



# Triage of Means: Options for Conserving Tiger Corridors beyond Designated Protected Lands in India

Indranil Mondal, Bilal Habib\*, Gautam Talukdar and Parag Nigam

Wildlife Institute of India, Dehradun, India

## OPEN ACCESS

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### \*Correspondence:

Bilal Habib  
bh@wii.gov.in;  
bilalhabib1@gmail.com

### Specialty section:

This article was submitted to  
Conservation,  
a section of the journal  
Frontiers in Ecology and Evolution

**Received:** 30 May 2016

**Accepted:** 08 November 2016

**Published:** 22 November 2016

### Citation:

Mondal I, Habib B, Talukdar G and  
Nigam P (2016) Triage of Means:  
Options for Conserving Tiger Corridors  
beyond Designated Protected Lands  
in India. *Front. Ecol. Evol.* 4:133.  
doi: 10.3389/fevo.2016.00133

The latest tiger census conducted in India during the year 2014 shows that it harbors 57% of the global tiger population in 7% of their historic global range. At the same time, India has 1.25 billion people growing at a rate of 1.7% per year. Protected tiger habitats in India are geographically isolated and collectively holds this tiger population under tremendous anthropogenic pressure. These protected lands are in itself not enough to sustain the growing tiger population, intensifying human-tiger conflict as dispersing individuals enter human occupied areas. These factors— isolation and inadequate size of the protected lands harboring tiger meta-populations, highlight the need to connect tiger habitats and the importance of corridors beyond protected lands. It is imperative to conserve such corridors passing through private lands to safeguard the long-term survival of the tigers in India. The goal of long-term tiger conservation in India lies in smartly integrating tiger conservation concerns in various sectors where tiger conservation is not the priority. To effectively tap into all these resources, we propose a “Triage of Means” strategy. Here we do not prioritize species, populations or sites due to the non-availability of conservation resources. Instead, we aim to channel from available resources (means to achieve conservation) from other sectors where tiger conservation is not the focus. We outline how to prioritize resources available from various sectors into conservation by prioritizing issues hampering tiger conservation beyond protected habitats.

**Keywords:** triage of means, corridors, conservation, tiger, Central Indian landscape, India

## INTRODUCTION

India harbors over half the global tiger (*Panthera tigris tigris*) population within just 7% of their historic range (Jhala et al., 2015). These tigers are distributed in geographically isolated populations (Qureshi et al., 2014), being separated by landscapes of intensive human occupation, such as expanding agriculture, urbanization and an aggressive infrastructural development fuelled by a national aspiration to achieve 8% economic growth (Ministry of Finance, 2016). However, India does not have a comprehensive landuse policy (Department of Land Resources, 2013), which may lead to unchecked land conversion near forest fringes. Moreover, most of the reserves that contain these isolated tiger populations are not large enough to sustain the steadily growing tiger population (Chundawat et al., 2016). This leads to an intensification of conflict between the growing tiger population and a human population of 1.25 billion increasing at a rate of 1.7% annually (Chandramouli, 2011). Dispersing tigers from protected reserves are prone to confrontations with humans, resulting in human-tiger conflict (Dhanwatey et al., 2013). Isolation and inadequate reserve size (average size is 486 km<sup>2</sup>, Karanth and Defries, 2011)

amongst sites that harbors the fragmented tiger populations highlight the need of connecting these forest patches and the importance of corridors in doing so.

## CORRIDORS: CONNECTING LINKS FOR LONG TERM CONSERVATION

The last decade in conservation research has illustrated that habitat corridors are an important conservation intervention to offset negative impacts of habitat fragmentation and to maintain meta-population dynamics (Hilty et al., 2012). The Central Indian Landscape which roughly covers an area of 76,913 km<sup>2</sup> (Yumnam et al., 2014), sets a perfect example of the importance of connecting fragmented tiger populations by corridors (Dutta et al., 2016). Deforestation, road widening, mining, aggressive urbanization and unchecked human activity in corridors are major concerns about the viability of corridors in the Central Indian landscape (Sharma et al., 2013a; Yumnam et al., 2014; Borah et al., 2016). Most studies unanimously suggest that reducing anthropogenic pressure (Joshi et al., 2013) and restoring habitat (Yumnam et al., 2014) are solutions for the long term sustainability of corridors. In addition, others have suggested involving local communities through community centered conservation programmes and eco-tourism (Ravan et al., 2005; Rathore et al., 2012), which may ensure that local communities are still able to derive their livelihood from the corridor forests. Elevating the legal status of corridors lands (Ravan et al., 2005; Yumnam et al., 2014) and use of smart green infrastructure in critical corridor habitats (Yumnam et al., 2014; Habib et al., 2015) has also been advocated as an alternative solution to safeguard corridors in the landscape. In areas where corridors span across multiple states, co-operation between different state agencies has been suggested (Ravan et al., 2005).

