# Reconciling the Values and Needs of Wildlife and Local Communities: A Way Forward to Deal with Human–Wildlife Conflicts in Malaysia

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**Abstract**

Human–wildlife conflicts represent a sign of undervaluing of various ecosystem services provided by wild animals. Such conflicts are common in many developing countries including Malaysia and occur when the values of wildlife have been overshadowed by short-term human gains as societies develop. This is indeed linked to market failure, i.e. wildlife and their habitats are often treated as public goods and hence they are prone to various threats and destruction. As a result, local communities have turned into victims of such conflicts affecting not only their long-term livelihood but also their lives. This chapter presents the various economic values of Malaysian wildlife and the consequences when these values are overlooked. Specifically, the associated costs due to local human–wildlife conflicts as well as conflict mitigation measures are discussed by highlighting local case studies. Besides local community involvement, the roles of various stakeholders including government agencies and non-governmental organisations are also included in the discussions. Finally, we review the current practices in Malaysia and recommend possible ways to reconcile the needs of local communities and wildlife to reduce these conflicts. In the end, this chapter intends to deliver a message that living harmoniously with wildlife is the way forward not

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only to sustain the livelihood of local communities in the developing countries but also the future development of these countries.

**Keywords**

Human–wildlife conflicts · Total economic value · Payments for ecosystem services · Stakeholder participation · Community engagement · Ecosystem functions · Malaysian wildlife

## 13.1 Being Rich: A Biological and an Economic Perspective

Located close to the equator and within the Sundaic region, Malaysia harbours one of the oldest rainforests on earth, which has also been recognised as a rich biome in which various flora and fauna have adapted to live. Blessed with the suitable climatic and edaphic factors, examples of terrestrial habitats in Malaysia include the mangrove, peat swamp, limestone, heath and riparian habitats. It is in such specialised habitats that unique species assemblages are found. Together with the marine habitats, the diverse ecosystems in Malaysia host more than 300 species of mammals, 780 birds, 240 frogs, 560 reptiles, 2060 marine and freshwater fishes and 13,000 butterflies and moths (MNRE, 2016). As with most tropical countries, intense species richness with large numbers of congeneric species, as well as many rare and endemic species, is a major characteristic of Malaysian biodiversity. With such high biodiversity, Malaysia has long been recognised as one of the 17 megadiverse countries in the world based on the National Biodiversity Index (Groombridge, 1994) and part of the global biodiversity hotspots (Myers et al., 2000) and Global Ecoregions (Olson & Dinerstein, 2002). The inclusion of Malaysia in both the Endemic and Important Bird Areas (EBA & IBA; Yeap et al., 2007) further exemplifies the significance of natural habitats in the country.

In an ecosystem, different organisms proclaim their niche, for instance, by occupying different strata of the rainforests or different vegetation downstream or upstream of riparian habitat. The complex ecological interactions among these organisms and the interactions between biotic communities and abiotic elements (cycling of nutrients and transfer of energy) are what provide mankind with the various ecological functions and services. These floral and faunal resources sustain not only the livelihoods of the local communities but also the larger economy of tropical regions, providing tangible or intangible or use or non-use values to human societies. Traditionally, the indigenous people (e.g. the Orang Asli or Orang Asal in Malaysia) have been consuming forest products ranging from wild meat to non-timber products for food, clothing, building material, survival tools and medicines. To modern societies, wildlife provides important values as far as recreation, education and research are concerned.

## 13.2 Economic Growth and Human–Wildlife Conflicts

Being rich in natural resources inevitably implies a greater amount of resources available for exploitation. In Southeast Asia, the relative deforestation rate is the highest of any major tropical region. It is estimated that three-quarters of its original forests and up to 42% of its biodiversity will be lost by 2100 (Sodhi et al., 2004). Malaysia, as of 2021, is facing a biocapacity deficit of 71% implying the ecological footprint has exceeded the biocapacity of the country, estimated to be at 72 million gha (GFN, 2011). This reflects the great demand for natural resources and, consequently, pressure on native biodiversity in the country. At the moment, at least 50 mammals, 40 birds, 21 reptiles, 46 amphibians and 47 fish species in Malaysia are listed under one of the threatened categories in the IUCN Red List.

