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Rapid Appraisal of Manas Tiger Reserve

to understand its Conservation Challenges

The authors present an analysis of the prevalent conservation challenges in Manas Tiger Reserve and World Heritage Site, together with the Trans-boundary Conservation Area, as discerned utilising four distinct techniques: literature survey, field visits, participatory appraisal of key stakeholders and focussed interviews. They found significant differences in the challenge perceptions of different stakeholders, indicating not only availability heuristic in operation, but also the complimentary strategies that need to be deployed for an ameliorated participatory management. They believe that the information presented through this analysis will be found useful by the managers for an expeditious mitigation of these conservation challenges, so obligatory for the management of this exceptional biodiversity hotspot.

Key words: Manas Tiger Reserve, Conservation challenges, Trans-boundary conservation area, World Heritage Site, Manas National Park.

An analysis of the prevalent conservation challenger in Manas Tiger Reserve and World Heritage Site

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Introduction

Manas Tiger Reserve in the state of Assam is a part of the Eastern Himalayan biodiversity hotspot. This region, hosting around 5,000 endemic plants (Mittermeier *et al*., 1998), the world's maximum diversity of song birds (Price *et al*., 2014) and alarge endemic freshwater biodiversity (Allen, *et al.,* 2010) is constantly under threat owing to massive deforestation and habitat loss in the area (Pandit *et al.* 2007). Of the regions covered in the hotspot, Manas Tiger Reserve is an especially significant protected area with the unique distinction of having a Natural World heritage site, a Tiger Reserve, a National Park, an Elephant Reserve and an Important Bird Area, all in its small territory.

Although extremely consequential from the biodiversity point of view, the management of the tiger reserve has of late witnessed large-scale changes in management and administrative scenarios before, during and after the Bodoland uprisings (1985 - 2003) with long-lasting impacts on its biodiversity (Goswami and Ganesh, 2011; Soud *et al.*, 2013), consequently leading to its placement in the endangered list of World Heritage sites from the years 1992 till 2011(Smith *et al*., 2000; Badman and Bomhard, 2008). Since then, several conservation steps have been taken in the form of intensive habitat management and translocation of greater one-horned rhinoceros to re-populate the National Park (Bonal *et al.,* 2009; Singh, Sharma *et al*., 2012; Barman *et al.,* 2014). However, recent studies have concluded that the human pressures continue to remain large, threatening the site (Allan *et al*., 2017). In this context, here we present and discuss the conservation challenges existent in the Tiger Reserve and the overarching Trans-boundary Conservation Area, as discerned through published literature, field visits, participatory appraisals and interviews of key stakeholders.

Material and Methods

Data collection from literature

The existing literature on Manas National Park, Manas Tiger Reserve, Manas World Heritage Site and Manas Trans-boundary conservation area were investigated to compile a list of the conservation challenges prevalent

in the area. This literature also included the Tiger Conservation Plan and the research reports of several NGOs.

Data collection from field visits

The area of the Manas National Park was surveyed during the period 05 April 2018 to 11 April 2018. The surveys included gypsy safari in the National Park and visits to the nearby villages, embankments and boundaries.

Participatory appraisals with department staff and villagers

The technique of participatory appraisal was utilised to understand the perceptions about conservation challenges, as prevalent among the department staff and the villagers. Briefly, groups of department staff and villagers were assembled separately. Each group was apprised of the aims of the study. They were then asked to prepare a list of the conservation challenges prevalent in the area. At this stage all entries were deemed to be of equal importance, and the input of the author was only limited to encouraging the group to try more. No extra points were added by the author to the list. Following this, the participants were asked to separately rank the items of the list according to their importance as perceived by them. When the list had been ranked by all the participants, an aggregate rank list was prepared by summing the ranks of each of the participants. Scores were computed for each item and doughnut charts were prepared. Then the participants were de-briefed about the results so obtained.

Focussed interviews with department personnel

To understand the differential perceptions of the departmental personnel at different ranks of hierarchy, focussed interviews were held with the Field Director, the Deputy Director, the Assistant Director, a Range officer, a Forester, a Forest guard and a Chowkidar/Casual labourer. The participants were briefed about the aims of the study, and were asked to list the conservation challenges as perceived by them and faced by them in their functioning. These were then ranked as per importance as perceived by the participants, and the top three conservation challenges were noted down.

