

## REVIEW of Site-specific Wildlife Management Plan (January 2021) of North Koel Reservoir Project (Mandal Dam)



JULY 2021



भारतीय वन्यजीव संस्थान  
Wildlife Institute of India



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## **EXECUTIVE SUMMARY**

This review consists of three parts. In the first part, largely through secondary sources, we provide a background of the North Koel Reservoir Project and information on Palamau Tiger Reserve (PTR) where the project is situated. We mention how the task of reviewing the Site-specific Wildlife Management Plan (January 2021) in lieu of diversion of 1007.29 hectares area (ha) of forest land for the project came to the Wildlife Institute of India (WII). We also describe our review objectives, methodology and approach towards the task, as well as limitations, as communicated to the Department of Forest, Environment & Climate Change, Government of Jharkhand. In the second part, we first provide general comments and observations on the plan and thereafter chapter-wise analyse and evaluate the same, with respect to our objectives and based on relevant guidelines framed and circulated by the office of the Principal Chief Conservator of Forests (Wildlife) and Chief Wildlife Warden (CWLW), Government of Jharkhand in this regard in 2015. We provide detailed observations and suggestions towards strengthening each chapter. We then mention details of our field visit including our learnings and insights gained from interactions with different stakeholders. In the third and concluding part, we provide recommendations towards improving the plan to benefit inhabiting wildlife and ecosystems in and around the project site and in its impact zone, as well as PTR as a whole. The second and third parts, thus, contain primary inputs in the form of actionable comments and suggestions from WII. We recommend a multi-seasonal year-long biodiversity assessment in the project impact zone. We also suggest exercising caution and applying scientific rationale in the use of barriers to reduce negative human-wildlife interactions and/ or to limit illegal activities. We also recommend setting aside budget towards empowering ecodevelopment committees in various management and conservation activities; upgrading facilities, providing training, equipment and field gear, and welfare for frontline staff (both temporary and permanent); and a comprehensive research program for PTR. We recommend drawing up detailed plans for ecotourism in PTR, providing alternative livelihood opportunities for the local indigenous population, habitat creation and habitat management towards wild herbivores' population augmentation etc to enable further scrutiny of such plans, among other suggested interventions. Relevant appendices are provided towards the end.

### **Acknowledgement**

We thank the Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden, Jharkhand, Shri. Rajiv Ranjan, IFS for providing us with the opportunity to review the site-specific wildlife management plan (January 2021) in lieu of forestland diversion in the North Koel reservoir project. We are indebted to the DFO (Core Area/ North Division), PTR, Shri. Ashish Kumar, IFS for helping us with logistics during field work, providing relevant data as and when we required them, and for useful discussions on PTR and its management challenges. We thank Shri. Manish Bakshi (GIS expert, PTR) for his help with required GIS layers and other information on PTR. We are grateful to the Field Director (PTR), DFO (Buffer Area/ South Division, PTR), all Range Officers and forest staff that aided us during our field visit. We also thank Prof. Qamar Qureshi (Scientist, WII) for help with additional data related to PTR, and Mr. Udhayaraj AD (GIS specialist, WII) for help with additional GIS layers. The review benefitted from useful comments regarding certain critical aspects by Mr. N. Lakshminarayanan (Project Scientist, WII) and Dr. Sreedhar Vijaykrishnan (Scientist, Centre for Wildlife Studies, Bengaluru). We are grateful for the support and encouragement of the Dean and Director of WII.

## **PART I – BACKGROUND**

### **1. North Koel Reservoir Project**

The North Koel Reservoir Project (hereafter “project”) was conceived at village Mandal, Block Barwadih, Latehar district in the 1960s while the project’s construction began in 1970-71 by the Irrigation Department of then undivided State of Bihar. The dam, constructed in a gorge of River North Koel – a tributary of River Son – was initially conceived at Full Reservoir Level (FRL) 364.82 m height from which water was to be released to augment Mohammadganj barrage located about 96 km downstream of the dam. The bed level of the river is about 305 m while the Dead Storage Level (DSL) is at 330 m. The project was to primarily bring irrigation benefits to residents of Aurangabad, Gaya (both in Bihar) and Palamau (now in Jharkhand) districts. A 24 MW hydro-electricity generation scheme was also planned but was later dropped. The project, as initially conceived, was to submerge 23 villages within the reservoir area in Palamau Tiger Reserve (PTR). The project received clearance from Project Tiger, Government of India (GoI) in 1978 with five conditions for compliance. Construction work started before Forest (Conservation) Act, 1980 (FCA) was enacted and almost every structure was created, except the installation of sluice gates and spillway (Figure 1). However, the process of forest diversion, initiated in 1982 after the FCA was enacted for forest land measuring 4,170.48 ha, was not completed as the GoI had sought certain clarifications which could not be complied with to the satisfaction of the Ministry of Environment and Forest (MoEF). The project received Environment Clearance (EC) in 1984 from the GoI with eight conditions for compliance. In 1986, GoI had again asked for clarification on 14 points, which was not provided. Hence, when the irrigation department/ dam authorities tried to install the sluice gate in 1993, PTR management did not allow the same and initiated action under the FCA and reported the matter to the GoI which ordered all construction activity to be stopped and action to be taken against violations. Since then and until today, the partially completed project is irrigating 71,720 ha land in the states of Bihar and Jharkhand (kharif and rabi seasons combined).

After the erstwhile undivided state of Bihar was partitioned in 2000, PTR and hence the area in consideration – the dam’s headworks and barrages – was included in the new successor state of Jharkhand. Hence, Government of Jharkhand’s Water Resources Department (WRD), vide a letter to MoEF in 2009, furnished information on 14 points sought in 1986 by the GoI in a bid to complete the project. A proposal for diversion of 6,023.53 ha of forest land was also submitted. Since this submission involved the diversion of 6,023.53 ha – different than the original proposal of 4,170.48 ha – it went against Para 4.14 (i)(c) of guidelines issued under FCA. Since the proposal also involved compromising huge areas of PTR, the Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden (CWLW) of Jharkhand referred to judgements of the Hon’ble Supreme Court in W.P. 202 of 1995 (Godavarman Thirumulpad vs Union of India) wherein diversion of land under National Park/ Wildlife Sanctuary cannot be permitted without the prior approval of the National Board for Wild Life (NBWL) and the Hon’ble Supreme Court.

A meeting was called by the GoI in January 2015 under the Chairmanship of Director General (Forests) attended by Members of Parliament (MPs), officers from the National Tiger Conservation Authority (NTCA) (ADG and Member Secretary), and officers of Bihar and Jharkhand state governments. It was resolved that the approval of NTCA, NBWL and Hon'ble Supreme Court must be obtained before a revised proposal is submitted under FCA by the WRD, Govt. of Jharkhand in accordance with rules and guidelines on the subject issued by GoI. A subsequent meeting in May 2015 under the Chairmanship of Hon'ble Union Minister of Environment, Forest and Climate Change (MoEF&CC) held at Parliament House resolved to initiate (by State Govt. of Jharkhand) the process of submitting fresh proposals to seek environment, wildlife and forest clearances under Environment (Protection) Act, 1986 (EPA), Wild Life (Protection) Act, 1972 (WLPA) and FCA, respectively and simultaneously, after due recommendation from the Jharkhand State Board for Wild Life (SBWL). Other noteworthy decisions taken in this meeting included NTCA constituting a new committee – upon submission of wildlife/ project tiger clearance proposals – with experts from hydrology, irrigation, and agriculture in addition to experts in forests and wildlife, to assess impacts of the project on PTR and its inhabiting wildlife; and that all inter-state issues with respect to the project be resolved by the states concerned through inter-state dialogue and discussion. In August 2015, based on recommendations of the NTCA, the Executive Engineer, Organisation & Monitoring Division, Medininagar informed that Govt. of Bihar had agreed to decrease the FRL of the project from 367.25 m to 362.28 m, thereby reducing the submergence area within PTR from 5113.36 ha to 4253.68 ha.



Figure 1: A view of the almost complete Mandal dam on North Koel River near village Kutku, PTR

In August 2016, a meeting chaired by Principal Secretary to the Prime Minister at South Block, New Delhi discussed the North Koel Reservoir Project, attended by Hon'ble MPs, CEO of Niti Aayog, representatives from Union ministries of Water Resources, River

development and Ganga rejuvenation (MoWR), Power (MoP) and MoEF&CC; Central Water Commission (CWC), representatives from department of water resources of Bihar and Jharkhand states, and Chief Engineer (Irrigation) of Jharkhand. Following a presentation made by MoWR and ensuing discussions, some key decisions taken during this meeting were as follows:

1. In-principle decision to complete the project;
2. The ponding level to be kept at 341 m (MDDL);
3. For this ponding, the Government of Jharkhand must estimate and submit to the CWC:
  - a. submergence with ground-truthing;
  - b. project design; and
  - c. execution plan.
4. Government of Jharkhand will submit offline application for forest clearance, and such an application must mention issue of 1164.53 ha of forest submergence for compensatory afforestation;
5. In consultation with the State Govt. of Bihar, Govt. of Jharkhand will submit another application to MoEF&CC for exemption from compensatory afforestation of the submergence area of 1164.53 ha by making a strong case for the same;
6. MoWR to verify if the project was ever approved under AIBP and releases made, and thereby appropriate action to be taken based on findings; and
7. NITI Aayog will review progress and send report within a month.

Following this meeting, necessary actions at all levels were initiated by the Government of Jharkhand. Details regarding completion of remaining works in the reservoir project is supplied in Appendix 1. Upon completion of the project at the revised FRL of 341.0 m, it is estimated that resultant availability of water will help irrigate up to a total 1,11,521 ha of land in the two states (kharif and rabi seasons combined), which is 39,801 ha more than what the incomplete project already provides as of today (71,720 ha). Under the revised FRL, the project proponent claims that only eight villages will be affected – three with full submergence and five others with partial submergence – and will require the cutting of an estimated 3.44 lakh trees in the submergence zone. Subsequently, an MoU was signed in January 2018 between the Union Water Resource Ministry and State Governments of Bihar and Jharkhand for completion of balance works of the project at an estimated cost of 1622.27 crores. The Hon'ble Prime Minister of India laid the foundation stone of the project in January 2019. The present status of forest, environment and wildlife clearances is as follows.

1. Forest Clearances – Stage I and Stage II clearances in lieu of diversion of 1007.29 ha of forest land and 630.66 ha of non-forest land (FRL 341.0 m) (Figure 2) obtained with conditions, proposal was submitted offline. Both Stage I and Stage II FC are available as appendices 2 and 3, respectively.
2. Environment Clearance – Environment clearance already obtained in 1984 was deemed as valid till date, see appendices 4 and 5.

3. Wildlife Clearance – NBWL’s Standing Committee (SC-NBWL) has positively appraised the project, after being recommended for approval by the Jharkhand SBWL, with conditions for compliance as recommended by the CWLW (Jharkhand) and SC-NBWL’s site inspection committee (Appendix 6), during SC-NBWL’s 43<sup>rd</sup> meeting (Appendix 7); some conditions were later waived off/ amended during SC-NBWL’s 51<sup>st</sup> meeting (Appendix 8).

## 2. Palamau Tiger Reserve

Palamau Tiger Reserve was one of the first nine tiger reserves established at the launch of Project Tiger in 1973 by the Government of India, and was notified in 1974. PTR is located in the western part of the Chhotanagpur Plateau and is spread over 1129.93 km<sup>2</sup> area comprising majority parts of Palamau Sanctuary (979.27 km<sup>2</sup>) and Betla National Park (226.32 km<sup>2</sup>), in the districts of Latehar and Garhwa of Jharkhand. Biogeographically, Chhotanagpur plateau forms the northern limit of Peninsular India that lies within the Paleotropic region. In their biogeographic classification of India, Rodgers and Panwar (1988) recognised this plateau as part of province 6B (Deccan Peninsula). PTR’s immediate adjoining landscape includes forests of Mahuadanr Range (towards south) – including Mahuadanr Wolf Sanctuary (under PTR management) – and forests of Bhandaria and Ranka East ranges of Garhwa Forest Division which are contiguous with the Balrampur Forest Division of Surguja Circle in Chhattisgarh (towards west) (Figure 3). The forests of Latehar Forest Division are on the eastern side, while there is connectivity with forests of Medininagar Forest Division in the northeastern part of the reserve. The altitudinal variation in the reserve ranges from 200 m to 1140 m above mean sea level (mainly along north-south axis) with a generally undulating terrain (Rawat 2015). According to the All India Tiger Estimation (AITE) exercise of 2010, PTR was estimated to have a mean population of ten adult tigers (range 6-13) with tiger occupancy spread over 1,116 km<sup>2</sup> (Jhala *et al.* 2011). In the exercise’s 2014 cycle however, based on scat samples, a population of only three tigers was estimated (Jhala *et al.* 2015). At present, except for transient tigers moving through the landscape, PTR does not have any resident tiger population (DFO Core Area, *pers. comm.*), and none were detected during AITE 2018 either (Jhala *et al.* 2020). However, one tiger was photo-captured and evidence of tiger signs recorded from PTR in between January and August 2019 (Jhala *et al.* 2020), while they have been occasionally spotted/ reported in and around PTR in the last two years (Ranjan 2020, Dey 2021).

