

India in Twenty First Century: Human Wildlife Conflicts Still Unsolved

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ABSTRACT Although India has succeeded in creation of 868 Protected Areas (PA) covering its 5.02 percent of the total geographical area; it comes with a social cost. With high population pressure and livelihood based on nature and natural resources, India is yet to find a pragmatic win-win solution for solving the problem of Human-Wildlife Conflict (HWC) in the twenty-first century. In the present paper, the authors discuss the nature of HWCs occurring in the country and major challenges in mitigation measures by analyzing the research trend, available literature sources, reports and with a special focus on two case studies from India, that is, Manas landscape and Indian Sundarbans based on field observations. The paper identifies there is a severe requirement of proper and authentic databases and standard methodology to evaluate the 'ecosystem (dis)-services' in the academic discourse. The authors also highlight their reservations about the effectiveness of 'compensation' as a mitigation measure.

INTRODUCTION

India has launched 104 satellites with the help of the Polar Satellite Launch Vehicle to its Mars Orbiter Mission, and has come a long way to gain recognition as one of the pioneer countries in the field of science and technology. The nation has also secured a respectable position among the world's fastest growing economies. However, such a level of success could not be attained in the mitigation of Human-Wildlife Conflicts (HWC) that have been emerging in complex and diverse landscapes, due to the contradiction between wildlife conservation and livelihood development.

India covers 2.4 percent of the total land area of the world and harbours 7 to 8 percent of all the recorded species on earth (IUCN). Out of the 35 biodiversity hotspots in the world, two are located in India (IUCN). Over the years, the expanding human population and increased anthropogenic pressure on the landscapes have led to the degradation and exploitation of the country's natural resources.

As forests are encroached for various economic activities like industrial development, construction of dams and agricultural extension, many critical wildlife habitats are destroyed and several species are pushed towards extinction on the

one hand, and on the other hand, forest dependent marginalized sections of society become homeless (Mohanty 2005; Lasgorceix and Kothari 2009; Sahu 2016). To avert the situation, the Government of India introduced the Wildlife (Protection) Act in 1972, which further led to the creation of Protected Areas (PA) in the country. This conservation model which India has followed is based on the North-American approach of conservation that has the basis for landscape segregation with the disjuncture between nature and society. This approach which is currently in practice and considered as an effective tool for conservation has serious socio-economic and ecological consequences (Nautiyal and Kaechele 2007; Nautiyal and Nidamanuri 2012). Pimm (2021) argues that conservation might only succeed if ways are found to accommodate both people and nature.

Landscape fragmentation and shrinkage of biological corridors along with limiting forest resources for sustenance of forest-dependent communities have brought upfront, a highly complex and challenging issue in the form of Human-Wildlife Conflicts (HWC). For instance, Gulati et al. (2021) states that in India the dominant cost of HWC is the loss of human lives. Despite of the strict conservation policies adopted to arrest the biodiversity loss, the results are not encouraging (Shanker et al. 2017). Researchers have diverse views as some are in favor of strict nature conser-

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vation (Wilson 2016) whereas others (Shanker et al. 2017) have the opinion that strict nature conservation is neither helpful in achieving the conservation goals nor it enables forest dependent societies to sustain their livelihood. This has made the socio-ecology of conservation areas more convoluted (Rao et al. 2002). This paper discusses the issue of HWC by surveying and interpreting the existing literature on the topic in the context of developing countries. The authors have also cited two empirical case studies from two socio-culturally and ecologically diverse landscapes namely the Manas landscape in Assam and the Indian Sundarbans in West Bengal. The case studies are cited from their respective field experiences in Manas and Indian Sundarbans. Further, the paper attempts to throw light on the various existing mitigation measures meant for solving the problems related to HWC.

