



POLICY BRIEF

CARBON FINANCE: SOLUTION FOR MITIGATING HUMAN–WILDLIFE CONFLICT IN AND AROUND CRITICAL TIGER HABITATS OF INDIA

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INTRODUCTION

Protected areas (PAs) cover about 5% of the total geographical area of India which is around 165,158.54 sq. km. Out of the total PA, tiger reserves cover approximately 71,027.10 sq. km.¹ There are a total of 50 tiger reserves in the country, spread across 18 states. Tigers—being an umbrella species—are vital in regulating and maintaining the ecological processes in the forest. Tigers in India are known to inhabit diverse habitats, ranging from the high mountains, mangrove swamps, tall grasslands, dry and moist deciduous forests and evergreen and shola forest systems. The latest tiger census identifies a significant rise in the tiger population, from 2226 in 2014 to 2967 in 2018 (Jhala, Qureshi, Nayak 2019). This has become possible only due to the successful conservation measures. It is to be noted that limited habitat, in the form of corridors, growing human population, and developmental pressure, is amongst the primary threats to the tigers.

Tiger reserves, in addition to providing habitat for wild animals also provide several ecosystem services such as biodiversity conservation, carbon sequestration, air and water purification, pollination, fuelwood and fodder and soil conservation. A majority of rural population in India—around 50 million people—stay around the PAs such as tiger reserves and depend on forest resources for their day-to-day livelihood. This dependence is in the form of collection of a variety of non-timber forest products (NTFPs) and collection of fuelwood and fodder for subsistence and livelihood purposes. Owing to this dependence on forest resources and lack of sufficient infrastructure, the local communities venture in the forest areas, resulting in attacks from wildlife such as leopards and tigers. Occasionally herbivores venture outside the PAs and destroy the agricultural field. This has increased incidences of human–wildlife conflicts around the tiger reserves, resultantly putting a threat to wildlife as well as livelihood of the communities. Human–animal conflicts result in significant economic losses to local communities from either loss or injury to life, crop damage, and loss to

livestock. This results in retaliation against wildlife which leads to lynching of tigers and leopards or poisoning of herbivores. Thus, addressing the issue of human–animal conflicts is a challenge in India mainly due to large human settlements around most PAs. This also poses challenges in ensuring successful wildlife conservation (Karanth, Kramer, Qian, *et al.* 2008).

Situation and Extent of Human–Wildlife Conflict

Majority of the human–wildlife conflict in India is in the form of livestock depredation by carnivores, crop damage by wild herbivores, loss of life, limb, and property. It is worth mentioning that it is not possible to state the exact extent of human–wildlife conflict because of lack of efficient reporting by the victims, lack of sufficient monitoring measures and absence of systematic, digital, real-time databases to monitor these conflicts. A detailed analysis on the situation and trend of human–wildlife conflict was carried out by Anand and Radhakrishna (2017) using literature published from 1976–2015. The study found that nearly 90% of the country is currently affected by human–wildlife conflicts (32 states and union territories) with a total of 88 species belonging to nine taxonomic groups. The top four causal species are the elephant (16.5%), leopard (7%), tiger (7%), and rhesus macaque (5.25%).

A study carried out by Karanth and Kudalkar (2017) has given ample evidence on human–wildlife conflict. It suggested that maximum human–wildlife conflicts are the result of crop damage caused by herbivores. The key species responsible for damage are *nilgai*, wild pigs, and rhesus macaques, particularly after they have been declared ‘vermin’ by several states. Gujarat, Kerala, and Haryana were the top three human–wildlife conflict locations, with crop depredation mainly attributed to elephant, primates, and ungulates during

¹Details available at http://wiienvis.nic.in/Database/trd_8222.aspx

1996–2005 while Karnataka, Assam, and Arunachal Pradesh were the top three human–wildlife conflict locations, mostly resulting in human injuries and casualties by large carnivores (mainly tiger and leopard). Events of crop depredation by elephant and primates took place in all three states. Thomassen, Linnell, and Skogen (2011) have reported that on an average 75 people are killed by tigers every year. Ministry of Environment, Forest and Climate Change has recorded 113 human deaths due to tiger attack from 2013 to 2017.² Leopard attacks are frequent in Uttarakhand, although some information suggests about 100 big cat attacks in Gujarat are mostly attributed to leopards (Shastri 2013). Newspaper reports (2010 onwards) clearly suggest that human–leopard conflicts have resulted in severe problem in the districts of Bilaspur, Hamirpur, Mandi, and Kangra districts and parts of Kullu, Shimla, Sirmaur, and Solan of Himachal Pradesh.³ Other states or union territories where occurrence of such conflicts has been reported include Maharashtra, Kashmir, and Haryana (Gurugram). Unfortunately, because of the paucity of records, no clear data is available and the available records rather than reflecting the number of incidents tend to reflect the frequency of reporting instead. In the light of the above-mentioned facts, it will be not wrong to conclude that human–wildlife conflict has become one of the major issues in the country.