PTR is surrounded by and forms the catchment of rivers North Koel (on its west) – along with its tributaries Burha and Aksi – and Auranga (on its north). Many streams – both seasonal and perennial – and *nallahs* crisscross the reserve, and all major rivers form extensive alluvial deposits in the valley areas where most cultivation is practiced. The forests of PTR Circle provide several ecosystem benefits to people residing in the larger region by augmenting rainfall (thus promoting ground water recharge), reducing soil erosion and regulating microclimate. The climate in and around PTR can be characterised by hot summers (March to June) with temperatures reaching up to 50° C,

humid monsoon (July to September), and cold winters (November to February) where temperature may drop to near freezing point with occasional occurrence of frost. The rainfall is higher in southern portion of the reserve than the northern portion with the mean annual rainfall estimated at 1075 mm. The region experiences periodic drought, observed approximately every five years. The area is dry, and humidity is low during March to early May. Most of the human population living in and around PTR is tribal and include members of certain Constitutionally-protected particularly vulnerable tribal groups (PVTGs) – such as Nagesia, Parahiya – as well. A few prominent tribal groups include Oraon, Kherwar, Korwa, Munda and Birjia. Villagers have always been and are still directly and substantially dependent on forest resources such as fuelwood and non-timber forest produce to sustain their lives and livelihoods. Eight forest villages – Ramandag, Latu, Kujrum, Bijaypur, Ghutuwa, Gopkhanr, Pandra and Henar – exist within the Core/ Critical Tiger Habitat (CTH) and these villages along with 191 villages around PTR populate the buffer area. Another 207 villages exist within a zone of 5 km from the reserve boundary (Rawat 2015). The Ranchi-Mughalsarai railway track – carrying large amounts of coal apart from passengers – passes through the PTR with stops at Barwadih, Chipadohar, Hehegara and Kumandih. Similarly, the Daltonganj-Mahuadanr-Netarhat-Ranchi SH9 almost bisects the reserve. The Ranchi-Daltonganj NH75 passes through the northern fringes of the reserve (Rawat 2015). Some of PTR area is inaccessible due to internal security strife, thus many Central Reserve Police Force (CRPF) pickets/ camps have been established in and around the reserve.

As per Champion and Seth (1968), forests in PTR belong to two main types – tropical moist deciduous forest and northern tropical dry deciduous forest – and five sub-types of forests viz., moist peninsular Sal, dry peninsular Sal, northern dry mixed deciduous, aegle and dry bamboo brake. Some of the more important trees and grasses include *Shorea robusta*, *Terminalia tomentosa*, *Adina cordifolia*, *Lagerstroemia parviflora*, *Acacia catechu*, *Bombax ceiba*, *Butea monosperma*, *Buchanania lanzan*, *Phoenix sylvestris*, *Aegle marmelos*, *Dendrocalamus strictus*, *Gmelina arborea*, *Madhuca longifolia*, *Ziziphus jujuba* etc (Rawat 2015). PTR Tiger Conservation Plan (TCP) (2013-14 to 2022-23) mentions the presence of many endangered, rare and threatened species of flora and fauna, including 97 species of important seed bearing plants, 139 species of medicinal plants, 49 species of shrubs and herbs, 30 species of climbers, semi-parasites and orchids, 18 species of grasses, 39 species of mammals, 205 species of birds and 28 species of amphibians and reptiles (Rawat 2015, MoEF&CC 2019). Some keystone and principal faunal species found in the area include the tiger *Panthera tigris*, Asiatic elephant *Elephas maximus*, Leopard *Panthera pardus*, Indian wolf *Canis lupus pallipes*, Asiatic wild dog *Cuon alpinus*, Gaur *Bos gaurus*, sloth bear *Melursus ursinus*, Four-horned Antelope *Tetracerus quadricornis*, Honey badger *Mellivora capensis* etc.

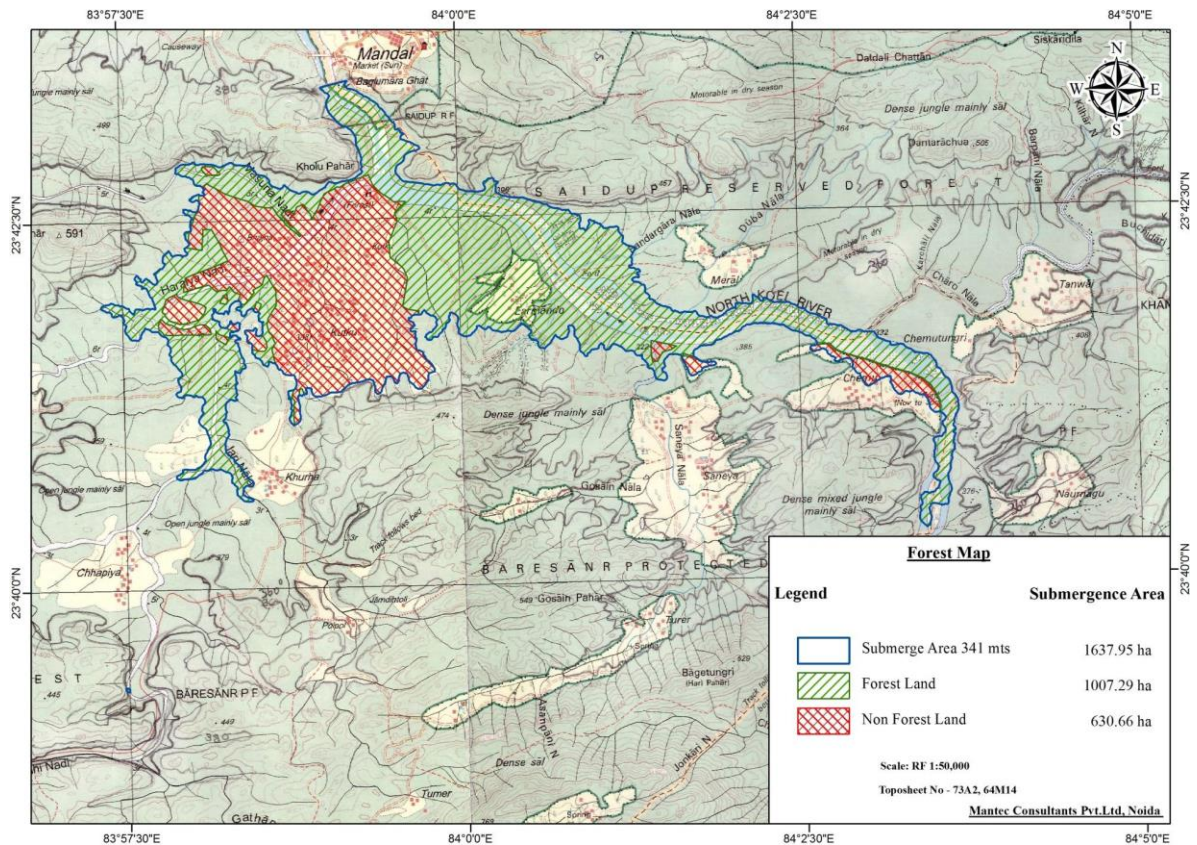


Figure 2: Map of submergence area at FRL 341.0 m, as prepared by WRD consultants and submitted to regulatory authorities, showing diverted forest and non-forest land within PTR for the project

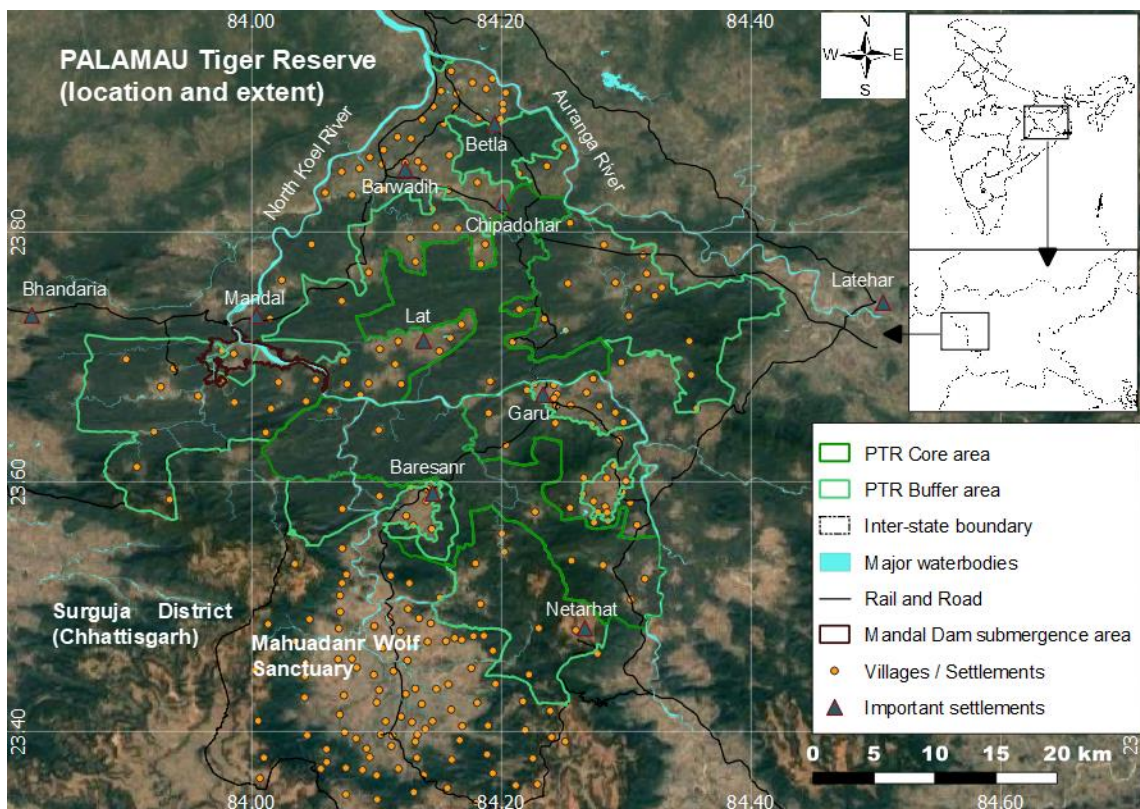


Figure 3: Map depicting location and extent of PTR core and buffer areas along with the submergence area (of Mandal dam at 341 m FRL) and settlements/ villages in and around PTR, overlaid on satellite image courtesy Google Earth (2020)

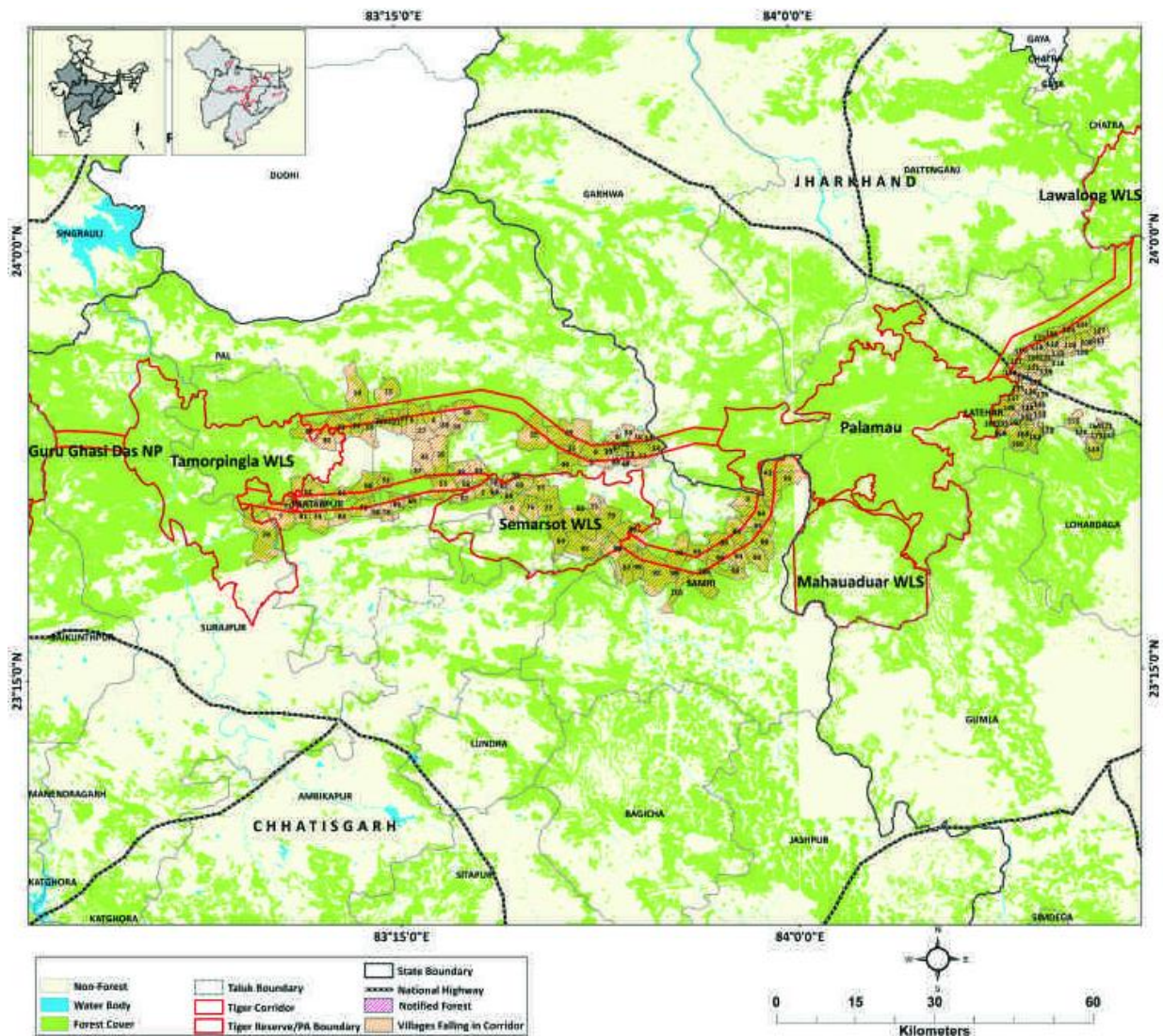


Figure 4: Corridors/Least cost pathway for tiger movement between Guru Ghasidas-Palamau-Lawalong protected areas overlaid with village map (Image/ Figure from Qureshi *et al.* 2014)