For many decades, people have been harvesting timber and non-timber forest products primarily for commercialisation purposes. It is primarily through logging activities that forests are degraded in terms of quantity and quality (Achard et al., 2002). Depending on the type of forest management practices, the associated effects may vary from the removal of large trees, destruction of forest structure and microhabitats, to land erosion. Such events alter tropical biotic communities both in terms of species and their numbers depending on the level of habitat disturbance (Berry et al., 2010). Overexploitation of forest may affect many interior forest specialists, and the recovery of the forest may be slow or may not reach its original condition as many forest-dependent species may have gone extinct (in the case of endemic species) locally. Similarly, building a dam may affect the aquatic ecosystems and disrupt the associated ecological interactions among aquatic organisms (Richter et al., 2010), which will eventually have a cascading effect on terrestrial organisms. It is through such activities and excessive use of natural resources that the growth of human populations is being supported, at the expense of biodiversity.

Throughout the world, wildlife and their habitats are being eliminated and disturbed at an alarming rate through deforestation, intensive agriculture, wetland drainage, invasive species, illegal poaching and pollution. In Malaysia, news about human–wildlife conflicts (HWC), roadkills and smuggling (Nijman, 2010) are making headlines more often than before. Such incidents are often complicated and interrelated with issues such as habitat encroachment, poaching, loss of human lives, damage to properties and the livelihoods of indigenous people (Clements et al., 2010; Saaban et al., 2011).

Out of 86,040 HWC complaints (e.g. wildlife disturbance and attacks as well as damages and losses of livestock and properties due to wild animals) recorded by the Department of Wildlife and National Parks (DWNP) from 2006 to 2015, most were associated with the long-tailed macaque (*Macaca fascicularis fascicularis*) (66%), followed by the Asian elephant (*Elephas maximus*) (9%), the wild boar (*Sus scrofa*) (7%), the common palm civet (*Paradoxurus hermaphroditus*) (6%) and the pig-tailed macaque (*Macaca nemestrina*) (3%). From 2004 to 2015, a total of 781 cases involving human death and injuries were recorded involving snakes (505), wild boars (99), primates (92), elephants, bees/hornets (29), Malayan sun

bear (*Helarctos malayanus*) (7) and Malayan tiger (*Panthera tigris jacksoni*) (9) (Saaban et al., 2016). Conflict undeniably causes fear and negative perception among the local communities towards wildlife. In terms of monetary value, a total of RM550,233 was lost due to livestock depredation between 2007 and 2015 with the highest loss reported from Terengganu (RM284,240) followed by Negeri Sembilan (RM77,170) and Pahang (RM58,524) (Saaban et al., 2016). In Sarawak, cases mainly involved the saltwater crocodile (*Crocodylus porosus*) and the long-tailed macaque in 2013–2015, i.e. 28 of 110 crocodile attacks resulted in 15 deaths and 13 severely injured, whereas it was 56 cases for macaques (Tisen, 2016).

Roadkill is another form of HWC involving many wildlife species (e.g. civets, pangolins, monitor lizards and snakes) (DTCP, 2009; Saaban et al., 2016). From 2011 to 2019, a total of 3386 cases of roadkill were recorded in Peninsular Malaysia with the highest cases recorded from the state of Johor (702 cases) (Ten et al., 2021). Based on 2010–2014 records, three recorded species of roadkill were listed as Endangered (Malayan tapir *Tapirus indicus*, Asian wild dog *Cuon alpinus* and Asian elephant). Three recorded species of roadkill were listed as vulnerable (smooth-coated otter *Lutrogale perspicillata*, pig-tailed macaque and binturong *Arctictis binturong*). The majority of road mortality occurred on oil palm plantation roads compared to highways (Jamhuri et al., 2020). Specifically, mortality of small- and medium-sized mammals due to roadkill was greater at locations closer to fragmented compared to continuous forests (Jamhuri et al., 2020). Such scientific-based findings related to roadkills would contribute towards better land use management and decision-making to reduce HWC occurrences. For instance, this can be done by identifying hotspots of roadkills and avoiding building roads that cut across contiguous forest habitats as well as creating wildlife corridors that connect forest fragments.

