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# Editorial: Reconciling nature conservation and sustainability of tropical ecosystems

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## Editorial on the Research Topic

### Reconciling nature conservation and sustainability of tropical ecosystems

The tropics are home to some of the world's most biodiverse areas and a wide variety of ecosystems, including some of the most iconic ones, such as the Atlantic and Amazonian forests of Brazil, the Serengeti, the Borneo, and the Congo rainforests. They also host approximately two-thirds of the earth's biodiversity (Sodhi et al., 2007) and many of the most endangered plant and animal species. Many local human populations also rely on the resources and services provided by these ecosystems: Fedele et al. (2021) estimate that approximately 1.2 billion people in the tropics (30% of the region's population) depend directly on locally available natural resources to meet their basic needs.

The importance of tropical biodiversity is demonstrated by the plant and animal resources it can provide, such as those used for human and animal food, fuel and timber, as raw materials for countless uses, and species used in traditional medicine. Tropical ecosystems are also vital to local people, by supporting socio-economic activities such as livestock farming, fuelwood harvesting, tourism, or even by providing support to cultural and spiritual needs. However, some more destructive practices, such as deforestation, land conversion to agriculture, or overexploitation, are unlikely to safeguard resource sustainability. Disputes can therefore be expected when conservation conflicts with human needs, such as poverty reduction or livelihood improvement (Minteer and Miller, 2011).

Seeking compatibility between conservation and development is a major and unavoidable challenge. Since the United Nations Convention on Biological Diversity, signed at Rio de Janeiro in 1992 (<https://www.cbd.int/>), many international legislative initiatives have reinforced the need to ensure that coexistence is achieved in a balanced way. The Kunming-Montreal Global Framework for Biodiversity, drawn up in 2022, refers

(Target 4) to the need to adopt “sustainable management practices, and effectively manage human–wildlife interactions to minimize human–wildlife conflict for coexistence.” These are essential “to halt human induced extinction of known threatened species and (...) to maintain and restore the genetic diversity within and between populations (...)”.

In conservation terms, the human–wildlife conflicts or, more generally, development–conservation conflicts are one of the most difficult problems to solve (Dickman, 2010). Not only do they pose a significant threat to species, but they also affect human livelihoods, food security, resource sustainability, sustainable economic development, and social equity (IUCN, 2023; Redpath et al., 2013).

The complexity of biodiversity-related conflicts, which often involve a wide range of stakeholders and a variety of factors, calls for the development of management strategies that are based on evidence of various kinds (Young et al., 2010). Human impacts on wild plants and animals should be interpreted in the light of the socio-economic and cultural contexts (Soliku and Schraml, 2018), which require close coordination between the social and natural sciences.

The number of published scientific articles associated with the keywords “conflicts” or “impacts” between humans and wildlife has increased significantly over the last two decades (Figure 1), which may indicate the growing concern about the topic and/or reflect a growing number of conflicts. Although the term “wildlife” can be used for both flora and fauna, it is much more commonly used for fauna, so many conflict situations related to plants may not have been identified (Figure 1a). When searching for the terms “over-exploitation” or “over-harvesting” or “deforestation”, the increase in the total number of publications is similar but, as expected, those concerning flora dominate (Figure 1b).

The aim of this Research Topic “Reconciling Nature Conservation and Sustainability of Tropical Ecosystems” is to bring together studies that address the reconciliation of biodiversity conservation and sustainable development.

Different uses of the same habitat (or species) by different groups are one of the most common sources of conflict (Young et al., 2010). This is the case for great apes in Africa and Southeast Asia, whose habitat is often affected by the expansion of agricultural land by local people. Meijaard et al. suggest that optimized land use planning combined with strategic investments in agriculture and wildlife conservation can improve the coexistence between great apes and humans. They also argue that it is essential to support effective economic development policies, enforce forest protection laws, participate in trade policy debates and link trade policy, food security, improved agricultural techniques and sustainable food systems to prevent further decline in great ape populations.