Ranking of the conservation challenges

The conservation challenges were assigned subjective priority and complexity rankings. These were then classified into four categories: high priority high complexity, high priority low complexity, low priority high complexity and low priority low complexity, to facilitate decision making regarding the sequence in which these challenges should be tackled by the management.

Results and Discussion

Description of the study site

The Manas Tiger Reserve is located in the North-Eastern state of Assam, India (Fig. 1a). It is a part of the Eastern Himalayas biodiversity hot spot, located at the junction of the Indo-Gangetic and Indo-Malayan realms. The reserve consists of a 526.22 km^2 core area comprising the Manas National Park and the Barnadi Wildlife Sanctuary, along with a buffer area of 2310.88 km^2 divided into several ranges (Fig. 1b). These areas together with the Royal Manas National Park form the Transboundary Manas Conservation Area (Fig. 1b). The national park consists of dense forests and grasslands that host several endangered and flagship species, including tiger, rhinoceros, elephant, wild buffalo, swamp deer, hog deer, pigmy hog, peacockand Bengal florican.

Table 1: List of conservation challenges discerned from literature.

Challenge	Reference(s)
Socio-political disturbance	[4]
Human pressures and forest loss	[5, 6]
Human wildlife conflict	[7]
Poverty and resource dependence of villages	[8]
Habitat degradation	[8]
Poaching	[8]

[4](Soud *et al*., 2013); [5](Allan *et al*., 2017); [6](Pandit *et al*., 2007); [7](Nath *et al*., 2009); [8]((Ghosh *et al*., 2014).

Since the Manas Tiger Reserve and the Royal Manas National Park form the contiguous Trans-boundary Manas Conservation Area being managed together by both the countries (India and Bhutan), we base our further analysis on this complete area for habitat degradation and animal movement (which are trans-boundary issues), while restricting our other analyses to the Manas Tiger Reserve.

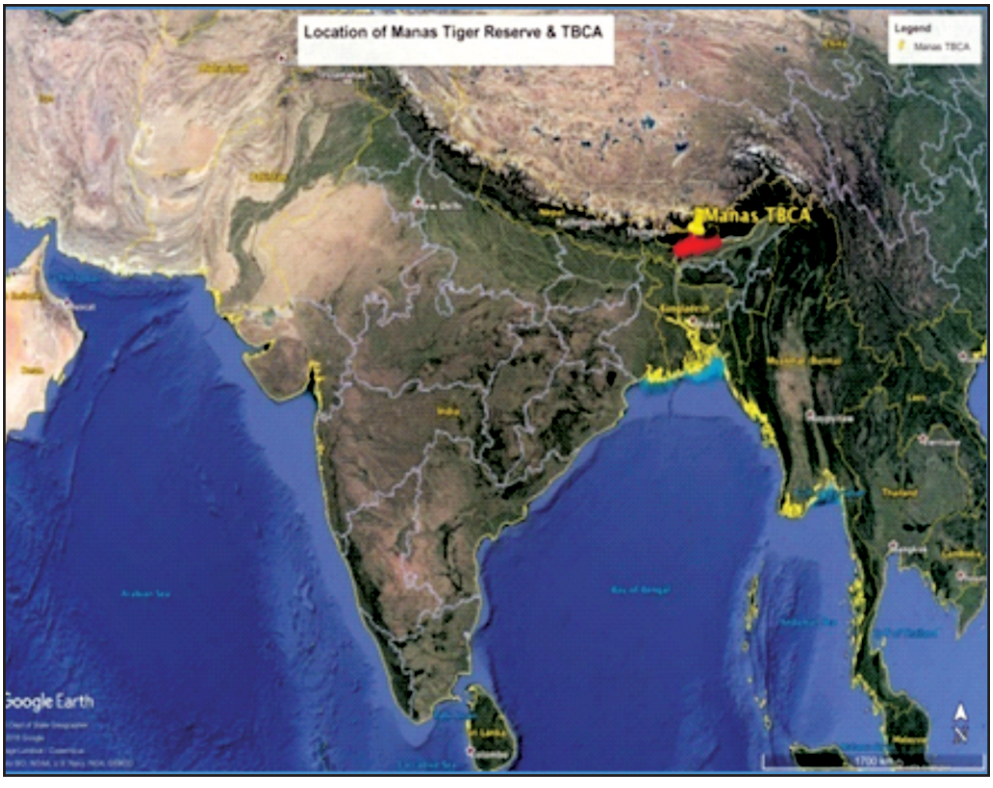
Conservation challenges discerned from literature

The conservation challenges as mentioned in published literature and reports are listed in Table 1.

