height of the external & internal dump would be 90m from the ground level. Final depth of the quarry would be about 300m from ground level. Approximate total no. of plants are estimated as 2685525 Nos. in which about 1985025 nos. of plants would be planted in internal dump. An area of 81 Ha. would be left as final void/water body after mine closure.

The final stage reclamation plan & cross-section thereof are shown in figures – 16.2 & 16.3 respectively of Chapter – XVI.

Year wise programme of OB removal, dumping, & plantation has been given in table 16.16 of Chapter – XVI.

**c) Top soil / soil amendment application**

The stock piling of top soil will be as follows:

- i) Top soil and other materials removed shall be stock-piled only when it is impractical to promptly redistribute such materials on regraded areas.
  - ii) Stock-piled materials shall be selectively placed on a stable area, not disturbed, and protected from wind and water erosion, unnecessary compaction, and contaminants which lessen the capability of the materials to support vegetation when redistributed.
  - iii) After the final grading the topsoil would be redistributed in a manner that achieves an approximate uniform stable thickness consistent with the post mining land uses, contours, and surface water drainage system.
- d) Plantation on external & backfilled area, avenue and block plantation with type of plantation i.e. local/native species. Name the local species for plantation.**

**Green belt on dumps:-**

After technical reclamation of OB dumps and redistribution of top soil over it, the dumps will be biologically reclaimed followed by plantation as details shown in table 18.5 above. About 1841075 nos. of plants would be planted over internal dump and plantation will continue after mine closure for 3 years.

**Green Belt Around Mine: -**

In the directions where natural forest does not exist, there is need for creating green belt of adequate width as an effective dust and sight curtain in the periphery of mining area. The trees planted in the green belt area shall act as buffers and shock absorber against dusts, noise and stone flying. The trees in the green belt will be tall, wind firm, broad leaved and evergreen.

**Haul Roads: -**

A green belt of adequate width on either side of the haul road will be raised and the existing vegetation will be protected. The plants will be raised at spacing of 2.0x2.0 m.

**All other roads: -**

Along the roads other than the haul roads also, dust resistant plants will be planted.

**Infrastructural Facilities (Nursery):-**

A nursery is a prerequisite for supply of seedlings of suitable species of right size to the extent required. Raja Van Vikas Nigam may be contracted the above supply.

**Species for plantation.-**

- **Fruit bearing trees**
  - Jamun, Mango, Imli, Sitaphal, Bel, Ganga Imli, etc.
- **Medicinal trees**
  - Neem, Karanj, Harra, Behara, Aonla, Arjun, Shikakai, Mahua, Kusum.
- **Timber value trees**
  - Teak, Shivan / Ghamar, Sissoo, Sisham, Safed Sirus, Bamboo, Peltaforum, Babool.
- **Ornamental trees**
  - Gulmohur, Kachnar, Amaltas, Saptapami, Grevelia, Peepal, Palm tree.

**e) Disposal of Coal beneficiation process reject.**

There is no coal beneficiation except silo proposed in Chhal OC (Seam III) Expansion Project.

**18.5 Details of surface structures proposed for dismantling (brief description) ( Unless used in a gainful way )****a) Industrial / mine structures**

The CHP, Workshop, Managers & Pit Offices will be dismantled unless otherwise gainfully utilized by company, State Govt. /Local Body.

**b) Residential Buildings**

Will be handed over to closest project.

**c) Service buildings**

Dispensary, telephone exchange, sub area Managers Office, Store will be handed over to closest project.

**d) Telephone Cables**

Telephone cables will be removed for re-use in other projects of the area, as far as practicable.

**e) Sub-stations**

Will be dismantled and equipment will be gainfully utilized in other projects.

**f) Transformers**

Will be dismantled and equipment will be gainfully utilized in other projects.

**g) Community Services:** Will be handed over to the local authorities.**h) Water line:** Will be handed over to the local authorities.**i) Water Treatment Plants:** Will be handed over to the local authorities.**j) Rly. Siding:** There is no Rly. siding in the mine area.**k) ETP/STP:** Will be handed over to the local authorities.**l) Power line:** Will be dismantled.**18.6 Disposal of Plants & Machineries.****Table-18.7**

S No.	Particulars	Proposed Disposal Practice
a	Disposal or reuse of existing HEMM, CHP, workshop and railway siding for OC.	HEMM and other equipments will be transferred to other project as per requirement.
b	Disposal or reuse of haulage system, ventilation, CHP, workshop, and railway siding for UG.	Structure Will be dismantled & its equipment will be gainfully reused in other project



c	Disposal or reuse of transmission and sub-station.	- Do -
---	--	--------

### 18.7 Safety and security arrangement

Table- 18.8


S No.	Particulars	Proposed Disposal Practice
a	Details of fencing around abandoned quarry indicating the length of the fencing.	In the last there will be a void of 197.19 Ha.
b	Mine entry sealing arrangements and subsidence management for UG mines. Sealing details and dimensions shall also be provided.	- Not applicable.
c	Providing one time lighting arrangement.	Will be provided.
d	Slope stability arrangement for high wall and back filled dumps.	Not applicable.

**NOTE:** However, possibility shall be explored for handing over the residential & non-residential buildings and other infrastructures including the reclaimed land to state govt. for the benefit of local villagers and strengthening the area infrastructures. The end use of these facilities shall be decided by State Govt. with the help of local govt. and Village Panchayat.

### 18.8 Economic Repercussions of closure of mine

**18.8.1 Manpower of the Project-** Proposed manpower requirement of the extension project for different options are as under,

- Departmental option – 1916 Nos.
- Outsourcing option – 296 Nos.

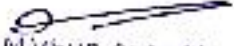
  
 Dy.G.M.(M)/SUD Area Manager  
 Chhal Sub Area, SEC1  
 Raigarh Area

## 18.8.2 Assessment of Income Scenario of Local People

Table – 18.9

Sl. No.	Particulars	Proposed Disposal Practice
a	Number of local employees redeployed in other projects of the company till their superannuation	All manpower including local employees in the role of SECL will be engaged in other projects of SECL till their superannuation.
b	Approximate no. of people engaged in indirect employment / ancillary activities.	This number would vary. It would be about 3 to 4 times of departmental employees. They would find no financial loss due to the mine closure as their activities will be shifted in the new or expansion mines located in the same or other coalfield area.
c	Resettlement / Redeployment of a & b.	(i) Decided by the company. (ii) Will be decided in consultation with local authority if required.
d	If no redeployment is possible then sustenance plan. i) Compensation for losing employment or income. ii) Vocational training for continuance / sustenance of income level	Affected persons would be given vocational and skill development training for continuance / sustenance of income level.
e	Views of society and expectation on closure of mine.	Society's anxiety is limited to assurance about continuation of employment opportunities and availability of civic amenities presently provided by mine management. The employment opportunities will remain available, albeit in other nearby projects. Civic amenities will also be available as the infrastructure for same will be handed over to State Government for future use of society.

**NOTE:** It is proposed that reclaimed and afforested land will be handed over to State Forest Dept for the benefit of local ecosystem. The forest wealth can also be utilized by local people or tribal in the form of fruits and fodders. The water reservoir in the mine voids will be utilized for pisciculture, irrigation, domestic drinking water or stabilizing the ground water regime. Landscaping during closure of mine will make the spot for tourist attraction.

  
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Job No. 504024

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REV, CMPDI

### 18.9 Time Schedule

The closure of mines involves environmental, technical, social aspect and financial assurance for implementing the post closure activities as per guidelines of Ministry of Coal. The post closure implementing activities will run for three years. The following activities will be implemented as per bar chart. The manpower for implementing the above activities with time bound manner will be provided.

Figure- 18.2

Sl. No.	Activities	Time Frame	Half Yearly					
			1	2	3	4	5	6
1.	Preparation of Survey & Disposal Report	6 months	■					
2.	Slope Stability study for high walls and internal backfilled dumps	-	Not Applicable					
3.	Disposal of P&M including HEMM, CHP, W/S, Siding	2 and half years	■	■	■	■	■	
4.	Backfilling of mined out Area ( OC )	2 years	■	■	■	■		
5.	Dismantling of Industrial structure	2 years	■	■	■	■		
6.	Grading & dozing of high walls for OC	2 years	■	■	■	■		
7.	Fencing of quarry	2 years	■	■	■	■		
8.	Clearing of Coal Stock and Infrastructural Area.	2 years	■	■	■	■		
9.	Disposal / Dismantling of Residential colony	2 & 1/2 years	■	■	■	■	■	
10.	Plantation & landscaping on backfilled area.	3 years	■	■	■	■	■	■
11.	Plantation over cleaned land of Infrastructure.	from 2 <sup>nd</sup> year			■	■	■	■
12.	Sealing of mine entries for UG mine	from 2 <sup>nd</sup> year	Not Applicable					
13.	Environmental Monitoring	3 years	■	■	■	■	■	■
14.	Subsidence Management for U/G	3 years	Not Applicable					
15.	Post closure subsidence monitoring for UG	3 years	Not Applicable					
16.	Any project specific activities	Nil						

NOTE: The progressive mine closure will be done as per the calendar plan of the project for technical and biological reclamation of dumps and internal voids.

### 18.10 Mine Closure Cost

18.10.1 The mine closure cost will cover the following activities for which a corpus escrow account @ Rs. 6.0 lakhs per Ha. for OCP & @ Rs. 1.0 lakh per Ha for UG mine of the project area shall be opened with the coal controller organization. In case of mines having acid mine drainage, post closure acid mine drainage management cost shall also be included in the total closure cost.

R.V, CMPDI

Job No.504024

Chapter 18/ 16 of 20

Dr. G. N. (P) / Sub Area Manager  
Chhal Sub Area, SET-1  
Rajgarh Area

### 18.10.2 Mine Closure Cost for OC mine

As per the guidelines of the MoC, the cost of the mine closure is to be computed based on the basis of project area involved in the project. In Chhal OC (Seam III), the total mining lease area is 1226.67 Ha. So, the closure cost is to be computed considering a total project area of 1342.86 Ha. Considering the wholesale price index as 171.6 as on May 2013, the updated cost of the mine closure is estimated to be Rs. 7.94 lakhs per hectare considering the admissible escalation over Rs. 6.00 lakh per Ha as on August 2009 when wholesale price index was 129.60.