PTR's landscape and forest-scape connectivity extends to and form part of one of the largest tiger metapopulation in the world – the Central Indian and eastern tiger landscape unit – through Semarsot WLS-Temorpingla WLS-Guru Ghasidas NP-Sanjay NP all the way up to Bandhavgarh TR (Figure 4). PTR is also connected to the Achanakmar-Kanha Tiger Landscape through the Jashpur and Mahan Forests of Chhattisgarh. The connectivity also extends to Similipal Tiger Reserve, Odisha through Palkot WLS-Simdega-Porahat-Saranda (West) and Singhbhum (East) forests, and this has particular significance with respect to genetic connectivity (Kolipakam *et al.* 2019). Connectivity with forests of Bihar and West Bengal is through Lawalong WLS-Gautam Buddha WLS-Hazaribag WLS-Koderma WLS and Dalma WLS (Figure 4). PTR was one of the source tiger populations in the landscape, but now needs to chart its tiger revival strategy through scientific habitat management, increased patrolling/ protection, prey population augmentation and tiger reintroduction (Jhala *et al.* 2020).

### **3. WII's Role, Objectives & Methodology adopted in Reviewing the Site-specific Wildlife Management Plan (January 2021)**

Wildlife Institute of India (WII), Dehradun received a letter (no. 169, dated 21 January 2021) from the office of the PCCF (Wildlife) & CWLW, Jharkhand (Appendix 9) requesting the Institute to vet the Site-specific Wildlife Management Plan (January 2021) in relation to the diversion of 1007 ha of forest land for the North Koel dam project in Jharkhand, prepared by the user agency in consultation with PTR management, and as per condition no. 13 mentioned in the Stage II Forest Clearance granted by GoI. The nodal officer of Environment Impact Assessment (EIA) Cell at WII drafted a concept proposal for the same detailing WII's deliverable and role with a work plan and budget. A detailed review of the plan with emphasis on methods followed, mitigation and management strategies recommended therein was proposed to be undertaken. The work plan included a brief field visit and a total time of three months for the review, with an estimated budgetary requirement of INR 3,99,050. This was communicated to the CWLW by the Director, WII through a letter (no. WII/EIA cell/North Koel Dam, dated 27 January 2021) requesting release of required funds to initiate the review (Appendix 10). On the transfer of funds from the Department of Environment, Forest and Climate Change, Government of Jharkhand in March 2021 for this purpose, WII initiated the review.

WII's objective in reviewing the plan is restricted to providing constructive comments and suggestions – based on a critical appraisal of the plan, learnings from the field visit, and from discussions with stakeholders – to improve the same for the benefit of inhabiting wildlife that will be displaced/ disturbed by the reservoir project. This review does not in any way imply the Institute's endorsement/ rejection of any already approved plan. Since statutory approvals for the project have either already been obtained or proposals for the same have been submitted to relevant agencies, WII will not comment on the feasibility and/ or utility of the project with respect to potential damage caused to environment and wildlife of PTR and adjoining landscape.

For this review, WII has followed a step-wise approach:

1. Literature review of and regarding Palamau Tiger Reserve and surrounding forested landscape, especially concerning its floral and faunal aspects – both historical and current; applicable laws, rules, regulations, guidelines, and court orders in the context of PTR. This was done throughout the study/ review period.
2. Short-term field visit to ascertain current situation on ground, interact with stakeholders (PTR management, PTR field staff, villagers in dam submergence area, consultant who compiled the plan) and gain a nuanced understanding of issues concerning PTR. This field visit was conducted during April 15 to May 02, 2021, by Shri Rohit Jha, Senior Project Associate, WII with the support of PTR management.

3. Obtain relevant and more detailed information (maps, figures, other data, documents etc) regarding the project, the plan itself, and regarding various managerial aspects of PTR, from PTR management and subject experts within WII. We obtained relevant data in this regard from PTR authorities in June 2021.
4. Compare the site-specific plan chapter-wise vis-à-vis its stated objectives and relevant guidelines from the PCCF (Wildlife) & CWLW's office (Appendix 11), understand information gaps, inaccuracies, and inconsistencies, update the same (wherever possible) using existing information and reviews in the public domain and/ or with WII, and provide specific comments and insights. Relevant authority to whom this review will be submitted may affect required budgetary and/ or other changes in the site-specific plan derived from our comments and recommendations.
5. Incorporate advice and inputs from domain experts within and outside WII to further strengthen and finalise the review with actionable suggestions towards improving the site-specific plan.

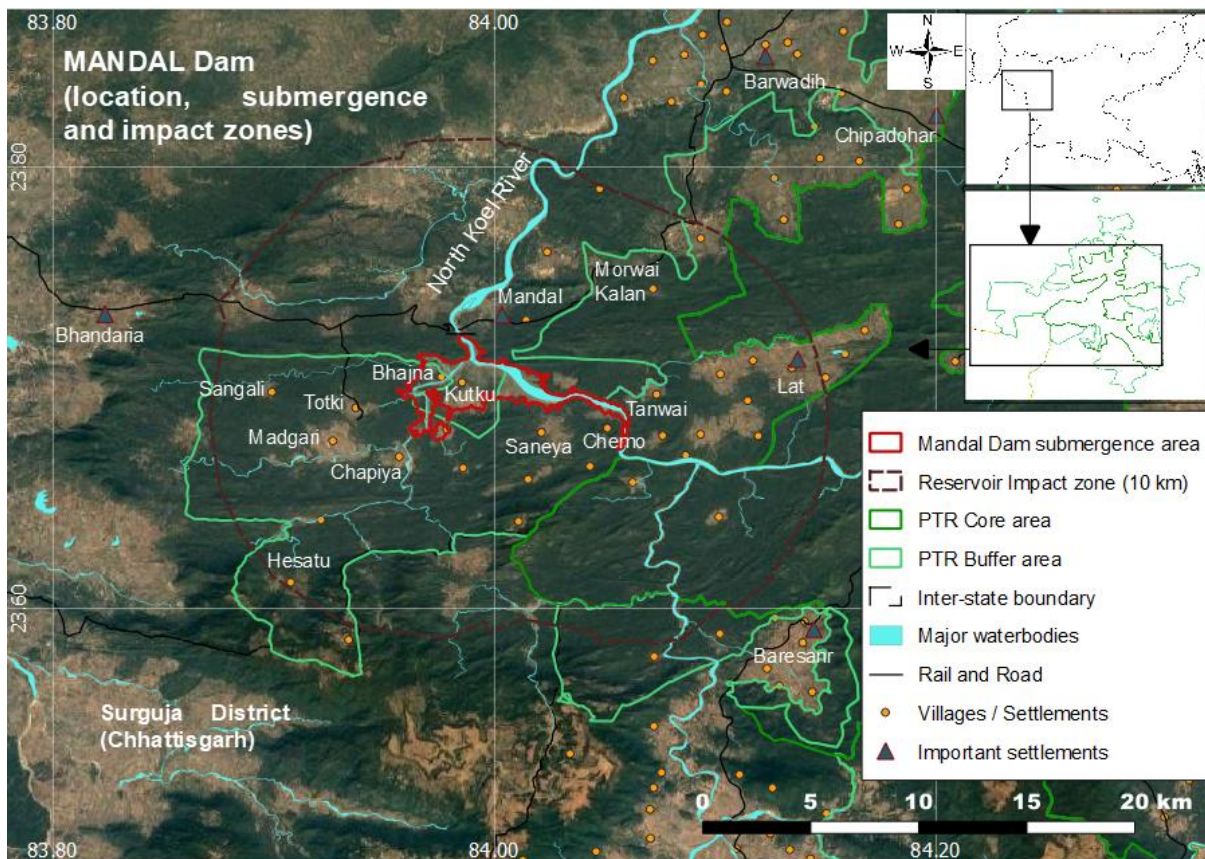


Figure 5: Map depicting location of Mandal Dam, its submergence area (at FRL 341 m), a 10 km radius “impact zone” around the submergence area, and some settlements therein; base satellite layer courtesy Google Earth (2020)

## PART II – CHAPTER-WISE REVIEW OF THE SITE-SPECIFIC WILDLIFE MANAGEMENT PLAN (JANUARY 2021)

### 1. General Comments:

Before providing chapter-wise specific comments, certain general comments applicable to the plan are as follows.

- i. Legal status of the January 2021 version of the site-specific wildlife management plan that has come to WII for vetting is unclear. A careful examination of conditional forest clearance (Stage II) and wildlife clearances (Jharkhand SBWL and NBWL) that the project has received so far, and from information on the MoEF&CC's single-window clearance website (<http://parivesh.nic.in/>), the original version of the plan prepared by Nature Conservation Society, Daltonganj (Srivastava *et al.* 2017) is referred to as "**approved**" and whose implementation/ operationalisation is suggested. The letter from the office of the CWLW, Jharkhand to the Director, WII (Appendix 9) however states that a site-specific wildlife management plan for the project needs to be prepared towards fulfilling condition number 13 mentioned in the Stage II FC granted by the Govt. of India in November 2018 (Appendix 3). The letter further states that in compliance with this condition, the user agency, in consultation with PTR management, **has prepared** such a site-specific plan whose vetting by WII was requested. However, condition no. 13 in the said clearance states, "*The State Government shall ensure that the Forest Department shall **implement approved Site-specific Wildlife Management Plan....***". SC-NBWL's recommendation regarding the project also states, "*Other suggestions and recommendations in the Site Specific Wildlife Management Plan of North Koel Reservoir Project (Mandal Dam) and accepted by the State Board for Wild Life should be **put into operation***" (Appendix 7).
- ii. The footer in the January 2021 version of the plan has two separate dates on different pages – April 2018 (pages 3-40) and January 2018 (pages 41-97) – while the plan's cover page mentions the date of compilation/ submission as January 2021. The footer of the January 2021 version further states, "*Final (with compliance) Site Specific Wildlife Management Plan of North Koel Reservoir Project (Mandal Dam)*", suggesting that the version incorporates various conditions of compliance. However, a comparison of the two versions (February 2017 against January 2021) reveals that chapter 3 (Objectives and Mitigation Strategies) is significantly different, while chapter 5 (Management Interventions for Forest Department) is entirely different. Many suggested interventions to be implemented by the Forest Department in the January 2021 version (Chapter 5) are, in fact, unrelated to most conditions of compliance. At least one condition of compliance – compensatory afforestation by planting trees through **Jan Van Yojana, Kisan nurseries** (recommended in both FC Stage I and II & by SC-NBWL, see appendices 2, 3 & 7, respectively) – has been omitted. Another

important condition of compliance – construction of jetties by the *user agency* (WRD) at important locations and purchase of motorboats/ paddleboats for patrolling (recommended in FC Stage II and by SC-NBWL, see appendices 3 & 7, respectively) – has been instead assigned to the *Forest Department* as a suggested intervention (Chapter 5, page 94). WII is unsure if Nature Conservation Society, Daltonganj has drafted both versions of the plan in their entirety – even if the footer of the January 2021 version suggests so – and if the original version referred to by various clearance authorities had the CWLW’s approval or not. Since the task entrusted to WII is to review the January 2021 version of the plan, we refer to only the said version hereon. However, in the spirit of information sharing and to enable scrutiny by any interested stakeholder, we also make available both versions of the site-specific plan, all mentioned appendices to this review, and other relevant documents through a folder in the cloud, available to view and download here: <https://drive.google.com/drive/folders/1SftVw2v77SLmt3eNdbFFkErYbHCCo1bs?usp=sharing>

- iii. The plan’s main objective seems to not only suggest recommendations to ameliorate immediate damage done to wildlife and forest land due to the project in the submergence and buffer/ impact zones (10 km around submergence area), but to also give a boost to conservation activities in all of PTR. Considering *in-situ* uniqueness of PTR – relatively high anthropogenic pressure, local extinction of the tiger, paucity of funds and other resources, location in an internal conflict zone – this is a fair and justified objective.
- iv. The plan needs to be more comprehensively researched with relevant in-text references. At many places, the plan has incomplete and/ or inconsistent information with inconsistent/ interchangeable usage of terms. As just one example, on page 79, the first bullet point mentions the presence of 6,990 households in the impact zone (10 km around submergence area) while on page 90, entry no. 20 (“10 km impacted villages”) in the given table mentions the presence of 5,630 households.
- v. Suggested measures to be implemented by Forest Department lack details and do not provide specific information regarding suggested interventions.
- vi. The plan also needs to draw relevant information regarding animal occurrences and management effectiveness evaluation from recent reports and data available in the public domain such as Mathur *et al.* (2015, 2019), Jhala *et al.* (2020) and others. For example, the first authentic photographic record of the rusty-spotted cat *Prionailurus rubiginosus* was obtained by Jhala *et al.* (2020) in forests near Lat village, which happens to be in the 10 km impact zone (see Figure 5). However, there is no mention of the rusty-spotted cat in Table 15 of the plan (Chapter 1, page 48) that lists mammals

found in the submergence and impact zones. There is little attention paid to issues concerning functional connectivity of PTR to other source wildlife populations/ areas of the landscape, which is recommended by Mathur *et al.* (2015) as an immediate actionable point, with implications for both wild herbivores and tiger populations.

