Letter :: Request Disposed Off

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Government of India Wildlife Institute of India, Dehradun Wildlife Institute of India P.O.Box-18, Chandrabani, Dehradun, Uttarakhand,

Dated: 03/11/2020

To

Shri P V Subramaniam A 1401/1402, Madhuban CHS, Deonar farm Rd Mumbai 400088

Registration Number: WLIOI/R/E/20/00062

Dear Sir/Madam

I am to refer to your Request for Information under RTI Act 2005, received vide letter dated 24/10/2020 and to say that *Kindly see the attached covering letter. The mentioned documents in the letter are being sent to you through email.*

In case, you want to go for an appeal in connection with the information provided, you may appeal to the Appellate Authority indicated below within *thirty days* from the date of receipt of this letter.

Director, WII

FAA & Director

Address: Wildlife Institute of IndiaChandrabaniDehradun

Phone No.: 01352646101

Yours faithfully

(P.K.Aggarwal) CPIO & Deputy Registrar Phone No.: 01352646110 Email: pka@wii.gov.in

1 of 1 03-11-2020, 05:10 pm

ACTION HISTORY OF RTI REQUEST No.WLIOI/R/E/20/00062

Applicant Name

P V Subramaniam

Please provide a copy of the report submitted by WII to Maharashtra Airport Development Co. Ltd. (MADC) dated March 20, 2020 regarding environmental/ wildlife impact of proposed greenfield airport at Chandrapur, Maharashtra, and the suggested mitigation measures.

Kindly see the attached covering letter. The mentioned documents in

Reply of ApplicationKindly see the attached covering letter. The mentioned documents in the letter are being sent to you through email.

Date of Action SN. **Action Taken** Remarks Action Taken By 1 RTI REQUEST 24/10/2020 **Nodal Officer RECEIVED** 2 26/10/2020 **Nodal Officer** Forwarded to CPIO(s): (1) P.K.Aggarwal REQUEST FORWARDED TO CPIO REQUEST DISPOSED 3 03/11/2020 P.K.Aggarwal-

Print

(CPIO)

OF

1 of 1 03-11-2020, 05:11 pm





No. WII/RTI/CPIO/2020-21 (Qtr-II)/ 69

Date: 03 November, 2020

To,

Shri P V Subramaniam A 1401/1402, Madhuban CHS,, Deonar farm Road, Mumbai, Pin:400088, Maharashtra Email: pvsari@gmail.com

Sub.: Information under RTI Act, 2005-reg.

Ref.: Your Online RTI No. WLIOI/R/E/20/00062 dated 24.10.2020

Dear Sir,

Please refer to your application cited above under RTI Act, 2005. In this context, the point-wise response to your queries is given below:

S.No.	Information Sought under RTI	Reply under RTI
1	Please provide a copy of the report submitted by WII to Maharashtra Airport Development Co. Ltd. (MADC) dated March 20, 2020 regarding environmental/ wildlife impact of proposed greenfield airport at Chandrapur, Maharashtra, and the suggested mitigation measures.	Please see Annexure-1. Soft any being attached.

In case, you want to go for an appeal in connection with the information provided, you may appeal to the Appellate Authority indicated below within *thirty days* from the date of receipt of this letter.

Director, WII FAA & Director

Address: Wildlife Institute of India, Chandrabani, Dehradun

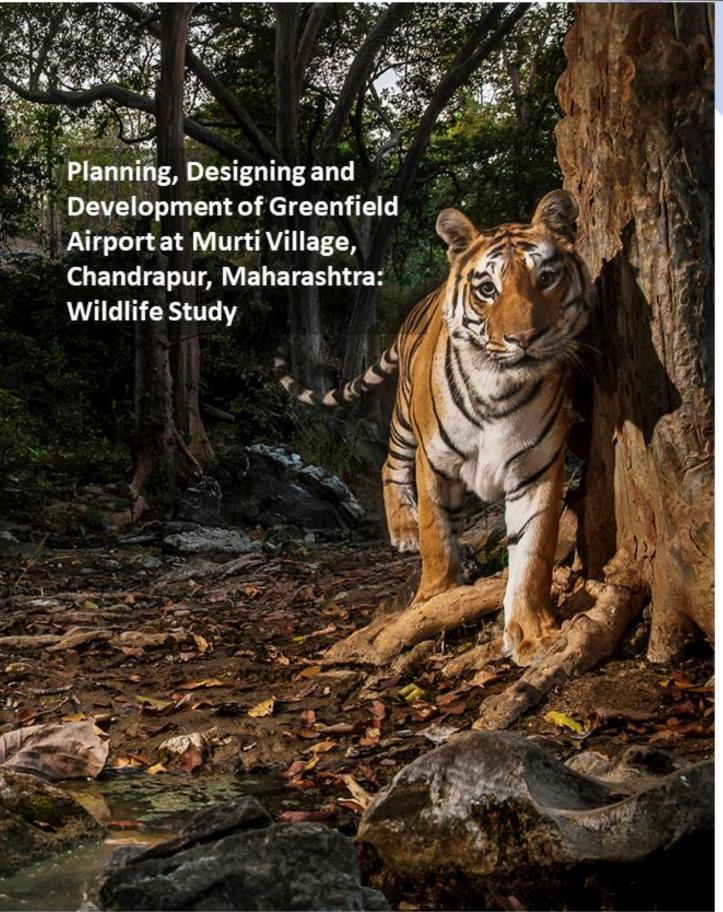
Phone No.: 01352640910

Thanking you,

NO & CPIO (RTI)

Encl.: as above.









Further Contact:

Director

Wildlife Institute of India, Chandrabani Dehradun, India 248 001

Tell: 00 91 135 2646283 Fax: 00 91 135 2640117 E-mail; <u>dwii@wii.qov.in</u>

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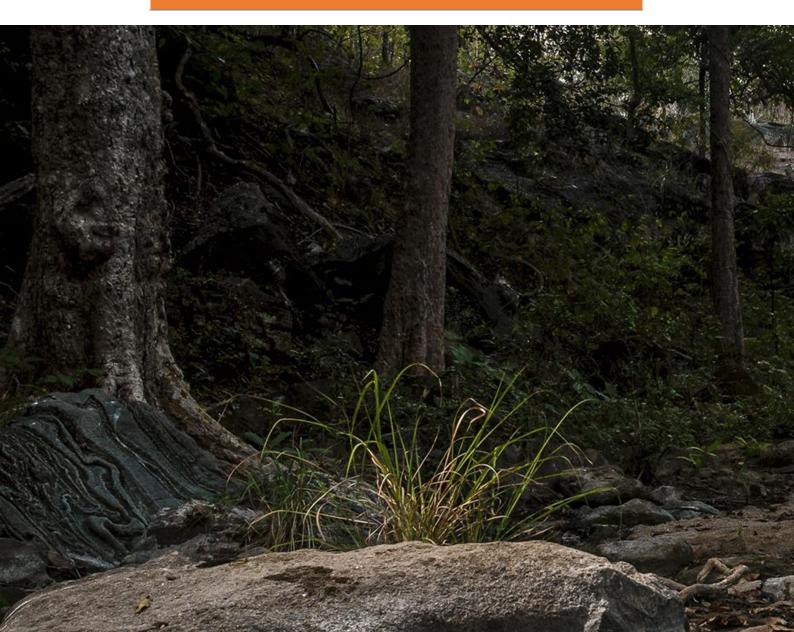
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Acknowledgements

We wish to express our sincere thanks to the Director and Dean of the Wildlife Institute of India, Dehradun, India, for regular advice and excellent support throughout the project. We want to thank the Maharashtra Forest Department personnel, especially, Shri. Rama Rao, Chief Conservator of Forest, Chandrapur and Shri Gajendra Hire, Deputy Conservator of the Forest for assisting us in conducting the field survey. We would like to thank Maharashtra Airport Development Company Limited (MADC) personnel, especially, Shri. Gaurav S. Upshyam, Senior Manager for assisting us to understand the dimension of the proposed airport and helping in the fieldwork. We express our thanks to different researchers working in various Maharashtra Projects for their support in the field work and GIS related mapping.



Executive Summary

The Maharashtra state is well known globally for the active policy for tiger conservation and other wildlife species. Eastern Vidarbha Landscape (EVL) in Maharashtra is one of the critical landscapes for tiger conservation and has more than 80% tiger of the state (312 tigers). This also provides connecting link between central and southern Indian tiger populations. Tiger areas of EVL comprise forests of six districts of Bhandara, Chandrapur, Wardha, Gondia, Nagpur and Gadchiroli. However, the forests of Chandrapur Division are crucial habitat that links the tiger habitat of Tadoba-Andhari Tiger Reserve (TATR) Maharashtra with Kawal Tiger Reserve, Telangana.

Maharashtra Airport Development Company Ltd. (MADC), Govt. of Maharashtra has proposed the Greenfield Airport close to Chandrapur, Maharashtra. The construction site of the proposed Greenfield Airport is at Murti village (GAMV), Chandrapur, Maharashtra that is surrounded by the tiger habitats. Given this, MADC has desired a need for wildlife study around the proposed site. Therefore, Memorandum of Understanding (MoU) was signed between MADC and the Wildlife Institute of India, Dehradun, India, for a wildlife study with the following objectives:

- **1.** Evaluate the location of the proposed "Greenfield Airport at Chandrapur" with respect to tiger reserves, eco-sensitive zone, tiger bearing and corridors.
- **2.** Evaluate the roads to and from proposed "Greenfield Airport at Chandrapur" with respect to impact on wildlife and connectivity.
- 3. Identify threatened and scheduled species as per IUCN and WPA, and
- 4. Evaluate occupancy of threatened and scheduled mammal species as per IUCN and WPA.

The proposed Greenfield airport at Murti village (GAMV), Chandrapur, Maharashtra is surrounded by the Forests of Chandrapur Division. The proposed site is within the critical habitat and connectivity corridors of tigers. Therefore, a comprehensive analysis was undertaken using available information on the presence of different wildlife species as per IUCN criteria, data collected during fieldwork, habitat use by the tiger and other wildlife and corridor connectivity of the landscape concerning to GAMV. Our recommendations are as follows:

- 1. The proposed GAMV site is well known for the wildlife value, especially for tiger conservation and its importance as connecting corridor with other areas of tiger conservation importance in this landscape. Hence, the present site may or shall not be considered for the construction of the airport. The proposed airport is going to impact functional connectivity and may result in enhancement of wildlife conflict in the district.
- **2.** In case there is no alternative site for the proposed airport, this may be constructed at the Murti village (GAMV), Chandrapur, Maharashtra after undertaking the following mitigatory measures:
 - a. Re-align airport boundary or reduce the area of "Runway end safety area".
 - b. Restoration and strengthening of existing wildlife habitat along the corridor and in the forests of Chandrapur Division, Maharashtra.
 - c. Minimize the likely impact of peripheral lights and sound level.

- d. Undertake suggested mitigatory measures across roads passing through the existing corridor and minimize the extent of increased disturbance with this development in this landscape.
- e. Wildlife use shall be monitored during the construction phase and for five years once the airport is operationalized. The estimated budget is Rs. 475.00 lakhs. All the costs for such monitoring shall be met by MADC. The Wildlife Institute of India shall provide a separate proposal with the cost details.
- f. MADC shall consider and accept any mid-term mitigatory measure suggested based on the monitoring undertaken during construction and after operation of the airport by the Wildlife Institutes of India, and
- g. A committee shall monitor the compliance of suggested mitigatory measures.