## 13.3 Market Failure and Wildlife Overexploitation

Knowing the consequences of HWC, one may raise questions on why development projects are resulting in losses rather than gains. In reality, most of the environmental problems including HWC occurring nowadays are directly and indirectly linked to human activities, more so when it involves unsustainable decisions to make trade-offs between preserving natural resources and development—we tend to underestimate or overlook the value of many 'unpriced' natural resources, including wildlife. On the other hand, the benefits of human activities are often being overestimated. As a result, the related, often adverse, impacts of development have to be borne disproportionately by other parties (Dixon & Sherman, 1991). For instance, a development project would encroach an existing habitat of elephants, forcing them out and to wander into nearby plantations, thereby threatening the lives of the local communities and their properties (Saaban et al., 2011). Such threats are usually not properly accounted for when a land conversion project is being implemented, and the wandering elephants would then be blamed for any accidents that happen. This shows that there is still a lack of understanding among the general public when it

comes to sources of HWC, as well as the value or importance of having these large herbivores (Campos-Arceiz et al., 2012) in an ecosystem.

The benefits of natural resources are undervalued for several reasons, which can be described as market failure or the failure of human societies to allocate resources efficiently. Natural resources are hard to express in monetary terms such as the ecological services and processes that sustain biodiversity. Unlike typically marketed goods, most natural resources are also regarded as common property implying that no one owns them. Wildlife that is not already traded in a marketplace may often be regarded as free goods, making them vulnerable to various threats as protection measures promoted by ownership cannot be adopted. The same goes for natural habitats that are needed to support wildlife. With only a few protected areas privately owned and managed, many natural areas are generally regarded as 'open access' (Ooi, 1990) for uncontrolled use and exploitation. In the case of natural areas that are established for recreational purposes, users may enjoy visiting, but unless a fee is imposed, there is no valuation on how much such 'enjoyment' is worth. Hence, regardless of whether the areas are under protection, under normal market mechanisms, the desired land area to be protected remains unknown as no individual is required to pay for its protection (Dixon & Sherman, 1991). Furthermore, since most protected areas are established through public investments made by governments, undervaluation or failure to estimate monetary benefits may provide little motivation concerning the allocation of funds needed for proper management to derive continued provision of the benefits associated with these areas.

The nature of some natural resources can further impede their protection. Unlike minerals and crops, some resources may be almost impossible to achieve exclusion, either technologically or physically. For instance, migratory birds on land and fish in the ocean can travel over large distances across manmade borders, and therefore protection of these species can be very difficult. The same goes for ecological processes, such as watershed protection and carbon sinks, which are dispersed over the landscape at large and are not confined to an area. Consequently, an efficient allocation and protection of resources may be problematic without some forms of government intervention, for instance, employing law enforcement. In Malaysia, the Wildlife Conservation Act 2010 [Act 716], Access to Biological Resources and Benefit Sharing Act 2017 [Act 795], International Trade in Endangered Species Act 2008 [Act 686], National Parks Act 1980 [Act 226] and Fisheries Act 1985 [Act 317] have been enacted to serve such a purpose.