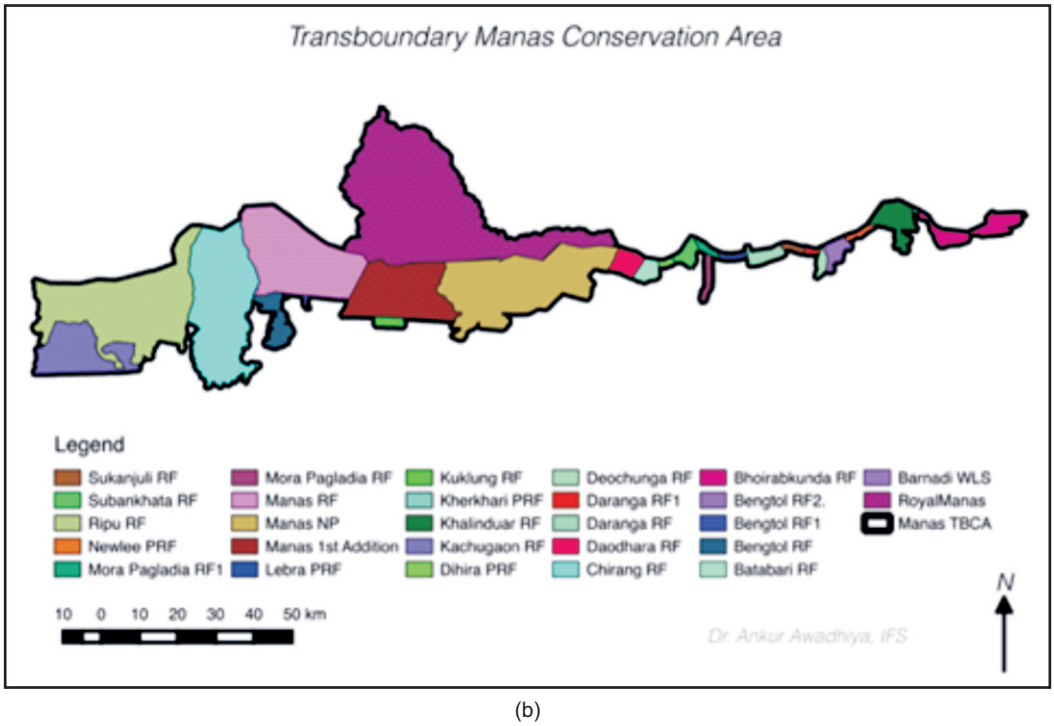
The major challenges include socio-political disturbance, human pressures due to poverty and resource dependence of villages causing an over-exploitation of forest resources and leading to forest loss and habitat degradation, further exacerbating the human wildlife conflict and poaching of wild animals prevalent in the area.

Conservation challenges discerned from field visits

The conservation challenges observed during our field visits are depicted in Figure 2. We noticed infestation of woodlands by weeds and climbers (Fig. 2a) resulting in reduced biodiversity, together with infestation of grasslands by woody species, especially *Semul* (*Bombax ceiba*) (Fig. 2b). There were plastic bags found in rhino dung (Fig. 2c), indicating that the animals were ingesting plastic. Since rhinoceros are hind gut fermenters, these plastic bags got egested along with their dung. Nevertheless, plastics do also carry the potential of causing blockages in the alimentary canal, that could even lead to the death of the animal (Ramaswamy and Sharma, 2011; Omidi *et al*., 2012). With the presence of several species of herbivores, this is a challenge that requires an urgent attention. The camp elephant at *Kuri beel* was found to be severely malnourished (Fig. 2d), indicating a dearth of nutritious feed, a prevalence of pathogens in the system, or both. This needs to be investigated in further detail, and may indicate a need for habitat management for other animals as well. The staff at the patrolling camps were found keeping pet cats (Fig.