Details for each above-mentioned mitigatory measures are being provided under the "Section V" and Annexure I.



Introduction

India is one of the 17 mega-biodiverse countries of the world and rich in wide variety of flora, fauna and biodiversity. However, due to the unsustainable use of natural resources and overexploitation, biodiversity is under severe pressure and facing numerous challenges and complexities in the face of rapid economic development. Hence, there is a pressing need for conservation and development to go hand in hand, complementing—rather than conflicting with each other.

A developing country like India, with a population exceeding 1.3 billion needs a good network of transportation viz. road, railway and air. In recent times, India has invested a lot in the transport section. However, the demand for an improved transport network may increase as the passengers will increase with time. This is the scenario in most of the countries, not just in India. According to the recent estimates, the annual increase of the vehicular fleet is 10 million cars and 5 million buses and trucks. If this trend continues, then there may be a billion vehicles using the roads by the end of 2030 (Walsh. 1990). There is also a significant increase in railway transport as well. Transportation by air is growing very fast in India as well as across the world, and it requires an unprecedented expansion and construction of several airports (Meyers. 1988). This trend is supposed to continue in the future.

The Government of India has recently launched UDAN (which stands for 'Ude Desh ka Aam Naagrik') to establish a regional connectivity among smaller cities across India. The scheme is aimed to offer air travel most affordable and widespread to encourage more people to fly and to boost inclusive national economic development, job growth, and air transport infrastructure development in India. Hence, this will require building more airports in India.

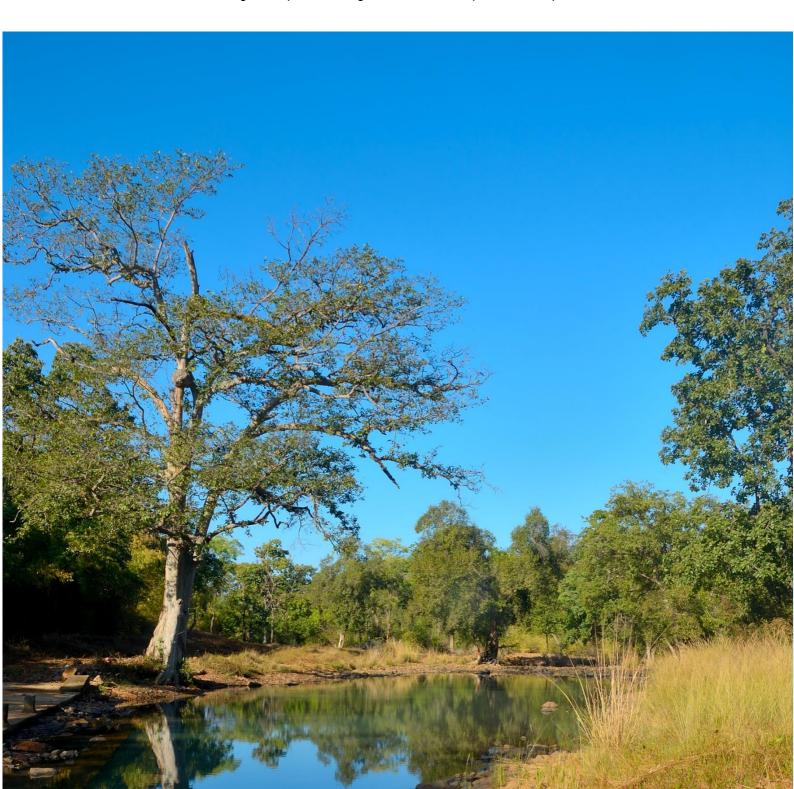
Although the direct impacts from airports and their associated roads and development are becoming increasingly recognized. Impacts on biodiversity (wildlife and habitats) (Clements et al. 2014) have tended to be less incorporated in the assessments when compared with impacts of noise, climate change and air pollution. Airports can influence biodiversity in several ways, including habitat loss, degradation or pollution of habitats, alteration of land use and land cover, diversion of drainages, impairment of wildlife movement paths, collisions of bird and impacts of light and noise pollution on behavioural biology of wildlife species in and around the airport's zone of influence.

The need to promote practices that integrate conservation concerns in infrastructure development are universally acknowledged by planners, transportation agencies and ecologists in most countries. The need is even more emergent in India and other developing countries where the challenge to maintain healthy living landscapes with the benefits they deliver invariably come in conflict with the expanding infrastructure development. During the last one-decade, different development projects have been planned to meet the requirements of urban cities. There has been a growing interest in developing new airports for better connectivity or expanding existing airports to meet the increased demand.

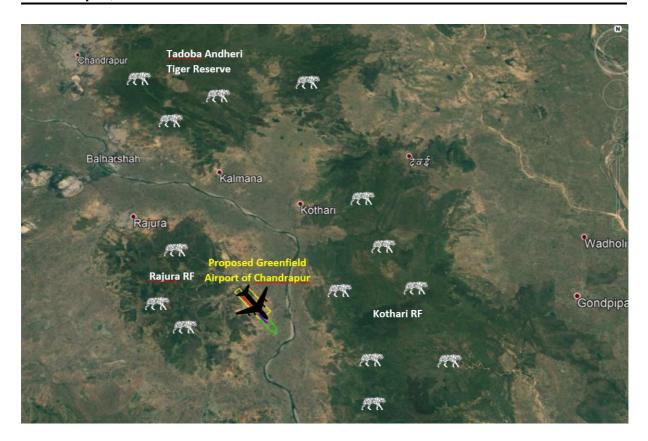
The proposed airport by MADC is at Murti Village in the Chandrapur district, which is about 40 km away from Chandrapur town in the Eastern Vidarbha Landscape (EVL) of Maharashtra, India. EVL is well known for tiger conservation and a significant tiger population of Maharashtra is in this landscape. The proposed site lies within tiger corridor connecting EVL with other tiger areas in Maharashtra and Telangana. Developmental projects such as airports are known to impact wildlife habitats. Visualizing the importance of the proposed site for tiger conservation, Maharashtra Airport Development Company Limited (MADC) desired a need for a proper ecological status survey of the wildlife in the area. Therefore, a Memorandum of Understanding (MoU) was signed between MADC and the Wildlife Institute of India

(WII) for assessing the status of wildlife and habitat in surrounding areas of the proposed airport with the following objectives:

- **1.** Evaluate status of the proposed site with respect to the tiger reserve, eco-sensitive zone and corridors.
- 2. Evaluate noise, light pollution evaluation with respect to its effect on wildlife.
- 3. Identify the rare and threatened plant/animal species in and around the proposed site.
- 4. Assess human-animal conflict and suggest measures to address the issue, and
- 5. Formulate management plans to mitigate the adverse impact of the airport on wildlife.



The proposed site of Greenfield Airport at Murti village (GAMV), Chandrapur, Maharashtra



Location and description of the proposed Chandrapur Greenfield Airport at Murti Village (GAMV), Chandrapur, Maharashtra:

The Maharashtra State Government identified Maharashtra Airport Development Company Ltd. (MADC) as the nodal agency for the implementation of this project. Five different sites were selected for the construction of the airport during a pre-feasibility study undertaken by the Airport Authority of India (AAI), New Delhi. After a critical analysis of the pros and cons of each site, the construction of the "Greenfield Airport" at the Murti Village, Chandrapur, Maharashtra, was selected (Fig.2.1). The proposed airport site lies about 40 km south of Chandrapur in Rajura taluka, Chandrapur district, Maharashtra. The place is well connected with Chandrapur by road and the Delhi-Chennai rail line lie on the western side of the site. The proposed airport is the first "Greenfield airport" in the Vidarbha region and will be the second-airport after Dr. Babasaheb Ambedkar International Airport, Nagpur. The proposed airport is situated very close to the Tadoba-Andheri Tiger Reserve (TATR), which attracts considerable number of tourists from all over the country as well as the world.

Other places like Ballarpur fort, Bhadrabati Jain temple, Chandrapur Jain temple, Ghorajhari lake, Manikgarh fort etc., also attract a considerable number of tourists all over the year. The airport would make TATR more accessible to tourists and would boost tourism in Chandrapur. Maharashtra. State Govt. has prioritized this project because it is a "Greenfield" project, i.e., a project that has no constraints imposed upon it by any prior work or any existing infrastructure. An improvement in the overall livelihood of the people of Chandrapur and its adjoining areas is envisioned through the execution of this project. will be better.

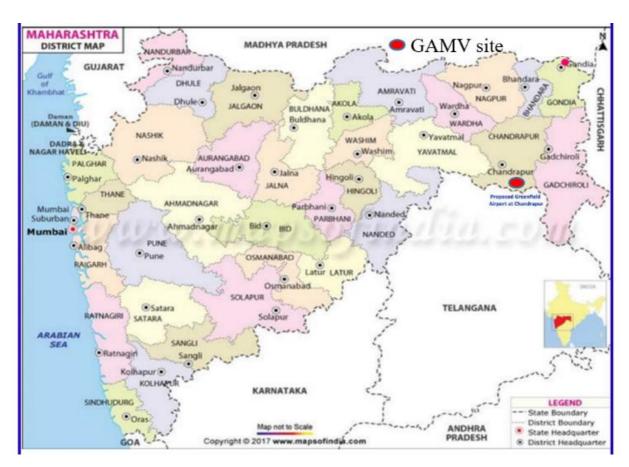
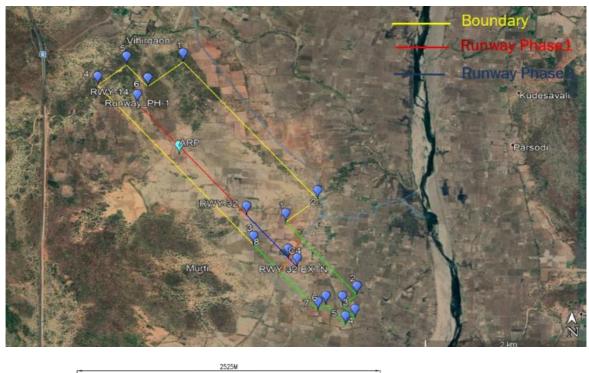


Figure 2.1: Location of the proposed Greenfield Airport at Murti Village, Chandrapur, Maharashtra, India.

The proposed GAMV will be built in two phases and 840 acres land is required which is mainly agricultural, scrub and forest lands. This land mostly belongs to Revenue Department (249.60 acres), Forest Department (83 acres) and Private land (507.40 acres). Under phase I, 2,050 meters long and 45 meters wide runway will be developed. Under Phase-II, an additional runway of 1 km will be added to have a total runway length of 3 km long with a width of 45 meters (Fig. 2.2). During Phase –I, the airport is planned for the operation of Q-400 and smaller planes with an estimated < 500 passengers/ day during initial years (Table 2.1). Operation of A-320 aircraft is being planned in Phase II and estimated passengers may reach ca. 2000 (Table 2.1.). Most of the aircraft shall be operated during daytime and there is no provision of operation of the aircraft in the night. In the future, it may be upgraded to an international airport (MADC report).