## **2. Chapter ONE – Introduction (Review)**

In this chapter consisting of 66 pages (pages 7-69), details regarding the reservoir project including its location, historical context, chronology, technical details, current work progress status, and clearances obtained/ being processed are described. The chapter also delineates an impact zone of 10 km around the submergence area as the “sampling zone”. It gives a detailed account of villages and habitation in the submergence and impact zones, demography, occupation, cropping pattern, and impact and dependency on forests. It describes the existing land use of the eight villages in the submergence zone and of sampled twelve other villages in the impact zone. The chapter also describes the life of and livelihood options available to villagers (including livestock) in the impact zone. The chapter also describes the topography, natural drainage, sources of stream and waterbodies in the region/ PTR along with linear infrastructure present within the 10 km impact zone.

The latter half of the chapter goes on to describe details about PTR itself such as its flora and fauna, its constitution/ notification/ extent including its core/ buffer areas, as well as legal status of Reserved and Protected Forests therein. The chapter describes the 549.94 km<sup>2</sup> study area (10 km impact zone) – including 368.53 km<sup>2</sup> area within PTR and 181.41 km<sup>2</sup> within villages and village forests in which biodiversity surveys were conducted by the survey team – in terms of observed forest types and vegetation dynamics. The survey lists finding 98 species of trees, 36 species of shrubs and climbers and 46 species of herbs, and depicts computed parameters such as relative density, relative frequency, relative dominance, importance value index and diversity indices such as Shannon-Wiener and Simpson’s. The chapter also lists 17 invasive alien species recorded during fieldwork.

The chapter has a separate small paragraph on aquatic ecology of the area on page 44. It then describes and lists 40 species of mammals recorded in PTR/ impact zone, ostensibly based on past records, including animals in Schedule I of the WLPA and important from the view of conservation such as Indian wolf, Gaur, Four-horned antelope, Asian elephant, mouse deer, leopard and tiger, among others. It also mentions the recorded presence of 71 species of birds, 17 species of reptiles and 8 species of amphibians during field surveys. The impact zone/ sampled area is described in terms of habitats, forest cover type and land ownership/ management. The buffer area of PTR (in totality) is described, its various management challenges and changes observed from a few decades ago, and anthropogenic pressures facing the area are detailed.

It is from page 51 onwards that results of the team's field surveys are described along with methods employed. The field survey period is mentioned as two months – December 2016 and January 2017. In 35 two-km transects walked, spread across the sampling zone, the survey team lists recording 28 species of mammals from direct/indirect evidence, while list of avian, reptilian and amphibian faunae are detailed in a separate appendix (no. 6 in the plan). Movement and presence of tiger and elephants are separately provided using both data collected by the team and previous data available with PTR authorities. The team's aquatic survey records 20 species of fishes. Occurrence of wildlife crime in the sampling zone along with data and trends of human-wildlife conflict – both in the sampling zone and the entire buffer area of PTR – is provided. Reasoning of the increase in observed trend in negative human-animal interactions (chiefly due to elephant and other large carnivores) is provided and an assessment of the project (in 5 points, page 60) with respect to wildlife of PTR is provided. Pages 61-69 provides more details of methodology adopted (both for fieldwork and in data analyses) for reporting on plant and animal diversity/ density/ presence in the sampling zone with relevant tables and figures.

***WII comments:***

- i. The introduction of the site-specific management plan comprehensively delineates the chronology of the reservoir project from the dam's conception until its present status today. It describes the area/ reserve (PTR and its surroundings) well, including management-related issues that affect its forests and wildlife. It also adequately describes technical information of the project and relevant information on affected villages, and area sampled to collect primary information. It also comprehensively lays down information on PTR including its extent, constitution, notification/ legal status, topography, forest types, conflict incidents etc.
- ii. According to CWLW (Jharkhand) guidelines on site-specific wildlife management plans (hereafter 'CWLW plan guidelines') for Chapter 1 (point i), *“survey of working plan prescriptions for management of forests and wildlife of the study area, if in vogue, and its status of implementation in consultation with the DFO concerned”* must be given. In PTR's case consisting of wildlife divisions and being a tiger reserve, such an analysis based on the current approved Tiger Conservation Plan (2013-14 to 2022-23, Rawat 2015) would be useful and is recommended.
- iii. According to CWLW plan guidelines for Chapter 1 (point j), *“Indicative plan showing location of other projects utilising forestlands or otherwise in the zone of impact (10 km radius or more, as the case may be) of the present project. The mitigative measures proposed in the Conservation Plans of such projects (within project impact area) prepared if any, are to be summarized and compared with the proposals in the present plan”*. Such a plan and analysis are missing, neither is there any information stating that there are no other such

- projects around the proposed project, thereby setting aside the need to do the same.
- iv. On page 16, paragraph 1.A.4 mentions information on the status of various clearances. Since the plan has the submission date of January 2021, this information is incomplete. However, we have provided updated information on this in Part I of our review (paragraph titled “North Koel Reservoir Project”) with appropriate appendices, which may be incorporated.
  - v. Socio-economic data provided is variously for individual villages/ village groups in the submergence, impact and study zones, and are hard to tease apart, or interpret which given information describes which zone. The impact and study zones are, in fact, interchangeably used at many places in the chapter and in the plan. Data on human-wildlife conflict is either for the entire buffer area of PTR (page 58, table 19) or of only two ranges – Chipadohar (west) and Kutku – in the submergence zone, not for the sampled/ impact zone (however defined), when in fact the sampled zone encompasses parts of five PTR ranges.
  - vi. Despite the chapter being quite comprehensive in many ways, the biodiversity assessment component – which typically lies at the heart of any wildlife management plan – seems incomplete since the field survey period is very short (two months) and insufficient to incorporate seasonal differences in animal use/ occupancy. This is especially true for amphibian and reptilian taxa which are generally more visible and active during non-winter months, while this survey was exclusively done in the winter (December 2016 – January 2017). It is also inaccurate at various places (as detailed below). Biodiversity indices are incorrectly calculated and/ or represented, thereby necessitating a thorough redoing.
  - vii. Recorded species (plants and animals, as shown in various tables and appendices) are not grouped taxonomically, rather alphabetically. This makes it difficult to assess family-wise richness of plants and animals to assess potential impacts of the project on specific families/ taxonomic groups.
  - viii. On page 44, in table 14, *Saccharum spontaneum* – a grass species native to Indian subcontinent – is incorrectly listed as an invasive species from tropical West Asia.
  - ix. On page 44, only a short paragraph (1.E.2.3) on aquatic ecology implies it being an under-surveyed component in the biodiversity assessment. This is hugely insufficient for a reservoir project that will most acutely impact riverine and freshwater-dependent (partially/ totally) biodiversity. Moreover, the paragraph’s last five lines seem to have been copy-pasted from an altogether different source and talks about River Beas (perhaps erroneously), which flows through the states of Himachal Pradesh and Punjab. Although on page 53, another short paragraph on aquatic ecology reports finding 20 species of fishes and various other crustacean species, this list is not provided for further scrutiny. Additionally, secondary data on odonates (dragonflies and damselflies) – which are regarded as good bioindicators (Rocha-Ortega *et al.*

- 2019) – could have been relied upon from a study by Sajan *et al.* (2014) where they listed the presence of 30 odonates in PTR.
- x. On page 44, paragraph 1.E.2.4, last few lines mention providing information on 205 species of birds, 28 species of amphibians and reptiles, 21 families of insects and 36 species of spiders recorded in appendices 5 and 6. However, appendix 5 lists only plant species, while appendix 6 lists 169 bird species and 8 species of reptiles (without listing their national/ international conservation status) with no information on other taxa.
  - xi. There are many errors in common and scientific names of plants and animals. In many instances they are based on an older system (unspecified), are inaccurate and/ or incomplete, and do not match with relevant appendices either. For example, page 48 mentions recording “Rufous-bellied Kite” during primary surveys, but no such bird exists anywhere. Assuming an error due to oversight, perhaps Rufous-bellied Kite alludes to Rufous-bellied Eagle (*Hieraaetus kienerii*), sighted in November 2016, and reported by Sajan *et al* (2016). However, there is no mention of such a kite or an eagle in Appendix 6 of the plan where bird species found during the assessment are listed. The same paragraph also incorrectly mentions the presence of Pied Kingfisher as a “rare” bird (IUCN status – Least Concern, BirdLife International 2017). It also mentions finding 17 species of reptiles and 8 species of amphibians, whereas in the related appendix, only 8 species of reptiles are listed while no amphibian species is mentioned (implying not finding any amphibian during primary surveys). Similarly, on page 51, paragraph 1.F.4 (“Wildlife census in sampled area”), the scientific name of barking deer (or northern red muntjac *Muntiacus vaginalis*) is misspelt as *Muntiacus muntijak*.
  - xii. Methodology adopted by the survey team to study abundance and distribution of plants and animals is ambiguously described with different number of transects walked, from 4 to 11 to 35, thereby impeding any interpretation of actual sampling effort, its adequacy and/ or its reliability.

### **3. Chapter TWO – Impact of the Project (Review)**

In this chapter consisting of eight pages (pages 70-77), various hypothesised impacts of the project on PTR and on the larger region’s environment (in general), including on soil, vegetation, water, and air are described. The dam’s impact on the catchment area (total 2855 km<sup>2</sup>, of which 814.88 km<sup>2</sup> is within PTR) and on river and silt flow/ deposit is described, mainly from the Catchment Area Treatment (CAT) Plan (refer Appendix 12 of this review) submitted by WRD, Govt. of Jharkhand (user agency). The chapter (on page 72) very briefly describes the impact of the dam project in terms of potential for a disaster and on human health. In the next few pages (pages 72-75), the plan provides details on villages that will be directly impacted by the reservoir project (names, no. of households etc), including socio-economic data of villagers such as population composition, literacy rates and working status, and those indirectly impacted due to potentially redirected/ increased movement of wildlife resulting from the creation of reservoir and/ or loss of habitat. The project’s impacts specifically on

forests and wildlife – especially due to infrastructure creation and forest land submergence – are briefly described on pages 76-77.

***WII comments:***

- i. This chapter adequately describes potential impacts of the project on affected people and communities.
- ii. Despite being the most important chapter in the plan, it is the most under researched/ referenced. Many unsubstantiated statements are made such as “*The fluctuation of humidity will cause several impacts on surrounding areas as well as habitation in the water*” (page 70) and “*The fish introduction for such ponds will be necessary*” (page 77) without adequate referencing and in-text citation to relevant scholarly work.
- iii. As per CWLW plan guidelines for Chapter 2 (point b), information on “*quantum of pollutants that may be produced by the project*” is not provided, and mainly very qualitative statements are given on aspects related to noise, air and underground pollution that may be caused by the project.
- iv. As per CWLW plan guidelines for Chapter 2 (point g), information on “*study techniques adopted and observations of the experts in the field giving details of visits, areas visited, observations, records referred to, sampling methods adopted and justification in extrapolation*” are not provided.

**4. Chapter THREE – Objectives and Mitigation strategies (Review)**

In this chapter consisting of eight pages (pages 78-85), strategies to mitigate the potentially negative impacts due to the reservoir project are detailed in a point-wise fashion. These list strategies to be implemented by both the user agency (WRD, Govt. of Jharkhand) and Forest Department. Some of the strategies listed include providing attractive and comprehensive resettlement and rehabilitation (R&R) plans to villages in both the submergence area and existing core zone of PTR, and encouraging partnership and relationship-building between PTR staff/ management and villagers through eco-development initiatives, income-generation schemes as well as by promoting education in villages in the impact zone. Extension of both core and buffer areas of PTR to compensate for loss of forest land due to the project is also suggested.