An Overview of Human-Wildlife Conflicts

In developed countries, there is a vivid demarcation between human society and forests. However, in developing countries like India, an overlapping situation prevails between human settlements and forests; human settlements are also located in the fringes of forests. From time immemorial, people have used and interacted with the forest for their economic, social and cultural needs. As the force of economic development swept across the length and breadth of the country forests and wildlife areas were reduced. In view of this, India moved forward to preserve the remaining forested areas by converting them into protected areas (Karanth et al. 2008). According to ENVIS (2019), the number of protected areas in India increased from being one in the year 1936 to 836 in the year 2019. As of January, 2019 approximately 5.02 percent of the total area of the country was under protected areas. The access to forest resources and utilization of such resources by local people have been restricted due to the strict conservation measures implemented in the form of PA management which endangered the interaction between wildlife and people (Johnson et al. 2018). "According to the World Conservation Union (World Park Congress 2003), HWC occurs when the requirements of wildlife overlap with those of human populations, creating costs to residents and wild animals" (Distefano 2005).

HWC results in human injury or death, damages to standing agricultural and plantation as well as harvested and stored agricultural crops, and often leads to the destruction of storage facilities, houses and other properties. Numerous researchers have cited the reasons for the human-wildlife conflict with special reference to India. HWCs in India occur because of undue focus on PA development, and the Government's attitude towards man-nature relationship in terms of conflicts and increased pressure of human settlement (Johnson et al. 2018). Many people have also blamed 'habitat encroachment' and 'anthropogenic pressure' for human-wildlife conflict (Chowdhury et al. 2008). However, most of the researchers tend to overlook the fact that an increase in the population of wild animals also leads to conflicts (Shanker et al. 2017). As socio-ecological systems are intricately connected, a change of elements in one system has a direct impact on the other system.

In India, tigers and elephants most frequently are involved in conflicts with humans; whereas, in Africa, the lion is the most common conflict animal. In India, the elephant and tiger populations have increased due to special attention on their conservation through flagship schemes like Project Tiger and Project Elephant. According to WWF, approximately 300 people are killed annually only due to human-elephant conflicts in India. However, the MoEFCC states that the number of human deaths because of human-elephant conflicts (HEC) is much higher (1713) than the number estimated by WWF. Data from Ministry of Environment, Forest and Climate Change on Human-Elephant conflict shows that the number of conflicts and the resulting deaths exceeded 400 for the years 2015-16 to 2017-2018 (MoEFCC, 2019). This huge number depicts the magnitude of HWC with reference to elephants in India. The total number of human deaths caused by elephant attacks was the highest in West Bengal (307), Odisha (305) and Assam (280) between 2015-16 and 2018-19. The detailed database on the resultant loss due to HWC is not available in an integrated form. However, the loss due to tiger and other animals is also equally high. It was reported in a newspaper paper that in Karnataka every year 45 people on an average lose their lives due to HWCs. A report shows over the course of five years (2014-18), 220 human deaths occurred due to attacks by elephant, tiger, bears and leopard in

Karnataka. Approximately an amount of Rupees 5 lakh was provided as compensation to every victim's family, contributing to a total expenditure of 130 million or 13 crore Rupees as compensation over the five years. A study reported that the number of casualties resulting from Tiger attacks is the highest in India, Bangladesh (Sundarban region), Sumatra and Singapore (Goodrich 2010). Ecosystem provides a number of services to mankind and several studies have evaluated such ecosystem services. However, the dis-services which come from ecosystems have not received much attention in the perspective of socio-ecological sustainability. The extent of damage that is induced due to the overlapping competition between human and wild species is the most prominent dis-service from the ecosystem. Understanding the root cause of such dis-services and proposing solutions for their mitigation have to be considered as most important aspects while discussing social and ecological sustainability.