Vihirgaon and Murti are the nearest villages to the site, while village Kollamguda falls within the alignment of the proposed airport. The Wardha river is about 3 km away from the airport site. On the other side of the river, Parsodi village is situated which is often used by the tigers. The proposed GAMV is in the plains surrounded by the forest areas and falls within the probable corridor between Rajura and Kothari forest range (19°42'45.58" N/ 79°27'24.36"E) of Chandrapur forest division (Fig. 2.2)



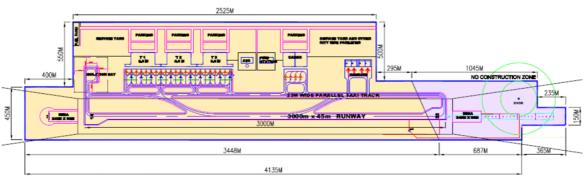


Figure 2.2: (A) Proposed site and (B) Conceptual plan for the development of the Greenfield airport at Murti village site, Chandrapur, Maharashtra. (Source: MADC Report 2018)

Table 2.1: Estimated airport traffic forecast. (Source: MADC Report).

Veer	Number of Pass	engers	Aircraft Requirement	
Year	Embarking and disembarking	One-way passenger	Q 400	A-320
2018	175	88		
2019	196	98		
2020	220	110	2	
2021	242	121	2	
2022	266	133	3	
2023	293	147	3	
2024	322	161	3	
2025	354	177	3	
2026	375	188		
2027	398	199		
2028	422	211	2	1
2029	447	224		
2030	474	237	2	1
2031	502	251		
2032	532	266		
2033	564	282		
2034	598	299		
2035	634	317	2	2
2036	659	330		
2037	685	343		
2038	712	356		
2039	740	370		
2040	770	385	2	2
2041	801	401		
2042	833	417		
2043	866	433		
2044	901	451		
2045	937	469	2	3
2046	974	487		
2047	1013	507		
2048	1054	527		
2049	1096	548		
2050	1140	570	1	4

Status of wildlife in and around the proposed Greenfield Airport at Murti village (GAMV), Chandrapur, Maharashtra



Introduction:

The Maharashtra state is well known globally for its pro-active policies for tiger and wildlife conservation. Eastern Vidarbha Landscape (EVL) in Maharashtra is one of the critical landscapes for tiger conservation and has more than 80% tiger of the state (312 tigers). The landscape also provides connecting links between central and southern Indian tiger populations. Tiger areas of EVL are spread across forests of six districts viz. Bhandara, Chandrapur, Wardha, Gondia, Nagpur and Gadchiroli. The forests of the Chandrapur Division are crucial habitats for linking TATR with Kawal Tiger Reserve, Telangana (Fig. 3.1).

Maharashtra Airport Development Company Ltd. (MADC), Govt. of Maharashtra, has proposed the Greenfield Airport near Chandrapur, Maharashtra. The construction site of the proposed Greenfield Airport is at Murti village (GAMV), Chandrapur, Maharashtra, which is surrounded by the tiger habitats. Therefore, most of the discussion is confined only to the Chandrapur Forest Division.

Evaluate the proposed site with respect to the tiger reserve, eco-sensitive zone and corridors:

Eastern Vidarbha Landscape (EVL) in Maharashtra is one of the critical landscapes for tiger conservation and has more than 80% tiger of the state (312 tigers). Of this, the Chandrapur Forest Division is a prominent habitat and the most important protected area is Tadoba-Andheri Tiger Reserve (TATR).

Besides, tigers of this landscape are well connected to Kawal Tiger Reserve in Telangana through the forest habitats of Rajura and Kothari, which lie in the southern part of the Chandrapur District (Fig. 3.1).

Forest characteristics of Chandrapur Forest Division, Maharashtra:

EVL is considered as one of the potential tiger conservation areas across India owing to high forest cover among the seven districts of EVL (13.68 to 69.41 percent) (Table 3.1). Of these districts, Gadchiroli and Chandrapur Forest Divisions have a high proportion of very dense forest cover ranging from 1326 to 4706 sq.km making these areas the most potential tiger habitats in EVL. Although the Gadchiroli has highest forest cover but with few resident tigers, and it has the potential to sustain the tiger population as good as of TATR if disturbance levels are reduced. Besides this district, Chandrapur Forest Division is the second largest having dense forest cover (Table 3.1) and is a significant source population of tigers in EVL.

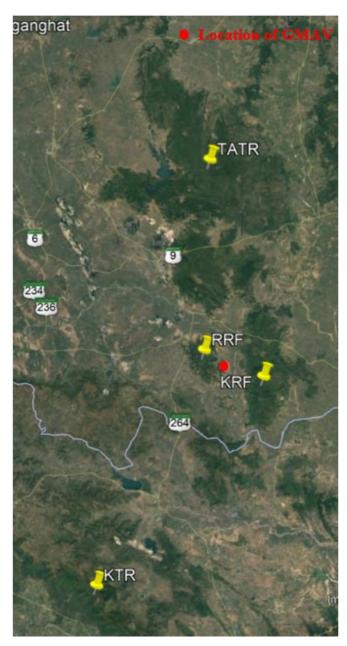


Figure 3.1: Location of Greenfield Airport at Murti village (GAMV) in relation to important tiger habitats connecting Tadoba-Andheri Tiger Reserve (TATR), Chandrapur, Maharashtra to Kawal Tiger Reserve (KTR), Telangana through forest araes of Rajura (RRF) and Kothari (KRF).

Table 3.1: Forest cover of Eastern Vidarbha Landscape (EVL).

	Area (Sq. km.)							
S. No.	District	Human Population	Total Area	Very Dense Forest	Moderately Dense Forest	Open Forest	Total Forest	% of TGA
1	Bhandara	12,00,334	4,087	171	567	268	1,006	24.61
2	Chandrapur	22,04,307	11,443	1,326	1,507	1,191	4,087	35.72
3	Gadchiroli	10,72,942	14,412	4,706	3,339	1,959	10,004	69.41
4	Gondiya	13,22,507	5,234	892	733	298	1,923	36.74
5	Nagpur	46,53,570	9,892	402	909	708	2,019	20.41
6	Wardha	13,00,774	6,309	10	410	443	863	13.68
7	Yavatmal	27,72,348	13,582	123	1,107	1,376	2,606	19.19
Total		1,45,26,782	65,959	7,630	8,635	6,243	22,508	34.65

TGA = TOTAL GEOGRAPHIC AREA

Forest patch size and its spatial configuration are known to affect long-term conservation strategies of species, especially in human-dominated landscape. The majority of the dense to moderately forest patches in this landscape are < 5 sq.km and a viable population can only be managed in this landscape by establishing connectivity among these patches (Table 3.2). Mondal et al. (2016) identified the corridors in EVL based on these forest characteristics so that conservation goals may be achieved. Besides the TATR in this landscape, the conservation of other forest areas such as of Rajura and Kothari is essential for facilitating the movement of tigers to Kawal Tiger Reserve, Telangana and requires strict protection (Fig. 3.1.)

Table 3.2: Forest cover characteristics of Chandrapur Forest Division, Maharashtra.

Size Class	Very Dense Forest		Mod. Dense Forest			Open Forest
(sq. km)	No. of Fragments	Mean Patch size (sq. km)	No. of Fragments	Mean Patch size (sq. km)	No. of Fragments	Mean Patch size (sq. km)
1 to 5	56	2.22	182	2.19	174	2.08
5.1 to 10	6	6.57	26	7.35	26	7.06
10.1 to 50	6	14.30	21	20.42	15	16.14
50.1 to 100	1	79.64	3	67.43		
100.1 to 500	2	213.37	1	113.96		
Above 500	1	680.68				

Flora:

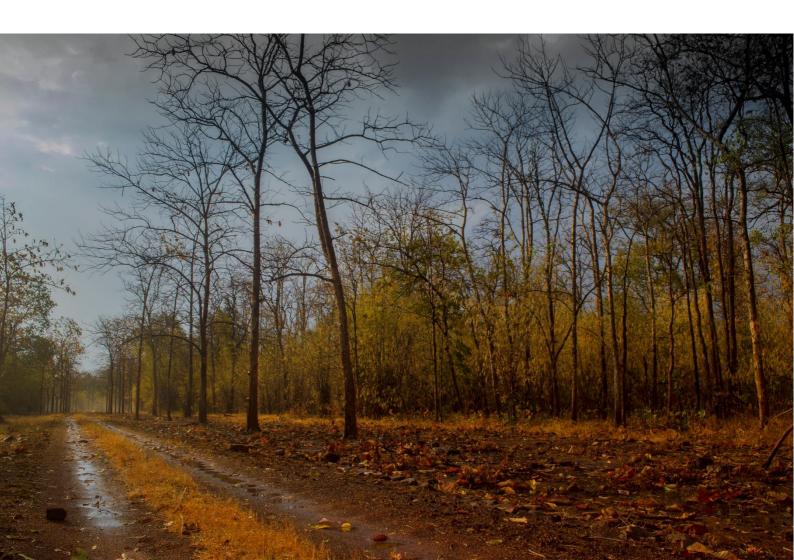
Maharashtra is very diverse in terms of vegetation. The diversity ranges from southern-tropical semievergreen forest of the Western Ghats in Western Maharashtra to the southern tropical thorn forest of Central Maharashtra and southern tropical dry deciduous forest of Eastern Maharashtra. According to Champion and Seth (1968), India is divided into six major groups and 16 sub-groups of vegetation. Maharashtra has 5 of those sub-groups.

The proposed site is situated in the Eastern Vidarbha landscape. The southern tropical dry deciduous forest type is mostly present here along with southern tropical thorn forests where the rainfall is low. Teak (*Tectona grandis*) is the dominant species and the associates are tiwas (*Ougeinia dalbergioides*), khair

(Acacia catechu), shivan (Gmelina arborea), dhawada (Anogeissus latifolia) etc. The forest condition in the area of low rainfall areas is degraded due to anthropogenic factors and the main tree species that are found in such habitat are babul (Acacia arabica), hiwar (Acacea leucophloea), ber (Ziziphus jujuba), palas (Butea monosperma) etc.

Fauna:

Vidarbha region lies in the heart of India geographically, and it is also the largest tiger landscape in Maharashtra, India. According to the biogeographic classification of India, it falls in the Deccan Plateau zone (Rodgers et al. 2000). The present site is ecologically significant because of the presence of the tigers (Panthera tigris). Tadoba-Andheri tiger reserve (TATR) is very close to the site and tiger presence has been documented in the proposed. Notable mammalian species that can be found in this region other than tigers are leopard (*Panthera pardus*), Indian wolf (*Canis lupus pallipes*), Asiatic wild dog (*Cuon alpinus*), golden jackal (*Canis aureus*), jungle cat (*Felis chaus*), sloth bear (*Melursus urcinus*). Wild herbivores found in this region are four-horned antelope (*Tetracerus quadicornis*), blackbuck (*Antilope cervicapra*), chinkara (*Gazella bennettii*), chital (*Axis axis*), sambar (*Rusa unicolor*), wild pig (*Sus scrofa*) etc. Indian pangolin (*Manis crassicaudata*) is also found in this region, but little is known about its conservation status. Indian giant squirrel (*Ratufa indica*), state animal of Maharashtra is also found in the Vidarbha region.



Tadoba-Andhari Tiger Reserve (TATR):

Tadoba Andhari Tiger Reserve (TATR) is the largest national park in Maharashtra. The total area of the reserve is 625.4 square kilometers which include Tadoba National Park with an area of 116.55 square kilometers and Andhari Wildlife Sanctuary with an area of 508.85 square kilometers. The reserve also includes 32.51 square kilometers of protected forest and 14.93 square kilometers of uncategorized land. To the southwest of TATR, lies Tadoba Lake spreads across 120 hectares which acts as a buffer between the park's forest and the extensive farmland, which extends up to Irai water reservoir. This lake is a perennial water source which offers a suitable habitat for aquatic fauna. Other wetland areas within the reserve include Kolsa Lake and the Andhari River.