Total Final mine closure cost (@ Rs.7.94/Ha.):Rs. **10662.31**lakhs upto two decimal place.

### 18.10.3 The detail of escrow account

The current value of corpus is Rs. **10662.31 Lakhs** (as on May. 2013). This corpus is to be divided by balance life of mine. Since, this is a running mine and the balance life after expansion is estimated as 30 years as on 01/04/2013, the annual corpus comes to Rs. **355.41 Lakhs** (up to two decimal place) by dividing 30 years. This amount is to be deposited in escrow account every year.

**Fund to be deposited in escrow account:** Year wise amount to be deposited has been given below in table 18.10.

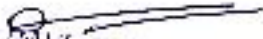
  
 Dy.G.M.(M)/Sub Area Manager  
 Chhal Sub Area,SECL  
 Raigarh Area

Table - 18.10

Year	Fund Deposited in Escrow Fund	Fund to be Reimbursed (Maximum)	
1	355.41	Nil	(+ ) accrued interest as applicable
2	373.18	Nil	
3	391.84	Nil	
4	411.43	Nil	
5	432.00	Nil	
<b>Phase-1 Total</b>	<b>1963.86</b>	<b>1571.09</b>	
6	453.60	Nil	
7	476.28	Nil	
8	500.10	Nil	
9	525.10	Nil	
10	551.38	Nil	
<b>Phase-2 Total</b>	<b>2506.44</b>	<b>2005.16</b>	
11	578.93	Nil	
12	607.87	Nil	
13	638.27	Nil	
14	670.18	Nil	
15	703.69	Nil	
<b>Phase-3 Total</b>	<b>3198.93</b>	<b>2559.14</b>	
16	738.87	Nil	
17	775.82	Nil	
18	814.61	Nil	
19	855.34	Nil	
20	898.10	Nil	
<b>Phase-4 Total</b>	<b>4082.73</b>	<b>3266.19</b>	
21	943.01	Nil	
22	990.16	Nil	
23	1039.67	Nil	
24	1091.65	Nil	
25	1146.23	Nil	
<b>Phase-5 Total</b>	<b>5210.72</b>	<b>4168.57</b>	
26	1203.54	Nil	
27	1263.72	Nil	
28	1326.91	Nil	
29	1393.25	Nil	
30	1462.92	Nil	
<b>Final Stage- Total</b>	<b>6650.34</b>	<b>5320.27</b>	
<b>Grand Total</b>	<b>23613.03</b>		

### 18.10.3 Tentative Final Mine Closure Activities & Cost Break-up:

The break-up of some major mine closure activities alongwith their tentative estimation of cost in terms of percentages of the total mine closure cost has been indicated in Table-18.11 below. The detailed activity schedule for the 'Final Mine Closure Plan' would be prepared five years before the intended final closure of the mine along with the detailed mine closure cost break-up.

**Table 18.11**  
**TENTATIVE MINE CLOSURE ACTIVITIES & COST BREAK-UP**  
 Type of mine: Open cast      Production Capacity: 6.0 MTY  
 Mining Lease Area: 1342.855 Ha.      Depth of the mine: 300m

Sl. No.	Major Closure Activities	Quantity	% of Total Closure Cost
<b>A</b>	<b>Dismantling of Structures</b>		
	Service Buildings		0.20
	Residential Buildings,		2.67
	Industrial Structures i.e. workshop complex, 33kv/3.3kv Sub-Station, Unit Stores, Security Barrack		0.30
<b>B</b>	<b>Permanent fencing of mine void &amp; other dangerous areas</b>		
	Random rubble masonry of height 1.2m including levelling up in cement concrete 1:6:12 in mud mortar.		1.50
<b>C</b>	<b>Grading of highwall slopes</b>		
	Levelling & grading of highwall slopes		1.77
<b>D</b>	<b>OB Dump Reclamation</b>		
	Handling/Duzzing of external OB dump into mine void.		88.66
	Bio-reclamation including soil spreading, plantation & maintenance.		0.00
<b>E</b>	<b>Landscaping</b>		
	Landscaping of the cleared land for improving its esthetic		0.30
<b>F</b>	<b>Plantation</b>		
	Plantation over area obtained after dismantling.		0.50
	Plantation around fencing		0.20
	Plantation over the cleared off external OB dump.		0.00
<b>G</b>	<b>Monitoring / testing of environmental parameters for three years.</b>		
	Air quality		0.22
	Water quality		0.20
<b>H</b>	<b>Entrepreneurship development (vocational and skill development training for sustainable income of affected people)</b>		0.26
<b>I</b>	<b>Miscellaneous &amp; other mitigative measures</b>		2.60
<b>J</b>	<b>Manpower Cost for supervision</b>		0.80
	<b>Total (%)</b>		<b>100.00</b>

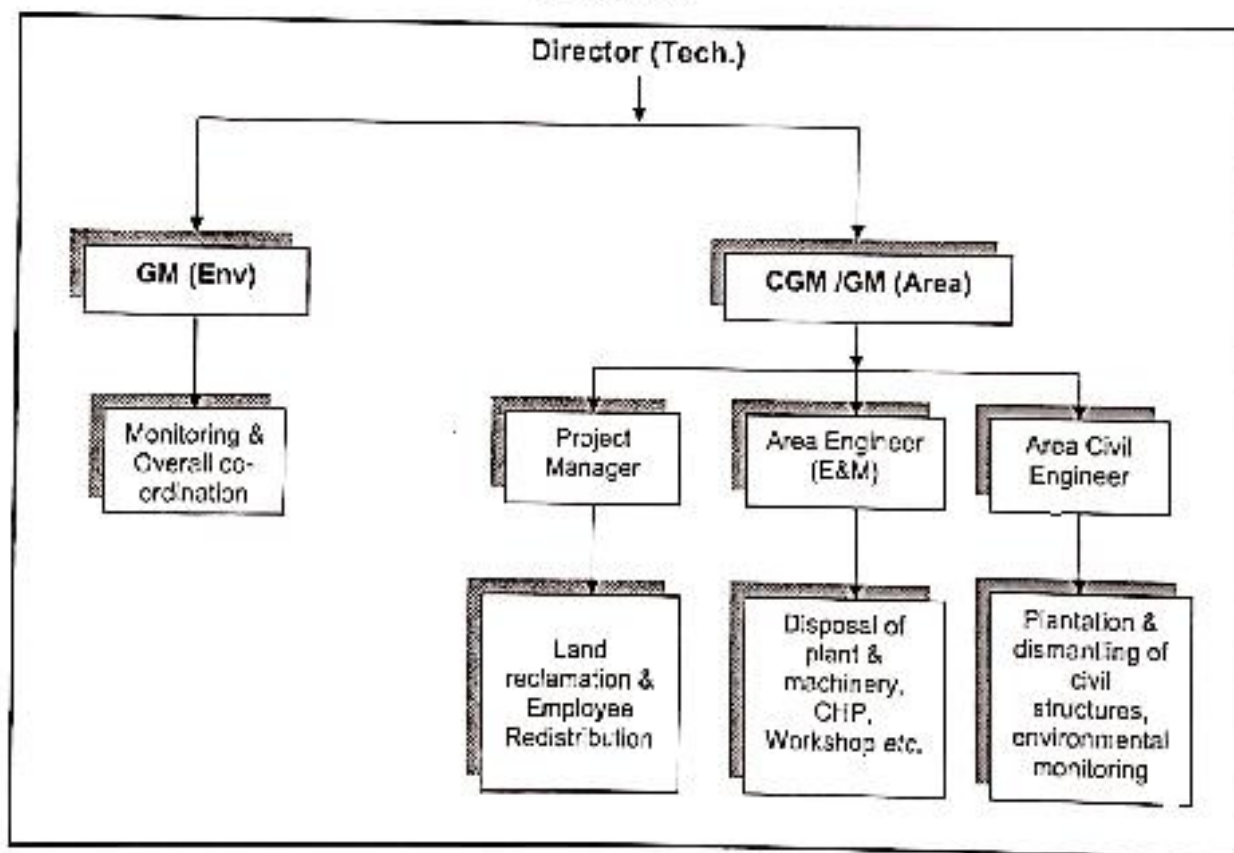
**NOTE:** The above cost expenditure will be met from the corpus escrow account deposited by the mine operator. In case of mines having acid mine drainage, post closure acid mine drainage management cost shall also be included in the total closure cost.

However, the additional amount beyond the escrow account will be provided by the mine operator after estimating the final mine closure cost five years prior to mine closure (as per the mine closure guideline).

### 18.11 Implementation Protocol

For implementing the mine closure activities, the following organisational structure has been proposed:

Figure 18.3



Environmental monitoring for three years after closure of mine will be carried out to evaluate the environmental quality of the area. If needed, proper mitigation measures will be taken up after evaluating the environmental quality. The funds for this have been provided in the cost estimate. Before closure of the mine, Area GM will prepare survey and disposal report and the same will be submitted to DGMS for acceptance.



South Eastern Coalfields Limited  
"A Mini Ratna Company"  
A Subsidiary of Coal India Ltd.)  
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ANNEXURE-06

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGII/S.O. (P&P)/2022/51

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition A(x) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall carry out the undermentioned activities in the mining lease area of the project as per the approved soil & moisture conservation Plan.

- Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department.
- Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme.
- Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme.
- Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and
- No damage shall be caused to the top-soil and will follow the top soil management plan.

  
General Manager,  
Raigarh Area SECL  
एस. ई. सी. एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area





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Chhota Ataramda, Raigarh-495006  
G.M. Office (Forest & Env't)  
Website: [www.secl.gov.in](http://www.secl.gov.in)

Fax NO. - 07762-223152  
Tel NO. - 07762- 222008  
M.NO. - 9425282388  
E-mail - [seclrgh@gmail.com](mailto:seclrgh@gmail.com)

ANNEXURE-07

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/52

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition A(xi) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall carry out gap plantation and soil & moisture conservation activities through CGRVVN, CG to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meters from outer perimeter of the mining lease.