## TRIAGE: IS IT THE WAY TO GO?

Conservation “is about conserving” (Harcourt, 2000); it’s about making things happen on the ground. Carrying out one research project after another, proposing laws, drafting policies, and holding meetings, may not provide the desired outcomes if it cannot transform into any conservation action on the ground (Knight et al., 2006, 2008; Boreux et al., 2009; Braunisch et al., 2012).

Recommendations emanating from scientific studies need hard implementation on the ground for corridor conservation to benefit from all the scientific efforts being invested in it. On the ground, implementation of the above recommendations face numerous hurdles and requires extensive negotiations and prioritization of conservation actions. The negotiation and prioritization process often takes the form of a to and fro dialogue between the advocates (conservation agencies) and the opponents (developmental agencies) of conservation. This increases the time lag between a management recommendation made in a scientific study and its implementation on the ground (Arlettaz et al., 2010). We may need to focus conservation efforts

in areas or on issues which are of more pressing nature or where negotiations may yield better results or follow implementation pathways which best suits available funds or alternatives.

Derived from the French word *trier* or “to sort,” the word Triage has been popularly used to connote this process of prioritization (Random House, 1997). The term originated from battlefields and hospital emergency rooms, which casts its analogy on conservation biology as a “crisis discipline,” a target oriented science where decisions need to be taken rapidly, often without the availability of complete knowledge and limited resources (Soulé, 1985). It echoes the political saying “choose the battles that you can win” (Ochoa-Ochoa et al., 2011).

There have been varying reactions from different quarters regarding the triage approach of conservation (Bottrill et al., 2008, 2009; Jachowski and Kesler, 2009; Parr et al., 2009; Ochoa-Ochoa et al., 2011; Rappaport et al., 2015). The argument for or against triage so far seems balanced as there are almost an equal number of publications supporting each view. Buckley (2016) has argued that when triage is followed to allocate scarce resources for conservation efficiently, it may send negative political signals by implying that global or local scale extinction of some species is acceptable. In the process, the damage caused far outweighs the attempted good that the triage approach may have achieved. In addition, Buckley (2016) states that the practice of conservation is a human socio-political process since conservation is driven or constrained by legislation and politics. In the triage approach, the process of prioritization may need the establishment of a threshold value and drawing a threshold is unscientific, leading to inevitable species extinction (Buckley, 2016). Furthermore, others argue that the triage approach which was adapted from battlefield and hospitals cannot fit scenarios applicable to conservation (Jachowski and Kesler, 2009).

Extinction is unacceptable according to the fundamental concepts of conservation biology since the general inherent consideration is that all species have an inherent value (Soulé, 1985). Some suggest that the conservation triage paradigm rejects this fundamental belief by neglecting some species, since conserving all species is costly and so-called inefficient, and ultimately push these species toward extinction (Jachowski and Kesler, 2009). Some research groups have gone to the extent of comparing the cost of conservation to the expenses allocated for space exploration (Balmford et al., 2002), and they argue that since conservation is not the costliest affair on this planet, we can allocate sufficient resources to conserve most species. Parr et al. (2009) say that we should not choose from species while letting some go extinct in the process of efficiently allocating resources.

While the preceding authors have identified the limitations in adopting a triage approach, we advocate triage as a tool available to a conservationist, under penny scarce conservation scenarios. We cite an Indian scenario where triage need not mean choosing from species, populations or sites while neglecting others. We define it as a prioritization process which lets one accumulate conservation funds from unconventional but potential sources; sources who’s main mandate is not conservation, but the funds available from them can be leveraged to assist conservation if channeled in the right direction.