Constructing fences and elephant-proof trenches (EPTs) to limit human-wildlife interface, awareness generation among people about wildlife and forests, appropriate training to PTR staff and officers, and setting up a full-fledged and operational veterinary hospital for PTR are suggested. To improve patrolling within PTR, procurement of vehicles for staff (motorcycle) and authorities (four-wheeler) is prescribed, and purchase of modern surveillance gadgets such as unmanned aerial vehicles (UAVs), vigilance cameras etc are suggested. Measures to be adopted by the user agency during construction and operational phases of the dam are also suggested, some of which include preparation of detailed CAT plans for each of 124 micro-watersheds falling within PTR, and use of only a minimum number of buildings for

operations by the WRD, while the rest to be handed over to the Forest & Environment Department. To maintain the integrity of the aquatic ecosystem (flora and fauna in and around North Koel river) even during the dry/ lean flow season, 10-20% of water discharge from the dam to downstream areas is suggested. A “green belt” of 500 m width of native plant species around the reservoir is proposed to be created/ planted to safeguard the same, and a suggested list of 17 native plants/ trees is given in Table 25 (page 85).

***WII comments:***

- i. The chapter is adequately written in so far as CWLW plan guidelines for Chapter 3 are concerned. It places emphasis on properly relocating affected villagers following all extant laws and rules (including the settlement of forest rights) before initiating any civil/ remaining dam-related work. It also recognises the importance of having a fully functional veterinary hospital and rescue centre for PTR.
- ii. Among other mitigation strategies suggested, ecocodevelopment initiatives in the 10 km impact zone of the project is a prominent one (page 79), ostensibly aimed at more actively involving people living in and around PTR in forest/ wildlife conservation activities, and to reduce their direct dependency on forests. However, it is unclear whether an assessment of similar ongoing participatory programmes in PTR on forest/ wildlife conservation has been done or not (eg. Arjunan *et al.* 2005, Dejouhanet 2010) to inculcate learnings from successes/ failures of the same. An environmental review of activities undertaken for village ecocodevelopment under the India Ecocodevelopment Project (IEP) in PTR in 2001 had revealed the need for forward linkages such as marketing (for income-generation activities), maintenance support (for village infrastructure development-related activities) and awareness raising (Rajvanshi 2001). The review pointed out the need to develop pasture lands as a priority activity to reduce cattle grazing inside demarcated protected areas (Rajvanshi 2001). It would also be useful to adopt best practices and learnings from well-developed participatory programmes operating successfully in other tiger reserves in the country such as Periyar (Kutty & Nair 2005, Damayanti & Masuda 2008) and Kaziranga (Ojah *et al.* 2000).
- iii. “Promotion of education” through sponsoring of computer and modern education aids in the 10 km impact zone is suggested. While this by itself is a commendable activity, details and rationale regarding how these activities connect with wildlife/ forest management/ conservation aims of the plan are not provided.
- iv. Construction of elephant-proof trenches (EPTs) and fencing has been erroneously recommended to “*reduce fragmentation*” (page 79) rather than to reduce conflict (unassessed). Another strategy to minimise disturbance caused by domestic cattle that freely graze inside PTR is to encourage stall feeding by providing high-quality milch animals to villagers (page 81). However, it is

unclear as to how will this achieve the stated objective, and if villagers will give up ownership of their already existing animals, or if milch animals will be provided conditional on beneficiaries giving up on their existing low-yielding animals.

- v. Promotion of eco-tourism has been suggested to help generate income for local people (page 81). However, this is a general and vague statement made without propounding any detailed plan regarding relevant agencies' approach and commitment.

## **5. Chapter FOUR – Proposed Management intervention from Project Authorities (Review)**

In this short five page chapter (pages 86-90), a detailed list of strategies and interventions (along with their justification) to be implemented by the project proponent/ user agency (WRD) towards mitigating potential negative impacts on environment, forest and wildlife during dam construction and operation stages are given. 21 such strategies are suggested, some of the most important of which include dam colony renovation based on “minimum requirement”, building VIP houses and other such facilities outside PTR at Barwadih, non-removal of trees for whatsoever purpose, covered/ underground electric lines, restriction on sound production (no more than 75 dB during day and no more than 65 dB during night), dust-control activities, maintenance of regular flow in downstream area, rehabilitation of villages under submergence zone, compensatory afforestation of about 2000 ha in the buffer area of PTR using native plants, undertaking eco-development activities in villages in the 10 km radius “impact zone” and full implementation of the CAT Plan (Appendix 12 in this review) to control siltation and soil erosion.

### ***WII comments:***

- i. This chapter adequately describes and lists suggested interventions during various phases of the project to be implemented by the project proponent.
- ii. According to CWLW plan guidelines for Chapter 4 (point c), “*relevant provisions of environment management plan (EMP) for the project and the interventions overlapping in nature*” are not specified. It is unclear if such an EMP for the project was ever drafted. However, MoEF&CC in 2019 had notified an area of 0 to 7 km around the boundaries of three protected areas (Betla National Park, Palamau Wildlife Sanctuary and Mahuadanr Wolf Sanctuary) as an eco-sensitive zone (Appendix 13), and thus an effort could be made to point out and detail relevant provisions, safeguards, and guidelines of this ESZ Notification applicable to the current reservoir project as it comes under the delineated ESZ.
- iii. According to CWLW plan guidelines for Chapter 4, point d states, “*plan period preferably for 10 years with suitable provisions for interim reviews and suitable modifications*” must be provided, however the said part is absent from the chapter. The financial forecast statement, financial outlay and component-

wise annual work programme for the suggested interventions are not provided. However, the justification given is that the WRD (project proponent/ user agency) will formulate its own budget for various suggested activities/ interventions. Since WRD may have done this already, the same could be provided as part of this plan for further scrutiny.

## **6. Chapter FIVE – Management interventions for Forest Department (Review)**

This chapter consists of 13 pages (pages 91-103) and lists actions, along with justification, to be implemented by the Forest Department. Citing the urgent need to halt wild herbivores' population decline by preventing easy access of people (ostensibly to prevent poaching, disturbance to wildlife), their livestock (that compete with wild herbivores for forage and space) and of free-ranging dogs (that hunt deer species) from the many settlements in and around PTR into forested areas, digging of elephant-proof trenches (EPTs) at forest boundaries is suggested with an estimated budgetary outlay of INR 7 crore. Similarly, at places vulnerable to poaching and other illegal activities and to limit people's entry into land meant for wildlife – and citing lack of vast continuous stretches of forests in PTR, limited staff to keep check on illegal activities, and precedence of erecting such barriers in different tiger reserves of the country – site-specific fencing has been recommended with a budgetary outlay of INR 15 crore.

A full-fledged and well equipped veterinary hospital complete with laboratories, rescue vehicles, medicines, and equipment, staffed with veterinarians and other support staff is suggested with an estimated budgetary requirement of INR 4 crore. Citing huge opportunity for developing eco-tourism facilities in PTR, INR 5 crore towards developing the same has been suggested. To curb and prevent illegal activities such as poaching, use of modern technology such as drones, cameras and other electronic equipment is suggested, with an estimated budgetary outlay of INR 4 crore. In the same vein, setting up patrolling camps in remote places such as at Latu, Kujrum and Henar (subject to their successful relocation) and a few other places is suggested, along with providing basic facilities to frontline staff (first aid kits, torches, raincoats, mobile phones etc) and vehicles to officers. In the reservoir created because of the proposed project, to help with patrolling the area, setting up of two jetties and purchase of four motorboats is suggested. An estimated budget of INR 6 crore has been set aside for these activities.

Since a large number of people directly or substantially depend on PTR forests to support their lives and livelihood, creation of and supporting alternative livelihood opportunities is also proposed. A milk processing/ collection centre is proposed to be established and distribution of higher-yielding milch cows (ostensibly to encourage stall feeding) is planned. A combined budget of INR 17.5 crore has been set aside for these activities. To give a fillip to village relocation, and enable flexibility in formulating suitable R&R plans over and above what is prescribed by NTCA/ Union/ State government, the plan suggests setting aside INR 30 crore for this purpose. This

will involve several confidence-building measures such as organising awareness programmes and meetings, distribution of certain essential items to persons in need, and hand-holding for a few months after relocation. To raise awareness among villagers on the effect of poaching and other illegal activities, sensitisation programmes are suggested to be organised at the village level. Similarly, to raise awareness among forest department officials, other government staff (such as various district level officers) and even political leaders, national/ international visits are proposed to learn best practices observed in tiger reserves such as Kanha, Bandhavgarh and Pench. A budget of INR 3.08 crore has been estimated for these activities. INR 0.5 crore has been estimated for monitoring and evaluation of activities mentioned in the plan and provide/ upload relevant monitoring reports every year detailing impact of activities under the plan and make course corrections, if required and upon consultation with CWLW, Jharkhand. For habitat improvement activities – to be especially carried out in the immediate neighbourhood of the reservoir – grassland creation, grassland management, soil and moisture conservation, and creation of small check dams, at a budgetary expenditure of INR 10 crore, has been estimated. Pages 97-98 provide a summary of the 12 suggested interventions to be implemented by PTR management (total estimated budgetary requirement INR 101.08 crore) and a 10-year expenditure

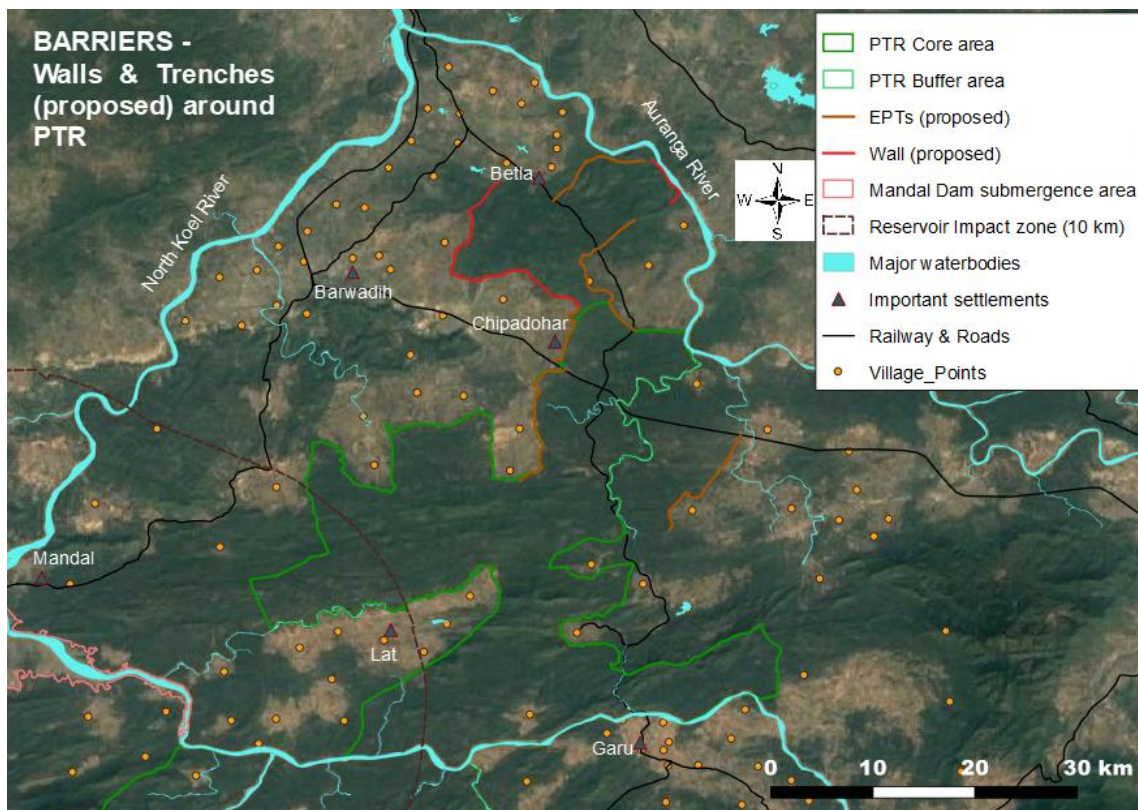


Figure 6: Barriers in the form of concrete walls (13.06 km) and elephant-proof trenches (EPTs) (26.75 km) planned around PTR core area, according to data obtained from PTR management (DFO, Core Area Division PTR) on June 25, 2021 as a kml (Google Earth) file; however this is a different configuration than the one shown in the plan (refer map on page 99 of the plan – reproduced below as Figure 7) which talks of fences and EPTs but does not specifically mention concrete walls; this indicates both a degree of arbitrariness in choice of barriers themselves, and a lack of clarity and scientific/ managerial rigour in barrier site-selection