  
General Manager,  
Raigarh Area, SECL  
General Manager  
एल.ई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area

**SOUTH EASTERN COALFIELDS LIMITED**

**(A MINI RATNA COMPANY)**

**BILASPUR (CHHATTISGARH)**

# **CHHAL OC PROJECT**



**PROJECT REPORT**

**ON**

**DESILTATION OF PONDS**

**LOCATED WITHIN FIVE KM FROM THE CHHAL OC PROJECT**

**DETAILS OF DESILTATION PONDS LOCATED WITHIN FIVE KM FROM CHHAL OC PROJECT**

S. NO.	VILLAGE NAME	Length (m)	Width (m)	Desiltation Depth (m)	Volume (m <sup>3</sup> )	Rate (per m <sup>3</sup> )	Total	GPS LOCATION	
								LATITUDE	LONGITUDE
<b>I MAWAPARA</b>									
1	Sagra Pond	104	85	1.5	13416	194.58	2610485	22°07'00" N	83°08'54" E
2	Pond near weekly Market	71	51	1.5	5431	194.58	1055753	22°07'10" N	83°08'37" E
3	Pond behind Nawabara colony	72	51	1.5	5724	194.58	1110776	22°07'14" N	83°08'29" E
4	Pond near temple	59	39	1.5	3752	194.58	1704313	22°07'14" N	83°08'47" E
<b>II Bafys</b>									
5	Godwan Pond	55	38	1.5	3135	194.58	1432518	22°07'18" N	83°08'12" E
6	Jurwadi	95	70	1.5	9975	194.58	1940955	22°07'56" N	83°08'30" E
<b>III CHITAPALI</b>									
7	Nava Pond	55	50	1.5	4125	194.58	802642	22°06'26" N	83°10'07" E
8	Soni Pond	73	58	1.5	6873	194.58	1337348	22°06'33" N	83°10'04" E
<b>IV Gadainibhari</b>									
9	Pond-1	68	50	1.5	4725	194.58	919190	22°07'33" N	83°08'33" E
10	Pond-2	59	48	1.5	4248	194.58	826575	22°07'56" N	83°08'32" E
11	Pond-3	55	34	1.5	3255	194.58	1024453	22°07'47" N	83°08'14" E

Measurement taken <sup>by</sup> ~~field~~  
By Jyoti Prasad Yadav (Chairman)

*(Signature)*  
M.A.M. (M) Sub Area Manager  
Chhal Sub Area, SEC  
Raigarh Area

S. NO.	VILLAGE NAME	Length (m)	Width (m)	Desiltation Depth (m)	Volume (m <sup>3</sup> )	Rate (per m <sup>3</sup> )	Total	GPS LOCATION	
								LATITUDE	LONGITUDE
V	<b>Domnara</b>								
12	Lahmoree pond	94	55	1.5	7755	194.58	1508967	22°04'40" N	83°06'01" E
13	Shankar pond	94	62	1.5	8742	194.58	1701018	22°04'45" N	83°05'47" E
VI	<b>Farkanara</b>								
14	Badakha pond	178	78	1.5	20826	194.58	4052323	22°05'55" N	83°03'44" E
15	Dandhi pond	61	60	1.5	5490	194.58	1068244	22°05'19" N	83°04'24" E
VII	<b>Chhote Pandarmuda</b>								
16	Indra sagar	95	65	1.5	9262	194.58	1802296	22°05'04" N	83°04'51" E
17	Awari muhalla pond	62	50	1.5	4650	194.58	904797	22°05'12" N	83°05'07" E
VIII	<b>AGASMAR</b>								
18	Pond 1	94	66	1.5	9306	194.58	1810761	22°03'45" N	83°05'52" E
IX	<b>CHHIRPANI</b>								
19	Pond 1	228	50	1.5	17100	194.58	3327318	22°04'07" N	83°05'08" E
X	<b>BARBHAUNA</b>								
20	NEAR PRIMARY SCHOOL	97	65	1.5	9457	194.58	1840240	22°04'17" N	83°08'50" E
21	UPPER POND	175	60		15750	194.58	3064635	22°04'03" N	83°09'06" E
XI	<b>CHANDRASHEKHARPUR</b>								
22	POND 1	84	61	1.5	10206	194.58	1985883	22°04'16" N	83°07'19" E

*S. K. Chakraborty*  
Chairman

*S. K. Chakraborty*  
P. U. & M. U. Area Manager  
G. S. & A. S. E. C. I.  
P. U. & M. U. Area  
K. P. S. Area

S. NO.	VILLAGE NAME	Length (m)	Width (m)	Des/Station Depth (m)	Volume (m3)	Rate (per m3)	Total	GPS LOCATION	
								LATITUDE	LONGITUDE
<b>XII GURDA</b>									
23	DAFRAMUDA POND	116	90	1.5	13000	194.58	3047122	22°02'56" N	83°09'29" E
<b>XIII CHHAL</b>									
24	NEAR MAJ CHANDRAMASINI TEMPLE Pond	55	55	1.5	4372	194.58	650801	22°07'25" N	83°07'18" E
25	JAM NIDAR PARA POND	85	72	1.5	10250	194.58	1995390	22°07'47" N	83°07'06" E
26	RLAH BOYS HOSTEL	77	55	1.5	6757	134.58	1250009	22°09'11" N	83°07'11" E
<b>XIV PUJARWAS LAAT</b>									
27	Pond 1	72	50	1.5	3400	194.58	1060732	22°08'10" N	83°07'31" E
<b>XV PUSALDAH</b>									
28	NEAR PRIMARY SCHOOL Pond	90	52	1.5	7020	194.58	1365950	22°05'22" N	83°09'14" E
<b>XVI DEHARI</b>									
29	Pond 1	120	82	1.5	15744	194.58	3063407	22°02'36" N	83°07'51" E
<b>XVII TUMIDIH</b>									
30	POND 1	93	83	1.5	11578	194.58	2252944	22°05'57" N	83°09'27" E
<b>XVIII NAGDI</b>									
31	POND 1	95	90	1.5	12960	194.58	2521756	22°07'20" N	83°04'25" E
		66	58	1.5	5742	194.58	1117278	22°07'50" N	83°05'18" E
		50	50	1.5	4500	194.58	875610	22°07'49" N	83°05'09" E
		116	90	1.5	15660	194.58	3047122	22°07'43" N	83°04'59" E
32	POND 2								
33	POND 3								
34	POND 4								

*Chhal Man*  
Chhal Man

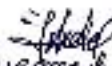
By G.P.(M) SUB Area Manager  
Chhal Sub Area, SEC  
Raigarh Area

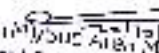
S. NO.	VILLAGE NAME	Length (m)	Width (m)	Desiltation Depth (m)	Volume (m <sup>3</sup> )	Rate (per m <sup>3</sup> )	Total	GPS LOCATION	
								LATITUDE	LONGITUDE
XII GURDA									
27	DARRAMUDA POND	116	90	1.5	15660	194.58	3047122	22°02'36" N	83°09'29" E
XIII CHHAL									
	NEAR MAA CHANDRAHASINI TEMPLE Pond	55	53	1.5	4372	194.58	850801	22°07'25" N	83°07'16" E
25	JANINDAR PARA POND	59	72	1.5	10260	194.58	1990390	22°07'47" N	83°07'06" E
26	NEAR BOYS HOSTEL	77	55	1.5	6352	194.58	1238069	22°08'11" N	83°07'11" E
XIV PUNARWAS LAAT									
27	Pond 1	72	50	1.5	5400	194.58	1050737	22°08'10" N	83°07'31" E
XV PUSALDAH									
28	NEAR PRIMARY SCHOOL Pond	50	52	1.5	7020	194.58	1368851	22°05'22" N	83°08'14" E
XVI DEHJARI									
29	Pond 1	175	82	1.5	15744	194.58	3063467	22°07'35" N	83°07'51" E
XVII TUMIDIH									
30	POND 1	93	83	1.5	11578	194.58	2252944	22°05'57" N	83°08'27" E
XVIII NAGOI									
31	POND 1	96	90	1.5	12960	194.58	2521755	22°07'20" N	83°08'25" E
32	POND 2	55	55	1.5	5742	194.58	1117278	22°07'50" N	83°08'18" E
33	POND 3	60	50	1.5	4500	194.58	875610	22°07'43" N	83°08'09" E
34	POND 4	116	90	1.5	15660	194.58	3047122	22°07'47" N	83°08'30" E

*Handwritten signature*  
Chhal Sub Area

*Handwritten signature*  
Chhal Sub Area Manager  
Chhal Sub Area, SECL  
Raigarh Area

S. NO.	VILLAGE NAME	Length (m)	Width (m)	Desiltation Depth (m)	Volume (m <sup>3</sup> )	Rate (per m <sup>3</sup> )	Total	GPS LOCATION	
								LATITUDE	LONGITUDE
NANDGAON									
XIX									
35	POND 1	117	66	1.5	11583	194.58	2253820	22°06'45" N	83°05'39" E
PUCHHIYAPALI									
36	POND 1	98	45	1.5	666	194.58	1372956	22°06'11" N	83°02'23" E
37	POND 2	107	64	1.5	10272	194.58	1998725	22°06'11" N	83°02'46" E
TOTAL					338542		65892960		

  
 Measurement taken by  
 Jasmira Pansod  
 Head, Chhatraan  
 Chhat Sub Area

  
 Chhat Sub Area Manager  
 Chhat Sub Area, SEC1  
 Rajgarh Area

**NAME OF WORK: DESILTATION OF PONDS / WATER BODIES LOCATED WITHIN FIVE KM FROM THE CHHAL OC PROJECT**

S. NO	DESCRIPTION OF WORK	ESTIMATED AMOUNT			JUSTIFIED AMOUNT (AS PER ANALYSIS)		REMARKS
		QTY M3	RATE (PER M3)	AMOUNT (Rs.)	RATE (PER M3)	AMOUNT (Rs.)	
1	37 ponds located within 5 km	338642	146.50	49611053	194.58	65892960	Item no 2.6.1 in DSOR 2013 & analysis of rate

*[Signature]*  
 Measurement taken  
 By  
 Jyotsna Bhandari  
 Head chain Man  
 Chhal Sub Area

*[Signature]*  
 U.G.M.(N)/Sub Area Manager  
 Chhal Sub Area, SEC  
 Raigarh Area





South Eastern Coalfields Limited  
"A Mini Ratna Company"  
A Subsidiary of Coal India Ltd.)  
Chhote Atarnuda, Raigarh-495006  
G.M. Office (forest & envt)  
Website: [www.secl.gov.in](http://www.secl.gov.in)

fax NO.- 07762-223152  
Tel NO.- 07762- 222008  
M.NO. - 9425282388  
E-mail - seclrgh (@) gmail.com

ANNEXURE-09

CIN-U10102CT1985GO1003161


Ref: - SECL/GM/RGH/S.O. (P&P)/2022/ 53

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition A(xiii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall carry out the undermentioned activities at the project cost for the management of safety zone as per the relevant guidelines issued by the MOEF & CC.