## TRIAGE: AN OPTION FOR TIGER CORRIDOR CONSERVATION

Recommendations by various research groups to safeguard the tiger and its habitat in India often hits the same road block: the dilemma of triage. The importance of protected areas (PA) for conserving natural resources has been highly recognized worldwide (Hockings, 2003; Rodrigues et al., 2004) and successful conservation strategies often consider connectivity with adjacent PAs (Jackson and Gaston, 2008; Ladle and Whittaker, 2011). A recent corridor study has identified 9371 km<sup>2</sup> of area outside PAs that are crucial for the dispersal and movement of tigers in the Eastern Vidarbha Landscape (EVL) in Central India (Mondal et al., 2016). This area includes reserve forest, unprotected forests, and privately owned lands covered by forested or agricultural landuse. These areas come under the “Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act” (Ministry of Law Justice, 2007) enabling local communities to derive their livelihood from these lands, including the forest. Due to the proximity of intensive human use areas, these multiple use forest areas suffer from anthropogenic pressures like resource extraction, grazing, mining, infrastructural developments and noise, light and air pollution. Despite the plethora of impediments, these corridors are still functional to allow the movement of animals across the landscape (Joshi et al., 2013; Sharma et al., 2013b). Many areas along these corridors are in a critical state due to fragmentation, degradation, and resource extraction. Habitat connectivity is uncertain at these spots and loss of contiguity here may render the entire length of the corridor non-functional. Overlap of human use and tiger presence leads to the prevalence of human-tiger conflict, including direct attacks on humans and livestock depredation (Miller et al., 2016). Such events contribute to negative attitudes of the local community toward tiger conservation in the area. On multiple occasions, deforestation occurring along corridor habitats occur outside of notified forest boundaries (Joshi et al., 2016) and the forest administration, as an advocate of conservation, hardly has a say.

The above points highlight the magnitude of mitigation measures that need to be employed for successful conservation of tiger corridors in the EVL, which includes protecting corridor forests, restoring degraded habitats, buying lands along corridors, paying compensation to villagers suffering from human-tiger conflict. In the 3rd Asia Ministerial Conference on Tiger Conservation 2016 held in New Delhi, the Honorable Prime Minister of India stated that “conservation of tigers is not a choice, it is an imperative.” He further added, “I believe Tiger Conservation and Conservation of Nature is not a drag on development, both can happen in a mutually complimentary manner, all we need is to reorient our strategy by factoring the concerns of the tiger in sectors, where tiger conservation is not the goal.” At the same meeting, the Honorable Minister of Environment, Forests and Climate Change addressed the government’s initiative to save tiger corridors: “We will incentivize project proponents to give land for compensatory afforestation in tiger corridors. By such measures, we can free tiger corridors from private incumbents, and it will become forest

land. It will protect tiger corridors which will protect the growing tiger population.” All this reflects a general positive public will toward tiger conservation, with further assurance being provided by available Government funds and above mentioned policies. To effectively tap into all these resources and public will, we must follow an unconventional triage approach as a means to prioritize alternative funding streams.

This we call, “trriage of means”: a process where we channel available resources by prioritizing from among various schemes of government ministries/departments for tiger corridor conservation. Under provisions of clause 135 of the Companies Act, 2013<sup>1</sup> funds are available from the corporate sector as well in the form of 2% of their average net profit in the previous 3 years toward Social Corporate Responsibility (CSR). Such CSR funds can also be used for tiger conservation. The merit of this proposed triage approach is its ability to draw resources from sectors, where tiger conservation is not the primary goal. Such indirect funds can be leveraged by mainstreaming the conservation agenda in these sectors.