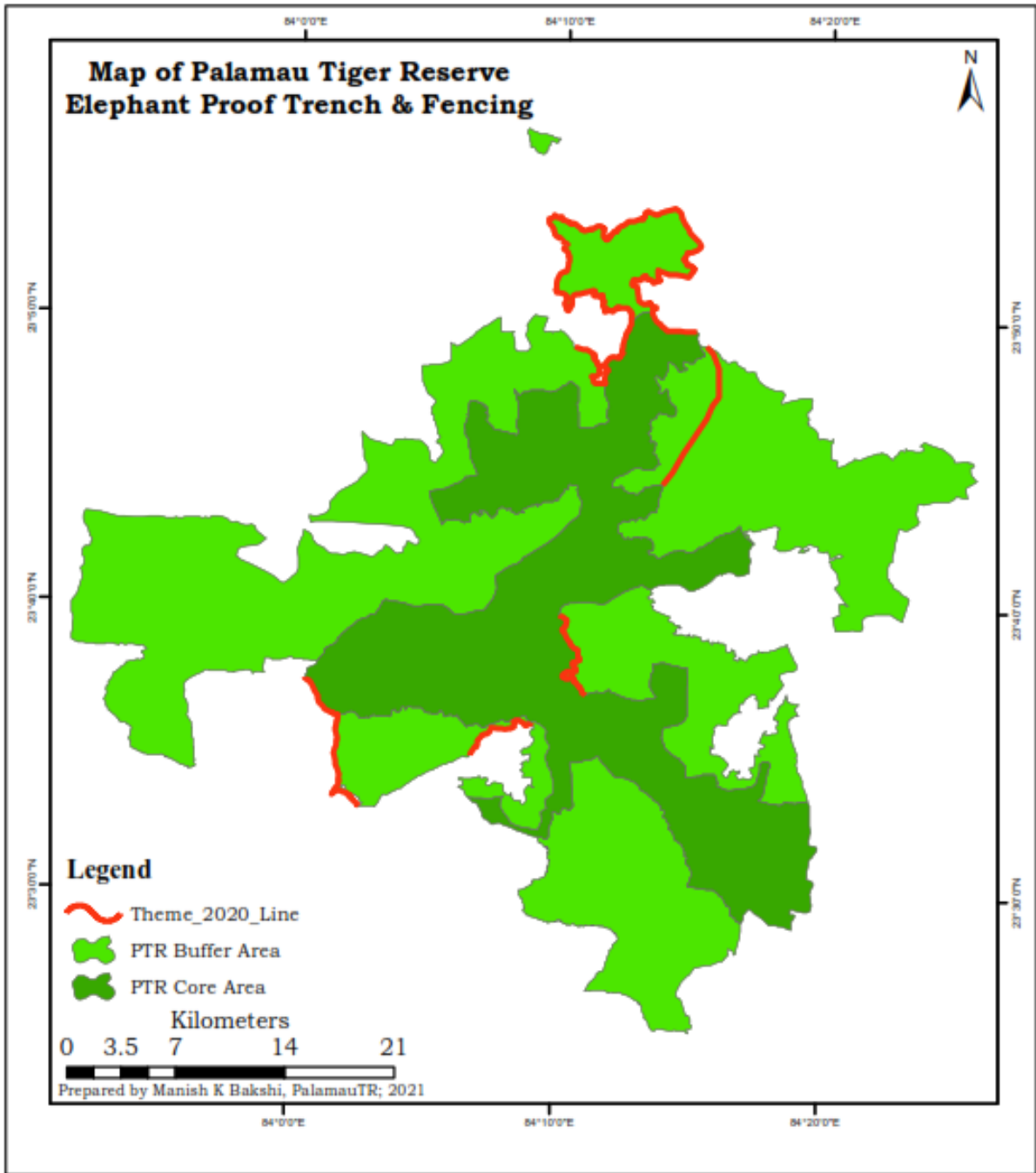


Figure 7: Map depicting the contours of proposed barriers (~ 60 km extent) in the form of EPTs and fences as it appears on page 99 of the plan

plan for the same, while pages 99-103 provide this information in relevant maps and a table with geocoordinates of places where intervention activities have been suggested.

**WII comments:**

- i. The chapter is written in accordance with CWLW plan guidelines for Chapter 5, but is very sketchy about proposed measures without giving any details about specific activities or detailed budgetary break-up, thus making it difficult to assess/ review their utility to achieve intended objectives.

- ii. INR 22 crore (out of total INR 101.08 crore transferred by the project proponent) is sought under this plan towards EPTs and fences (pages 91-92), including perhaps concrete walls (see Figures 6 & 7). The objective here is to discourage movement of wild animals into the many settlements in and around PTR, thus getting poached and/ or causing conflict, as also to prevent unnecessary entry of people and even stray dogs into forested areas. Newspaper clippings of such fencing activity done in other PAs of the country are provided (Kanha, Nagarahole etc) as examples. However, there is no scholarly analysis of the pros and cons of such a massive undertaking, or any PTR-specific study of animal movement overlaid on conflict and/ or poaching incidents backing the same. Furthermore, exact specifications of such barriers (EPTs and fences/walls) and how their placement at given locations were determined are not provided, thereby making it difficult to assess the budgetary outlay and/ or potential usefulness (or lack thereof). There is no mention of how these structures will be maintained post-construction or if such stretches will be monitored to study their efficacy with respect to objectives. While the text and related map (on page 99) talk about EPTs and fences, a kml (Google Earth) file shared by the Divisional Forest Officer (Core Area Division, PTR) – deemed as the ‘final’ configuration – had no mention of fences, it rather suggested building concrete walls (13.06 km) and EPTs (26.75 km). This suggests arbitrariness and a lack of clarity/ planning or scientific rigour derived perhaps from deficiency of data regarding animal movements and conflict incidents in the choice and placement of barriers.
- iii. INR 5 crore has been set aside towards ‘development of eco-tourism in PTR’ (page 93). However, no further details or even an outline of plans have been provided regarding the same. Ill-planned and exclusionary ecotourism activities with minimal involvement of local inhabitants could prove detrimental in the long term and sever support of the local population to conservation efforts. Well-planned ecotourism activities centred around small and sustainable home stays could prove more helpful, but require longer term commitment (both in terms of time and financial resources) through best practices by generating awareness, providing training and hand-holding from other stakeholders/ domain experts, especially regarding marketing and setting up of such facilities.
- iv. On page 94, under suggested intervention ‘Development of Infrastructure and purchase of vehicles for patrolling’, creation of two jetties is mentioned. However, this could rather be included as an intervention for the user agency/ project proponent (WRD) in Chapter 4, in compliance with condition no. 6 of FC Stage II clearance.
- v. INR 0.5 crore has been set aside for ‘monitoring and evaluation’ (page 96). However, it is unclear if this is proposed to be done by the implementing agencies themselves or in collaboration with other stakeholders.

## **7. Chapter SIX – Suggested recommendations, Maps and other information (Review)**

In pages 104-107, all suggested recommendations from chapters 3, 4 and 5 are summarised and divided as per phase of progression of the project (pre-construction, construction/ site development and operational phases). Relevant maps pertaining to the plan depicting submergence area due to the reservoir (341.0 m FRL), sampling and impact zones, drainage and forest cover maps of the sampled zone, location of transects (for biodiversity surveys/ assessments) and presence/ movement of elephants and tigers are provided in pages 107-111.

### ***WII comments:***

- i. As per CWLW plan guidelines, Chapter 6 “...*should state the maps/ appendices/ plans and cost schedules/ relevant orders enclosed to the plan*”. Thus, the suggested recommendations – most of which overlap with suggested interventions for project proponent (Chapter 4) and Forest Department (Chapter 5) – this seems unnecessary and may rather be appropriately merged with those to avoid redundancy and maintain uniformity/ readability.
- ii. On page 107, compensatory afforestation (CA) in adjacent forested areas of PTR has been suggested to make up for the loss of 1007.29 ha of forestland by the North Koel dam/ reservoir. However, details regarding this plan are missing and maps depicting afforestation plots/ areas have not been provided. After obtaining relevant GIS data from PTR management, we show proposed CA areas in Figure 8. Since habitat loss will occur in a wildlife-rich area of the PTR, it is important to ensure that plantation activities result in improving identified *degraded habitat* in the adjoining landscape to encourage wildlife occupancy and persistence, especially in identified animal corridors (especially bottleneck areas, see Figure 8) towards enhancing and/ or maintaining functional connectivity in the larger landscape.
- iii. Most maps provided in this chapter have already been provided in earlier chapters. It would be useful to either give an appropriate justification or provide more relevant maps following CWLW plan guidelines, such as (reproduced from CWLW guidelines):
  - a. Land use plan maps of the project (existing and proposed during present diversion).
  - b. Location map showing other leases and forest diversions in the project impact area giving details of the projects.
  - c. Location map with respect to protected areas, elephant corridors and elephant reserves. This map should also show other infrastructures developed in the study area including roads, rail lines, canals, water reservoirs etc. causing obstructions in the movement of wildlife.
  - d. Map showing location of animal depredation including human kill/ injury, cattle kill and crop damage and the wild animal kills due to various reasons occurred within the study area.

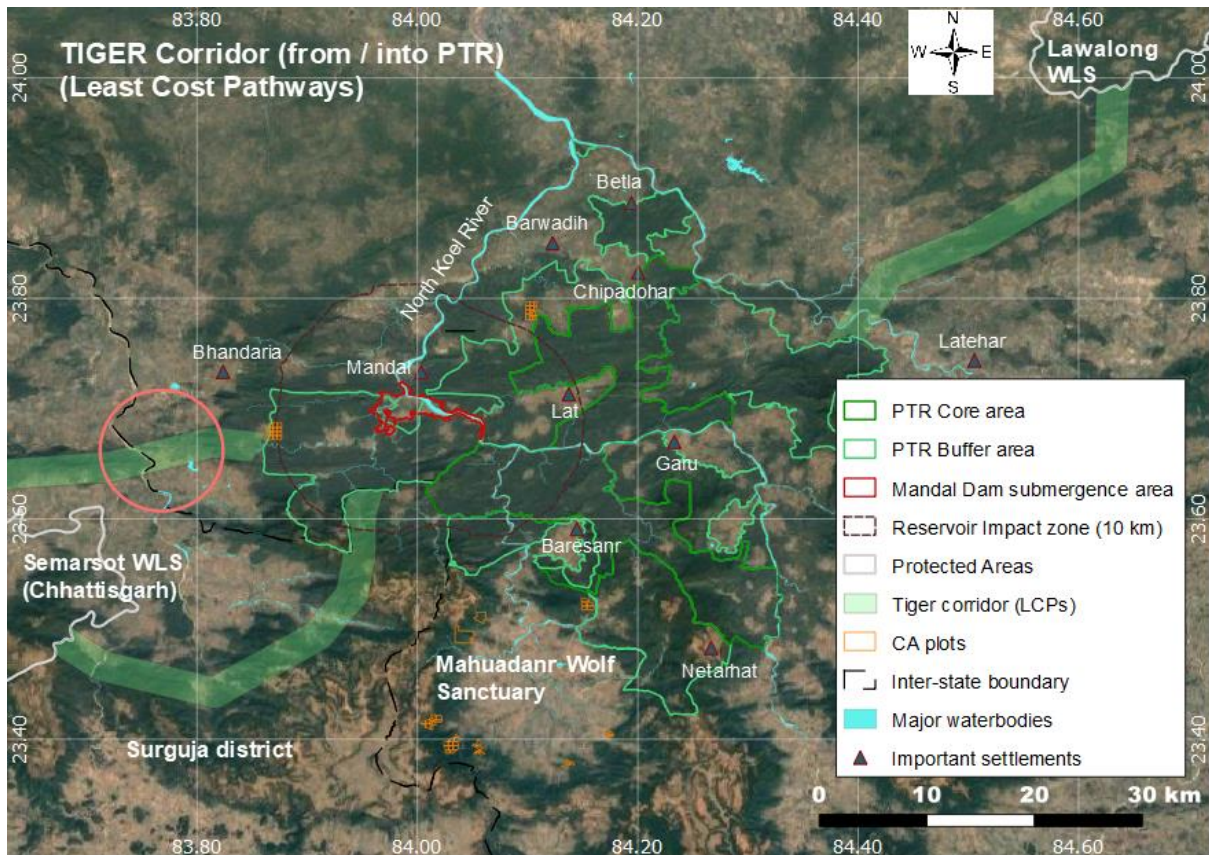


Figure 8: Map showing important tiger corridors (least cost pathways or LCPs) from/ into PTR, neighbouring Protected Areas, compensatory afforestation (CA) plots (total 2,014 ha) against diversion of 1,007.29 ha of PTR forestland and a potential bottleneck in connectivity (depicted by a pink circle over an identified LCP, from Qureshi *et al.* 2014) where compensatory afforestation efforts could be preferentially invested; CA efforts could also be preferentially invested in the narrow corridor connecting Betla Range with other parts of PTR

## 8. FIELD VISIT

As the appointed researcher on the project, Shri Rohit Jha (Senior Project Associate, WII) made a rapid field visit to PTR during April 15 to May 02, 2021 as part of the work plan. The field visit was to primarily –

- i. Interact with PTR management, field staff and survey team to solicit their views on the site-specific management plan and recommendations suggested therein.
- ii. Visit areas under the submergence and impact zones (10 km radius from the reservoir) and interact with affected villagers.
- iii. Visit most PTR areas/ ranges and gain an understanding of the ground situation and associated forest/ wildlife management challenges.