- (a) Ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the State Forest Department.
- (b) Boundary of the safety zone of the mining lease, adjacent to habitation/roads shall be properly fenced.
- (c) Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area at the project cost under the supervision of the State Forest Department.
- (d) Along with the State Forest Department shall ensure that safety zone is maintained as per the prescribed norms.
- (e) Deposit the cost of felling of trees with the State Forest Department.

  
General Manager,  
Raigarh Area, SECL  
SECL, Raigarh Area



## कार्यालय कलेक्टर (भू-अभिलेख शाखा), रायगढ़ (छ.ग.)

क्रमांक / 1720 / रा.नि.का. / 2014  
प्रति,

रायगढ़ दिनांक 22 / 12 / 2014

मुख्य वन संरक्षक (भू-प्रबंध)  
एवं नोडल अधिकारी वन संरक्षण अधिनियम  
अरण्य भवन मेडिकल कॉलेज रोड,  
रायपुर (छ.ग.)

विषय :- एसईसीएल रायगढ़ क्षेत्र की प्रस्तावित छाल खुली कोयला खदान SEAM - III परियोजना (8 MTY) में स्थित कुल वन भूमि 185.017 हे० में स्थित राजस्व वन भूमि 8.307 हे० का अनापत्ति प्रमाण-पत्र गैर वानिकीय उपयोग हेतु प्रदाय करने बाबत ।

संदर्भ : कार्यालय महाप्रबंधक एसईसीएल रायगढ़ क्षेत्र के पत्र क्र. 1545 दिनांक 12.03.2014

\*\*\*\*\*

विषयांतर्गत संदर्भित पत्र द्वारा तहसील धरमजयगढ़ के ग्राम खेदापाली के राजस्व वन भूमि छोटे झाड़ के जंगल खसरा नंबर 5/2, 0.380 हे. एवं 85/2क, 7.866 हे. रकबा कुल रकबा 8.307 हे. का गैर वानिकीय उपयोग हेतु अनापत्ति प्रमाण-पत्र चाही गई है।

उपरोक्त आवेदित भूमि के संबंध में अनुविभागीय अधिकारी (रा.) धरमजयगढ़ के प्रतिवेदन अनुसार अनापत्ति प्रमाण-पत्र दिये जाने हेतु प्रकरण प्रस्तुत किया गया है।

अतः अनुविभागीय अधिकारी (रा.) धरमजयगढ़ के अनापत्ति प्रमाण-पत्र के अनुशंसा अनुसार आवेदित ग्राम खेदापाली तहसील धरमजयगढ़ के कुल खसरा नंबर 02 कुल रकबा 8.307 हे. राजस्व वन भूमि छोटे झाड़ का जंगल को गैर वानिकीय उपयोग हेतु वन संरक्षण अधिनियम 1980 तहत नियमानुसार गैरवानिकी/व्यपवर्तन हेतु उच्च कार्यालय को आवेदन प्रस्तुत करने पर इस कार्यालय को कोई आपत्ति नहीं है।

अनापत्ति देने का तात्पर्य यह कदापि नहीं माना जावेगा कि उपर्युक्त भूमि आवेदक विभाग को हस्तांतरित करने का निर्णय लिया जा चुका है।

कलेक्टर

रायगढ़ (छ.ग.)

रायगढ़ दिनांक / 22 / 12 / 2014

पृ.क्रमांक / 1720 / रा.नि.का. / 2014

प्रतिलिपि :-

महाप्रबंधक एसईसीएल रायगढ़ क्षेत्र को सूचनाार्थ ।

कलेक्टर

रायगढ़ (छ.ग.)

No (Copy)























ENVIRONMENTAL  
CLEARANCE

**Government of India**  
**Ministry of Environment, Forest and Climate Change**  
**(Impact Assessment Division)**

To,

The GENERAL MANAGER(ENVIRONMENT)  
SOUTH EASTERN COALFIELDS LIMITED  
SOUTH EASTERN COALFIELDS LIMITED, SECL BHAVAN, SEEPAT  
ROAD BILASPUR (C.G.) PIN 495006,SOUTH EASTERN COALFIELDS  
LIMITED, SECL BHAVAN, SEEPAT ROAD BILASPUR (C.G.) PIN  
495006,Bilaspur,Chhattisgarh-495006

**Subject:** Grant of Environmental Clearance (EC) to the proposed Project Activity  
under the provision of EIA Notification 2006-regarding

Sir/Madam,

This is in reference to your application for Environmental Clearance (EC)  
in respect of project submitted to the Ministry vide proposal number  
IA/CG/CMIN/11029/2007 dated 09 Jul 2021. The particulars of the environmental  
clearance granted to the project are as below.

1. <b>EC Identification No.</b>	<b>EC22A042CG113476</b>
2. <b>File No.</b>	No.J-11015/1000/2007-IA.II(M)
3. <b>Project Type</b>	Expansion
4. <b>Category</b>	A
5. <b>Project/Activity including Schedule No.</b>	1(a) Mining of minerals
6. <b>Name of Project</b>	Chhal Opencast Exprn
7. <b>Name of Company/Organization</b>	SOUTH EASTERN COALFIELDS LIMITED
8. <b>Location of Project</b>	Chhattisgarh
9. <b>TOR Date</b>	20 Jul 2017

The project details along with terms and conditions are appended herewith from page  
no 2 onwards.

Date: 02/08/2022

(e-signed)  
Lalit Bokolia  
Scientist F  
IA - (Coal Mining sector)

*Note: A valid environmental clearance shall be one that has EC identification  
number & E-Sign generated from PARIVESH.Please quote identification  
number in all future correspondence.*

*This is a computer generated cover page.*



**File No. J-11015/1000/2007-IA. II(M)**  
Government of India  
Ministry of Environment, Forest and Climate Change  
(Impact Assessment Division)

\*\*\*\*\*

Indira Paryavaran Bhawan,  
Jorbagh Road, N Delhi - 3  
Email: ik.bukolia@nic.in Tel: 01120819417

**Dated: 2<sup>nd</sup> August, 2022**

To

The General Manager (W B P & Environment)  
M/s South Eastern Coalfields Ltd.  
W B P & Environment Department, Seepur Road,  
**Bilaspur** - 495006 (Chhattisgarh) Email: gmenv@secl@gmail.com

**Sub: Expansion of Chhal Opencast coal mining from 3.5 MTPA to 6 MTPA (Peak) with increase of mine lease area from 641.013 ha to 1342.86 ha by M/s South Eastern Coalfields Limited located in Tehsil Dharamjaigarh, District Raigarh (Chhattisgarh) – For Environmental Clearance – reg.**

Sir,

This has reference to your online proposal No. IA/CG/CMIN/11029/2007 dated 9<sup>th</sup> July, 2021, submitted to this Ministry for grant of Environmental Clearance (EC) in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 under the Environment (Protection) Act, 1986 for Expansion of Chhal Opencast coal mining from 3.5 MTPA to 6 MTPA (Peak) with increase of mine lease area from 641.013 ha to 1342.86 ha by M/s South Eastern Coalfields Limited located in Tehsil Dharamjaigarh, District Raigarh (Chhattisgarh).

2. The project/activity is covered under category 'A' of item 1(a) 'Mining of Minerals' the Schedule to the EIA Notification, 2006

3. The proposal was considered by the sectoral Expert Appraisal Committee (EAC) in its 16<sup>th</sup> EAC meeting held on 22<sup>nd</sup> July, 2021 and 29<sup>th</sup> EAC meeting held on 25 - 26 April, 2022. The details of the project, as per the documents submitted by the project proponent, and also as informed during the meeting, are reported to be as under: -

- i. The project area is covered under Survey of India Topo Sheet No. 61 N/4 and is bounded by the geographical coordinates ranging from 22°4'40" N and 22°6'27" N and longitudes 83°6'10" E and 83°9'10" E.
- ii. Coal Package: Thermal Power Stations
- iii. Joint venture: No Joint Venture
- iv. Project does not fall in the Critically Polluted Area (CPA), where the MoEF&CC's vide its OM dated 13<sup>th</sup> January, 2010 has imposed moratorium on grant of environment clearance.  
Employment generation/To be generated: 296

- v. Benefits of the Project: The coal mine will go a long way in fulfilling the demand nation's electricity and other coal-based industries, apart from earning revenue for the government. Opportunity of employment for the project affected villagers and allied industries
- vi. Earlier, the environment clearance to the project was obtained under EIA Notification, 2006 vide Ministry's letter No J-11015/1000/2007-IA-II(M) dated 27.04.2010 for 3.5 MHPA in mine lease area of 641.013 ha.
- vii. Total mining lease area as per block allotment is 1342.86 ha. Mining Plan (Including Progressive Mine Closure Plan) has been approved by the CIL Board on 16.12.2013
- viii. The land usage pattern of the project is as follows:

Pre-mining land use details (Area in Ha)

S. N.	LAND USE	Within ML Area (Ha.)	Outside ML Area (Ha.)	Total
1	Agricultural Land	695.826	130.001	825.827
2	Forest Land	240.867	0	240.867
3	Waste Land	172.799	0	172.799
4	Grazing Land	31.632	0	31.632
5	Surface Water Bodies	23.426	0	23.426
6	Settlements	18.089	0	18.089
7	Others	24.056	6.164	30.220
<b>Total</b>		<b>1206.695</b>	<b>136.165</b>	<b>1342.86</b>

Land Use During Mining

S. No.	Land Use during Mining	Land Use (Ha)				Total
		Plantation	Water Body	Public Use	Undisturbed	
1.	External OB Dump	130.73	0	0	0	130.73
2.	Top Soil Dump	0	0	0	0	0
3.	Excavation	794.01	81	0	0	875.01
4.	Roads	0	0	3.5	0	3.5
5.	Built up areas	5	0	41.5	0	46.5
6.	Safety Zone as green belt	144.47	0	0	0	144.47
8.	Undisturbed Area	0	0	92.65	0	92.65
10	R&R	0	0	50	0	50
	<b>TOTAL</b>	<b>1074.21</b>	<b>81</b>	<b>187.65</b>	<b>0</b>	<b>1342.86</b>