For various reasons mentioned above, under typical market mechanisms, the economic values or benefits we derive from natural resources are not entirely accounted for, but the costs of their protection are often being mentioned. Moreover, there is a tendency to understate the risks involved when the proper functioning of ecosystems is affected due to exploitation and destruction of natural resources. For example, overfishing distorts the entire food chain in the ocean altering marine ecosystem structure and functions, leading to serious social, economic and environmental implications (Ooi, 1990). The largest marine turtle in the world, the leatherback sea turtle (*Dermochelys coriacea*), used to nest in great numbers on the east coast of Peninsular Malaysia. However, the over-harvesting of its eggs caused a

dramatic population decline from more than 10,000 nests in the 1950s to none today (Chan, 2006; Chan & Liew, 1996). The local extinction of the species in Malaysia has also affected tourism (i.e. from turtle watching; MNRE, 2016) in the area. With an increase in pressure on natural resources from economic development, giving value to natural resources in a more holistic approach is one way towards improving policy and decision-making (Davison, 1997) to encourage the use of natural resources in a more sustainable manner.

## 13.4 Valuing Wildlife Through Various Approaches

Today, we choose to pay for goods and services according to our choice or priority which reflects the value that we put on the things we buy. Conceptually, the value of unpriced natural resources such as wildlife is analogous to the value of goods and services that we are willing to make trade-off or give up in exchange for getting those benefits associated with the resources. As such, by denominating it a monetary unit, wildlife resources can be valued for a variety of uses and reasons. The concept of total economic value (TEV; Fig. 13.1) is often used to categorise the values of natural resources. The TEV framework comprises two broad categories, i.e. use and non-use values. Total use value comprises the actual use value which is divided into current use value and option value. These values may come in the form of direct or indirect use values. For wildlife, the direct use values may be derived from harvesting bushmeat or wild honey or taking wild animals legally as pets, which can also be referred to as consumptive use values. Globally, the annual retail value of the live reef fish trade was estimated at US$1.2 billion (about RM4.8 billion) in 1995, of which US$1.0 billion came from live food fish while US$200 million was from aquarium fish (Barber & Pratt, 1998). Ng and Tan (1997) further estimated that the aquarium fish trade in Southeast Asia can reach S$100–200 million (about RM290–590 million) annually. In the case of edible bird's nest, the global trade was estimated to be over US$1.6 billion (about RM6.5 billion), and the annual production in Malaysia alone has reached RM1 billion (Runckel, 2010; Thorburn, 2015). These are examples of consumptive use-values.

On the other hand, the non-consumptive use values are obtained from wildlife-based recreation or ecotourism activities such as birdwatching and nature photography. With the biodiversity in Malaysia, wildlife has certainly become a prime attraction concerning the nation's ecotourism industry. Examples of famous ecotourism activities include watching of vertebrates [e.g. the Bornean orangutan (*Pongo pygmaeus*) at the Sepilok Orangutan Rehabilitation Centre and the sun bear at the Bornean Sun Bear Conservation Centre (BSBCC) in Sabah; the Asian elephant at the National Elephant Conservation Centre, Kuala Gandah, Pahang (Kaffashi et al., 2015); migratory raptors at Tanjung Tuan, Melaka (Puan et al., 2014); the kelah or red mahseer (*Tor tambroides*) at Lubuk Tenor, Taman Negara Pahang] as well as activities involving invertebrates [e.g. the fireflies at Kampung Kuantan Firefly Park in Kuala Selangor, Selangor (Mohd Shahwahid et al., 2013); the Rajah Brooke's birdwing (*Trogonoptera brookiana*) in Ulu Geroh, Perak; and squid jigging in Kuala