We summarise our learnings and understanding from the above interactions as follows:

- i. **a. PTR management** – In the current PTR management’s perspective, it is difficult to reconcile the interests of tribal communities living in and around PTR and at the same time behold conservation priorities of the landscape. PTR management opines that for the benefit of wildlife, especially to revive

the locally extinct (or occasionally occurring) tiger population, and in view of increasing dependence on forest resources – due to non-availability of more mainstream livelihood options – concomitant with rise in human and livestock populations (unassessed), it had become paramount to protect wild herbivores that currently exist in their greatest numbers and density in the Betla Range of PTR. For Betla to act as the source population and repopulate other parts of PTR, it had become necessary to a. protect the stable population of wild herbivores inside Betla Range by restricting access to people, and b. create and improve suitable habitat in other parts of PTR. Apart from this, PTR management also recognises dangers from “parcelling” of PTR due to development and/ or expansion of linear infrastructure such as roads and rail network. The PTR management looks at the budget received from the WRD in lieu of forestland diversion in the current project to fortify the reserve and to fulfil its infrastructure requirements and modernise its patrolling activities. It also looks at the money deposited by the user agency (WRD) to help provide a spectrum of attractive R&R packages, beyond what is prescribed by NTCA/ Union/ State government guidelines, to villages inside the core area on priority (to provide inviolate space for tigers/ predators to breed) and small hamlets in buffer areas (to reduce dependence of people on forest resources). The loss of forestland is unfortunate, in view of PTR management, but on balance is deemed beneficial since it will help reduce biotic pressure of 16 villages in and around the reservoir as they will be resettled outside PTR. The reservoir will also provide an always available source of water to animals, especially in the dry season. The DFO (Core Area Division, PTR) admitted to having revised the site-specific plan, after appraisal and scrutiny, from the one that was originally submitted by the survey team/ organisation Nature Conservation Society (to WRD, in consultation with the previous PTR management) to primarily include and/ or provide more budgetary space for aspects related to stopping access of humans/ livestock/ free-ranging dogs from neighbouring settlements into forested areas by way of barriers (fences/ walls/ trenches), among effecting other alterations, primarily in suggested interventions by the Forest Department.

**b. PTR field staff/ trackers** – Interactions with PTR ground/ field staff revealed a general degree of dissatisfaction with facilities and/ or support provided towards patrolling activities. Although frontline staff vacancies were filled to a large extent recently in compliance with orders of the Hon’ble High Court of Jharkhand, manpower shortage remains considering the extent of PTR and its various issues (high biotic pressure, insurgency, human-elephant conflict etc). Since there is little or no allowance given to field staff specifically for patrolling, at times, they must purchase fuel from their salaries to patrol forests under their jurisdictional watch. This is expensive since, due to insurgent and anti-state activities, many range

offices and staff quarters are located at relatively safer places far away from the range. This could be a result of a decline in allocated forest department budget by the Jharkhand State government (Mohan 2021).



Figure 9: Less than 70 estimated gaurs (*Bos gaurus*) survive in the Betla Range of PTR as a stable population; PTR management says that gaur and sambar deer do not occur anywhere else in the reserve; a recently born gaur calf is seen at the centre of the image alongside this herd of seven adults in a grassland plot created and maintained by PTR management as a prey augmentation and grassland habitat creation/ maintenance activity.

The staff has been provided with new buildings to stay at and have adequate facilities. Field staff also mention the need for more training regarding aspects related to wildlife conservation (including in identification of different groups of plants and animals) and wildlife/ forest related legislations and best practices. The need for and training in using equipment such as hand-held GPS units and cameras (hand-held units and remotely operated) was especially felt. Since forest fire is a common occurrence during the dry season (March-May) that coincide with collection of *Madhuca longifolia* (mahua) flowers and *Diospyros melanoxylon* (tendu) leaves (Figure 11), lack of suitable and sufficient fire-fighting equipment and other safety material/ considerations is a serious concern, both with the staff and villagers/ watchers temporarily deployed in anti-fire squads to douse fires during this time (Figure 10).



Figure 10: A forest fire being doused by a tracker/ anti-fire squad member (local inhabitant) by twigs and bare hands in the absence of equipment or due to their insufficiency



Figure 11: Widespread forest fires in PTR (March-April) coincide with/ caused due to mahua flowers collection by local tribal inhabitants

**c. Survey team (Nature Conservation Society)** – Interactions with the original survey team members/ organisation (Nature Conservation Society, Daltonganj) was mostly regarding the sharing of primary data of their biodiversity assessment in the impact zone of the planned North Koel reservoir, which was submitted as part of necessary clearances in February 2017 to WRD, Govt. of Jharkhand, through an intermediate consultant. Since the Chairperson of the survey team Dr D.P. Srivastava is a resident of Daltonganj and has been involved in wildlife conservation related activities and tasks in the landscape, his views, and insights on the most pressing conservation issues of PTR were gathered and understood.



Figure 12: View of a typical tribal hamlet/ settlement within PTR depicting cultivation activity, streams and plantations surrounded by forests

- ii.** We visited areas under the submergence and impact zones of the proposed project and interacted with villagers (Figures 13-15). Kutku village is located closest to the dam site, is the largest settlement to be completely submerged by the North Koel reservoir and has been at the forefront of the resistance against inadequate or incomplete R&R attempts by WRD. Every monsoon when water from river North Koel rises – since the dam is half-operational even without the installation of gates – they must leave their houses and take shelter temporarily on higher ground, later come back and reconstruct all over again. This hampers all developmental activity in the village under any government scheme. Most villages inside the submergence zone, including Kutku, are remote and insular with weak or no telecommunication network. Although many villagers are keen to move/ be resettled out of PTR, they are unhappy with an R&R plan that does not give land and housing to each family, and demand that the entire village be

resettled together at one place rather than in a piecemeal fashion. In official records, many villages have already been resettled as compensation and jobs (to some) were provided to their forefathers by WRD in the 1960s and 70s when dam construction activity was initiated, but since there was no hand-holding, a majority extinguished their compensation money and came back to their original settlements. Amongst villagers there is anxiety and concern that upon commissioning of the reservoir, they will be left with no option and eventually be forcibly moved using police and paramilitary forces. Many villagers work with the Forest Department as trackers and informants, and are provided with temporary work as labour in various forest conservation activities. They also recognise the fact that it was the Forest Department that stopped the project, and thereby indirectly protected them from probable evacuation and inadequate resettlement. We also visited Khura, Pol Pol, Chapiya, Totki, Madhgarhi, Tatha, Meral, Chemo, Kuchila, Muru, Jargad, Saidup, Harhe, Lat, Serendag, Patradih, Baire, Karamdih, Nawarnago, Tanwai, and Bankheta villages in and around the submergence zone during three days (April 19-21, 2021) with forest department staff and trackers. These were chiefly areas in the Kutku and Chipadohar west ranges which will be most affected directly by the dam project.



Figure 13: Kutku village's valley area with grazing cattle in the submergence zone overlooking Mandal dam's headworks; the valley region is very fertile and used by villagers for kharif season cultivation

- iii. We also visited other parts of PTR namely forests of Betla, Garu west, Garu east, Chipadohar east, Bariansanr and even Mahuadanr ranges (Mahuadanr Range, including Mahuadanr Wolf Sanctuary, is not part of PTR but managed by PTR Circle) (Figures 9, 16, 17). Our impression is that PTR forests are beautiful and rich with wildlife, despite high biotic pressure from

a population of more than 1.5 lakh persons living in almost 200 settlements in and around the reserve, a majority of whom are tribal and poor, completely or substantially dependent on forest resources for sustaining their lives and livelihoods. Forests become denser as one travels in the southern direction from Betla to Baresanr and Mahuadanr. Despite located in one of the driest regions in Jharkhand, due to its undulating terrain, PTR is blessed with many seasonal and perennial streams that provide water to both local inhabitants and wildlife populations. PTR field staff and management are doing a tremendous job despite being faced with a multitude of challenges such as shortage of trained forest staff, limited infrastructure and scarce resources.



Figure 14: Chemo village in the submergence zone of proposed Mandal dam



Figure 15: Fishing activity in the North Koel river using traditional means by tribal women from Bhajna and Kutku villages in the submergence zone; the river is reduced to a trickle during dry/ lean season



Figure 16: A typical stretch of dry deciduous forests in the Betla Range of PTR; certain moisture-retention activities by PTR management can be seen in the image



Figure 17: A typical Sal (*Shorea robusta*) forest patch in PTR on a hilly slope

### **PART III – RECOMMENDATIONS TO IMPROVE THE PLAN TOWARDS BENEFITTING PTR FORESTS, WILDLIFE & PEOPLE AFFECTED BY THE PROJECT**

We list the following recommendations as suggested additions/ modifications to the plan which, if adopted, will strengthen the same. These are derived from chapter-wise comments detailed above as well as from learnings and insights gained during our field visit and interactions with stakeholders. We also recommend that any revised plan address our specific chapter-wise and general plan-wide comments as well.

- 1. Biodiversity assessment** – A multi-seasonal year-long biodiversity assessment of the submergence and impact zones (10 km around the submergence area) employing more reliable field and analytical methods is recommended to present a more accurate picture of the wildlife value of these areas. This will help towards more accurately predicting the project’s impacts on forests and wildlife. Such a study must place special emphasis on the aquatic/ freshwater component and organisms inhabiting therein – especially fishes and amphibians – as this aspect is most lacking/ incomplete in the current site-specific plan being reviewed. Such a study must include riverine areas at least 10 km upstream from the last point in the submergence zone and at least 10 km downstream from the dam, incorporating effects of reduced flow in the downstream areas on biodiversity, local climate (soil, vegetation etc) and on people’s rights over rivers (fishing, navigation etc). Care must be taken to use terms and definitions uniformly, describe methods fully and unambiguously, and must list all species (plants and animals) as per taxonomically-appropriate groups using appropriate nomenclature, while also presenting their

global and/ or local conservation status (from IUCN RedList, international conventions, WLPAs schedules etc).

2. **Potential impacts of the reservoir project** on local climate and on wildlife, quantum of pollution forecasted to be caused during dam completion/ operation and related activities and their effects on wildlife, rights of people over rivers (especially in downstream areas), potential for a disaster and preparedness for the same – especially considering the dam is a very old structure – need to be more thoroughly researched/ examined and analysed in a scientific manner, and relevant appendices supplied with the plan.
3. **Human-wildlife conflict** measures should be well-thought out, scientifically sound, carefully sited and must have the support of and seek participation from the local population. Creating barriers to reduce negative human-animal interactions – except in very context-specific circumstances – have proven to be ineffective (MoEF&CC 2017, Natarajan *et al.* 2021), may hinder movement of animals in the larger conservation landscape (Graham 1973), apart from causing direct mortalities (Fernando *et al.* 2008). The main problem with EPTs is erosion and caving-in of the side walls – depending on the area’s soil conditions and rainfall – which fills up the trench, enabling elephants to cross it (see Figure 18) and negate its utility (Fernando *et al.* 2008). They are especially unsuitable for rugged terrain (like PTR), and are very expensive to maintain involving high labour input (Lenin & Sukumar 2011). Barriers of any kind – whether fences (electrified or otherwise), walls, EPTs – are neither permanent nor comprehensive solutions as elephants eventually learn ways to avoid/ bypass them (see Figures 18, 19). They are most useful for relatively short stretches and usually at hard boundaries between forests and habitation/ farmland, where the local community does not have reason to themselves damage barriers (to access forest), rather has a stake in maintaining those for their own safety and to protect their crops from elephants and other herbivores. Hence, creating a vast network of potentially ineffective barriers – despite huge cost incurred – will be unable to fulfil other objectives of the PTR management towards installing/ constructing these, such as stopping entry of people and cattle/ free-ranging dogs. We encourage the PTR management to contemplate using barriers only in the most chronically conflict prone spaces/ areas after collecting animal use data across seasons at forest boundaries, and evaluate the utility of context-specific barriers of different kinds. For example, solar hanging fences have recently proven effective in reducing human-elephant conflict in Sri Lanka, parts of southern and north-east India (Figure 20) and could be thought of as an alternative.

Since the present design and extent of barriers (both those supplied as a kml file in June 2021 and that shown in the plan on page 99) seem to not have been derived from field data on animal movements and conflict hotspots, we recommend that any such barrier (walls/ fences/ EPTs) construction work (ongoing/ planned) be continued only after evaluating their need, requirements and feasibility based on

scientific evidences of potential conflict and animal movement. The efficacy of any already constructed barrier (walls/ fences/ EPTs) should be immediately assessed towards their intended objectives. We recommend that the existing comprehensive set of human-elephant conflict (HEC) guidelines issued by the MoEF&CC (2017) (Appendix 14) may be relied upon for planning any barrier as a mitigatory measure. Such measures should be in consonance with the tiger conservation plan and other official management related documents for the area/ reserve concerned. We recommend that PTR management prepare a detailed plan and rationale for each kind of barrier before they implement any such activity in the field. Specifically, the HEC guidelines state:

*“If barriers are to be created a map should be prepared showing location of elephant groups, seasonal migration patterns of elephants and locations of elephant corridors. The map should show location of proposed elephant barriers. A proposal should be prepared with all information and submitted to the Project Elephant Director of the state who will take a decision about it after reviewing the entire information and take the advice of elephant experts when needed.”*

We further recommend that rapid response teams (RRTs) – comprising of senior forest staff, trained personnel, veterinarian professionals (if available) – be operationalised in every range, and anti-depredation squads be formed through EDCs in high conflict zones manned by local inhabitants to tackle and/ or reduce negative interactions. Members of EDCs may also assist in verification of conflict claims to assist quick and easy compensation o affected individuals/ families.