## TRIAGE OF MEANS

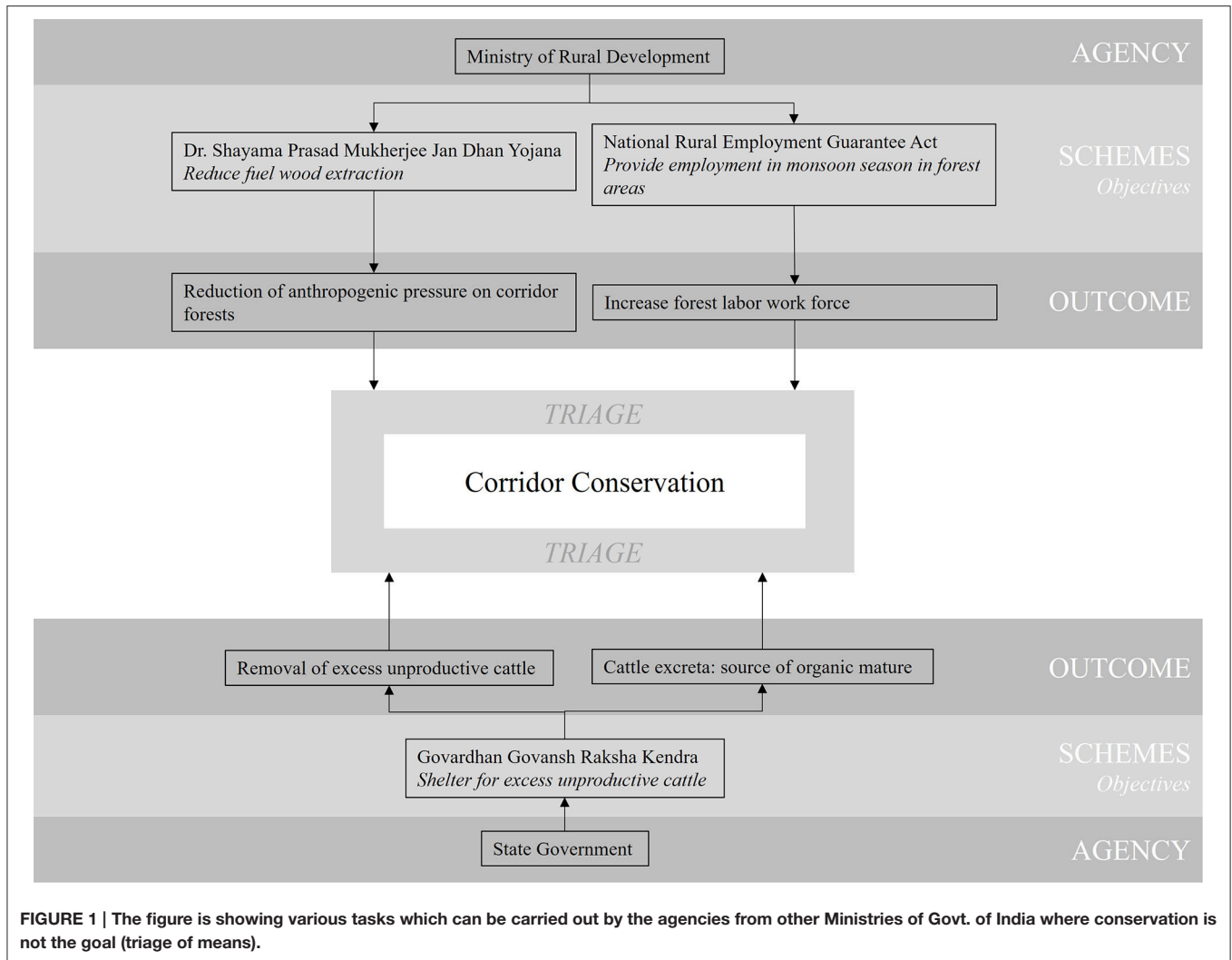
The key strategy of the triage of means that we present is to harness resources available from several areas, which typically lie in the purview of different ministries of the Central Government of India (GoI)<sup>2</sup>. This can only be achieved if environmental concerns are internalized in policymaking in a large number of sectors. The major portion of funds available for conservation in India is under various programs of the Ministry of Environment, Forest and Climate Change (MoEF & CC). These funds are available in the form of core (direct and immediate biodiversity impact), and non-core funding (pollution, hazardous substances management, etc. which facilitate biodiversity conservation of river streams, wetlands) from MoEF & CC (MoEF, 2012). Out of the MoEF & CC’s aggregate budget of USD 362.52 million for the year 2013–14, the core funding constitutes USD 233.38 million while the non-core accounts for USD 38.76 million (MoEF, 2014). Apart from MoEF & CC, states in India also allocate a part of their budget for biodiversity conservation. It amounts to USD 749.75 million as per their 2013–14 budget. The indirect peripheral funding amounting to USD 351.3 million is available from 77 schemes from 23 Ministries/Departments of GoI. They support activities that benefit biodiversity but for which biodiversity conservation is not the main focus. Core and some part of non-core funding from MoEF & CC are directly available to be used in protected areas or lands, yet it fails to consider areas outside the purview of this protection and financial assistance. Our triage of means is about opportunistically amalgamating resources from peripheral funding sources (Figure 1).

## IMPLEMENTING TRIAGE OF MEANS

Corridor habitats in India often consist of degraded forest surrounded by human-dominated landscapes. Due to this

<sup>1</sup>[www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf](http://www.mca.gov.in/Ministry/pdf/CompaniesAct2013.pdf)

<sup>2</sup>[www.cbd.int/financial/doc/india-assessment-funding-support-en.pdf](http://www.cbd.int/financial/doc/india-assessment-funding-support-en.pdf)



close interface, the corridors are facing intense anthropogenic pressures, such as extraction of fuelwood and fodder, the presence of invasive species and excessive grazing. Here we try to suggest options how we can mobilize resources from other sectors to reduce these pressures on the corridors.