(a)

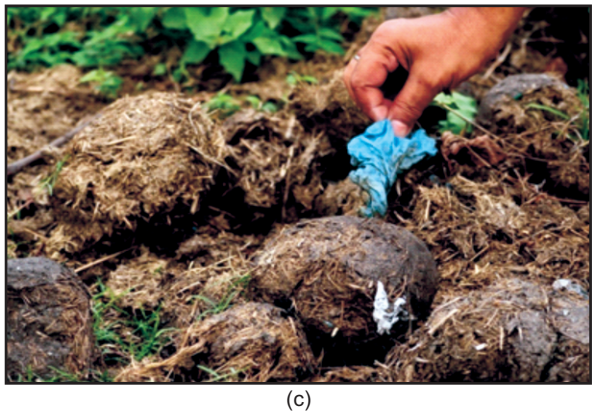


(b)

Fig. 1: (a) Location of Manas Tiger Reserve and trans-boundary conservation area. (b) Map of ranges of the Manas Tiger Reserve along with the Royal Manas Tiger Reserve making up the Manas trans-boundary conservation area.

(a)

(b)



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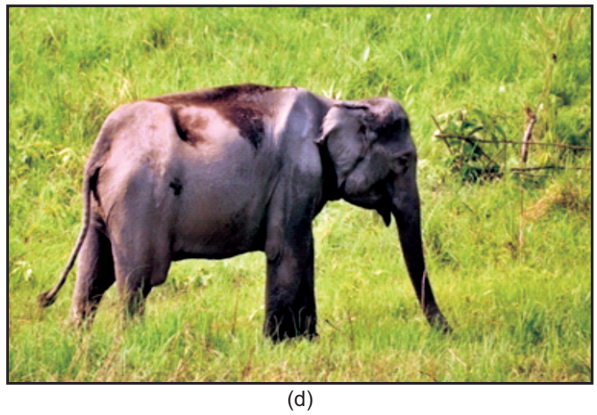


(d)

(e)

(f)

(g)

(h)

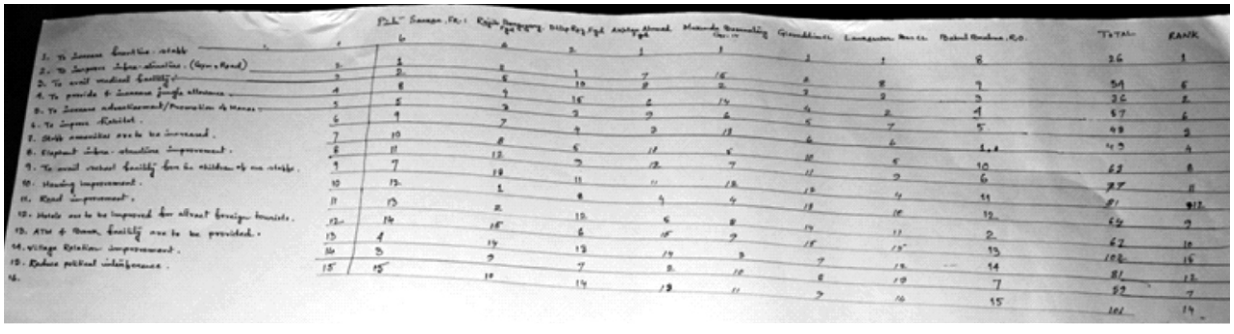
Fig. 2. Conservation challenges from field visits: (a) infestation of woods by weeds and climbers, (b) infestation of grasslands by woody species, (c) plastic bags observed in rhino dung, (d) malnourished camp elephant at *Kuri beel*, (e) presence of pet carnivores such as cats, (f) rhinoceros near habitations, (g) embankments to train river channels and (h) large-scale erosions in the embankments, (i) cattle grazing in the National Park area, (j) accidental fire in grasslands, (k) difficulty in eradicating *Semul* trees through girdling, (l) poor infrastructure in the secondary entrance to the National Park, (m) poor infrastructure at camps, (n) location of Bansbari-Mathanguri road running through the Manas National Park.