Economics of Mitigating Human–Wildlife Conflict

Both direct economic costs and indirect costs are associated with human–wildlife conflicts. Indirect costs are composed of hidden social costs such as diminished states of psychological or physical well-being (Ogra 2008). Direct economic costs of conflict comprises market price for victims' crops and livestock raiding and medical expenses in the event of animal attacks. Indirect costs also include the opportunity costs associated with conflict mitigation and protection activities (Hoare, 2000; Naughton, Rose, Treves 1999) and transaction costs for

pursuing compensation (Dixon and Shermom 1990). Other factors associated with indirect costs include loss of resources such as fuel wood, fodder, and other NTFP, borne by the villagers. Manral, Sengupta, Hussain, *et al.* (2016) conducted a review of the economic implications of the losses due to human–wildlife conflict through review of several articles and found that there are very few studies dealing with monetary cost associated with human–wildlife conflict and there is a serious lack of any estimates for particular species. In a study, blackbuck was identified to cause a loss of 48,600 kg of sorghum in a single season, resulting in loss of INR 29,000 (Jhala 1993). Similarly, Karanth, *et al.* (2013) reported an annual loss of US\$155, 246, 546 from crop loss per household due to herbivores around key tiger habitats such as Kanha, Ranthambore, and Nagarhole National Park. The average annual income to these households ranged to around US\$300.

To address these losses (costs) and mitigate the conflicts, the Government of India has implemented financial compensation, in the form of *ex-gratia* for losses resulting from human–wild conflicts. The *ex-gratia* policy differs from state to state but is mostly based on the factors such as damage to property, life, or crops. As described by Johnson, Karanth, Weinthal, *et al.* (2018), the government has found the compensation policy to be a key tool to mitigate economic losses, resulting from human–wildlife interactions. The compensation policy also aims at reducing the potential retaliation and promotes tolerance for conservation activities as well. Karanth, Gupta, Vanamamalai (2018) found that the total compensation payment paid in the year 2012–13 in 18 states was nearly \$5,332,762 of which the average expenditures per incident were \$47 for crop and property damage, \$74 for livestock, \$103 for human injury, and \$3224 for human death.

Additionally, the Government of India has developed a policy of village relocation on voluntary basis from the core/critical habitat of tiger reserves. This incentive

² Details available at <http://www.indiaenvironmentportal.org.in/files/file/human%20animal%20conflicts.pdf>

³ Details available at http://www.thaindian.com/newsportal/enviornment/leopard-attacks-on-humans-on-rise-in-himachal_100327903.html

driven, voluntary village relocation for communities has a package of Rs 10 lakh per family with two options, namely Option-I and Option-II. Option-I is applicable where payment of entire package amount of Rs 10 lakh per family is done, in case of family opts so, without involving any rehabilitation by the Forest Department. In the case of Option-II, complete rehabilitation is done by the Forest Department such as providing houses, agricultural land, and community facilities. In case the rehabilitation cost, including settlement of rights per family, exceeds Rs 10 lakh, the concerned state government has to bear the additional cost. So far, 12,327 families, living in 173 villages from the core/critical habitat of tiger reserves have been resettled/ relocated with an expenditure of Rs 1123.93 lakh till 2018–19 (NTCA 2019)⁴. However, mostly it is found that either the communities are unaware of the compensation mechanism or compensation doesn't really compensate for the actual economic loss (Johnson, Karanth, Weinthal 2018). In most of the cases, there are lapses in implementation of rules by the relevant departments and officials, as highlighted by several court cases and Comptroller and Auditor General (CAG) report.⁵

The options available for addressing human–wildlife conflicts are heavily centralized and the process is very tedious for a local villager or farmer to follow. Also the mitigating measures, especially the infrastructure measures (physical barriers), electronic devices, insurance schemes, translocation of animals, and alternate livelihood activities for the communities are finance-intensive activities. These activities need to be managed in a continuous timely manner and thus require a continuous financial mechanism. In many of the states, lack of resources to compensate the loss of the communities is a big challenge as it leads to boosting of antigovernment and wildlife sentiments, resulting in substantial eradication of wildlife (Jackson and Wangchuk, 2001; Madhusudan, 2003; Gubbi, 2012). All these call for a dedicated finance mechanism which shall help mitigate the issue of human– wildlife conflict in an efficient way.