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**Post Mining Land use**

S. No.	Type	Total Area	Reclaimed Area (ha)	Un-reclaimed area (ha)
1.	Excavation/Quarry Area:			
	(a) Backfilled areas	794.01	794.01	0
	(b) Excavated Void	81.00	0	81
2.	External Dump	130.73	130.73	0
3.	Safety Zone	144.47	144.47	0
4.	Road and Infrastructure	50.00	5	45
5.	Garland Drains	3.360	0	3.360
6.	Embankment	33.6	0	33.6
7.	R&R	50	0	50
8.	Others	55.69	0	55.69
	<b>TOTAL</b>	<b>1342.86</b>	<b>1074.21</b>	<b>268.65</b>

- ix. Total geological reserve reported in the mine lease area is 197,257 MT with 151.36 MT mineable reserve. Out of total mineable reserve of 151.36 MT, 151.36 MT are available for extraction. Percent of extraction is 100%.
- x. 13 seams with thickness ranging from 0.5 m to 11 m are workable. Grade of coal is G-11, stripping ratio 5.63, while gradient is  $4^{\circ}$  to  $11^{\circ}$
- xi. Method of mining would be Opencast method (Coal- Surface miner with front end loader and dumper; OB-Shovel and dumper combination)
- xii. Life of mine is 30 years.
- xiii. The project has one external OB dumps in an area of 130.73 ha with 90 m height and 71.52 Mcum of OB two internal OB in an area of 794.01 ha with 780.55 Mcum of OB is envisaged in the project.
- xiv. Total quarry area is 875.01 ha out of which backfilling will be done in 794.01 ha while final mine void will be created in an area of 81 ha with a depth of 300 m. Backfilled quarry area of 794.01 ha shall be reclaimed with plantation. Final mine void will be converted water body
- xv. Transportation of coal has been proposed by In-pit by trucks and in-pit belt conveyors both, from surface to siding by trucks and loading at sidings by railway and to local customers by trucks
- xvi. Total afforestation Plan in an area of 1074.21 ha, comprising of 130.73 ha of external dump, 794.01 ha of internal dump and 144.47 ha of safety zone as green belt & 5 Ha others.
- xvii. 185.07 ha of forest land has been reported to be involved in the project for which application has been made on 10th May 2016. Forest Clearance awaited.
- xviii. No National Parks, Wildlife Sanctuaries and Eco-Sensitive Zones have been reported with 10 km boundary of the project.
- xix. The ground water level has been reported to be varying between 2.52 m to 14.27 m during pre-monsoon and between 5.85 m to 14.27 m during post-monsoon between 2.52 m to 8.02 m. Total water requirement for the project is 6874 m<sup>3</sup>/day
- xx. Application for obtaining the approval of the Central Ground Water Authority for dewatering ground water has been submitted on 30<sup>th</sup> December, 2017
- xxi. Public hearing for the project of Chhal OC Seam-(III) 6.0 MTPA & 7.5 Peak capacity in an area of 1342.86 ha was conducted on 12.03.2021 near govt middle school, Nawapara, Tehsil- Dharamjagarh, Dist. Raigarh (C.G.) under the Chairmanship of Additional Collector



- Raigarh. Major issues raised in the public hearing include compensation, RR, Environment, employment.
- xxii. Consent to Operate for the existing capacity was obtained from the State PCB on 19/10/2020 and is valid till 25.09.2022
- xxiii. Mand River is in the west, flowing southerly of the project
- xxiv. Regular monitoring of ambient air quality is being carried out on fortnightly basis. The documented report is submitted to SPCB and also to MoEF&CC along with half yearly EC compliance report. In general, the results of ambient air quality monitoring data were found within prescribed limits except few aberrations which can be attributed to the specific local conditions during the day of sampling.
- xxv. Pending legal litigations: -
- Case No. 218/2014 - case has been disposed of.
  - Case No. Cr.MP 408-413/2007 - Both the cases 408 & 413 have been disposed of.
- xxvi. The project involves 450 project affected families. The PAF's and PAI's are being rehabilitated and paid economic compensation/ employed as per State Govt. R&R package and Coal India rule.
- xxvii. Total cost of the project is Rs. 610.63 crores. Cost of production is Rs.685.02/- per tonne. at 85% production level. CSR cost is 2% of the average net profit of the company for the three immediate preceding financial years or Rs. 2.00 per tonne of coal production of previous year whichever is higher. R&R cost is Rs. 5354.49 lakhs. Environment Management Cost is Rs. 7731.45 lakh.

4. The proposal was considered by the sectoral Expert Appraisal Committee (EAC) in 29<sup>th</sup> EAC meeting held on 25 - 26 April, 2022 through Video Conferencing and recommended for grant of Environment Clearance. Based on recommendations of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords approval to Expansion of Chhal Opencast coal mining from 3.5 MTPA to 6 MTPA (Peak) with increase of mine lease area from 641.013 ha to 1342.86 ha by M/s South Eastern Coalfields Limited located in Tehsil Dharamjigarh, District, Raigarh (Chhattisgarh), under the provisions of Environment Impact Assessment Notification, 2006 and subsequent amendments/circulars thereto subject to the compliance of the following terms & conditions / specific conditions for environmental safeguards as stated below:-

- i. Environment Clearance is granted based on Stage-1 EC submitted by PP on 06.07.2022 for non-forestry use of 240.867 ha, comprising of 185.017 ha Revenue Forest Land and 55.850 ha identified as forest land in terms of dictionary meaning under the Forest (Conservation) Act, 1980 subject to certain terms and conditions.
- ii. PP shall obtain CTO for 6 MTPA (Peak) from State Pollution Control Board. PP must obtain the CTE and CTO of STP. No wastewater from mine lease area shall be disposed outside the mine lease area into the river. Treated wastewater from STP and ETP shall be utilised within area and treatment plants designed should be based on zero liquid discharge.
- iii. PP shall deploy of atleast 10 nos of fog cannon for mitigation of fugitive dust on the haul road, coal storage yard and transportation route. Also 5 Movable long range fog cannon on the affected village must be immediately installed within 3 months.
- iv. Further expansion (if applied) in capacity will only be considered by EAC when at least 75% of EC conditions are complied fully and PP to obtain 5-star rating from Ministry of Coal as per their guidelines.
- v. PP must plant 150,000 of native trees other than the green belt development proposed in the EIA /EMP report, also the broad leaves along the transportation route in three years to prevent the effect of air pollution. PP shall implement Peripheral tree plantation along the mine lease area with miyawaki method of 50 mts width within 2 years through independent

- expert. After completion of tree plantation, number of trees shall be duly endorsed from District Forest Officer
- vi. PP will construct community toilet blocks in nearby areas in consultation with gram panchayats within 1 year to the grant of this EC
  - vii. As committed, PP to install silo loading and railway siding with full mechanized system to transport coal from pit head to railway siding by October 2023. No CTO shall be granted by SPCB by road transportation after October 2023. SPCB shall allow only 10% coal by road against the sanctioned capacity (i.e 0.6 MTPA) beyond October 2023.
  - viii. Coal extraction mandatory by surface miner method only and it should be deployed by December 2022. SPCB shall grant the CTO accordingly.
  - ix. No village road shall be used for transportation of coal and no road transport route shall be adopted, which is passing through any sensitive location such as schools, hospitals etc. PP shall take legal undertaking from its consumers accordingly.
  - x. PP to fulfil the commitment made during public hearing and a progressive record must be submitted to IRO
  - xi. PP shall deploy only 40-50 tones covered trucks/dumper to reduce fleet size
  - xii. PP to undertake the recruitment of a full-fledged qualified manpower with Environmental Engineer/Environment Science degree background in Environment Management Cell etc at coal mining site for compliance of EC conditions.
  - xiii. PP must adopt the proper mitigation measure as propose under EMP with budgetary of 7731.45 lakhs as proposed by PP. The progressive audit of the same may be given to IRO
  - xiv. PP to install solar lights within 1 year from the grant of this EC along the road used for transportation of minerals to avoid the accidents at night and also seek its maintenance. PP is asked to also identify the rural areas for installation of solar light with its maintenance within the study area of 10 km radius buffer zone within one year
  - xv. Project proponent shall supply clean drinking water and for domestic purpose for the people coming under the zone of influence of this mining activity.
  - xvi. Persons of nearby villages shall be given training on livelihood and skill development to make them employable.
  - xvii. PP to install 2 nos of continuous ambient air quality monitoring stations at suitable locations preferably village side in consultation of SPCB. The real time data so generated shall be uploaded on company website. In addition, data should also be displayed digitally at entry and exit gate of mine lease area for public display. These monitoring station shall be deploy by December 2022.
  - xviii. Continuous monitoring of occupational safety and other health hazards, and the corrective actions need to be ensured.
  - xix. Proponent shall appoint an Occupational Health Specialist for Regular and Periodical medical examination of the workers engaged in the Project and maintain records accordingly; also, Occupational health check-ups for workers having some ailments like BP, diabetes, habitual smoking, etc. shall be undertaken once in six months and necessary remedial/preventive measures taken accordingly. The Recommendations of National Institute for ensuring good occupational environment for mine workers shall be implemented; The prevention measure for burns, malaria and provision of anti-snake venom including all other paramedical safeguards may be ensured before initiating the mining activities.
  - xx. The illumination and sound at night at project sites disturb the villages in respect of both human and animal population. Consequent sleeping disorders and stress may affect the health in the villages located close to mining operations. Habitations have a right for darkness and minimal noise levels at night. PPs must ensure that the biological clock of the villages is not disturbed; by orienting the floodlights/ masks away from the villagers and keeping the noise levels well within the prescribed limits for day light/night hours



- xxi. PP shall implement rain water harvesting mechanism in order recharge the ground water or as water conservation measure in addition to the proposed structure. PP shall carry out regular monitoring of Ground water level and quality.
- xxii. PP shall pay to farmers of agricultural land if there is any loss due to pollution found by concerned District Commissioner as per extent rules or norms
- xxiii. Hon'ble Supreme Court in an Writ Petition(s) Civil No. 114/2014, Common Cause vs Union of India & Ors vide its judgement dated 8th January, 2020 has directed the Union of India to impose a condition in the mining lease and a similar condition in the environmental clearance and the mining plan to the effect that the mining lease holders shall, after ceasing mining operations, undertake re-grassing the mining area and any other area which may have been disturbed due to their mining activities and restore the land to a condition which is fit for growth of fodder, flora, fauna etc. Compliance of this condition after the mining activity is over at the cost of the mining lease holders/Project Proponent". The implementation report of the above said condition shall be sent to the Regional Office of the MoEF&CC.