2e), which is a threat to the birds. This small carnivore is an especially important threat for the critically endangered Bengal florican birds residing in the grasslands of the park. We observed a rhinoceros very near to habitation (Fig. 2f), which could be a signal of exacerbating human-wildlife conflict situations due to the closeness of wild animals to human habitations. The rivers in the area tend to change course, and to train these streams

Table 2: Conservation challenges discerned through focussed interviews

Rank	Challenge 1	Challenge 2	Challenge 3
Field Director	Need for more manpower for protection	Need for more funds for protection	Need for more research inputs for habitat management
Deputy Field Director	Need for more funds for protection	Need to manage tourism	Need for more manpower for protection
Assistant Field Director	Need for better habitat management	---	
Range officer	Need to improve habitat for animals	Improvement in access roads for better protection	Availability of medical facility to frontline staff
Forester	Improvement of infrastructure	Availability of medical facility to frontline staff	Need to improve staff-villager relations
Forest guard	Provisioning of decent accommodation to frontline staff	Improvement in access roads for better protection	Advertisement and promotion of Manas to attract more tourists
Chowkidar / Casual labourer	Regularisation of casual labourers to improve morale	Improvement of infrastructure	Availability of medical facility to frontline staff

(a)



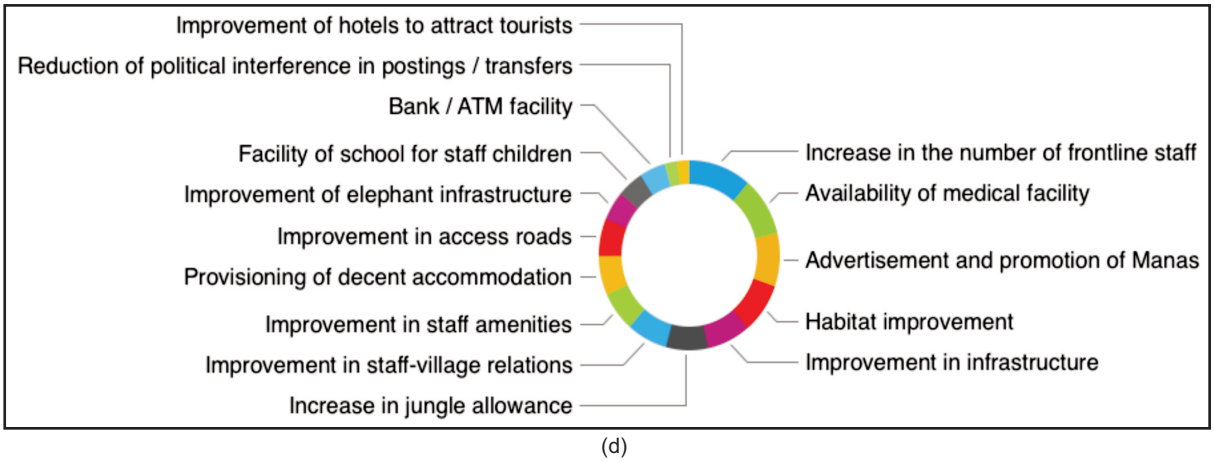
(b)

embankments have been constructed (Fig. 2g). While these lead to habitat modifications, we also noted that there were signs of large-scale erosions in these embankments, necessitating management interventions [Fig. 2h] to avoid a crisis, keeping in mind the geology and hydrology of the region. The park faces a heavy biotic pressure from nearby villages, and we observed several cattle grazing in the National Park area (Fig. 2i), which needs to be controlled. While the forest department utilises fires for grassland habitat management, we also observed some accidental fires in the grasslands (Fig. 2j), indicating a need to bolster the capabilities of the staff to

Table for PRA exercise with forest staff

S. No.	Need / Participant	Pintu Sarkar, Forester	Rajib Borgoyarey, Forest guard	Dilip Roy, Forest guard	Akhtar Ahmed, Forest guard	Mukunda Basumatary, Chowkidar	Giasuddin, Casual labourer	Lankeswar Das, Casual labourer	Babul Brahma, Range officer	Total	Rank
1	Increase in the number of frontline staff	6	6	2	1	1	1	1	8	26	1
2	Improvement in infrastructure	1	11	1	7	15	2	8	9	54	5
3	Availability of medical facility	2	5	10	8	2	3	3	3	36	2
4	Increase in jungle allowance	8	4	15	6	14	4	2	4	57	6
5	Advertisement and promotion of Manas	5	3	3	9	6	5	7	5	43	3
6	Habitat improvement	9	7	4	3	13	6	6	1	49	4
7	Improvement in staff amenities	10	8	5	10	5	10	5	10	63	8
8	Improvement of elephant infrastructure	11	12	9	12	7	11	9	6	77	11
9	Facility of school for staff children	7	13	11	11	12	12	4	11	81	12
10	Provisioning of decent accommodation	12	1	8	4	4	13	10	12	64	9
11	Improvement in access roads	13	2	12	5	8	14	11	2	67	10
12	Improvement of hotels to attract tourists	14	15	6	15	9	15	15	13	102	15
13	Bank / ATM facility	4	14	13	14	3	7	12	14	81	12
14	Improvement in staff-village relations	3	9	7	2	10	8	13	7	59	7
15	Reduction of political interference in postings / transfers	15	10	14	13	11	9	14	15	101	14