Ecosystem Services Vs (Dis)services

Ecosystem services are the benefits people obtain from ecosystems (Millennium Ecosystem Assessment 2005). The ecosystem provides numerous services in the form of food, fuelwood, and fodder for livestock, timber for building houses, honey, aesthetic value, carbon sink, nitrogen fixation, regulation of hydrological cycle and many others. These services are classified into four categories: (a) Provisioning Services, (b) Cultural Services, (c) Regulation Services and (d) Supporting Services (MEA 2005). Economic valuation documents both tangible and intangible services provided by the ecosystem. The economic evaluation of ecosystem services has helped understand the importance of conserva-

tion and formulating management policies for protected areas. Scholars from academic disciplines such as environmental economics and ecology have embraced and keenly studied this aspect. For instance, the outcome of research conducted by Indian scholars (Kadekodi 2001; Ninan 2012) and others (Costanza et al. 1997; Costanza et al. 2014) have highlighted the immensely important role played by the forest and natural resources.

However, all ecosystem functions cannot be regarded as benefits. There are certain ecosystem functions that act as deterrents or disincents to human welfare like economic losses, health and security risks and nuisances caused by floods and fires, pests and vector-borne diseases, and invasive or unwanted species. Those functions that are perceived as negative for human well-being can be labelled as ecosystem dis-services (Lyytimäki and Sipilä 2009). An example for a simplistic view on services vs disservices provided ecosystems are illustrated in Table 1.

There has been a dearth of focus on ecosystem disservices in academic discourse. For example, a search on google scholar showed that between 2005 and 2019 (till 14 March 2019) 51500 papers were published bearing the phrase 'ecosystem services in India' in their respective titles, while there were only 5450 in case of the phrase 'ecosystem disservices in India' (Fig. 1). However, the few studies which focused on ecosystem disservices, have considered compensation as a parameter while assessing ecosystem disservices. It was found that the extent of loss (crop damage, livestock and human life loss) is not estimated scientifically and hence the compensation paid further aggravates conflicts (Nautiyal and Kaechele 2007; Lele and Srinivasan 2013).

Table 1: Types of ecosystem services and dis-services arising from the wildlife

<i>Wildlife species</i>	<i>Ecosystem services</i>	<i>Dis-services</i>
Wild boar (ungulate)	Provision of meat, hunting	Crop damages
Crane (grazing birds)	Bird watching, tourism	Crop damages
Wolf (or other predators)	Prey regulation, tourism	Livestock predation (fear)
Tiger/Leopard	Maintains ungulates/herbivores population Help conserving in ecosystem quality	Attacks upon humans; and opportunity costs, where people forgo economic or lifestyle choices due to impositions placed upon them by the presence of wild animals or conservation areas

Source: Authors

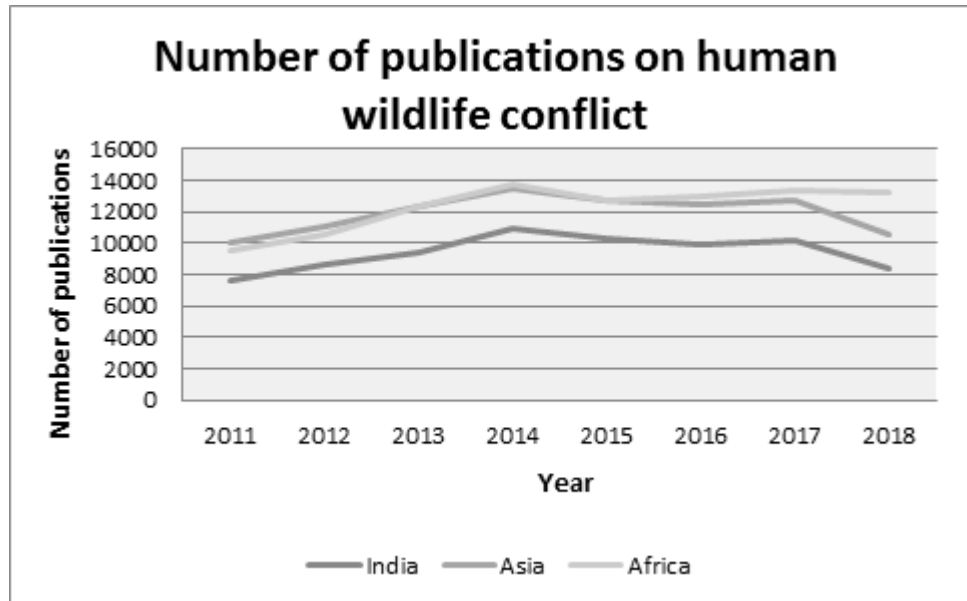


Fig. 1. Year-wise publication of research papers on HWC originating from three selected regions from 2011 to 2018