**4.1** The grant of environmental clearance is further subject to compliance of the Standard EC conditions as under:

**(a) Statutory compliance**

(i) The project proponent shall obtain forest clearance under the provisions of Forest (Conservation) Act, 1986, in case of the diversion of forest land for non-forest purpose involved in the project.

(ii) The project proponent shall obtain clearance from the National Board for Wildlife, if applicable.

(iii) The project proponent shall prepare a Site-Specific Conservation Plan / Wildlife Management Plan and approved by the Chief Wildlife Warden. The recommendations of the approved Site-Specific Conservation Plan/Wildlife Management Plan shall be implemented in consultation with the State Forest Department. The implementation report shall be furnished along with the six-monthly compliance report (in case of the presence of schedule-I species in the study area).

(iv) The project proponent shall obtain Consent to Establish/Operate under the provisions of Air (Prevention & Control of Pollution) Act, 1981 and the Water (Prevention & Control of Pollution) Act, 1974 from the concerned State pollution Control Board/ Committee.

(v) The project proponent shall obtain the necessary permission from the Central Ground Water Authority.

(vi) Solid/hazardous waste generated in the mines needs to be addressed in accordance to the Solid Waste Management Rules, 2016/Hazardous & Other Waste Management Rules, 2016.

**(b) Air quality monitoring and preservation**

(i) Continuous ambient air quality monitoring stations as prescribed in the statute be established in the core zone as well as in the buffer zone for monitoring of pollutants, namely PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub> and NO<sub>x</sub>. Location of the stations shall be decided based on the meteorological data, topographical features and environmentally and ecologically sensitive targets in consultation with the State Pollution Control Board. Online ambient air quality monitoring stations may also be installed in addition to the regular monitoring stations as per the requirement and/or in consultation with the

SPCB. Monitoring of heavy metals such as Hg, As, Ni, Cd, Cr, etc to be carried out at least once in six months.

(i) The Ambient Air Quality monitoring in the core zone shall be carried out to ensure the Coal Industry Standards notified vide GSR 742 (E) dated 25<sup>th</sup> September, 2000 and as amended from time to time by the Central Pollution Control Board. Data on ambient air quality and heavy metals such as Hg, As, Ni, Cd, Cr and other monitoring data shall be regularly reported to the Ministry/Regional Office and to the CPCB/SPCB.

(ii) Transportation of coal, to the extent permitted by road, shall be carried out by covered trucks/conveyors. Effective control measures such as regular water/mist sprinkling/rain gun etc shall be carried out in critical areas prone to air pollution (with higher values of PM<sub>10</sub>/PM<sub>2.5</sub>) such as haul road, loading/unloading and transfer points. Fugitive dust emissions from all sources shall be controlled regularly. It shall be ensured that the Ambient Air Quality parameters conform to the norms prescribed by the Central/State Pollution Control Board.

(iv) The transportation of coal shall be carried out as per the provisions and route envisaged in the approved Mining Plan or environment monitoring plan. Transportation of the coal through the existing road passing through any village shall be avoided. In case, it is proposed to construct a 'bypass' road, it should be so constructed so that the impact of sound, dust and accidents could be appropriately mitigated.

(v) Vehicular emissions shall be kept under control and regularly monitored. All the vehicles engaged in mining and allied activities shall operate only after obtaining 'PUC' certificate from the authorized pollution testing centres.

(vi) Coal stock pile/crusher/feeder and breaker material transfer points shall invariably be provided with dust suppression system. Belt-conveyors shall be fully covered to avoid air borne dust. Side cladding all along the conveyor gantry should be made to avoid air borne dust. Drills shall be wet operated or fitted with dust extractors.

(vii) Coal handling plant shall be operated with effective control measures w.r.t. various environmental parameters. Environmental friendly sustainable technology should be implemented for mitigating such parameters.

**(c) Water quality monitoring and preservation**

(i) The effluent discharge (mine waste water, workshop effluent) shall be monitored in terms of the parameters notified under the Water Act, 1974 Coal Industry Standards vide GSR 742 (E) dated 25<sup>th</sup> September, 2000 and as amended from time to time by the Central Pollution Control Board.

(ii) The monitoring data shall be uploaded on the company's website and displayed at the project site at a suitable location. The circular No.1-2001/VI/2006-IA, (V) dated 27<sup>th</sup> May, 2009 issued by Ministry of Environment, Forest and Climate Change shall also be referred in this regard for its compliance.

(iii) Regular monitoring of ground water level and quality shall be carried out in and around the mine lease area by establishing a network of existing wells and constructing new piezometers during the mining operations. The monitoring of ground water levels shall be carried out four times

a year i.e. pre-monsoon, monsoon, post-monsoon and winter. The ground water quality shall be monitored once a year, and the data thus collected shall be sent regularly to MOEFCC/RO.

(iv) Monitoring of water quality upstream and downstream of water bodies shall be carried out once in six months and record of monitoring data shall be maintained and submitted to the Ministry of Environment, Forest and Climate Change/Regional Office.

(v) Ground water, excluding mine water, shall not be used for mining operations. Rainwater harvesting shall be implemented for conservation and augmentation of ground water resources.

(vi) Catch and/or garland drains and siltation ponds in adequate numbers and appropriate size shall be constructed around the mine working, coal heaps & OB dumps to prevent run off of water and flow of sediments directly into the river and water bodies. Further, dump material shall be properly consolidated/ compacted and accumulation of water over dumps shall be avoided by providing adequate channels for flow of silt into the drains. The drains/ ponds so constructed shall be regularly de-silted particularly before onset of monsoon and maintained properly. Sump capacity should provide adequate retention period to allow proper settling of silt material. The water so collected in the sump shall be utilised for dust suppression and green belt development and other industrial use. Dimension of the retaining wall constructed, if any, at the toe of the OB dumps within the mine to check run-off and siltation should be based on the rainfall data. The plantation of native species to be made between toe of the dump and adjacent field/habitat/water bodies.

(vii) Adequate groundwater recharge measures shall be taken up for augmentation of ground water. The project authorities shall meet water requirement of nearby village(s) after due treatment conforming to the specific requirement (standards).

(viii) Industrial waste water generated from CUP, workshop and other waste water, shall be properly collected and treated so as to conform to the standards prescribed under the standards prescribed under Water Act 1974 and Environment (Protection) Act, 1986 and the Rules made there under, and as amended from time to time. Adequate ETP /STP needs to be provided.

(ix) The water pumped out from the mine, after siltation, shall be utilized for industrial purpose viz. watering the mine area, roads, green belt development etc. The drains shall be regularly desilted particularly after monsoon and maintained properly.

(x) The surface drainage plan including surface water conservation plan for the area of influence affected by the said mining operations, considering the presence of river/rivulet/pond/lake etc. shall be prepared and implemented by the project proponent. The surface drainage plan and/or any diversion of natural water courses shall be as per the approved Mining Plan/BLA/EMP report and with due approval of the concerned State/Central Authority. The construction of embankment to prevent any danger against intrusion of surface water into the mine should be as per the approved Mining Plan and as per the permission of DGMS or any other authority as prescribed by the law.

(xi) The project proponent shall take all precautionary measures to ensure riverine/riparian ecosystem in and around the coal mine up to a distance of 5 km. A riverine/riparian ecosystem conservation and management plan should be prepared and implemented in consultation with the irrigation / water resource department in the state government.

**(d) Noise and Vibration monitoring and prevention**

(i) Adequate measures shall be taken for control of noise levels as per Noise Pollution Rules, 2016 in the work environment. Workers engaged in blasting and drilling operations, operation of HEMM, etc shall be provided with personal protective equipments (PPE) like ear plugs/muffs in conformity with the prescribed norms and guidelines in this regard. Adequate awareness programme for users to be conducted. Progress in usage of such accessories to be monitored.

(ii) Controlled blasting techniques shall be practiced in order to mitigate ground vibrations, fly rocks, noise and air blast etc., as per the guidelines prescribed by the DGMS.

(iii) The noise level survey shall be carried out as per the prescribed guidelines to assess noise exposure of the workmen at vulnerable points in the mine premises, and report in this regard shall be submitted to the Ministry/RO on six-monthly basis.

**(e) Mining Plan**

(i) Mining shall be carried out under strict adherence to provisions of the Mines Act 1952 and subordinate legislations made there-under as applicable.

(ii) Mining shall be carried out as per the approved mining plan (including Mine Closure Plan) abiding by mining laws related to coal mining and the relevant circulars issued by Directorate General Mines Safety (DGMS).

(iii) No mining shall be carried out in forest land without obtaining Forestry Clearance as per Forest (Conservation) Act, 1980.

(iv) Efforts should be made to reduce energy and fuel consumption by conservation, efficiency improvements and use of renewable energy.

**(f) Land reclamation**

(i) Digital Survey of entire lease hold area/core zone using Satellite Remote Sensing survey shall be carried out at least once in three years for monitoring land use pattern and report in 1:50,000 scale or as notified by Ministry of Environment, Forest and Climate Change(MOE/FC) from time to time shall be submitted to MOEFCC/Regional Office (RO).

(ii) The final mine void depth should preferably be as per the approved Mine Closure Plan, and in case it exceeds 40 m, adequate engineering interventions shall be provided for sustenance of aquatic life therein. The remaining area shall be backfilled and covered with thick and alive top soil. Post-mining land be rendered usable for agricultural/forestry purposes and shall be diverted. Further action will be treated as specified in the guidelines for Preparation of Mine Closure Plan issued by the Ministry of Coal dated 27<sup>th</sup> August, 2009 and subsequent amendments.

(iii) The entire excavated area, backfilling, external OB dumping (including top soil) and afforestation plan shall be in conformity with the "during mining"/"post mining" land-use pattern, which is an integral part of the approved Mining Plan and the FIA/EMP submitted to this Ministry. Progressive compliance status vis-a-vis the post mining land use pattern shall be submitted to the MOEFCC/RO.