(c)



(d)

control fires. The invading *Semul* trees in the grasslands are being managed through girdling (Fig. 2 k); however, the results are sub-optimal, suggesting a need for more and directed research develop a better method of controlling this species. The park has few visitors leading to inadequate gate money. Besides, the grants through the government are also low, leading to poor and ill-maintained infrastructure throughout the park (Fig. 2 l, m) which needs to be upgraded. We also noticed that a road linking India with Bhutan, the Bansbari-Mathanguri road runs right through the Manas National Park (Fig. 2 n). The traffic on this road has been growing, and this could become a formidable conservation challenge in the near future.

Conservation challenges discerned through participatory appraisals

The results of the participatory appraisals are depicted in

Table for PRA exercise with villagers

S. No.	Need / Participant	Shyamal Dutta	Janmeyjay Nath	Krishna Das	Ratul Rabha	Krishna Lama	Komison Pathak	Pranab Das	Jahin Baraik	Simanta Koch	Phanin Nath	Total	Rank
1	Advertisement / Promotion of Manas	20	2	9	4	21	1	12	9	1	2	81	5
2	Road improvement	6	3	14	5	17	3	3	3	5	8	67	3
3	Alternate amusement facilities for tourists, e.g. gardens or parks	18	10	12	7	16	5	11	21	4	1	105	9
4	Regulation of traffic, especially polluting vehicles	5	13	13	16	10	4	13	13	13	7	107	10
5	Maintenance of embankment to prevent flooding	1	1	1	1	1	2	2	2	3	3	17	1
6	Education and training of locals	3	7	20	2	3	16	4	1	2	5	63	2
7	Reduction in entry fees	21	12	11	21	9	19	14	20	7	9	143	18
8	Transparency in bookings	11	14	21	18	18	21	15	19	10	4	151	20
9	Monitoring of visitors inside the National Park	12	16	18	17	11	18	18	12	12	10	144	19
10	Cleanliness, availability of garbage bags	9	18	8	11	19	6	17	4	9	12	113	12
11	No VIP culture	15	21	10	19	12	20	16	16	14	16	159	21
12	Increase in animal numbers through habitat management and translocations	19	4	16	8	20	15	19	11	8	20	140	16
13	Hospital facility	2	8	4	10	13	17	1	18	15	15	103	8
14	ATM / banks	10	9	5	3	7	7	5	8	17	13	84	6
15	Provisioning of 24 hr electricity	4	6	3	6	2	13	6	10	18	11	79	4
16	Provisioning of treated water	14	15	7	20	4	14	20	17	16	14	141	17
17	Mosquito control	13	17	2	15	8	12	21	15	20	6	129	13
18	Utilisation of NGOs for conservation purposes	7	11	6	9	14	11	7	5	21	21	112	11
19	Rescue of stranded animals	16	20	19	12	5	8	8	14	19	17	138	15
20	Ban on fishing	17	19	15	13	15	9	9	6	11	19	133	14
21	Restoration of Mathanguri site	8	5	17	14	6	10	10	7	6	18	101	7

(e)