Vegetation type of TATR is predominantly southern tropical dry deciduous forest with dense woodlands comprising about eighty-seven percent of the protected area (PA). Teak is the predominant tree species and Bamboo thickets grow throughout the reserve in abundance.

Flagship species of TATR is the tiger (*Panthera tigris*) and is the major tourist attraction. Other significant species of this PA are leopard, nilgai, dhole, small Indian civet, jungle cats, sambar, barking deer, chital, chausingha and honey badger. Tadoba lake sustains the marsh crocodile, which was once common all over Maharashtra. The lake contains a wide variety of water birds, and raptors. 195 species of birds have been recorded, including three endangered species. The grey-headed fish eagle, the crested serpent eagle, and the changeable hawk-eagle are some of the raptors seen in the park.

The Eco-sensitive zone around TATR:

Reference to the powers conferred by sub-section (1) and clauses (v) and (xiv) of sub-section (2) of section 3 of the Environment (Protection) Act, 1986 (29 of 1986) read with sub rule (3) of rule 5 of the Environment (Protection) Rules, 1986, the Government has notified the area as "Eco-sensitive zone" from 3 to 16 km from the boundary of the Tadoba-Andhari Tiger Reserve. This spreads over an area of 1346.61 sq.km. The proposed GAMV is on the southern side of the TATR and ESZ is about 29 to 40 km away from the TATR boundary (Fig. 3.2).



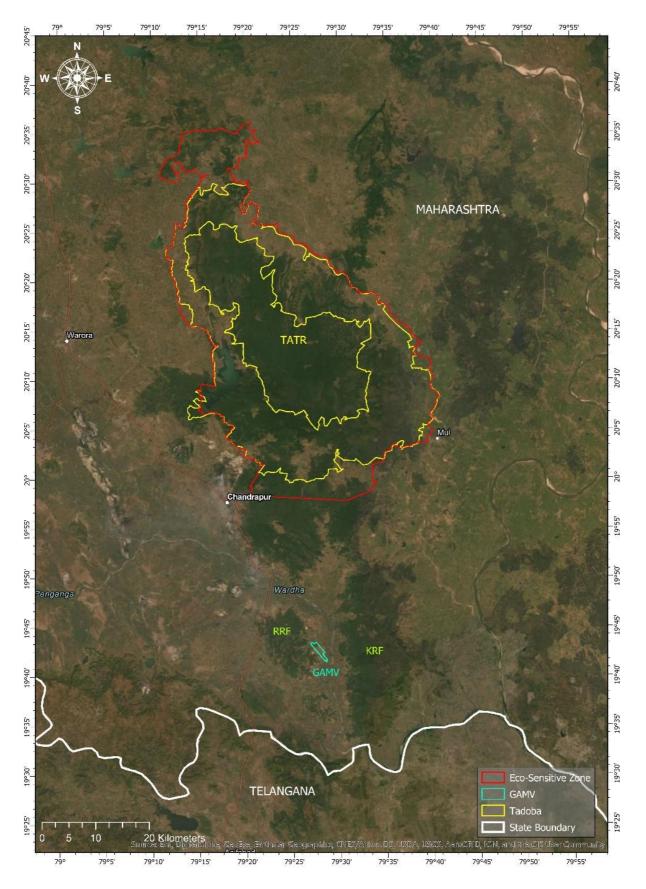


Figure 3.2.: Greenfield Airport at Murti village (GAMV), Chandrapur in relation to the location of Tadoba-Andhari Tiger Reserve and ESZ around TATR.

Corridors of Chandrapur Forest Division:

During the last one decade, wildlife habitat has been fragmented due to development and encroachment, creating forest patches of varying sizes in this landscape. (Table 3.3). Tiger is the apex predator of this landscape. Managing species as a panmictic population demands connectivity among these patches through "wildlife corridor", which are linear stretch of vegetation that connect forest patches and facilitate movement between each patch to prevent their isolation (Rosenberg et al. 1995). The importance of corridors in wildlife conservation is immense; therefore, protecting these are important. Corridors not only facilitate the movement but also provides shelter for many large, long-ranging carnivores like tigers, leopards etc. It has also been observed that habitat connectivity increases the viability of a population (Beier et al. 2008). Visualizing this need for effective conservation planning, Mondal et al. (2016) identified various corridors in EVL (Fig. 3.3.)

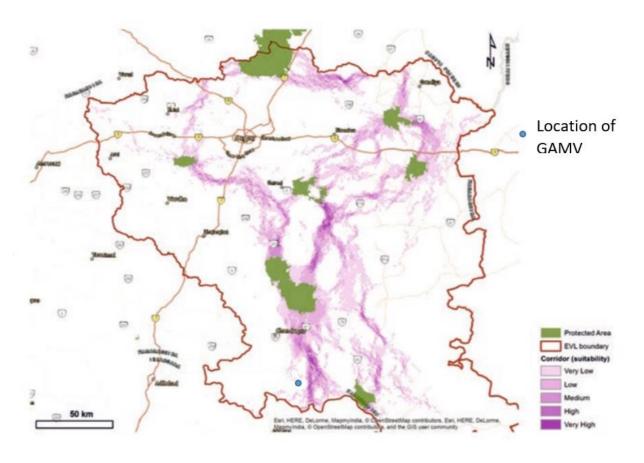


Figure 3.3: Location of GAMV in relation to identified "Wildlife Corridor" in Eastern Vidarbha Landscape, Maharashtra. (Adopted from Mondal et al. 2016)

The proposed site for the airport falls within the probable corridor between the Rajura and Kothari forest ranges which is why an assessment of wildlife presence and usage of the corridor should be done on the site. MADC in collaboration with Wildlife Institute of India (WII) conducted reconnaissance and comprehensive survey in the area.

Proposed Kanhargaon Wildlife Sanctuary (KWS) in Kothari RF:

Kothari Reserved Forest and Forests of FDCM of Chandrapur Forest Division are potential wildlife areas especially for tiger conservation because it connects tiger habitat of TATR with Kawal Tiger Reserve,

Telangana. Therefore, Maharashtra Forest Department has demarcated areas and completed the formalities for declaring Kanhargaon Wildlife Sanctuary (KWS) of around 265 sq.km in Gondpipri tehsil of Chandrapur district (Fig. 3.4). However, official notification is yet to be released. The proposed area of KWS is pristine forests, which used to be shooting blocks during the British era. The area has ca. 15 tigers and other wildlife species and may enhance the conservation of tigers of TATR and EVL. Besides, this may be a potential site for wildlife tourism.



Figure 3.4: Proposed site of Kanhagaon Wildife Sanctuary (KWS)

Assessment of wildlife status around Greenfield Airport at Murti village (GAMV), Chandrapur:

We determined the status of wildlife use around GAMV by reviewing the available information from the previous studies undertaken by the WII and Forest Department, undertaking reconnaissance survey, grid-based systematic sampling and discussion with Forest Officers and local people. We made three field visits for the collection of data and most of these visits were conducted along with the officers from the Forest Department and MADC (Fig.3.5).



Figure 3.5: Field site visit by the officers from Forest Department, MADC and the Wildlife Institute of India.

Reconnaissance survey:

Most of the forest areas around GAMV are of Rajura (RRF) and Kothari (KRF), which are connecting links between TATR and KTR in Telangana. Therefore, we planned to determine wildlife status in these areas (Fig. 3.1). We conducted a reconnaissance survey in these forest areas and our total survey efforts were of 133.2 km. We recorded direct sightings and wildlife signs such as tracks, scat, dung, pellets, etc. along with GPS during this survey. We also conducted informal interviews with the villagers.

Rajura (RRF) is a continuous forest patch of about 10 sq.km devoid of any human settlements situated on the western riverbed of the Wardha river (Fig. 3.6). Habitat is mostly of mixed forest dominated by teak (*Tectona grandis*) and amaltas (*Cassia fistula*). During the survey, we recorded direct sightings of chital (*Axis axis*), whereas indirect signs observed were tiger (*Panthera tigris*), sloth bear (*Melursus ursinus*), sambar (*Rusa unicolor*), and wild pig (*Sus scrofa*).

We observed seasonal streams in this landscape, and among these, the most important is Varaspindi nala (VN), which starts from the western side of the Wardha river (WR) and flows 5 km up north before meeting with Pachkawani nala near the railway underpass in RRF (Fig. 3.6). Most of the vegetation around VN is quite dense and is the most suitable as a "Stepping Stone" habitat for the tiger to cross from KRF to RRF. The presence of tiger signs indicates its importance of moving tigers from KRF to RRF. Part of this stream (VN) is just touching the northern boundary wall of the proposed airport (Fig. 3.6).

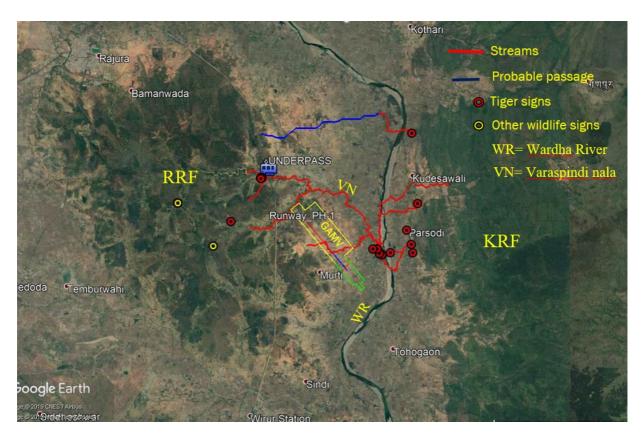


Figure 3.6: Observed wildlife signs and important streams often used by tigers crossing from forest areas of Kothari (KRF) to Rajura (RRF) around GAMV.





Figure 3.7: (A) Opening and (B) dense vegetation of the Varaspindi nala near Wardha riverbank.

Systematic status survey of wildlife in and around the proposed GAMV site:

Besides the reconnaissance survey, we also assessed systematically the status survey of wildlife species of the Rajura (RRF) and Kothari (KRF) reserve forests around GAMV using grid- based approach. Both the areas were divided into grids, each of 2 x 2 km (Fig. 3.8). Of these, ten grids in each forest i.e. RRF and KRF, were walked by a team of two persons for two kms. We noted wildlife signs and sightings along with GPS. All the data were analyzed under the occupancy framework (MacKenzie et al., 2017). However, our data were sparse for achieving a meaningful analysis; therefore, we provide only "Naive occupancy".

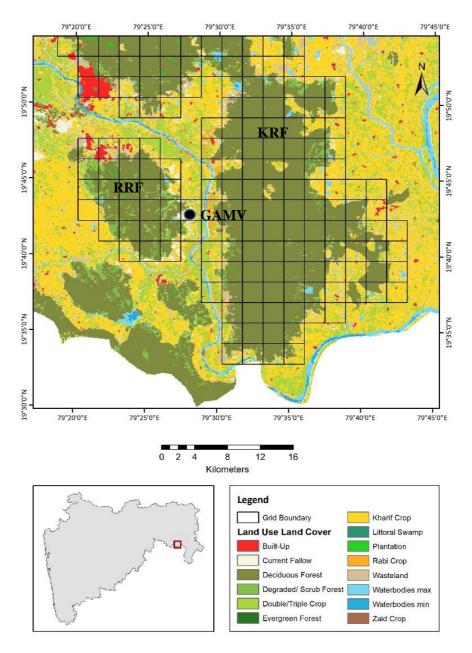


Figure 3.8: Rajura (RRF) and Kothari (KRF) reserve forests divided into grids each of 2 x 2 km around GAMV.