Source: Authors

A simple search was conducted in google scholar using the keywords 'Human-Wildlife Conflict in India', 'Asia' and 'Africa' from 2011 to 2018. The search was undertaken to highlight and understand the gravity of the issue and its relevance in academic discourse. The Google scholar database was used as it provided comprehensive search results on papers published with the same keywords vis-à-vis relying on a single journal database. It is evident from Figure 1 that there was a constant increase in the number of publications across the study regions considered till 2014. The peak year in terms of the number of attacks across three regions was 2014. Due to the paucity of information, the real cause behind the peak in the number of publications in 2014 could not be established? However, it is assumed that it could be due to the frequency of HWC occurring across the regions in that particular year. The reason for the rise and fall in the number of publications in Asia could be the rise and decline in the number of publications in India. Although, the number of publications originating from Africa reduced after 2014 like elsewhere in India and Asia, there

were lower fluctuations in the case of Africa compared with India and Asia. A strong focus is required on field-based studies with regard to HWC, Ecosystem Services vs (dis) services. The authors' efforts in this endeavor are continued as working in many protected areas in India for the last several years. The examples of two protected areas are discussed in the following section to bring the ground level reality to the attention of the stakeholders.

A Socio-ecological Framework

Social-ecological system (SES) approach considers the interactions between ecology and society. The anthropocentric orientation of SES considers human beings' dependence on and interaction with the biological world. However, the resilience of SES also depends upon the sustainable usage of its resources. According to Ostrom (2009), SES can be explained as the interaction among several subsystems that leads to outcomes. The actions of the actors like park managers, local communities, NGOs or local authorities

lead to outcomes that could be favourable or non-favourable to resource users. In this context, for instance, a crab catcher in Indian Sundarbans has to interact with the forest and river and its associated attributes to sustain his livelihood. This interaction between a crab catcher and the resource system could either be in an advantageous or disadvantageous position. At times, while extracting the resource he might get involve himself in such a situation where he confronts in conflict with the wildlife. Conservation policies emerging out of the concern to preserve the ecology has failed to incorporate the anthropocentric necessity. Hence, an integrative policymaking should be initiated considering both the subsystems in purview.

Empirical Case Studies - Manas and Indian Sundarbans

Manas Landscape

The Manas Landscape comprising an area of 2,840 sq. km. is situated in the Northeastern state of Assam (India) and lies on the northern bank of the river Brahmaputra that shares a contiguous border with the Royal Manas National Park of Bhutan on the north. The Landscape boasts of being a Biosphere Reserve, a Tiger Reserve, an Elephant Reserve and a National Park, which is also a UNESCO world heritage site. It is characterized by a range of forested hills, alluvial grasslands and tropical evergreen forests. Manas Landscape, besides, being an important habitat for biodiversity and wild life is also a home for diverse ethnic cultures and communities.

Historical Background of Manas

Manas Landscape was caught in a cross-fire of civil conflict that almost rendered it extinct. Manas National Park was severely damaged during the conflicts that started in the late nineties and continued to the turn of the new millennium. Decade long conflicts had disastrous impacts on the habitat and its wildlife. Given the severity of the conflict, forest guards left the forest protection camps fearing for their lives and there was a total absence of forest management. These vacant protection camps inside the forest became hideouts for the insurgents and poachers. Poach-

ers and illegal loggers took full advantage of the lack of ownership of the forest, hunted down and cut trees of their free will. Besides this, timber merchants of nearby towns employed the locals to supply them timber at very low wages (Horwich et al. 2013).