Figure 18: Representative image of elephants crossing an EPT in Tamil Nadu (image courtesy ‘Frontier Elephant Programme’, <https://frontierelephants.info/>)



Figure 19: Representative image of elephants crossing an electrified fence in Tamil Nadu; male elephants learn that their tusks are non-conducting and use them expertly to cross barriers (image courtesy 'Frontier Elephant Programme', <https://frontierelephants.info>)



Figure 20: Hanging solar fences are a novel concept in human-elephant conflict management having recently been used in Sri Lanka, southern and north-eastern India with promising results; these fences are much higher than conventional fences (14 ft) and are also electrically charged (solar) to give a mild shock to elephants, who learn and adapt to avoid the fences and such areas; these fences hang like a curtain with a gap underneath for smaller animals to cross and cannot be toppled easily by force (Image courtesy Wildlife Trust of India, see <https://youtu.be/FFhXWSaBPJA> )

**4. Detailed plans on developing ecotourism, creation of alternative livelihood opportunities, developing infrastructure and equipment for improved patrolling at PTR, awareness creation, and habitat improvement** need to be prepared, in consultation with relevant stakeholders, describing in much greater detail the management's plans while undertaking these activities, to enable any degree of review and scrutiny. Lack of detailed plans leave scope for ambiguity and space for arbitrariness in implementation of these very important activities with a combined budgetary outlay of INR 45.58 crore. Some points worth considering while drafting such detailed plans include:

- i. **Ecotourism** – Developing an economy around decentralised nature-based and sustainable ecotourism activities in the form of home stays – which increasingly appeal to a new group of eco-conscious visitors who respect and are curious about local cultures – could be an important way to involve local inhabitants into conservation activities through direct financial benefits (Prasad 2008, Bagadion & Juan 2015) and help reduce biotic pressures on forests (Ghosh-Harihar *et al.* 2019). Encouraging and facilitating such independent ecotourism ventures has the potential to reduce poverty (eg. Ferraro & Hanauer 2014) as well as encourage entrepreneurship (Meera & Vinodan 2019). On behalf of the International Union for Conservation of Nature (IUCN), Scherl *et al.* (2004) have drafted a comprehensive document detailing the opportunities and limitations of such an approach. We recommend that a detailed ecotourism plan be made incorporating such a participatory, sustainable and benefit-sharing equitable approach (Vinodan & Manalel 2011), especially relevant with the largely financially poor indigenous population living in and around PTR, with commitment of required resources in terms of funding (infrastructure and other costs), training and marketing. These facilities and activities could be run and managed by EDCs of at least three villages in the impact zone on a pilot basis. Prasad (2008) mentions that in 2001, tourist accommodation at Kehr was given to the eco-development committees to manage; but it failed probably due to a lack of training for the members of the eco-development committees and a lack of interest on part of the Reserve management. Lessons must be learned from this experience to avoid making the same mistakes. A larger ecotourism facility could be established at Mandal/ Barwadih to house a greater number of visitors, with tour guides and service providers from local population. Prasad (2008) additionally recommend a whole host of PTR-specific decentralised suggestions that could be implemented in this regard (Appendix 15), some of which include developing nature trails, bird-watching points, temporary nature camps etc.
- ii. **Awareness creation** – *a. Indigenous peoples* – It is well known and demonstrated that tribal indigenous population can sustainably manage forestlands (Persha *et al.* 2010, Singh *et al.* 2018), given partnering and

stakeholder individuals/ institutes work as a cohesive group (Datta & Chatterjee 2012). Some of these aspects were incorporated in the Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act of 2006. However the legislation's unsatisfactory implementation so far – both in Jharkhand (Sarangi 2020, Sahu 2021) and more generally in India (Lee & Wolf 2018) – has throttled the movement towards a more decentralised forest/ wildlife management regime which has the demonstrated potential to deliver benefits to both biodiversity and indigenous peoples/ cultures (Ens *et al.* 2016). Thus, any awareness creation activity must never patronise tribal peoples and/ or their way of life, rather appreciate tribal histories, traditions, and value their cultural knowledge regarding forests and wildlife and be more of trust and rapport-building exercises. Awareness could be generated about certain legal provisions with respect to forest and wildlife governance, and on other more global aspects and challenges such as wildlife trade, biodiversity crisis, climate change, zoonotic diseases etc. In all such interactions and programmes, a bidirectional knowledge exchange should be encouraged.

**b. Frontline forest staff** – A calendar schedule of training and awareness programmes for all frontline and managerial staff of PTR may be drafted. The training and awareness programmes thus organised should have subject and domain experts conduct these, and must incorporate aspects related to wildlife and forest laws interpretation/ enforcement with a special emphasis on myth-busting the Forest Rights Act, managing human-wildlife conflict situations (esp. crowd control) and best practices, developing soft skills to respectfully interact with local populations, awareness on various kinds of wildlife/ ecosystems and the range of threats they face, field animal identification skills, basic biodiversity assessment methods, training to operate equipment – GPS devices, range-finders, compass, binoculars, hand-held cameras, camera traps, drones etc.

**c. PTR management** – PTR authorities may need training and knowledge about alternate and participatory regimes of forest and biodiversity management/ governance along with available tools and platforms (in legislation, policy – both national and international perspectives) to facilitate the same which could complement already formalised plans and actions; developing leadership skills; and required training in developing/ co-managing ecotourism opportunities.

**d. Security force** – Since a large number of security forces (both state police and central paramilitary) are deployed in and around PTR who may not necessarily be well-versed with forest and wildlife related laws and rules, or unaware of appropriate conduct with local indigenous populations, it is essential to provide for and organise regular workshops for such security personnel as well on these aspects. Any potential to collaborate and share relevant information towards preventing illegal activities must be explored.

5. **Empowering Eco-development committees (EDCs)** – EDCs have a large and potentially positive role to play in and around fringes of Protected Areas. EDCs must be strengthened and various activities that focus on both reducing direct pressure/ dependence of people on forest resources and improving peoples’ lives be encouraged and facilitated. We recommend drafting micro-plans for EDCs in villages of the impact zone (10 km around submergence area) to incorporate relevant activities, following detailed consultations with local communities.

- i. **In the context of the proposed Mandal dam**, appropriate activities should include – developing and managing low-impact homestay facilities for tourists, establishment of *kisan nurseries* from whom the Forest Department could purchase saplings for afforestation activities in the landscape, promotion of horticulture, provision/ facilitation of LPG cylinders to reduce dependency on forest for fuelwood etc. Budgetary provisions to facilitate these activities for ten years could be made in the site-specific plan.
- ii. **Enhancing role of EDCs in conflict management** – To tackle a potential increase in negative human-animal interactions arising out of displacement of animals due to reservoir creation (habitat loss) and redirected wildlife movements (since reservoir might act as a barrier), certain conflict management strategies are suggested to be incorporated into the plan. Certain villages and areas either already are or will become (post reservoir formation) centres of negative interactions, especially with respect to elephants. On identification of such villages/ areas, crop-guarding/ anti-depredation squads from relevant EDCs could be formed and members trained on repelling elephants should they be found near croplands, and provided with necessary equipment and provisions for the same (high-intensity LED torches, fire crackers etc). Each such EDC may also employ two exclusive elephant watchers at the sanctioned minimum



Figure 21: Shri Dhaneshwar Oraon (village Henar, in PTR Core Area) with a hand-made bamboo chair and other furniture – there is a need to create forward market linkages to support such alternative income-generating opportunities

wage (with accident insurance) during months when conflict is high. A budgetary provision to sustain these activities for 10 years could be made in the plan. If barriers are to be made (see recommendation 3 above), community involvement is essential for their maintenance. Written agreements should be made with the communities that they will take responsibility for their maintenance and the required monetary support for the same should be provided (MoEF&CC 2017).

- 6. To regulate and reduce livestock grazing pressure** and its associated direct and indirect effects on habitats (Silori & Mishra 2001) and on wild/ native ungulates (Clegg 1994, Madhusudan 2004) within PTR, alongside encouraging stall-feeding by providing milch cows to identified families (marginal farmers and/ or landless), pasturelands could be developed along forest fringes through support and involvement of EDCs. However, stopping livestock grazing altogether within a short span of time is not an inclusive strategy and, considering that wild herbivores density is very low in PTR, could have deleterious effects on grassland habitats/ spaces through an unchecked growth of woody species. In this context, Das (2008) observes that rotational grazing could be a more effective and democratic way to reduce pressures from livestock overgrazing – considering the socio-economic importance of keeping domestic animals for impoverished communities living in and around forests. This could be coupled alongside a system of issuing grazing passes in degraded areas within Protected Forests and Sanctuary limits (outside core TR area) towards gradually phasing out livestock grazing within Critical Tiger Habitat. These inclusive solutions could be considered, deliberated upon and



Figure 22: Most cattle/ livestock owned by the local indigenous population is of the low milch-yielding native varieties that are typically short in stature, easier to maintain and graze freely in forests; livestock hold more socio-cultural value in people's lives here than economic

implemented, wherever feasible. Provisions of Section 33A of the WLPA, 1972 regarding immunisation of livestock should be strictly enforced. Cattle-proof trenches at known entry/ exit stretches in critical areas constructed in a limited manner maybe more feasible, effective, easier to maintain/ monitor (through community/ EDC involvement) and fiscally prudent than EPTs and fences/ concrete walls. This must be scientifically justified and be consistent with the approved TCP.



Figure 23: Buffaloes and other livestock can be regularly found grazing deep inside PTR forests, although their area of influence/ operation may only be a few km around settlements

7. **Forest fires management** – Fire prone areas in PTR have been identified and categorised into various high and low risk categories by Kumari & Pandey (2020). For erecting future fire watchtowers, this publication along with information from trackers could be used as a guideline. Depending on an area/ beat/ sub-beat’s fire risk profile, additional fire watchers/ helpers could be hired from local EDCs during the fire season of about three months. Each sub-beat where forest fire is determined as a yearly and recurrent occurrence must have various protective equipment for persons engaged in dousing fires such as goggles, fire-resisting gloves, chest guards, headlights, water bottles, first aid kits, anti-fire blowers etc. Relevant budgetary provision per year at the sub beat level is recommended to provide *sattu*, *gur* (jaggery), glucose etc. as added allowance during firefighting.
8. **Support to forest staff and staff welfare** – Although seven new patrolling camps are proposed to be constructed in the plan, patrolling staff in many already

established camps inside the reserve live in poor conditions. These camps must be made more liveable by providing solar power, first-aid kits, solar-powered water pumps, and should be protected by elephant-proof trenches. Each camp may also have relevant equipment to record field data such as a GPS unit, rangefinder, camera etc. Patrolling camp staff (trackers/ fire-fighters etc) are and have been at the forefront of conservation at PTR (Kazmi 2016) and must be mandatorily provided with accident and health insurances, and necessary help to file claims, when required. Each forest guard should be provided with required field gear and equipment to record field data, and must be covered under insurance schemes. Forest guards should be provided with patrolling allowance to cover for necessary fuel costs incurred during patrolling and fulfilling other such assigned duties. Required budget in the current plan to provision for such a comprehensive suite of support could be set aside/ offered for ten years, and necessary funds be deposited into the Palamau Tiger Conservation Foundation.

- 9. Research and monitoring** – We recommend setting aside a substantial sum for initiating a long-term research and monitoring programme/ activities in PTR. The tiger reserve management must initiate a comprehensive research program covering biodiversity assessments, animal population estimate exercises, evaluating biotic pressures on forests, assessing people’s relationships and attitude with respect to forest and wildlife conservation, influence of Forest Rights Act towards settling long-standing disputes etc. It would be useful to hire at least two biologists and at least one social scientist/ anthropologist for the next five years for this purpose.
  
- 10. Evaluation of the site-specific plan** – We recommend the involvement of independent, neutral and credible third-party assessors (not associated with any plan implementing agency) to monitor and evaluate the effectiveness of suggested measures in this plan, and suggest suitable modifications from observed data in the field, in consultation with PTR management, every six months to the CWLW. This will help implement a fair system of checks and balances.

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**Front Cover:** (*top*) Submergence area in Kutku village’s valley within PTR immediately upstream of Mandal dam headworks; (*bottom*) Malabar Pied Hornbill *Anthracoceros coronatus* sighted in the Mahuadanr Range of PTR near Netarhat at about 1050 m asl elevation during field visit.

**Credit Page:** (*top*) A small hamlet located within PTR core area flanked by streams and hilltop forests; (*bottom*) A herd of chital deer *Axis axis* spotted in the Betla Range of PTR during field visit.



**Back Cover (above):** A small stream flowing through rocks near Netarhat – a popular tourist destination adjacent to PTR

**Cloud Folder** to access February 2017 and January 2021 versions of the site-specific WMP, PTR’s Tiger Conservation Plan (2013-14 to 2022-23) and other appendices to this review:  
<https://drive.google.com/drive/folders/1SftVw2v77SLmt3eNdbFFkErYbHCCo1bs?usp=sharing>