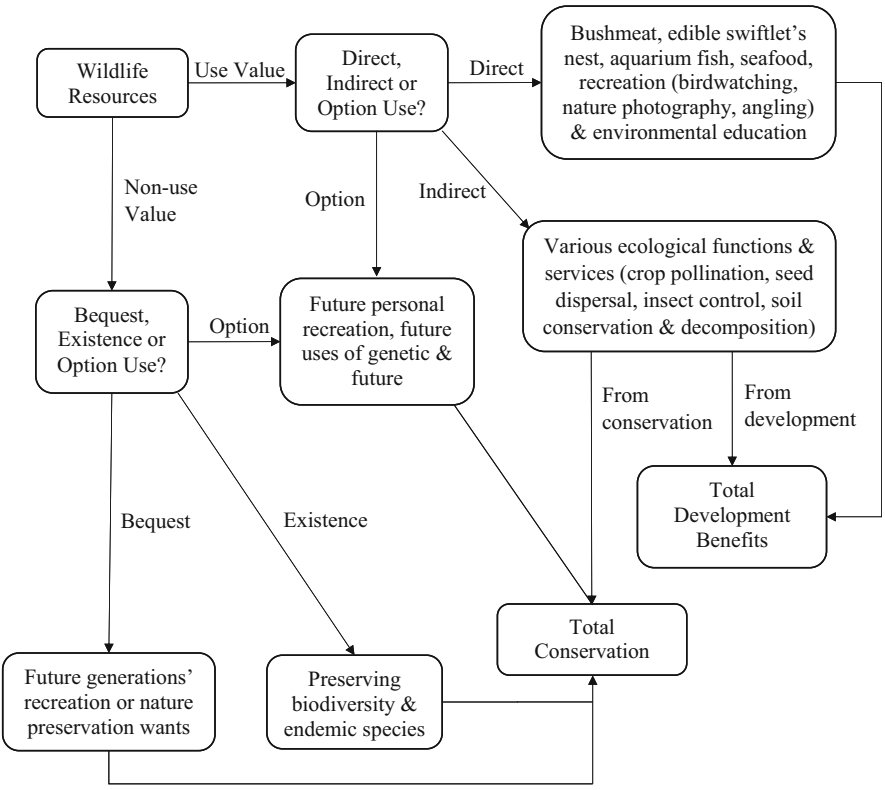


**Fig. 13.1** The total economic value of wildlife (Bateman & Turner, 1995)

Terengganu, Terengganu]. The economic values of many of such ecotourism spots in Malaysia have yet to be estimated.

The indirect use values are values gained from indirect uses of the resources. For wildlife, indirect use values include various ecological roles of wildlife in maintaining ecosystem functions and services that are beneficial to humans. For instance, bats have been known to be a crucial pollinator and seed disperser in an ecosystem (Kingston, 2010). Owing to their ecological roles, disturbance to bat populations will affect forest regeneration as well as the yield of many fruit crops (Fujita & Tuttle, 1991) including durian (*Durio zibethinus*) and petai (*Parkia speciosa*) of high economic return. As of 2019, durian export in Malaysia was reported to be US$22.3 million (Safari et al., 2021) implying the significant indirect use value we gained from ecological services provided by bats. Another example of a nocturnal animal contributing to such a value is the barn owl (*Tyto alba javanica*). In Malaysia, the owl species has been successfully introduced in agricultural areas, mostly in oil palm plantations (Puan, 2013) due to the abundance of rodents as food and the provision of nest boxes in these plantations. A study on the predation efficiency of the owl showed that a breeding pair and their chicks could consume

up to 1200–1500 rodents annually (Duckett & Karuppiah, 1990). In most plantations, the owls provide supplemental biological control of rodent pests, which has helped to reduce the baiting cost of RM2–RM30 per ha annually (Hafidzi & Saayon, 2001). These are examples of the indirect use values we obtain from wildlife.