Figure 3.9 indicates a relatively high use of carnivore and herbivore wildlife species in both the forest areas of Rajura and Kothari reserve forests. Among wild herbivores, naïve occupancy ranged from 0.1 in barking deer to 1.00 in Chital in the surrounding forests of GAMV whereas in carnivores, it ranged from 0.3 to 0.5 (Table 3.3)

Table 3.3: Naïve occupancy (Ψ) for different species observed in Rajura and Kothari reserve forests

Herbivores	Ψ	Carnivores	Ψ
Chital	1	Civet	0.3
Porcupine	0.25	Tiger	0.5
Nilgai	0.8	Leopard	0.4
Gaur	0.2	Sloth Bear	0.35
Langur	0.25	Jungle cat	0.4
Sambar	0.55		
Wild Pig	0.5		
Hare	0.5		
Barking Deer	0.1		
Cattle	0.1		

Occupancy analysis indicates that both the forests of Rajura and Kothari have a very high potential habitat for wild herbivores and carnivores. Forest Officials have recorded presence of tigers in these areas around GAMV using camera traps and recorded several kills made by tigers (Personal communication).



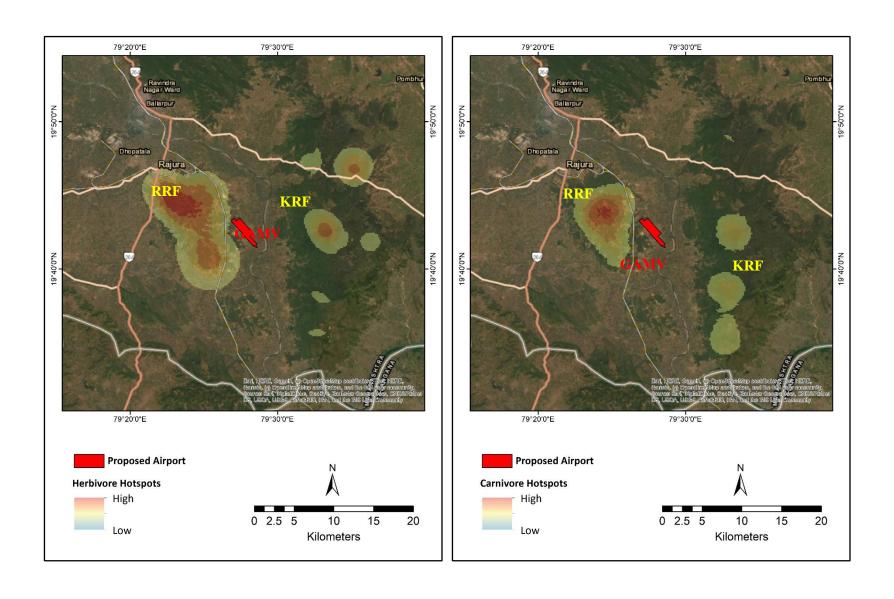


Figure 3.9: Distribution of carnivore and herbivore abundance hot spots in Rajura (RRF) and Kothari (KRF) reserve forests around GAMV.

Presence of tiger corridors between the forests of Rajura and Kothari around GAMV:

Tigers are long-ranging animals and require to move from one patch of forest to another. However, the area in and around GAMV is mostly human dominated consisting of agriculture fields. Based on the survey undertaken and interviews with local people around GAMV, we identified potential probable streams that are used by tigers for moving between forests of Rajura and Kothari. Most of these streams are seasonal and have vegetation cover. Hence, observed signs of tigers indicate that these seasonal drainages are potential corridors for the movement of tigers and other carnivores between these two forests (Fig. 3.10).

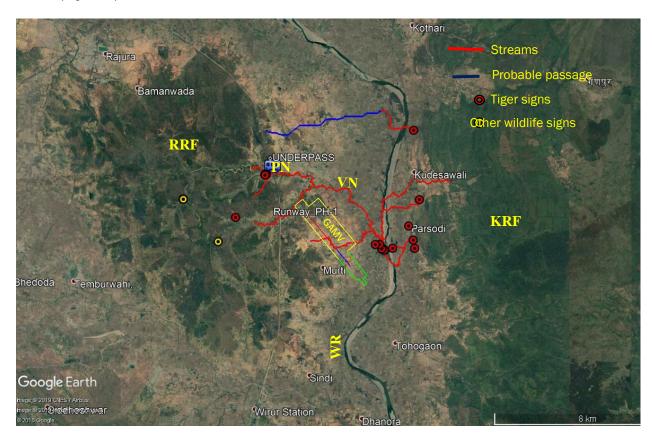


Figure 3.10: Seasonal streams around GAMV used by tigers to move between the forests of Rajura

The most important seasonal drainage is Varaspindi nala (VN) which is further connected with the Pachkawani nala (PN) where tiger pugmarks were recorded (Figure 3.10). On the eastern side of the Wardha river (WR), there are four probable tiger corridors through seasonal drainage (Fig. 3.10). They all are situated along the periphery of the reserve forest. Parsodi village and its adjoining areas were found to be prime locations for the corridor.

Introduction:

Linear structures like roads and railway lines have an array of adverse effects on wildlife that range from habitat fragmentation, mortality, disruptive dispersion, reduced gene flow, biodiversity loss and many more (van der Ree et al. 2011). Recently, there has been growing interest in preparing more comprehensive and effective Aerodrome Wildlife Management Plans (AWMPs) that go beyond compliance with International Civil Aviation Organization (ICAO) standards and recommended practices (SARPs). The recent update of several ICAO documents related to aviation safety and wildlife management has highlighted the need for AWMPs to be harmonized with the Aviation Safety Management System (ASMS). Most of the frequent disturbances highlighted in AWMP are of birds hit, flooding the forest by night light, the excessive sound caused by the aircraft engines. Besides, airports and associated development also leads to habitat degradation, fragmentation, and impact long-term wildlife conservation goals. Therefore, it is evident that any developmental construction in the wildlife habitat or the corridor may affect the wildlife adversely. The proposed airport GAMV is surrounded by wildlife habitat and may have the following effects on wildlife in the near future.

Physical barrier:

The airport will have a boundary wall surrounding the entire construction. The total length of the airport is 4 km (approximately). Therefore, a 4 km wall will be created in between the corridor, which may surely work as a physical barrier in the near future. Because of the wall, animals won't be able to use the corridor, and it may affect movement between RRF and KRF (Figure 4.1).



Figure 4.1: Boundary wall of the proposed GAMV.

Light:

The proposed airport will have artificial lighting installed for surveillance and many other purposes. The light of the airport can be classified in these following classes (https://www.slideshare.net/abhionly4you/airport-lighting)

- Airport beacon
- Approach lighting
- Apron and hanger lighting
- Boundary lighting
- Lighting of boundary direction indicator
- Lighting of wind direction indicator
- Runway lighting
- Taxiway lighting
- Threshold lighting

It is the boundary lighting that may cause disturbance and to hamper the movement of the animals in and around the proposed airport site. The invention relates to airport boundary lights designed to give a signal to the aviator distant from the landing field and at an elevation suitable for gliding to a landing (Rolph. 1935). The boundary lighting is crucial as it provides a degree of protection from illegal activities like theft, vandalism, etc. at night. Good protective lighting is achieved by using adequate, even light upon bordering areas, glaring lights oriented toward pedestrian and vehicle avenues of approach and relatively little light on the guard personnel. Generally, the lights should illuminate the barricade but will not interfere with the activity of aircraft. The boundary lights can be classified in this manner (US Dept. of Homeland Security. 2017):

- Continuous lighting: This is the most common protective lighting system. It consists of a series of fixed lights arranged to flood a given area with overlapping zones of light continuously during the hours of darkness.
- Standby lighting: Lights in this system are either automatically or manually turned on at a prearranged time, when suspicious activity is detected, or when an interruption of power occurs.
- Movable lighting: This type of light consists of manually operated, movable floodlights.
- Emergency lighting: This system may duplicate any of the systems as mentioned above. Its use is limited to periods of power failure or other emergencies and is dependent upon an alternate power source.
- Solar-powered lighting: In areas where electricity does not exist or is cost-prohibitive, solar -powered light may be considered a viable alternative and have a wide range of applications.

The protective lighting may be helpful for the airport. However, if not appropriately planned for the airport, which is in the amidst of the forest habitat, it may have a significant obstacle mainly to the nocturnal wild animals, which move from one area to other using corridor in these habitats. Artificial night lighting has many adverse effects on animals, like disrupting foraging behavior, disrupting the dispersion, increasing predation risk, etc. Many nocturnal animals like bats have rod-dense retina and can get blind because of the bright lighting (Beier et al. 2006).

Sound:

The operation of airports results in environmental impacts associated with high levels of noise and vibrations. These may have severe adverse effects on both workers and surrounding residents and their properties (Mato et al. 1999). Studies have shown that noise produced by small airports can cause annoyance among humans. Sound, which is more than or equal to 70dB, will cause irritation among the humans who live around the airport (Rylander et al. 1997). The sound level varies with time, for example, the sound increases as the aircraft approaches the runway and it decreases as the aircraft recedes (Department of Transportation, 2013). Figure 4.2 indicates that the sound is extreme when it touches down the runway.

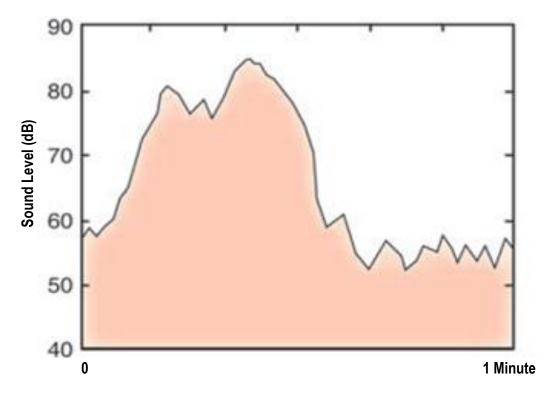


Figure 4.2: A-weighted sound level over 1 minute.

It is crucial because the human ear can cope with only low and mid-frequency sound. High- frequency sound such as this cause problems and annoyance. According to WHO, 90dB should be the highest sound level one should be exposed to workplace (Grivin. 2009).

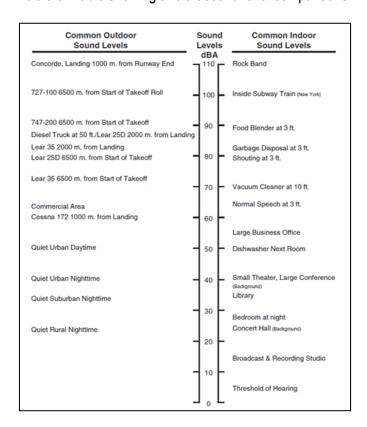


Table.3: Table showing aircraft sound level comparisons.

Sound has long-term effects on wildlife; it impacts the energy budget, reproductive success and long-term success of survival (Radle. 2007). The immediate response towards the noise may help the animal momentarily but in the long run it may cause negative impacts (Knight et al. 2011). Sound from aircraft, vehicles, machinery etc. may have long term effects on animals that live near the forest and use the passage as a corridor between Rajura and Kothari. Noise associated with airport may also affect people of the adjoining villages like Murti and Vihirgaon and could create cardiovascular and neuroendocrine problems for humans (Knight et al. 2011). Based on the sound contour profile recorded at the airport site (Fig. 4.3), it is recommended that the sound level should not be more than 45 dB at the boundary of the airport.