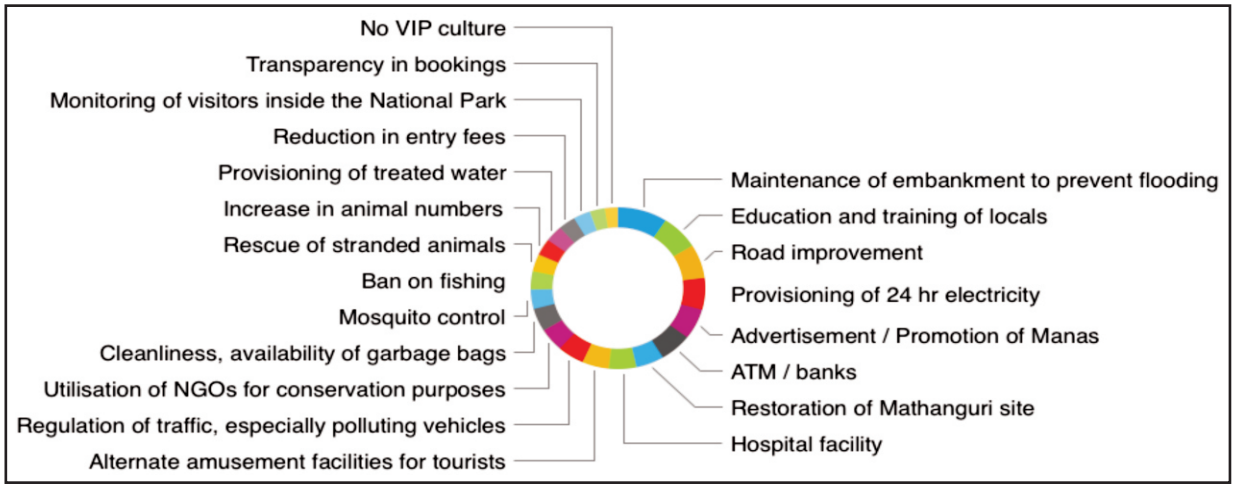
Fig. 3. We observe that for the department personnel, the top quartile of conservation challenges comprised increasing the number of frontline staff, and provisioning of medical facility to the staff. These challenges represent the need for improving the staff morale for enhancing the protection of the park. On the other hand, for the villagers, the top quartile of conservation challenges comprised maintenance of embankments for prevention of flooding, education and training of locals for employment in protection and hospitality sectors, and improvement of roads inside and leading to the national park. These challenges represent the need for participatory management involving the locals.

It is important to note here that these differential perceptions are not indicative of antagonistic viewpoints towards conservation, but rather represent complimentary strategies that are required to maximise the contributions of both these important stakeholders. At the same time, we also observe that the stakeholders tend to highlight those challenges that are closer to them, indicating the operation of *availability heuristics* here.

Conservation challenges discerned through focussed interviews with department personnel

The results of the focussed interviews are depicted in Table 2. The availability heuristic reveals itself here as well, for while the officers at the higher echelons of management take a bird's eye view and express concern about manpower, funding and research issues, the personnel at the lower rungs of the administrative hierarchy are more concerned about the more immediate issues such as regularisation of casual labourers, improvement of infrastructure and provisioning of medical facilities.

It is pertinent to note here that all these challenges complement each other, and are articulations of the



(f)

Fig. 3. The process of participatory appraisal (a) and the sheet generated through the process (b). The preference ranking matrix for the department staff (c) and the doughnut chart of the scores for different preferences (d) was quite different form the preference ranking matrix for villagers (e) and the doughnut chart of the scores for different preferences (f).