Similar to the concept of paying for insurance coverage, option value represents the value derived from knowing the existence of an opportunity or leaving an option of using certain resources in the future. For example, people would be willing to pay for the preservation of the leatherback sea turtle (*Dermochelys coriacea*) to have an opportunity to observe the animals in the future. On the other hand, bequest value is the benefit obtained by individuals from knowing that their future generations will be benefited in the same way in the future. This is evidenced by the contribution of money and energy by volunteers in environmental programmes to create awareness of preserving natural resources for future generations. Similarly, existence value is the benefit derived from simply knowing that the resources exist even when one may not have utilised or had any intention of using these resources. Existence value can be significant especially when it involves threatened species like hornbills or very unique habitats like the montane forest. A person may be willing to contribute a certain amount of money to protect these resources, although he or she is not a birdwatcher or has limited knowledge of birds. Over the last two decades, many environmental NGOs, projects or programmes have been established in Malaysia of which their major intention can be directly and indirectly linked to indirect use, bequest and/or existence values. With each targeting on a specific taxon, such programmes or projects include the Sea Turtle Research Unit (SEATRU) formed in 1998 in Terengganu; the Raptor Count that started in 2000 at Tanjung Tuan, Melaka; the Malaysian Conservation Alliance for Tigers (MYCAT) founded in 2003; the Save Our Seahorses (SOS) that commenced in 2005; the Hornbill Volunteer Programme that started since 2008 at the Belum-Temengor Forest Complex; the Turtle Conservation Society of Malaysia that established in 2011; and the Sabah Shark Protection Association formed in 2015.

SEATRU has been operating for more than two decades with its volunteer programme running annually from April to September. Over the years, the responses of volunteers have been overwhelming. A willingness of these volunteers to pay a participation fee (i.e. RM500–800 for each local participant) can indirectly reflect the value people place on the conservation of wildlife, to a certain extent, and in this case, the sea turtle. In addition, many of such organisations or programmes also receive a donation from public or private funders to carry out their work, e.g. RM11.4 million being donated to the Borneo Rhino Alliance (BORA) in 2009 for saving the then critically endangered Sumatran rhinoceros (*Dicerorhinus sumatrensis*), which unfortunately has now gone extinct locally. In Malaysia, as well as Southeast Asia in general, more and more research units or programmes have been formed, most of which offer internship and/or volunteering and outreach programmes. Examples include the Tropical Research and Conservation Centre (TRACC) in Borneo initiated in 2001; the Southeast Asian Bat Conservation Research Unit (SEABCRU) founded in 2007; Rimba formed in 2010; the

Management and Ecology of Malaysian Elephants (MEME) founded in 2011; the Hose's Civet and Small Carnivore Project in Borneo (HOSCAP Borneo) commenced in 2012; and MareCet Research Organization established in 2012.

In Malaysia, other than using market price, the contingent valuation method (CVM; e.g. Amiry et al., 2009; Mohd Rusli et al., 2009; Puan & Zakaria, 2006; Siew et al., 2015) and travel cost method (TCM; e.g. Syamsul Herman et al., 2013) are two valuation methods that have frequently been applied in estimating the value of wildlife (particularly non-traded animals) and/or wildlife-based activities. CVM requires people to state their value directly through a survey or interview about their willingness to pay (WTP) for a particular ecosystem service. On the other hand, as its name implies, TCM calculates the related value based on the amount of money and time to access and engage in certain activities (mainly recreational activities). For example, visitors to the Panti Forest Reserve in Johor are required to pay RM150 to get a permit to access the forest, a popular site for birdwatching. Such payment can then be used as a starting bid to measure the economic value of the forest via the concept of WTP, in addition to the associated costs to make such travel.

Fraser's Hill in Pahang is another renowned birdwatching site (Noramly & Yeap, 2001; Puan & Zakaria, 2006), which attracts both local and foreign birdwatchers. The money and time that these birdwatchers are willing to spend are an indication of the value they placed to engage in wildlife-based activities at the site. However, does this mean Fraser's Hill has no value to non-birdwatchers or people who have never visited the site? Puan and Zakaria (2006) attempted to answer this question by conducting a questionnaire survey of the WTP (Bateman & Turner, 1995) of both birdwatchers and non-birdwatchers for the protection of Fraser's Hill as a bird sanctuary. It was estimated that respondents were willing to contribute at least RM30.40 per year for that purpose. By multiplying this estimate by the annual number of visitors, the conservation value or benefit of protecting Fraser's Hill was estimated at RM1,463,760 per year.