Visualizing the impact of sound on wildlife, the US Legislature recognizes and declares state policy to "actively encourage the safe and biologically sound management of wildlife resources" on state publicuse airport.

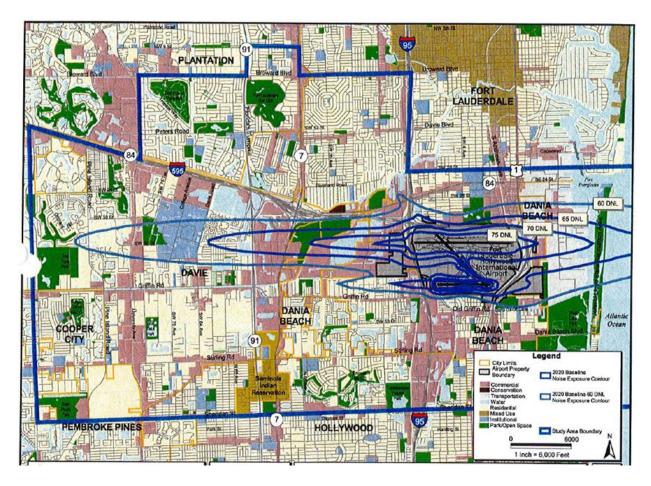


Figure 4.3: Sound contour of Florida Airport. (Source-Internet).

Expansion of the Road:

The road running right beside the airport boundary (Fig. 4.4) may be expanded in the near future to accommodate the massive traffic load. It connects the Chandrapur city to the proposed site and also connects the site to Telangana state. It may look suitable for the airport, but roads have a negative impact on wildlife.

Roads can negatively impact the population process of wildlife through fragmentation, vehicle mortality, barrier effect, etc. (Taylor et al. 2010). Many studies have shown that the expansion of roads increases hunting pressure (Laurence et al. 2006). SH264 runs on the western side of the RRF, which would be expanded to accommodate the heavy traffic load. The impact of these two roads on wildlife may be immense.

Associated development:

The airport may cause development in the adjoining areas. Many resorts, hotels, restaurants may be established in the near future (mostly in Vihirgaon and Murti). The light and sound from such establishments may cause a negative effect on wildlife such as increased mortality, reduced breeding success, and have long term effects at the ecosystem level (Green et al. 2004).

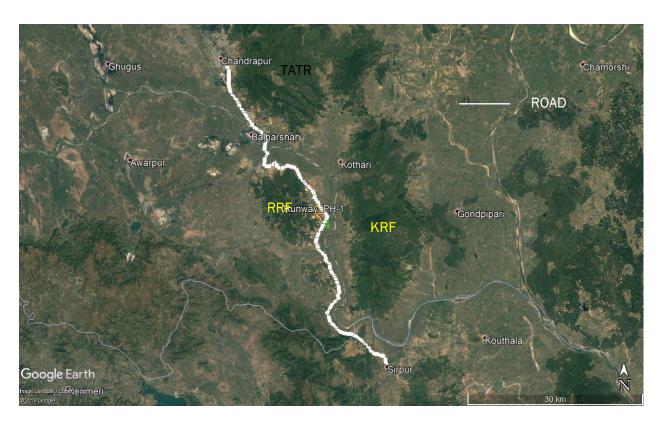
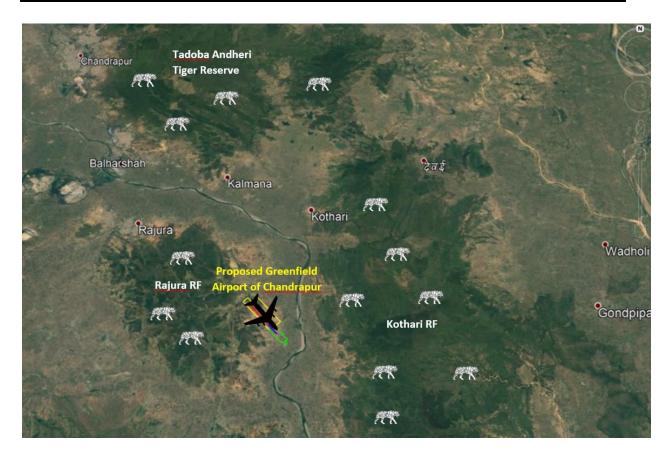


Figure 4.4: The road that runs beside the proposed airport and connects Chandrapur to Telangana (Sirpur). (KRF=Kothari reserve forest, RRF=Rajura reserve forest).

Human-animal conflict:

The airport may cause more human movements near the forest. This may definitely increase the conflict between man and animal. Tigers are long-ranging animals, and they require corridors to move from one forest to another. Increased human movement in the area may disrupt the tiger movement. It may increase the man-tiger conflict and make the tiger conservation more questionable in such an area. Increased garbage, if properly not managed, may also attract several wildlife species such as wild pig and others and may lead to Human-Wildlife Conflict.



Based on the comprehensive analysis undertaken using existing available information on wildlife use, data collected during fieldwork, habitat use by the tiger and other wildlife and corridor connectivity of the landscape, our recommendations are as follows:

1. The proposed Greenfield airport at Murti village (GAMV), Chandrapur, Maharashtra is within the wildlife habitat and connecting corridors:

Within the EVL, Chandrapur Forest Division is the home of 80% tigers of the Maharashtra State. We have discussed and highlighted the significance of (i) conserving the wildlife habitats of the Forests of Chandrapur Division for ensuring long-term conservation of tigers within the EVL and (ii) corridors which connects the tigers of TATR to the habitats of Kawal Tiger Reserve, Telangana. The proposed GAMV is within these critical wildlife habitats and connecting corridors (Fig. 5.1) of the Chandrapur Forest Division, Maharashtra. The construction of airport at such a wildlife rich site will risk the life of humans also

Recommendation: Given the wildlife value of the area and its importance of connecting corridors, the present site may or shall not be considered for the construction of the proposed Greenfield airport at Murti village (GAMV), Chandrapur, Maharashtra.

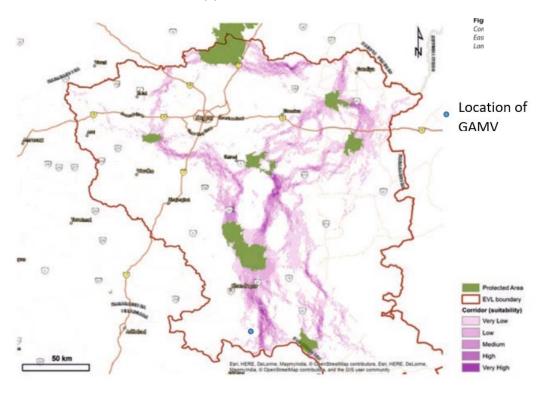
2. In case there is no alternative site for the proposed airport, following mitigation measures need to be consider if the decision is taken to continue with the construction of GAMV, Chandrapur, Maharashtra:

2.1: Re-align GAMV boundary:

Tigers are known to move in human dominated landscape, however mostly during night when level



(a) Tiger habitat around GAMV.



(b) Identified tiger movement corridor around GAMV.

Figure 5.1: (a) Tiger habitats around GAMV and (b) identified tiger movement corridor (Adopted from Mondal et al. (2016).

of disturbance is low. Most of the preferred tiger movements from one forest patch to others have been through drainage channels, which provide cover because of presence of vegetation like, grasses, weeds etc., due to relatively high soil moisture than adjoining areas. Protection or restoration of such habitat provides suitable habitats for connectivity. GAMV has been planned mostly on area which is mainly under agriculture (dryland farming) except small proportion of private, and forest lands. However, the northern part of the airport boundary is very close to most important drainage "Varsapindi Nala" (Fig. 5.2).



Figure 5.2: Observed tigers sings during survey undertaken from to in relation to location of "Varsapindi Nala" and Railway line.

The "Varaspindi Nala" (VN) which starts from the western side of the Wardha river and flows 5 km up north before meeting with "Pachkawani Nala" near the railway underpass in RRF. Hence, VN is the most conducive site for tigers moving between KRF and RRF, and tiger signs were found on VN during our survey. Thus, this side should remain disturbance free at least by 200 meters from the boundary wall of the airport.

Recommendation: Therefore, we suggest re-aligning the boundary as suggested in Fig. 5.3.

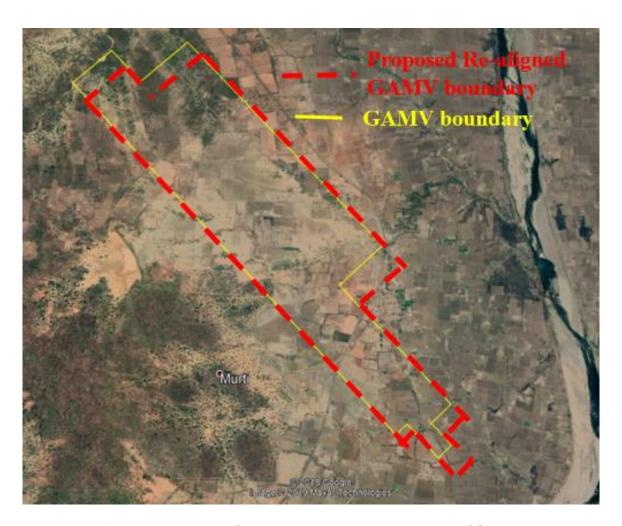


Figure 5.3: Location of original and re-aligned boundary wall of GAMV.

2.2: In case re-alignment of the airport boundary is not possible, reduce runway end safety area (RESA) in northern side:

Runway end safety area (RESA) or "Runway Safety Area (RSA) is defined as "the surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

Past standards called for the RSA to extend only 60m (200 feet) from the ends of the runway. Currently the standard of International Civil Aviation Organization (ICAO) requires a minimum of 90 m RSA and preferably 300 m starting from the end of the runway strip. The standard dimensions have increased over time to accommodate larger and faster aircraft, and to improve safety (https://en.wikipedia.org/wiki/ Runway_safety_area).

RESA at Jolly Grant Airport, Dehradun is only around 220 meters (Fig. 5.4).



Figure 5.4: RESA of 220 meter at Jolly Grant Airport.

Recommendation: At present "Runway end safety area" (RESA) for the proposed GAMV on northern side is of 400 meters. We suggest to reduce this by 200 meter to provide disturbance free area for animal movement through "Varaspindi Nala" (Fig. 5.5).

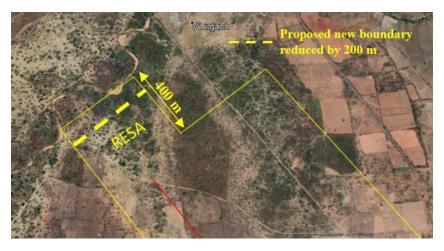
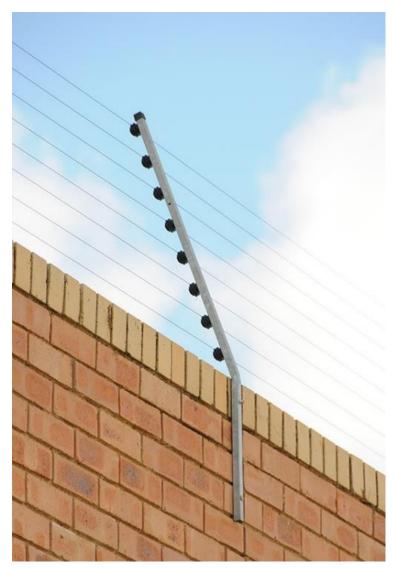


Figure 5.5: Suggested reduction in RESA in northern side by 200 meters.