(iv) Fly ash shall be used for external dump of overburden, backfilling or stowing of mine as per provisions contained in clause (i) and (ii) of subparagraph (8) of fly ash notification issued vide SO 2804 (E) dated 3rd November, 2009 as amended from time to time. Efforts shall be made to utilize gypsum generated from Flue Gas Desulfurization (FGD), if any, along with fly ash for external dump of overburden, backfilling of mines. Compliance report shall be submitted to Regional Office of MoEF&CC, CPCB and SPCB.

(v) Further, it may be ensured that as per the time schedule specified in mine closure plan it should remain live till the point of utilization. The topsoil shall temporarily be stored at earmarked site(s) only and shall not be kept unutilized. The top soil shall be used for land reclamation and plantation purposes. Active OB dumps shall be stabilised with native grass species to prevent erosion and surface run off. The other overburden dumps shall be vegetated with native flora species. The excavated area shall be backfilled and afforested in line with the approved Mine Closure Plan. Monitoring and management of rehabilitated areas shall continue until the vegetation becomes self-sustaining. Compliance status shall be submitted to the Ministry of Environment, Forest and Climate Change/ Regional Office.

(vi) The project proponent shall make necessary alternative arrangements, if grazing land is involved in core zone, in consultation with the State government to provide alternate areas for livestock grazing, if any. In this context, the project proponent shall implement the directions of Hon'ble Supreme Court with regard to acquiring grazing land.

**(g) Green Belt**

(i) The project proponent shall take all precautionary measures during mining operation for conservation and protection of endangered/ endemic flora/fauna, if any, spotted/ reported in the study area. The Action plan in this regard, if any, shall be prepared and implemented in consultation with the State Forest and Wildlife Department.

(ii) Greenbelt consisting of 3-tier plantation of width not less than 7.5 m shall be developed all along the mine lease area as soon as possible. The green belt comprising a mix of native species (endemic species should be given priority) shall be developed all along the major approach/ coal transportation roads.

**(h) Public hearing and Human health issues**

(i) Adequate illumination shall be ensured in all mine locations (as per DGMS standards) and monitored weekly. The report on the same shall be submitted to this ministry & it's RO on six-monthly basis.

(ii) The project proponent shall undertake occupational health survey for initial and periodical medical examination of the personnel engaged in the project and maintain records accordingly as per the provisions of the Mines Rules, 1955 and DGMS circulars. Besides regular periodic health check-up, 20% of the personnel identified from workforce engaged in active mining operations shall be subjected to health check-up for occupational diseases and hearing impairment, if any, as amended time to time.

(iii) Personnel (including outsourced employees) working in core zone shall wear protective respiratory devices and shall also be provided with adequate training and information on safety and health aspects.

(iv) Implementation of the action plan on the issues raised during the public hearing shall be ensured. The project proponent shall undertake all the tasks/measures as per the action plan submitted with budgetary provisions during the public hearing. Land owners shall be compensated as per the norms laid down in the R&R policy of the company/State Government/Central Government, as applicable.

(v) The project proponent shall follow the mitigation measures provided in this Ministry's OM No.Z-11013/5712014-IA.II (M) dated 29<sup>th</sup> October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease area'.

#### **(f) Corporate Environment Responsibility**

(i) Fund allocation for Corporate Environment Responsibility (CER) shall be made as per Ministry's O.M. No. 22-65/2017-IA.III dated 30<sup>th</sup> September 2020 and based on commitment made during public consultation process for incorporating in BIA-EMP for deliberation of TAC

(ii) The company shall have a well laid down environmental policy duly approved by the Board of Directors. The environmental policy should prescribe for standard operating procedures to have proper checks and balances and to bring into focus any infringements/deviation/violation of the environmental/forest/wildlife norms/conditions. The company shall have defined system of reporting infringements/deviation/violation of the environmental/forest/wildlife norms/conditions and/or shareholders/stake holders.

(iii) A separate Environmental Cell both at the project and company head quarter level, with qualified personnel shall be set up under the control of senior Executive, who will directly to the head of the organization.

(iv) Action plan for implementing EMP and environmental conditions along with responsibility matrix of the company shall be prepared and shall be duly approved by competent authority. The year wise funds earmarked for environmental protection measures shall be kept in separate account and not to be diverted for any other purpose. Year wise progress of implementation of action plan shall be reported to the Ministry/Regional Office along with the Six Monthly Compliance Report.

(v) Self environmental audit shall be conducted annually. Every three years third party environmental audit shall be carried out.

#### **(g) Miscellaneous**

(i) The project proponent shall make public the environmental clearance granted for their project along with the environmental conditions and safeguards at their cost by prominently advertising it at least in two local newspapers of the District or State, of which one shall be in the vernacular language within seven days and in addition this shall also be displayed in the project proponent's website permanently.



(ii) The copies of the environmental clearance shall be submitted by the project proponents to the Heads of local bodies, Panchayats and Municipal Bodies in addition to the relevant offices of the Government who in turn has to display the same for 30 days from the date of receipt.

(iii) The project proponent shall upload the status of compliance of the stipulated environment clearance conditions, including results of monitored data on their website and update the same on half-yearly basis.

(iv) The project proponent shall monitor the criteria pollutants level namely; PM<sub>10</sub>, SO<sub>2</sub>, NO<sub>x</sub> (ambient levels) or critical sectoral parameters, indicated for the projects and display the same at a convenient location for disclosure to the public and put on the website of the company.

(v) The project proponent shall submit six-monthly reports on the status of the compliance of the stipulated environmental conditions on the website of the ministry of Environment, Forest and Climate Change at environment clearance portal.

(vi) The project proponent shall follow the mitigation measures provided in this Ministry's OM No.Z-11013/5712014-IA.II (M) dated 29<sup>th</sup> October, 2014, titled 'Impact of mining activities on habitations-issues related to the mining projects wherein habitations and villages are the part of mine lease areas or habitations and villages are surrounded by the mine lease areas'.

(vii) The project proponent shall submit the environmental statement for each financial year in Form-V to the concerned State Pollution Control Board as prescribed under the Environment (Protection) Rules, 1986, as amended subsequently and put on the website of the company.

(viii) The project authorities shall inform to the Regional Office of the MOEFCC regarding commencement of mining operations.

(ix) The project authorities must strictly adhere to the stipulations made by the State Pollution Control Board and the State Government.

(x) The project proponent shall abide by all the commitments and recommendations made in the EIA/EEMP report, commitment made during Public Hearing and also that during their presentation to the Expert Appraisal Committee.

(xi) No further expansion or modifications in the plant shall be carried out without prior approval of the Ministry of Environment, Forests and Climate Change.

(xii) Concealing factual data or submission of false/fabricated data may result in revocation of this environmental clearance and attract action under the provisions of Environment (Protection) Act, 1986.

(xiii) The Ministry may revoke or suspend the clearance, if implementation of any of the above conditions is not satisfactory.

(xiv) The Ministry reserves the right to stipulate additional conditions if found necessary. The Company in a time bound manner shall implement these conditions.

(xv) The Regional Office of this Ministry shall monitor compliance of the stipulated conditions. The project authorities should extend full cooperation to the officer (s) of the Regional Office by furnishing the requisite data / information/monitoring reports.

(xvi) The above conditions shall be enforced, inter-alia under the provisions of the Water (Prevention & Control of Pollution) Act, 1974, the Air (Prevention & Control of Pollution) Act, 1981, the Environment (Protection) Act, 1986, Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016 and the Public Liability Insurance Act, 1991 along with their amendments and Rules and any other orders passed by the Hon'ble Supreme Court of India / High Courts and any other Court of Law relating to the subject matter.

5. The proponent shall abide by all the commitments and recommendations made in the EIA/EEMP report and also that during presentation to the EAC. All the commitments made on the issues raised during public hearing shall also be implemented in letter and spirit.

6. The proponent shall obtain all necessary clearances/approvals that may be required before the start of the project. The Ministry or any other competent authority may stipulate any further condition for environmental protection. The Ministry or any other competent authority may stipulate any further condition for environmental protection.

7. Any appeal against this environmental clearance shall lie with the National Green Tribunal, if preferred, within a period of 30 days as prescribed under Section 16 of the National Green Tribunal Act, 2010.

8. The coal company/project proponent shall be liable to pay the compensation against the illegal mining, if any, and as raised by the respective State Governments at any point of time, in terms of the orders dated 2<sup>nd</sup> August, 2017 of Hon'ble Supreme Court in WP (Civil) No.114/2014 in the matter of 'Common Cause Vs Union of India & others

9. The concerned State Government shall ensure no mining operations to commence till the entire compensation for illegal mining, if any, is paid by the project proponent through their respective Department of Mining & Geology, in strict compliance of the judgment of Hon'ble Supreme Court.

10. This environmental clearance shall not be operational till such time the project proponent complies with the above said judgment of Hon'ble Supreme Court, as applicable, and other statutory requirements.

11. All the conditions stipulated in earlier Environment Clearance vide letter No J-11015/1000/2007-IA-I(VI) dated 27.04.2010 shall be complied.

This issue with approval of the competent Authority.



**(Lalit Bokolia)**  
**Director**

**Copy to:**

1. The Secretary, Ministry of Coal, Shastri Bhawan, New Delhi
2. Deputy Director General of Forests (C), Ministry of Env., Forest and Climate Change, Integrated Regional Office, Aranya Bhawan, North Block, Sector-19 Naya Raipur, Aral Nagar, Chhattisgarh - 492002
3. The Chairman, Chhattisgarh State Environment Conservation Board, 1-Tilak Nagar, Shiv Mandir Chowk, Main Road, Avanti Vihar, Raipur-Chhattisgarh- 492001
4. The Member Secretary, Central Pollution Control Board, CBD-cum-Office Complex, East Arjun Nagar, New Delhi - 32
5. The Chairman, Central Ground Water Authority, Ministry of Jal Shakti, Jammagar House, 18/11, Man Singh Road Area, New Delhi, Delhi 110001
6. The District Collector, Raigarh, Government of Chhattisgarh.
7. Monitoring File/Guard File/Record File.
8. PARIVESH Portal



**(Lalit Bokolia)**

Signature Not Verified

Digitally signed by Lalit Bokolia  
Scientist F

Date: 8/2/2022 2:37:11 PM



South Eastern Coalfields Limited  
"A Mini Ratna Company"  
A Subsidiary of Coal India Ltd.)  
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G.M. Office (forest & Env't)  
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M.NO. - 9425282388  
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Annexure-A

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGII/S.O. (P&P)/2022/33

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(i) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that legal status of the diverted forest land of 240.867 Ha. (185.017 Ha. of Revenue Forest Land + 55.850 Ha. of Deemed Forest Land) of the project remains unchanged.