Conflicts resulting from changes in land use are also a challenge in other ecosystems. Sandoval-Calderon et al. identify changes in land use, economic activities, and climate as the main drivers of shifts in wild and domesticated camelid populations in the Apolobamba National Park in Bolivia. They found a negative correlation between wild vicuña populations and indigenous communities without mining activities, whereas communities with increasing mining concessions supported larger vicuña populations, likely due to local conservation efforts and reduced competition with domestic livestock. The authors suggest, however, that alternative livelihood sources besides mining should be addressed to improve the sustainable grassland management and the livelihoods of indigenous communities. Understanding the long-term effects of land use changes is essential to defining comprehensive and sustainable land-use strategies that

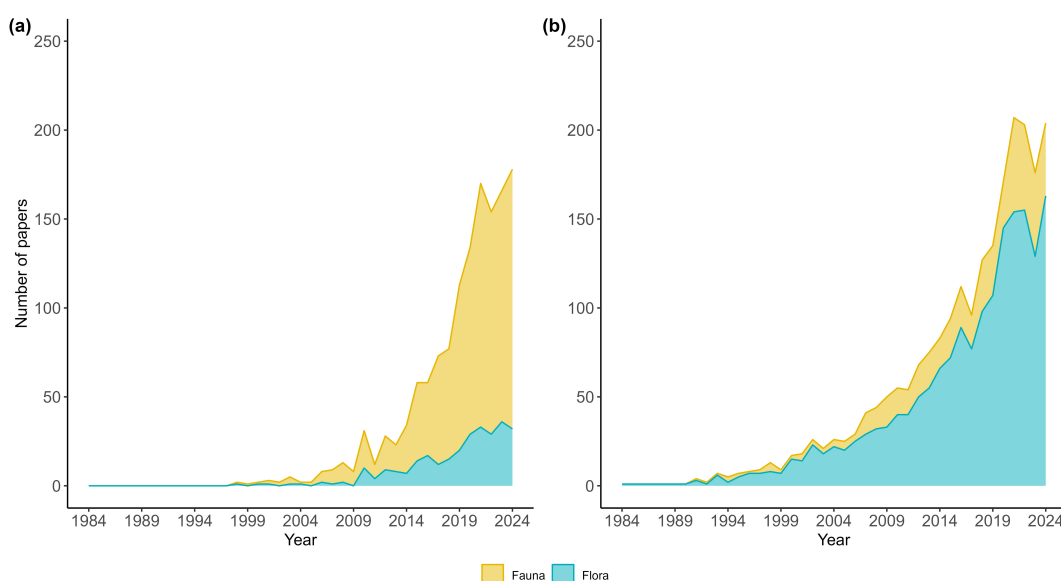


FIGURE 1

Stacked area graphs that illustrate the number of scientific articles with keywords (a) “human–wildlife” and (“conflict” or “impact”) and (“flora” or “plant” or “fauna” or “animal”) - totaling 1239; and (b) (“over-exploitation” or “over-harvesting” or “deforestation”) and (“conflict” or “impact”) and (“flora” or “plant” or “fauna” or “animal”) - totaling 2020. Retrieved from Web of Science, January 2025.

support grassland and animal conservation while providing livelihood security.

Another issue is human actions that attempt to improve ecosystems, which, if not properly planned, can lead to conflict. This is the case with ecosystem restoration, where taking into account local needs and cultural contexts can increase the equitable sharing of benefits. Changing land-use management strategies affects indigenous practices, so a better understanding of landscape history, especially through the collection of paleoecological data, can make an important contribution (Gillson et al.). Paleoecological data help to reconstruct past vegetation types, thus contributing to an improved interpretation of current landscapes in mega-diverse areas, such as Madagascar (Gillson et al.). In this way, future conflicts could be reduced through ecologically and socially responsible community engagement in restoration projects (Fox and Cundill, 2018).

Increasing conflicts between conservation and human activities seem inevitable (Redpath et al., 2013), and conservation and management practices should take into account the interdependence between people and nature (the biocultural and people-centered conservation, referred to by Hoffmann, 2022). Greater cooperation with indigenous peoples, community groups and private initiatives is essential to the success of biodiversity management and conservation in the 21st century (Maxwell et al., 2020).

However, there is still a great need to develop multidisciplinary approaches that can help reconcile human-wildlife relationships and transform conflict into healthy coexistence. There are no simple or clear-cut solutions to resolving conflicts between development and conservation, as each case is unique, and above all, as Young (2006) points out, we need to avoid missing the forest for the trees.

## Author contributions

MD: Conceptualization, Visualization, Writing – original draft, Writing – review & editing. JM: Visualization, Writing – review & editing. SB: Writing – review & editing. MR: Conceptualization, Writing – original draft, Writing – review & editing.

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