2.3: Construction of permanent boundary wall and other measures to prevent entry of any wild animal within airport premises to avoid conflict with aircraft operation:

Wildlife straying into airports has been a critical issue for airport manager across world. Various stray, wild and domestic animals have been reported on Indian airports including Jackals, Nilgai, monitor lizards, peacocks, porcupines, snakes, monkey, foxes, dogs and birds of prey. However, the majority of the available literature related to managing wildlife in and around airport is related to the bird strikes. However, airports close to the wildlife habitats require a better understanding of "Wildlife-Habitat Relationship" so that risk may be reduced.

The proposed airport is close to the forest areas; therefore, we suggest the following to minimize the risk of animals straying into the airport:



Construction of boundary wall:

Though construction of firm and suitable boundary wall has been visualized in the report of MADC titled "Obstacles survey-cumproject feasibility report", we suggest that foundation of the wall should be such that no burrowing mammals such rodents, wild boars porcupine etc., can manage to enter the airport. The "Solar Perimeter Security Electric Fence" system is a modern-day alternative to conventional methods of fencing to protect crops & property from wild animals. This has been a effective means for reducing losses caused by animals.

Recommendation: Therefore, based on animals reported straying into airports in India, we suggest using solar powered electric fence over the wall; the total height including electric fence should be at least around 12 feet (Fig. 5.6).

Figure 5.6: Suggested type of electric fence over wall (Source: Internet).

Removal of trees within 100 meter of boundary wall of the proposed GAMV: Because of the strategic location of GAMV within the wildlife habitat, it requires proper landscaping to deter animals as improper landscaping can attract animals to the airport and create wildlife hazards. Habitat modification, which is not suitable to wildlife species, is an effort to create an environment around the airport that is unattractive to potentially hazardous animals. It has been widely reported that few animals, which are arboreal in habit such as Small Indian Civet, Palm Civet and Leopard, are known to enter residential complexes and airports for escape cover or for any other habitat need.

Recommendation: Therefore, we suggest removing any tree that is within 100 meter of boundary wall towards forest side (Fig.5.7A) and should be managed as scrub habitat (Fig.5.7 B). We also propose solar powered wildlife electric fence of eight strands at 100 meters from the boundary wall towards forest side of eight strands (Fig. 5.7 C). Spacing between lower four strands should be ½ feet to deter any wild boar and deer species (Chital and Sambar) approaching the airport wall.

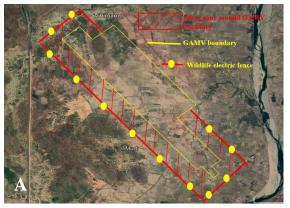






Figure 5.7: (A) Proposed 100-meter zone around GAMV boundary, (B) Manage 100 meter zone as scrub habitat and remove all tree, and (C) Proposed "Solar wildlife electric fence".

2.4. Minimize occurrence of subsidized food resources for wildlife species through waste management of the adjoining villages:

Presence of food subsidies during Anthropocene has been as major driver which has shaped many communities and ecosystems differently than the natural ecosystems. India has been found to have high anthropogenic food subsides (AFS) that is likely to impact wildlife from individual to ecosystem level in the trophic structure (Oro et al., 2013, Kumar et al., 2018, O'Niel et al., 2018, Reshamwala et al. 2018). Most of the impacts due to AFS or food dumping sites have resulted in increase in the local predator species including birds of prey. Such increase in birds of prey due to AFS or dumping sites in villages near the airport may pose threats to operation of aircraft. There are two villages viz. Murti and Vihirgaon which are very close (<1 km) to the airport (Fig.5.8).

Recommendation: Therefore, we suggest placing efficient waste management system, and appropriate agency may be approached for preparing "Waste Management Plan" for these two villages.



Figure 5.8: Location of two villages' viz. Murti and Vihrigaon that require preparation of "Waste Management Plan".

2.5: Boundary and approach lightings:

Bright lightings are known to affect movement patterns of large carnivores and animals usually avoid such areas. Since the proposed GAMV is close to the wildlife habitats, therefore, we proposed peripheral lightings towards forest side be such that minimum light goes to surrounding environments (Figure 5.9).



Figure 5.9: Suggested peripheral lightings around GAMV.

Recommendation: MADC officials may visit to Dehradun's Jolly Grant airport to see type of peripheral lightings which are needed for the proposed GAMV. Since there is no flight operation during night, therefore, we suggest that only essential lights should be used during night.

2.6: Minimize airport noise level in the surroundings of GAMV:

Most of the noise level is either by the aircraft or of passengers at the airport. Proposed GAMV airport has planned to operate only daytime flights and would have relatively less impact on the nocturnal animals. However, sound contour profile of most of the airport clearly indicates the presence of noise level around 45 dB at the boundary which is well within the limit set by World Health Organization. Hence, we suggest considering the standard aviation guidelines to retain airport noise level < 45 dB at the boundary of the airport so that it may have less likely impacts on wildlife species.

Recommendation: In addition to this, we also suggest further reduction in the noise level for animals. This may be achieved by placing the sound insulation panels in the boundary wall to further reduce airport noise at the boundary (Figure 5.10).





Figure 5.10: Proposed noise-absorbing panels in the boundary wall.

2.6: Minimize the disturbance during construction phase:

Construction phase involve use of heavy machinery, establishment of labor camps and movement of vehicles for the transport of construction materials.

Recommendation: For minimizing the disturbance to the wildlife, we suggest that construction work should only be undertaken during daytime; all labor camps should be close to either Murti or Vihirgaon and minimize the disturbance close to northern part close to the drainage (Figure 5.11). All other required guidelines suggested during construction phase by the Ministry of Environment, Forests and Climate Change, Govt. of India should be followed.

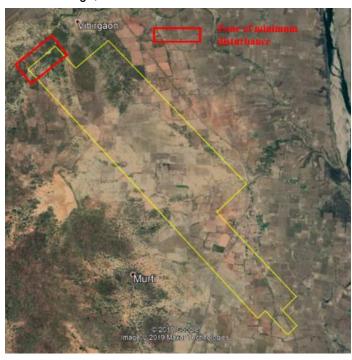


Figure 5.11: Proposed minimum disturbance zone during construction phase.

2.7: Regulated development in and around proposed GAMV and road linking Rajura to Murti for the airport:

There is a possibility that development may take place once the airport is functional and may cause disturbance and reduce tiger connectivity between RRF and KRF.



Figure 5.12: "No Development Zone" within 2 km of the GAVM and around Murti and Vihirgaon villages.

The proposed GAMV airport would cater the air travel requirements of people of Chandrapur, Sirpur in Maharashtra and other areas in Telangana. This may cause increase in the vehicular traffic as well as expansion of the road in future. The road running right beside the airport boundary may be expanded in near future to accommodate the huge traffic load.

Recommendation: Therefore, we suggest declaring "No Development Zone" within 2 km of the airport and around Murti and Vihirgaon villages. Besides, we also suggest that road link between Chankha and Murti should not be beyond two lanes in near future (Figure 5.13). Besides, we also suggest a "Open span bridge type Wildlife Underpass" of 150 (long) x 5 (height) meter over "Varsapindi Nala" on this road for tigers moving between KRF and RRF.



Figure 5.13: (A)Road between Chankha and Murti, (B & C) Wildlife Underpass over "Varsapindi Nala" and (D) Suggested "Open span bridge type wildlife underpass"

2.9: Estblishing multi-directional "Stepping stone" connectity through habitat restoration:

Managing tiger as panmictic population in this landscape from Tadoba-Andheri Tiger Reserve, Maharashtra to Kawal Tiger Reseve in Telangana requires ensuring "Stepping stone" connectivity among different forest patches in this fragmented landscape. Most tigers prefer using drinage channels or forest patches to move from one area to another, and also through agriculture land preferrably at night. In this landscape, bamboo has been major vegetation type and provides adequate cover for movement among different patches. Therefore, we suggest use of Katang bamboo (*Bambusa arundinacea*) for habitat restoration because of its quality and low market value.

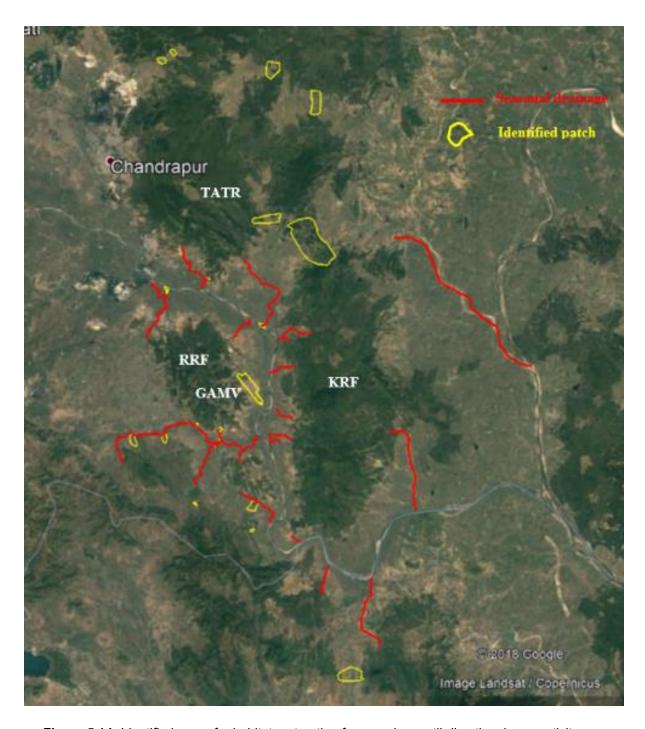


Figure 5.14: Identified areas for habitat restoration for ensuring mutli-directional connectivity. (GAMV = Proposed Greenfield airport at Murti village; KRF=Kothari reserve forest, RRF=Rajura reserve forest).

a) Restoration of habitat around seasonal drainage: Being a cryptic species, tiger requires cover when it moves or hunts. Based on our survey it can be said that the seasonal streams are important in terms of tiger corridors or the passageways. Therefore, connectivity must be maintained by protecting and maintaining these seasonal drainages. Between RRF and KRF, few patches around seasonal streams can be identified and managed maintain connectivity. If these patches can be restored and conserved then the connectivity between TATR, RRF and KRF may be maintained. These can be done through plantation of Katang bamboo. b) Restoration of identified habitat patches: Most of the habitat is human dominated and is agriculture. The important patches which are free of agriculture and presently are degraded forest or scrub habitat have been identified (Figure 5.15).

Recommendation: Therefore, it is suggested that Katang bamboo (*Bambusa arundinacea*) should be planted along the streams and in the reserve forest to increase the forest cover (Fig. 5.14). Based on tiger use and abundance data, we suggest habitat restoration at least 100 meter on both sides of identified crucial drainage channels. We identified 17 such seasonal drainage channels ranging from 1 to 34.5 km long which would enhance the connectivity across this landscape especially between RRF and KRF (Figure 5.15; Table 5.1.).

We suggest restoration of 17 forest patches with plantation of Katang bamboo (*Bambusa arundinacea*) so that these may ensure mutli-directional connectivity of tigers in this landscape as "Stepping Stone" habitat (Figure 5.16).