*Handwritten signature*  
General Manager,  
Raigarh Area, SECL  
SECL, Raigarh Area



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Annexure-09

CIN-U10102CT1985GO1003161


Ref: - SECL/GM/RGH/S.O. (P&P)/2022/ 53

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition A(xiii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall carry out the undermentioned activities at the project cost for the management of safety zone as per the relevant guidelines issued by the MOEF & CC.

- Ensure demarcation of safety zone (7.5-meter strip all along the inner boundary of the mining lease area), and its fencing, protection and regeneration by erecting adequate number of 6 feet high RCC boundary pillars inscribed with DGPS coordinates with barbed wire fencing and deploying adequate number of watchers under the supervision of the State Forest Department.
- Boundary of the safety zone of the mining lease, adjacent to habitation/roads shall be properly fenced.
- Safety zone shall be maintained as green belt around mining lease and to ensure dense canopy in the area, regeneration shall be taken up in this area at the project cost under the supervision of the State Forest Department.
- Along with the State Forest Department shall ensure that safety zone is maintained as per the prescribed norms.
- Deposit the cost of felling of trees with the State Forest Department.

  
General Manager,  
Raigarh Area, SECL  
SECL, Raigarh Area



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Annexure-07

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/52

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition A(xi) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall carry out gap plantation and soil & moisture conservation activities through CGRVVN, CG to restock and rejuvenate the degraded open forests (having crown density less than 0.40), if any, located in the area within 100 meters from outer perimeter of the mining lease.

  
General Manager,  
Raigarh Area, SECL  
General Manager  
एल.ई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area



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Annexure-06

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGII/S.O. (P&P)/2022/51

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition A(x) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall carry out the undermentioned activities in the mining lease area of the project as per the approved soil & moisture conservation Plan.

- (a) Mitigative measures to minimize soil erosion and choking of stream shall be implemented within a period of three years with effect from the issue of Stage-II clearance in accordance with the approved Plan in consultation with the State Forest Department.
- (b) Planting of adequate drought hardy plant species and sowing of seeds, in the appropriate area within the mining lease to arrest soil erosion in accordance with the approved scheme.
- (c) Construction of check dams, retention /toe walls to arrest sliding down of the excavated material along the contour in accordance with the approved scheme.
- (d) Stabilize the overburden dumps by appropriate grading/benching, in accordance with the approved scheme, so as to ensure that angles of repose at any given place is less than 28°; and
- (e) No damage shall be caused to the top-soil and will follow the top soil management plan.

  
General Manager,  
Raigarh Area SECL  
एस. ई. सी. एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area



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Annexure-S


CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/ 50

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xix) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall submit the annual self-compliance report in respect of the conditions stipulated in Stage-I Forest Clearance of the project to the State Government, concerned Regional Office and to this Ministry by the end of March every year regularly.

  
General Manager,  
Raigarh Area, SECL

General Manager  
एल.ई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area





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Annexure-R

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/49

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xviii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall not violate of any of the conditions stipulated in Stage-I Forest Clearance granted to the project and shall be responsible for legal action that would be taken as prescribed in para 1.21 of Chapter 1 of the Handbook of comprehensive guidelines of Forest (Conservation) Act, 1980 as issued by this Ministry's letter No. 5- 2/2017-FC dated 28.03.2019 as violation of any of the said conditions will amount to violation of Forest (Conservation) Act, 1980.

  
General Manager,  
Raigarh Area, SECL  
SECL, Raigarh Area



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Annexure-Q


CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/ 48

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xvii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall comply with all the provisions of all the Acts, Rules, Regulations, Guidelines, Hon'ble Court Order (s) and NGT Order (s) pertaining to this project, if any, for the time being in force, as applicable to the project.

  
General Manager,  
Raigarh Area, SECL

महाप्रबन्धक  
General Manager  
एस.ई.सी.एन.एन. क्षेत्र  
SECL, Raigarh Area



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Annexure-P

CLN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/ 47

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xvi) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall comply with the provisions of any other condition that the concerned Regional Office of this Ministry may stipulate with the approval of competent authority in the interest of conservation, protection and development of forests & wildlife.

*[Handwritten Signature]*  
General Manager,  
Raigarh Area SECL  
General Manager  
ए.ए. रा. अ. रा. रा. क्षेत्र  
SECL, Raigarh Area



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Annexure-O


CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/46

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xv) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that no damage to the flora and fauna of the adjoining area to the project is caused due to mining.

  
General Manager,  
Raigarh Area, SECL  
SECL, Raigarh Area



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Annexure-N

CIN-U10102CT1985GO1003161


Ref: - SECL/GM/RGII/S.O. (P&P)/2022/45

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xiv) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that the forest land of 240.867 Ha. of the project proposed to be diverted is not transferred to any other agency, department or person without prior approval of the Central Government.

  
General Manager,  
Raigarh Area, SECL

  
प.स.ई.जी. राय, रायगढ़ क्षेत्र  
SECL, Raigarh Area



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Annexure-M

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/ 44

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xiii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that the layout plan of the mining plan/proposal is not changed without the prior approval of the Central Government and the forest land is not used for any purpose other than that specified in the proposal.

  
General Manager,  
Raigarh Area, SECL  




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Annexure-L

CLN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/48

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that the boundary of the diverted forest land, mining lease and safety zone, as applicable, is demarcated on ground at the project cost, by erecting four feet high reinforced cement concrete pillars, each inscribed with its serial number, distance from pillar to pillar and GPS coordinates.

  
General Manager,  
Raigarh Area, SECL  
General Manager  
एस.ई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area



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Annexure-K

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/42

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(xi) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that no labour camp is established on the forest land and alternate fuels preferably domestic gas to the labourers and the staff working at the site is provided so as to avoid any damage and pressure on the nearby forest areas.

  
General Manager,  
Raigarh Area, SECL  
General Manager  
राजई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area





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CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/41

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(ix) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall comply with the statutory provisions in connection with the validity of period of approval of forest diversion proposal of 240.867 Ha. which shall be co-terminus with the period of validity of the mining lease if, granted under the Mines and Minerals (Development and Regulation) Act, 1957, as amended and the Rules framed there-under.

*[Handwritten Signature]*  
 General Manager  
 Raigarh Area, SECL  
 SECL, Raigarh Area



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Annexure-H

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/40

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(viii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall undertake mining in a phased manner after taking due care for reclamation of the mined over area. Further, this is to undertake that the concurrent reclamation plan as per the approved mining plan shall be executed by the Mine Management from the very first year, and an annual report on implementation thereof shall be submitted to the Nodal Officer, Forest (Conservation) Act, 1980, Government of Chhattisgarh and Integrated Regional Office, Raipur.

  
General Manager,  
Raigarh Area, SECL  
General Manager  
राइगराह क्षेत्र  
SECL, Raigarh Area



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Annexure-G

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/89

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(vii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall comply with the Hon'ble Supreme Court order on re-grassing and re-grass the mining area and any other areas which may have been disturbed due to mining to restore them to a condition which is fit for growth of fodder, flora, fauna, etc. in a timely manner.

  
General Manager,  
Raigarh Area SECL  
SECL, Raigarh Area



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Annexure-F

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGII/S.O. (P&P)/2022/38

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(vi) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall explore the possibility of translocation of maximum number of trees identified to be felled and shall ensure that any tree felling is done only when it is unavoidable and that too under strict supervision of the State Forest Department.

  
General Manager,  
Raigarh Area, SECL  
General Manager,  
रायगढ़ क्षेत्र, सीएल  
SECL, Raigarh Area



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Annexure-E

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/37

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(v) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that trees are felled in phased manner as per the requirement in the approved Mining Plan with prior permission of DFO, Dharamjaigarh, (C.G.).

  
General Manager,  
Raigarh Area, SECL  
General Manager,  
ए.स.ए.ए. रावगाड़ क्षेत्र  
SECL, Raigarh Area



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Annexure-D

CIN-U10102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/36

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(iv) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall pay the additional amount of NPV, if so determined, as per the final decision of the Hon'ble Supreme Court of India to already paid NPV amount of Rs.29,36,77,168.86 in Chattisgarh State CAMPA A/C No. 150645816237745, IFSC Code-UBIN0996335 vide UTR No.UTIBR52022090100354111, dtd.31.08.2022 for the diversion of 240.867 Ha. of forest land (Rs. 22,50,60,417.36 for 185.017 Ha. of Revenue Forest land and Rs. 6,86,16,751.50 for 55.850 Ha. of Deemed Forest land), as per the guidelines issued by this Ministry vide its letters No. 5-3/2011-FC (Vol.) dated 06.01.2022 read with letter dated 22.03.2022.

  
General Manager,  
Raigarh Area, SECL  
SECL, Raigarh Area



South Eastern Coalfields Limited  
"A Mini Ratna Company"  
A Subsidiary of Coal India Ltd.)  
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Annexure-C

CIN-UI0102CT1985GO1003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/35

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(iii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that a minimum of 120 meters distance from the bank of Mand River is kept as intact and no mining is carried out in this area. Further, it shall be ensured that embankment is constructed for the protection of the river and its hydrology from the mining.

  
General Manager,  
Raigarh Area, SECL  
General Manager,  
एस.ई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area



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Annexure-B

CIN-UI0102CT1985G01003161

Ref: - SECL/GM/RGH/S.O. (P&P)/2022/34

Date: - 17/10/2022

## //UNDERTAKING//

In reference to condition B(ii) of the Stage-I Forest Clearance granted to Chhal OC Seam-III 6.0 MTY Project by MOEF & CC, GOI, New Delhi vide letter no. 8-15/2021-FC, dtd.06.07.2022, this is to undertake that the Mine Management/Project Proponent of Chhal OC Seam-III 6.0 MTY Project shall ensure that compensatory afforestation over orange forest land, double in extent to the forest land being diverted, is raised by the State Forest Department at the project cost within three years from the date of grant of Stage - II approval.

  
General Manager,  
Raigarh Area, SECL  
General Manager  
एस.ई.सी.एल., रायगढ़ क्षेत्र  
SECL, Raigarh Area