The turnaround for Manas happened when one of the insurgent outfits, Bodoland Liberation Tigers (BLT), involved in the conflict gave up arms and formed the government in 2003. As a part of the tri-partite agreement with the Central Government, Assam Government and the BLT; a territorial council named as Bodoland Territorial Council (BTC) was formed comprising of four districts for socio-economic and cultural development of the Bodo' community. The new regional government worked in tandem with various stakeholders to restore the lost glory of Manas. Currently, Manas National Park, which is the core area of Manas Landscape is stable and thriving.

According to the Forest Department's Internal Survey of Manas National Park in 2018, there were 36 Rhinos, 1376 Elephants and approximately 30-45 Tigers (2016-17). As the animal population increased, the anxiety of the fringe residents increased due to conflicts between the humans and the wildlife. Due to the presence of the wild animal's people feared to go inside the forest and collect the basic necessities like firewood, fishing and grazing, among others. The questionnaire-based household survey and interviews with local organizations in the fringes of the eastern most part of Manas National Park brought to light the tension and apprehension of people. The data highlighted below reveals the information of human-wildlife conflicts in some pockets of Manas. This does not reflect the overall HWC situation of the entire Manas National Park or the Landscape as there is a lack of HWC data at the landscape level.

The information on HWC from Manas records elephant depredation in each year from 2015 to 2018 and the number of conflicts ranged from 4 to 19. The data shows the severity of damage to residential houses, injury to people and crop damage because of the elephant- depredation in Kamardwisha Forest Range of Manas National Park. It was noticed that conflict took place due to the elephants which entered human habitations (48 cases are reported in 4 years). Perhaps, the number of conflicts for 2018 increased because the

information was collected during the first quarter of that year. Crops were raided by wildlife during the harvesting period and post-harvesting that tend to destroy by wild animals particularly the elephant. These information reveals that the conflicts between elephants and humans in Manas are aggravating and a conducive habitat should be created where both humans and elephants can coexist harmoniously.

As far as the issue of compensation is concerned it is a different story altogether. Local people are not aware of the procedure to claim compensation. During the field investigation it was observed that the process of receiving compensation required a long period of time and in many instances over 2 years were needed to receive even a small amount which was paid to replenish the loss. Currently, for the destruction of a dwelling house an amount of Rs. 5, 000 is paid as compensation, whereas Rupees 2000 to Rupees 3000 are paid for crop raiding only by elephants and not by other herbivores. This clearly reveals that there are no comprehensive compensatory mechanisms and tools to value the dis-services in the landscape. This, in turn enhances the resentment and grievances of the people towards wildlife and biodiversity conservation in the landscape.

The Case of Indian Sundarbans

The Indian portion of Sundarbans covers an area of approximately 9600 sq. km out of which 4262 sq. km is the actual forested area, whereas the remaining portion is the inhabited area. Recognised as a UNESCO world heritage site and Ramsar site, the Indian Sundarbans consist of a National Park, a Wildlife Sanctuary and Tiger Reserve. An area of 2585 sq. km constitutes the Sundarban Tiger Reserve (STR) and Sundarban National Park. The transition zone of the STR is the only inhabited area with a population density of over 1000 people per km² according to the Census of India, 2011. The confluence of forest, rivers and alluvial soil provide diversified livelihood opportunity to the people in the area. The major livelihood activities of this area are agriculture, fishing, as well as crab and honey collection.