Forest Department may be requested to provide estimate for the habitat restoration of the identified patches and seasonal drainage so as the multi-directional connectivity is ensured for the movement of tiger from one area to another in this landscape. Table 5.1 describes summary of area (seasonal drainage/patch) required for habitat restoration.

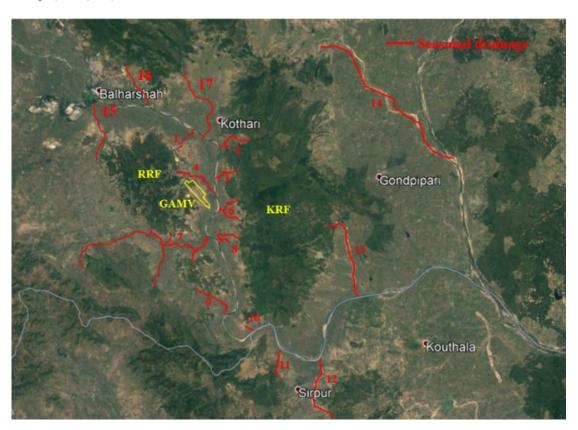


Figure 5.15: Identified areas for restoration of habitat approximately 100 meter on both side of the seasonal drainage. (GAMV = Proposed Greenfield airport at Murti village; KRF=Kothari reserve forest, RRF=Rajura reserve forest).

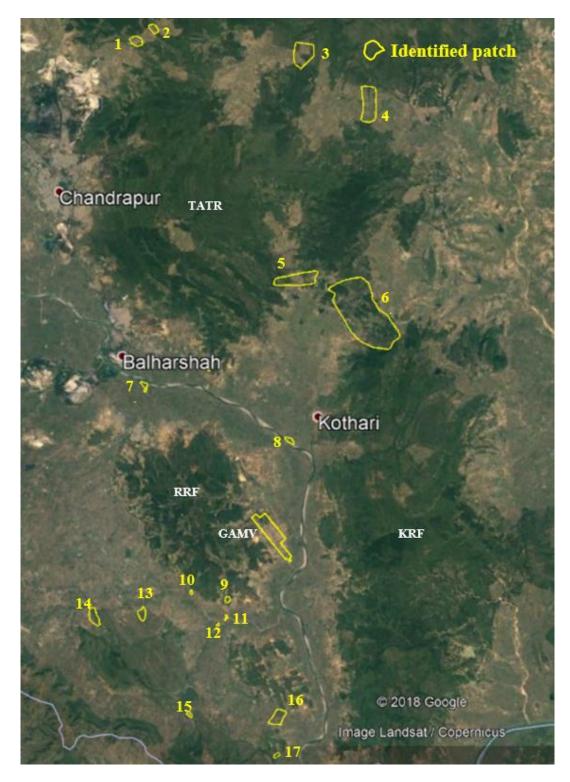


Figure 5.16: Restoration of habitat of identified patches. (GAMV = Proposed Greenfield airport at Murti village; KRF=Kothari reserve forest, RRF=Rajura reserve forest).

Table 5.1: Identified areas for habitat restoration around drainage and forest patches so as to retain multi directional connectivity as "Stepping Stone".

S. No. of patch/drainage*	Patch area (sq.km)	Drianage length (km)
1	0.59	4.54
2	0.38	6.3
3	2.5	3.69
4	2.96	6.7
5	2.65	1.0
6	16.8	6.48
7	0.2	34.49
8	0.2	6.46
9	0.21	6.98
10	0.1	1.53
11	0.14	3.45
12	0.1	9.71
13	0.43	11.6
14	0.73	24.5
15	0.1	11.1
16	0.93	6.6
17	0.12	11.9
Total	29.14	157.03

^{*} Details of all identified seasonal drainage and habitat patches on map are being provided in Annexure I.

3. Monitoring responses of wildlife species and movement patterns during construction and operation phase of the airport for five years:

Monitoring of wildlife habitat use and likely impact during construction and operation phase of the airport are most crucial to incorporate any mid-term mitigatory measures needed for achieving the conservation goals.

Recommendation: Being critical wildlife habitat, we strongly suggest monitoring of the response of wildlife species and movement patterns during construction and operation phase of the airport. This would enable us to suggest any mid-term mitigatory measures if needed.

Estimated expenditure is as follows:

S. No.	Activity	Estimated expenditure, Rs. in lakhs*	Remarks
1.	Engaging Research Personnel, field staff, and CDLs, base camp and others @Rs.2.00 lakhs/month	150.00	For undertaking research work
2.	Purchase of relevant equipment and other items for monitoring ranging patterns of tiger (10) and leopard (10) through GPS telemetry	200.00	Proposed to use GPS tagged individuals and molecular tracking for understanding responses of wild animals during construction and operation phase of the airport.
3.	Purchase of camera traps, items for molecular tracking and other equipment	100.00	Monitor distribution patterns, abundance, sex and age structure, population demography
4.	Miscellaneous including vehicle hiring	50.00	For undertaking field work
5.	Institutional charges @15%	75.00	
6.	Grand Total	475.00	

^{*} During construction and operationalized phase for five years

The Institute will provide a detailed proposal along with the financial layout to suggest any mid-term mitigatory measures if needed.

4. Expedite declaration of the proposed Kanhargaon Wildlife Sanctuary (KWS) in Kothari RF:

Kothari Reserved Forest and Forests of FDCM of Chandrapur Forest Division are potential wildlife areas specially for tiger conservation because it connects tiger habitat of TATR with Kawal Tiger Reserve, Telangana. Therefore, Maharashtra Forest Department has demarcated areas and completed the formalities for declaring Kanhargaon Wildlife Sanctuary (KWS) of around 265 sq.km in Gondpipri tehsil of Chandrapur district. However, official notification is yet to be released. The proposed area of KWS is pristine forests, which used to be shooting blocks during the British era. The area has ca. 15 tigers and other wildlife species and may enhance conservation of tigers in TATR, EVL and may be potential site for wildlife tourism.

Until sanctuary declaration process is complete, we suggest that Forest Department should take necessary measures to avoid any further degradation of the dense forest patches of RRF and KRF and stop any extraction of forest produce from these key habitat areas (Fig. 5.17).

Once the Kanhargaon Wildlife sanctuary is notified, GAMV will be within 10 km of sanctuary boundary. Therefore, a prior clearance from Standing Committee of the National Board for Wildlife (SCNBWL) would be required as per the recent Office Memorandum of Ministry of Environment, Forest and Climate Change (Dated 8th August 2019).

Recommendation: We suggest expediting declaration of Kanhargaon Wildlife Sanctuary (KWS) so that quality of the forest patches of Kothari is not further degraded.

5. Constitution of committee for monitoring the compliance of mitigatory measures:

Compliance of suggested mitigatory measures is a crucial for retaining the connectivity of tiger in this landscape and surrounding habitats of GAMV. Therefore, we suggest that Forest Department should constitute a committee of the followings to monitor the compliance of mitigatory measures by the MADC:

Chairman: CCF, Chandrapur Forest Division

Member: Nominee of Maharashtra Airport Development Company Ltd.

Member: Nominee of the Wildlife Institute of India
Member: Nominee of Tadoba-Andheri Tiger Reserve

Member Secretary: Divisional Conservator of Forest, Chandrapur Forest Division



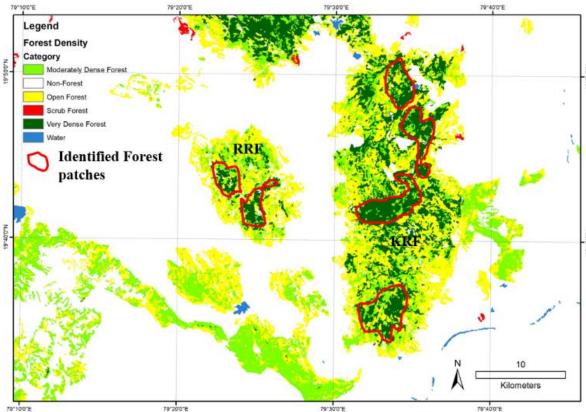


Figure 5.17: (A) Proposed site of Kanhargaon Wildife Sanctuary (KWS) and (B) identified desne forest patches for extra protection in RRF and KRF to minimize further degradation of habitat quality.

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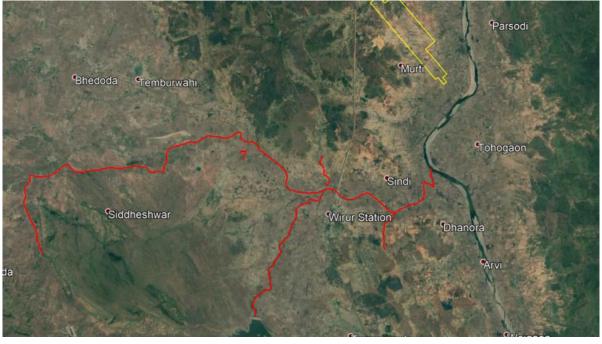
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Details of identified seasonal drainage (as indicated by number) for habitat restoration (Refer Table 5.1. for suggested extent of area for each drainage)













Details of identified forest patches (as indicated by number) for habitat restoration (Refer Table 5.1. for suggested extent of area for each forest patch)



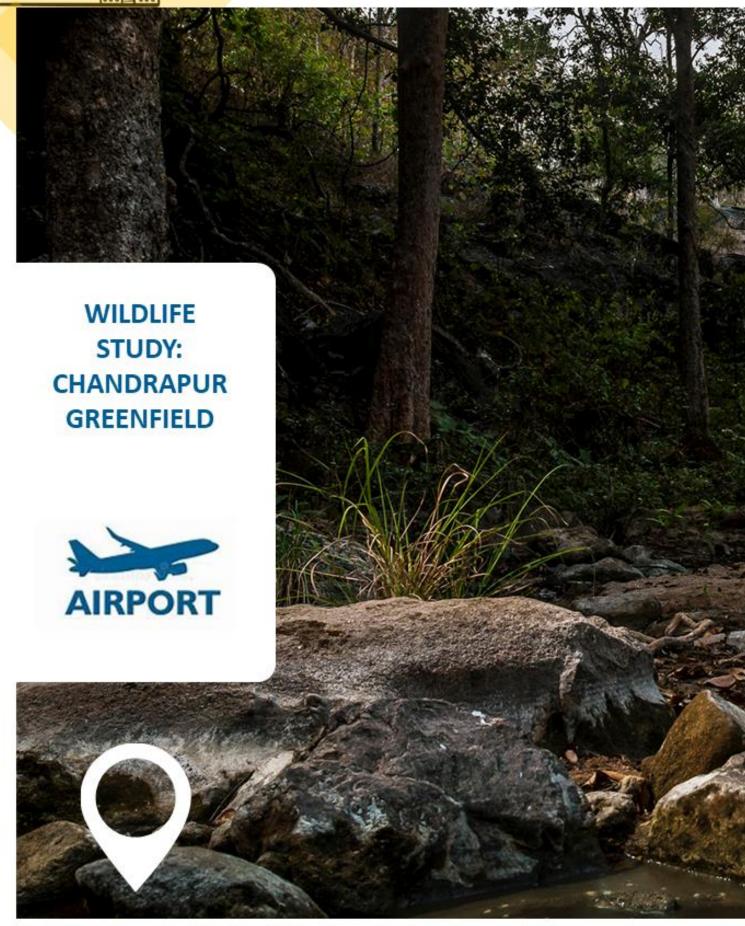












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