The National Rural Employment Guarantee Act (NREGA) 2005, under the Ministry of Rural Development, provides secure livelihood to rural populations in the form of 100 days of wage employment for unskilled manual labor.<sup>3</sup> It has been recognized as the most ambitious example of rural social security and public works programme in the World Development Report, 2014 by World Bank (2013). However, in the monsoon season, this scheme fails to provide any jobs to the local villagers due to flooding and muddy conditions. On the other hand, this workforce of thousands of manpower can be well employed in corridor forest areas in weed removal exercises and habitat restorations. This way the NREGA scheme picks up even in

monsoon providing employment to thousands of villagers, and at the same time improve habitat quality in the corridor areas.

Dr. Shayama Prasad Mukherjee Jan Dhan Yojana (scheme) by the Ministry of Rural Development aims to provide the rural population with cooking gas (Liquid Petroleum Gas) or biogas (made from cattle dung) as an alternate source of daily household energy needs in the state of Maharashtra. Such schemes, when targeted in villages near corridor areas, can reduce their dependency on forests and reduce extraction of firewood and fodder. Lesser ventures into the forest to gather such resources also reduces the chances of encounters with tiger and thus has the potential to reduce conflict.

Recently due to a ban on cow slaughter in the state of Maharashtra<sup>4</sup> the cattle population in the state has increased dramatically.<sup>5</sup> This has led distressed farmers to abandon their unproductive cattle thereby increasing the number of unattended cattle which are venturing into forest areas to graze. Consequently, this high amount of uncontrolled grazing is

<sup>3</sup>[http://rural.nic.in/sites/downloads/right-information-act/02%20\\_CIC\\_PartII\\_MG\\_NREGA\(F\).pdf](http://rural.nic.in/sites/downloads/right-information-act/02%20_CIC_PartII_MG_NREGA(F).pdf).

<sup>4</sup><http://bombayhighcourt.nic.in/libweb/acts/Stateact/2015acts/2015.05.PDF>

<sup>5</sup><http://goo.gl/eqphXu>.



leading to degradation of the corridor forests. A new initiative of the State Government of Maharashtra is to set up cow shelters in selected districts to mitigate this problem. These shelters are being called the “Govardhan Govansh Raksha Kendra.”<sup>6</sup> This scheme will be conducted through local NGOs, where abandoned unproductive and non-lactating cattle will be contained inside the walls of these shelters and cattle excreta will be used to manufacture organic manure.<sup>7</sup> When implemented in villages near tiger corridors, this initiative helps triage with its 2-fold benefits: reduction of grazing pressure in corridor habitats and promotion of the use of organic fertilizers.

## CONCLUSION

We believe that triage is more than just focusing on single species conservation, but more broadly prioritizing of conservation actions when resources are scarce. We argue that funds can be funneled from diverse sectors when dedicated funding available for conservation may not be enough and provide an example of how this may work using the Indian tiger conservation challenge. Adoption of triage provides us with a logical and intuitive approach for efficiently distributing available resources among management actions to achieve a targeted conservation goal. By explicitly choosing among available resources using a transparent triage approach, we may be able to highlight any deficit in available funds which otherwise may go unnoticed (Bottrill et al., 2008). The practice of conservation is a human socio-political

process since conservation is driven or constrained by legislation and politics (Buckley 2016). Adoption of a transparent decision-making process through triage will rule out the possibility of charismatic taxa or emotive causes diverting funding from a more rationally valid cause (Metrick and Weitzman, 1996). Conservation efforts that follow the principle of triage are logical, can be duplicated across time and space (Bottrill et al., 2009).

The triage of means that we suggest can clearly and objectively apportion funds from peripheral sources for corridor conservation that have been hitherto invisible and/or seldom tapped into. If meticulously pursued, *Triage of Means* may become the best *means of triage* for safeguarding tiger corridors in India. The crux lies in intelligently formulating policies and schemes to mainstream conservation for agencies without conservation mandates.

## AUTHOR CONTRIBUTIONS

IM, BH, GT, and PN designed, drafted and revised the paper, and approved the final version of the manuscript before submission.

## ACKNOWLEDGMENTS

We are grateful to the Director, Dean and Research Coordinator of the Wildlife Institute of India for facilitating this research. We are thankful to the National Tiger Conservation Authority (NTCA) for funding our research. We are also thankful to the Maharashtra State Forest Departments for logistic support during field work. The authors also thank the University Grants Commission for the fellowship.

<sup>6</sup><http://goo.gl/utbEQ4>

<sup>7</sup><http://goo.gl/hRkBVU>.

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**Conflict of Interest Statement:** The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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