However, the availability of multiple livelihood options does not reduce the hardships faced by the people. Low income, isolation and lack of communication with the mainland, and excessive dependence on natural resources have made the people of Sundarbans very vulnerable. The most

prominent form of conflict faced by the people of Sundarbans is tiger attack. In fact, the Royal Bengal tigers of Sundarbans are known for their habit of attacking and consuming humans. Although research has been undertaken to find out whether the humid climate or the saline water is responsible for such behaviour of the tigers, a proper scientific explanation in this context has not yet been established without any particular reason. The majority of the attacks occur when people are engaged in livelihood activities such as the collection of crab and honey. According to a news report, on an average every year 16 people are killed by wildlife in the forests of Sundarbans. On the other hand, according to Sundarban Biosphere Reserve, between the years 2002-03 and 2005-06 there were 20 cases of tigers straying out of the forest which led to the killing of one tiger. During the field study it was observed that the death toll due to tigers was not as high as that of some other animals, but the resultant psychological effects were enormous (Chowdhury et al. 2008). This is especially true for the trauma suffered by the widows of the victims of tiger attacks. The number of widows in Lahiripur village of Gosaba is so high that it is known as the '*Bidhaba Pally*' or the 'widow colony' where in almost every household one male member has been killed because of tiger attack and consequently left behind the widow and other dependant members. These widows are often accused of bringing bad luck and thus held responsible for the death of their husbands by tiger attack. The government provides compensation to the victims following very strict guidelines. In most of the cases, people restrain themselves from applying for compensation as in the case of other protected areas and the reasons are the same as those reported for Manas National Park. For example, long and complex application procedures (sometimes it takes decades to receive the full amount of compensation, after completing all the formalities). In addition, middlemen and corruption are also involved, and finally without any proper evaluation and meagre amount paid as compensation after a long and hectic process.

Mitigation Measures: Current Practices and Future Considerations

The fallout of Human-Wildlife Conflicts can be very costly not only in monetary terms, but also in terms of the number of humans and wild

animals killed. In order to placate the tensions of the victims and reduce the economic burden, various preventive and mitigative measures are being taken by the government. In India, the foremost practice of mitigating wildlife conflicts is the payment of compensation to the victims. However, it is not the only HWC mitigation tool in India, even though it is most commonly applied (Johnson et al. 2018). A number of reasons explain the reservations about the effectiveness of 'Compensation' as a mitigation measure. Similarly, there is also a large body of study that discusses or contests 'Monetary Compensation' as a tool to mitigate human wildlife conflicts (Dickman et al. 2011; DeMotts and Hoon 2012; Ravenelle and Nyhus 2017). Further, there is a discrepancy between HWCs experienced by people vis-a-vis what government considers as HWCs (Dickman et al. 2011).

Compensation helps to ease the pain of the victims and increases the level of tolerance and develop an affinity and support for wildlife conservation (Nyhus et al. 2005). However, there is a pervasive problem about compensation that is reported across the country. The letter containing the guidelines for the management of Human-Elephant Conflicts of the MoEFCC addressed to the central and various state governments also admits the drawbacks of compensation schemes. The main complaints received from the farmers against the compensation or ex-gratia are: a) the ex-gratia amount provided in case of crop damage is insufficient, b) the ex-gratia process is so lengthy and time consuming that the victims prefer not to apply for the same and c) the ex-gratia is disbursed too late.

The problem of compensatory mechanism has already been highlighted in a previous study (Nautiyal 2011). Nautiyal (2011) shows the gap between the losses incurred and compensation received by families due to the implementation of conservation policies in the Nanda Devi Biosphere Reserve. The empirical study carried out for over 15 years in the Central Himalaya showed that the loss incurred by the local farmers was Rupees 11,367 (per family per year) on an average. When the values were revised with respect to the current economic scenario, it amounted to around Rupees 22000 against which mere Rupees 3500 was paid as compensation. The maximum loss incurred was due to the ban on tourism (Rupees

7,350 on an average), followed by the decline in animal husbandry (Rupees 2,800 on an average) because of the damage caused by wild animals, and the compensation paid was inadequate. This example demonstrates the failure of conservation policies to address the issues related to local people's livelihoods. It is suggested that an inclusive strategy should be taken instead of a strict top-down conservation approach.