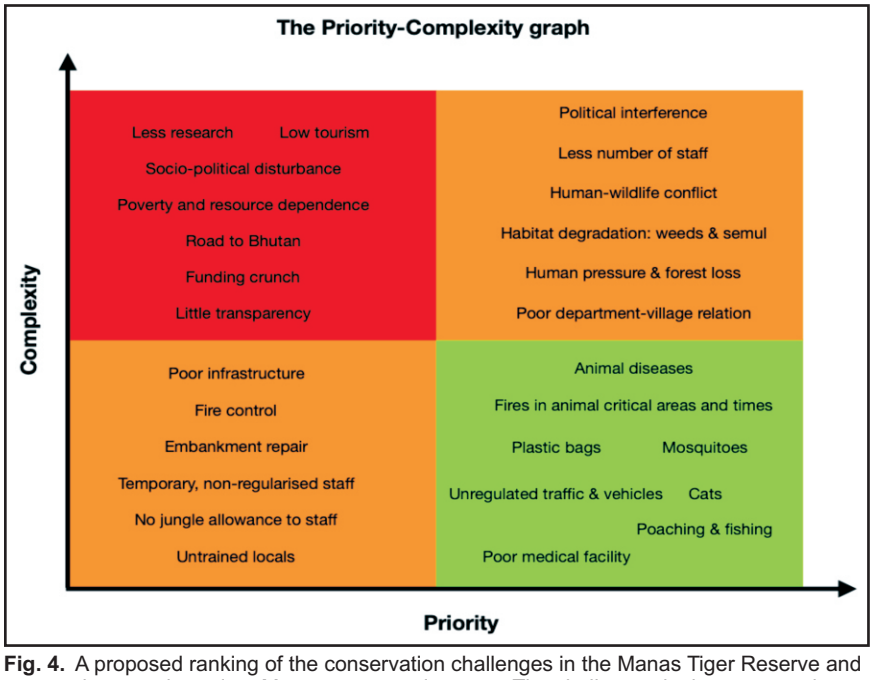


Fig. 4. A proposed ranking of the conservation challenges in the Manas Tiger Reserve and the trans-boundary Manas conservation area. The challenges in the green region must be tackled first, followed by the challenges in the orange region and lastly followed by the challenges in the red region.

limitations being perceived at different levels of the administrative hierarchy. All of these challenges will need to be addressed for better management of the Manas National Park and Tiger Reserve protected area.

Ranking of the conservation challenges

The subjective ranking of the conservation challenges with respect to their priority and complexity results in the priority-complexity graph depicted in Fig. 4. The conservation challenges with high priority and low complexity, depicted by the green shaded region and representing low-hanging fruits, need to be tackled first, while the conservation challenges with low priority and high complexity, depicted by the red shaded region, could be tackled last. Those challenges with high priority and high complexity, and those challenges with low priority and low complexity could be tackled in between.

From the figure, we note that the conservation challenges

needing immediate attention (due to them being high priority and low complexity challenges) are animal diseases, fires in animal critical areas and times, plastic bags, mosquitoes, unregulated traffic and vehicles, cats, poaching and fishing, and poor medical facility. We would recommend the management to handle these as soon as possible for quick and demonstrable results.

Summary and recommendations

In this paper, we presented an analysis of the prevalent conservation challenges in Manas Tiger Reserve and World Heritage Site, together with the Trans-boundary Conservation Area, as discerned utilising four distinct techniques: literature survey, field visits, participatory appraisal and focussed interviews of key stakeholders. The challenge perceptions of different stakeholders vary considerably, indicating not only availability heuristic in operation, but also the complimentary strategies that must be deployed for effective results. The field visits presented several conservation challenges that are unreported in the published literature. Ranking the conservation challenges indicated that animal diseases, fires in animal critical areas and times, plastic bags, mosquitoes, unregulated traffic and vehicles, cats, poaching and fishing, and poor medical facility need to be tackled as soon as possible for quick and demonstrable results. We believe that analyses such as the ones presented here should be utilised by managers of protected areas to improve the quality of conservation.

मानस बाघ रिजर्व का, इसकी संरक्षण चुनौतियों को समझने के लिए, त्वरित मूल्यांकन

अंकुर अवधिया एवं अजय श्रीवास्तव

सारांश

लेखकों ने चार विशिष्ट तकनीकों : साहित्य सर्वेक्षण, क्षेत्र भ्रमण, मुख्य हितधारकों का सहभागी मूल्यांकन तथा केन्द्रित साक्षात्कारों का उपयोग करके पहचान के रूप में परा-सीमा संरक्षण क्षेत्र के साथ विश्व विरासत स्थल तथा मानस बाघ रिजर्व में चालू संरक्षण चुनौतियों का एक विश्लेषण प्रस्तुत किया है। लेखकों ने न केवल संचालन में उपलब्धता स्वतः शोध बल्कि अनुपूरक रणनीतियों, जिनकी एक सुधारात्मक सहभागी प्रबंध के लिए नियोजित करने की आवश्यकता है, को भी दर्शाते हुए विभिन्न हितधारकों के चुनौती अवबोधन में महत्वपूर्ण विभिन्नताएं पाई हैं। लेखकों का विश्वास है कि इस विश्लेषण के जरिए प्रस्तुत सूचना इन संरक्षण चुनौतियों के एक त्वरित न्यूनीकरण के लिए प्रबंधकों द्वारा उपयोगी पाई जाएगी, जो इस विशिष्ट जैवविविधता हॉटस्पॉट के प्रबंधन के लिए अत्यन्त अनिवार्य है।

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