Carbon Finance as a Supplementary Finance Mechanism

Finance through carbon-related projects could be an important solution to address the issue of finance crunch. Carbon finance project could yield additional finance which is required to address the issues of community alternative livelihood and mitigation strategies for human–wildlife conflict. The PAs in India have been identified to have potential of generating around 10,000,000 carbon emission reduction (CER), the tradable form of carbon, which could be traded in the carbon market. The market prices per CER have been observed to vary between US\$4 and US\$45 in the voluntary carbon market (Hamrick and Gallant 2017). The high rate—of US\$45—has been known to be given for the projects which include the aspects of ecosystem services such as mitigation of human–wildlife conflict, biodiversity conservation, and enhancement of livelihood of the communities. Irrespective of the formation of India's climate policy, India still has not yet established a carbon market or carbon pricing or carbon trading policy to benefit from carbon trading. Also there are no studies or mechanism developed to recognize the importance of carbon sequestered by halting forest degradation in PAs. This not only leads to carbon mitigation but also conserves biodiversity and enhances tangible and intangible ecosystem services.

Mechanism such as Afforestation /Reforestation Clean Development Mechanisms (A/R CDM) developed under the United Nation Framework on Convention on Climate Change (UNFCCC) allows emission-reduction projects in developing countries to earn certified CER credits, each equivalent to one tonne of CO₂. CDM projects only recognize the benefits accrued from carbon sequestered through plantations or forestry activities but fails to recognize the benefits accrued from non-forests activities such as enhancement of ecosystem services. On the other hand, mechanisms such as Climate, Community and Biodiversity Alliance (CCBA) Standards support land-use

⁴ Details available at <https://projecttiger.nic.in/>

⁵ CAG, 2017. Administration of National Parks and Wildlife Sanctuaries Government of Karnataka, Report No.6 of 2017

projects in addressing climate change, engaging positively with local communities and smallholders, and conserving biodiversity. This makes it a key mechanism which shall help generate supplementary finance. Irrespective of this fact, this mechanism fails to differentiate between the prices of CER generated in the voluntary market from forestry-based and non-forestry-based activities (such as enhancement of ecosystem services, sustaining local livelihoods).

Thus in order to use carbon finance in an efficient manner it is necessary to understand the contribution of ecosystem services in the finance obtained through the carbon projects. It is necessary to develop an index to standardize the contribution of co-benefits of biodiversity conservation and livelihood enhancement in PAs of India or especially tiger reserves of India.

The Scenario of Dudhwa Tiger Reserve

TERI estimated the contributions of co-benefits by studying the scenario for Dudhwa Tiger Reserve. The Dudhwa Tiger Reserve, a significant PA of India, is situated on Indo–Nepal border and is a representative of the Terai ecosystem in the foothills of Himalayas. It comprises three PAs, namely (i) Dudhwa National Park, (ii) Katarniaghat Wildlife Sanctuary, and (iii) Kishanpur Wildlife Sanctuary. As per the Tiger Conservation Plan of Dudhwa Tiger Reserve, more than 6 lakh people and more than 90,000 livestock are in the zone of influence of the Reserve, dependent on the forest resources to some extent for their sustenance. Removal of forest cover for the settlement of people and the conversion of land to agriculture in areas along the border in Nepal has affected the Reserve in several ways.

Additionally, between 2000 and 2013, 151 human–wildlife conflict cases that resulted in human deaths and injuries were recorded by the Uttar Pradesh Forest Department in this landscape, 90.1% of which involved leopards and tigers while an additional 474 cases involving leopards and tigers, which directly resulted in the death of livestock (Chatterjee *et al* 2017).

Dudhwa Tiger Reserve being an important tiger habitat also provides several ecosystem services (co-benefits) in the form of provisioning, regulating, and supporting. The Reserve is also important from the perspective of cultural services. The ecosystem services identified for the study were fuel wood, biodiversity conservation, minor forest produce, carbon storage and sequestration, fodder and grazing, and recreation. In order to understand the contributions of co-benefits, valuation of ecosystem services was conducted for the financial year 2019 so as to compare the contribution of carbon sequestration with respect to other ecosystem services (Table 1).