Another example of a wildlife value estimation approach would be based on the costs of damage avoided, replacement or substitution, e.g. the value of the endangered milky stork (*Mycteria cinerea*) in Malaysia was about RM404,000 based on the costs of species reintroduction in 1997 (Davison, 1997). To deal with HWC in Kelantan, some local villagers took the initiative by installing fences (58.82%) or shooting wildlife (41.8%), while others chose to ignore the conflict (31.02%) or made a report to the related authorities (29.95%). Some even tried to approach poachers to resolve conflicts as it was perceived to be more effective (Hassan et al., 2017). All these actions have their respective costs and challenges that the villagers have to bear (Nyhus et al., 2005). On a larger scale, the Malaysian government had allocated RM2.5 million to purchase land for the building of wildlife corridors, habitat restoration and HWC monitoring (Ten et al., 2021) as part of the Central Forest Spine (CFS) Master Plan for Ecological Linkages. The CFS aims to restore connectivity among forest complexes in Peninsular Malaysia (DTCP, 2009; Saaban et al., 2016) as a long-term solution to deal with HWC. Other efforts include having restrictions on the expansion of lanes on highways, monitoring viaduct effectiveness to habitat connectivity and stepping up anti-poaching

efforts (Wong et al., 2018) by involving the local community (Hassan et al., 2017). Viaduct usage is also being improved via habitat enrichment, e.g. by deploying artificial salt licks, establishing pastures and planting local fruit trees (Zainol et al., 2021). All these measures exist and therefore should be properly accounted for (e.g. cost-benefit framework) in development projects.

## 13.5 The Way Forward: Wildlife Value Capturing and Inclusion

Malaysia harbours rich and diverse wildlife resources, and consumers or stakeholders may place very different economic values on these resources. From a Malaysian perspective and based on mostly local case studies, this chapter highlighted not only the current environmental issues that have resulted from market failure as well as ignoring the TEV of wildlife resources in the country but also the potentials of capturing these values in the country. Furthermore, this chapter also reveals that there are plenty of research opportunities to estimate the economic values of wildlife in Malaysia.

With the country's population of more than 31 million, greater pressure will continue to befall wildlife and their habitats in Malaysia over time. Even with the current Wildlife Conservation Act 2010 that has had the majority of wildlife species listed as totally protected or protected, this still does not guarantee the long-term protection of these animals. Under limited public budgets, wildlife conservation will need to compete with many other social goals, whose related costs and benefits are already clear in monetary terms. In other words, if wildlife resources are merely being treated as raw materials to be exploited, no amount of scientific knowledge or justification will solve the problem of wildlife loss. With such a condition, more wildlife is expected to follow the footsteps of the already locally extirpated Javan rhinoceros (*Rhinoceros sondaicus*), green peafowl (*Pavo muticus*), leatherback sea turtle and Sumatran rhinoceros.

Considering the increasing risks of losing our natural resources and biodiversity and having more HWC in the future, developing countries must find ways to reconcile the need for wildlife conservation and economic development, as well as bridging the gap between policymakers and conservationists via stakeholder participation, community engagement and integration of scientific-based knowledge. In addition, this can also be achieved through integrating economic values of wildlife resources and mainstreaming the importance of such values into all levels of decision- and policy-making processes to prevent undesirable externalities, as mentioned above. All in all, the TEV of wildlife needs to be sufficiently identified and empirically assessed and captured through appropriate economic instruments (Bateman & Turner, 1995; Davison, 1997). All these are requirements that will facilitate the implementation of Payments for Ecosystem Services (PES; MNRE, 2016; Wunder, 2005) in the future. Capturing these values would provide economic incentives coupled with finding a sustainable financing mechanism to safeguard our wildlife resources and mitigate HWC so that humans and wildlife can co-exist harmoniously.

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