Compensation schemes in India tend to overlook crop depredation caused by wild pigs and Nilgai (Asian antelope) (Johnson et al. 2018). Similar stories are being circulated in the case of Manas as well as Sundarbans. Particularly, in the case of Manas, the locals as well as forest officials mention that compensation is not paid for damages caused by herbivores. It is opined that crop loss caused by herbivores is difficult to estimate. In Rajasthan, a large number of losses arising because of herbivore depredation are not considered for compensation (Johnson et al. 2018). The success of compensation schemes is also determined by the social standings of the victims like income, gender and education (Ogra and Badola 2008).

In this regard, in addition to compensation, conservation education and moral persuasion could play a more effective role in preventing people from resorting to retaliatory killings or poaching (Nyhus et al. 2005). For the efficient implementation of compensation schemes in India, lacunae such as the presence of middlemen in the application process, corruption and complexity of procedures should be eradicated.

Some states in India, have introduced insurance schemes to cover the crop losses arising due to animal depredation. However, the ground level experiences indicate that such initiatives have not always fulfilled expectations. For instance, people inhabiting the fringes of Sariska Tiger Reserve, India had to bear an exorbitant insurance rate of Rupees 1168 against the average annual loss of Rupees 370 resulting from HWC (Sekhar 1998). Similarly, 'Relocation' of people away from the forest has also proved to be a costly strategy for both the government and the forest dwellers, who are deprived of their land. Another measure that could be adopted to deal with the issue of human-wildlife conflict is the engagement of the local community in conservation. Often, the local community has more man-

power and knowledge about the village than the forest department. The issue of HWC could also be tackled by deploying anti-depredation squads (ADS) which has also been suggested by the guidelines of the MoEFCC. In fact, such squads which monitor the movements of wild animals are common in West Bengal and Assam. A study (Jayson 2016) in Kerala suggests that a “first-line defence” should be provided in the fringe areas of forests as a mitigation measure for the safety of both people and wildlife.

To mitigate conflicts the compensatory mechanism should be viewed in the perspective of (dis)services from ecosystems. The damages suffered by people because of the effects of ecosystems have to be realistic while discussing the sustainability of social-ecological system in real term i.e. biodiversity conservation, habitat conservation, ecosystem sustainability, and sustainable resource flow. Understanding the process from ecosystems that benefit human are considered as services. Similarly, the negative impacts of ecological systems on social systems are considered as ecosystem disservices. This requires proper arguments and standard methodology (as developed for the evaluation of services) for the quantification of disservices and this would lead to the formulation of a proper mechanism for solving the complexity of the human-ecosystems (positive and negative interactions). This is more realistic for the country which has a rich biodiversity for mankind on the one hand, and on the other hand also has a large population which still depends on existing biodiversity for sustenance. Disservices are essentially the opposite of compensation and hence need special attention to be incorporated into policy framework to ensuring social and ecological sustainability of complex landscapes.

CONCLUSION

In order to efficiently conserve wildlife and natural resources in India, there is a need for adequate preparedness for ecosystem (dis) services and bearing the negative impacts arising out of conservation, namely HWCs. The disservices arising out of the ecosystem, including the HWCs need to be valued, so that the stakeholders will understand the actual outcome of conservation efforts. At present, the valuation of ecosystem

(dis)services tends to be overlooked by researchers. Accessible resources are limited therefore, the conservation and human problems are associated and valuation of ecosystem services has contributed towards judicious use of their available resources. The conflicts for resources and conflicts for space between humans and wild animals are likely to exacerbate in the future.

RECOMMENDATIONS

Stakeholders have to reconsider the preventive and mitigation measures in India. Monetary compensation for disservices from ecosystems could be vital to ameliorate the conflicts between human and wildlife. A proper mechanism for the valuation of disservices and reaching out to the victims in the socio-ecological system would enable people to change their attitudes and become more responsible for their contribution to the wildlife and biodiversity conservation. For example, there is no proper explanation why Rupees 5 lakh is paid as compensation when a person is killed by wildlife. This has to be evaluated logically and methodologically explained. Failure to develop a proper mechanism on these aspects in the context of HWCs (dis-services) in India, would undermine India's international commitments for achieving Sustainable Development Goals (SDGs).

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