The total economic value of Dudhwa Tiger Reserve is **Rs. 10.59 billion** annually (in 2019 prices). The economic value of carbon sequestration is Rs 1,116,475,424 and rest of the ecosystem services is Rs 9,465,869,367. This indicates that the index for Dudhwa Tiger Reserve is **1:8** which implies that the value of ecosystem services is 8 times greater than the value of carbon. This indicates to the fact that use of Climate, Community and Biodiversity Standards (CCBS) approach to generate carbon finance can yield 8 times more finance than just considering the aspect of carbon sequestration, as usually seen in A/R CDM projects. This is the additional finance which could be generated to mitigate human–wildlife conflict in and around tiger reserves.

Table 1: Valuation of ecosystem services for Dudhwa Tiger Reserve

S. No	Ecosystem Services	Value (Rs)	Value (\$)	Percentage
1	Fuel wood	1,007,171,667	14,481,260.49	10
2	Fodder and grazing	1,473,206,604	21,181,978.49	14
3	Minor forest produce (MFP)	338,403,351.9	4,865,612.536	3
4	Biodiversity conservation	5,810,817,381	83,548,776.14	55
5	Carbon sequestration	1,116,475,424	16,052,845.79	11
6	Recreation/ ecotourism	836,270,363.7	12,024,016.73	8
		10,582,344,792	152,154,490.2	100.00

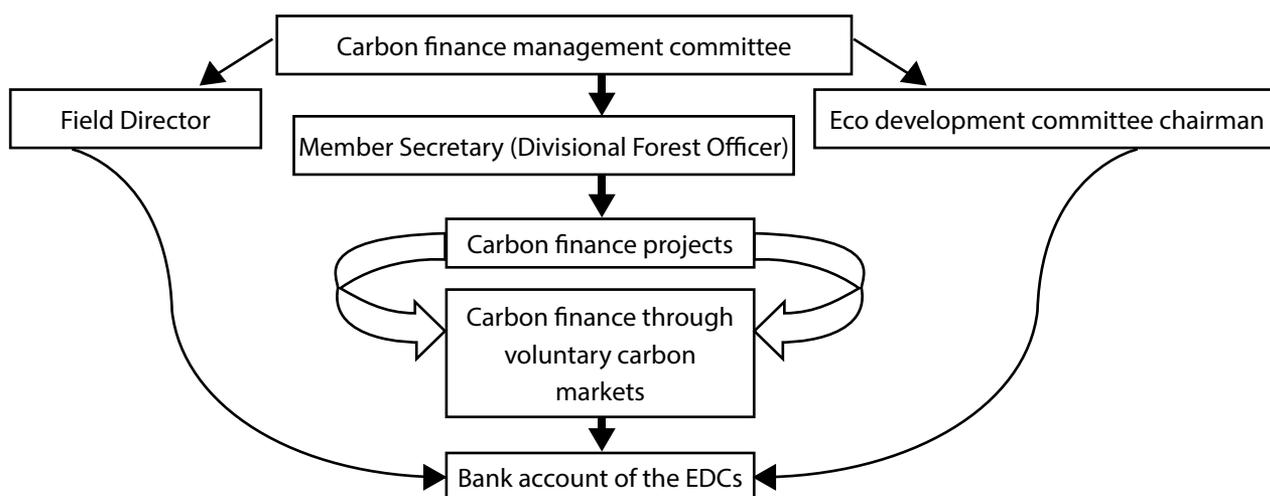
Need of a Governance Model and Institutional Framework

CCBA is an ideal mechanism which supports not only the aspects of community enhancement but also initiatives of biodiversity conservation. The carbon finance generated from this approach shall help in mitigation of human-wildlife conflict and generate additional livelihood opportunities for the communities reducing their dependence on the forest resources. Several countries have used similar approach to generate finance through the payment for ecosystem services mechanism to conserve biodiversity and ensure carbon sequestration.

Payments for environmental or ecosystem services (PES) are now becoming an important means to support biodiversity conservation and community development (Gutman 2007). Currently China, Costa Rica, Mexico, and Vietnam are the leading countries along with Ecuador, South Africa, and United States which have adopted the concept of payment for PES programmes or PES-like schemes (Prokofieva 2016) in their policy. The mechanism is used as a poverty alleviation tool to increase its efforts to direct payments to marginalized groups of the society to reduce their dependence on the forest resources. These countries have been successful in generating financial benefits by adopting the approach of ecosystem services. Calvet- Mir, Corbera, Martin, *et al.* (2015) conducted a review of several countries and identified 29 PES programmes and projects focused on biodiversity, water,

and carbon. Countries such as Mexico, Bolivia, Columbia, Belize, and Mozambique have successfully implemented the PES scheme, keeping carbon sequestration as focus while several other have ensured successful biodiversity conservation and carbon sequestration from watershed, forestry, habitat management, Regional Integrated Silvopastoral Ecosystem Management Project (RISEMP) scheme and eco-tourism projects (Calvet-Mir, Corbera, Martin, *et al.* 2015). Thus, the importance of ecosystem services has well been realized in several countries. By adopting the ecosystem service approach in their policies, various countries have demonstrated their commitment towards preservation of ecosystems by providing benefits through community livelihood and biodiversity conservation through various projects.

Currently India's climate policy framework is mostly based on its 2008 National Action Plan on Climate Change (NAPCC), which focuses on the reduction of carbon emissions and enhancing carbon sequestration. But there is no as such policy which ensures financial benefits for the local communities for conservation of the biodiversity and ecosystem services. Hence, initially, the government needs to develop a policy intervention at the state and central level which addresses the objective of carbon neutrality. After development of the policy, an institutional framework should be developed wherein the carbon finance is managed through the Eco-development Committees (EDCs).⁶ While developing the institution mechanism, a management committee should



⁶ The key objective of the EDCs is to promote wildlife conservation in the fringe forest areas and ensure sustainable livelihood activities for the local communities to reduce their dependence on forest resources.

be developed to manage the carbon finance projects of the particular forest division with the field director as the chairperson and divisional forest officer (DFO), as member secretary. The EDC, chairperson shall also be part of the management committee. The management committee, headed by the field director, should monitor and coordinate with the participating EDCs. The committee at the divisional level should ensure that the benefits accrued through this project will directly reach the communities.

The finance would be generated by trading in the voluntary carbon market. In addition to the CCBS mechanism as described in this document, Gold Standard is also an important platform through which climate finance could be generated. The Gold Standard comprises specific practice standards which can provide financial assistance to climate and sustainable development interventions. The finance generated through the carbon finance project should be directly transferred through the forest department to the account of the respective EDCs as per their share which would be used on community development and biodiversity conservation activities. Hence, this aspect of ecosystem services needs to be well integrated in the climate neutrality policy of India. Today, many of the corporate and governmental organizations in India have taken the decision to be carbon neutral and such policy at the central would be an important initiative towards climate change mitigation. The carbon neutral policy approach shall help bridge the gap of the timely financial requirements to mitigate human-wildlife conflict and ensure community participation in biodiversity conservation by involving the local communities. This approach shall also benefit in climate change mitigation towards achieving the additional nationally determined target (NDC) of 2.5-3 billion tonnes of CO₂ equivalent sequestration from forestry project. Such projects shall also contribute towards the Bonn challenge of restoration of degraded land by 2020 through forest landscape approach and help achieve the target set by India at the UNCCD of restoring 26 million hectares of degraded land by 2030.

Conclusion

To effectively counter the impending threat of climate change, a policy on 'carbon neutrality' seems to be

the need of hour. Tiger reserves in India enjoy status of highest degree of protection under the Wildlife (Protection) Act, 1972. The core/critical habitats of tiger reserves have to be maintained as 'inviolable' under the law for tiger conservation purposes. Forest and biodiversity in such areas are fully protected. Besides, stock of carbon in the vegetation and soil, they add to the carbon stock due to growth. These untapped vast resources can only be mobilized for the benefit of communities if 'carbon market' is created in the country by adopting a policy of 'carbon neutrality' for industries and other economic activities which adversely affect the environment.

Today more than 50 million people, living in and around PAs are facing human-wildlife conflict and suffering damages to their life and crop, and resultantly are developing apathy towards wildlife and forests. PAs are needed to secure fundamental right under Article 21 of the Constitution of India for the better life and environment to the people of the country. It is also mandate to compensate the damage caused to the people who are living in and around forests. The Government of India is struggling to keep balance between ecological need of the country and people who suffered the damage due to wildlife. This is chiefly attributed to paucity of financial resources. PAs sequester carbon along with maintaining ecosystem services including biodiversity conservation. There is potential of 10 million CERs per year which are of worth around US\$100 million. This can considerably help people to compensate for their life and crop damage, and would also help in generating additional livelihood. It is high time we go for Carbon Neutrality Policy under the Polluter Pays Principle.

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