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# Editorial: Global change ecology: threats and solutions

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## Editorial on the Research Topic

### Global change ecology: threats and solutions

## 1 Introduction

The special Research Topic, “Global Change Ecology: Threats and Solutions,” seeks to illuminate the complex interplay between global environmental changes and ecological systems. In an era defined by rapid transformations driven by human activities and natural processes—such as climate change, urbanization, biological invasions, and pollution—an understanding of these dynamics is crucial. These global changes are causing significant biodiversity loss and triggering adverse eco-evolutionary impacts at various scales, from individual populations to entire ecosystems. Thus, our Research Topic of interdisciplinary articles provides crucial insights into how such environmental shifts can reshape biodiversity and ecosystem functions.

This topic encompasses a wide array of studies focusing on the effects of environmental stresses on diverse biotic communities, ranging from terrestrial to marine ecosystems. By integrating experimental, modeled, and observed data, the contributions explore ecological and evolutionary responses that enhance our ability to forecast and mitigate the impacts of environmental disturbances. Articles in this Research Topic address key areas such as ecological responses to climate variability, land use dynamics, sustainable agricultural practices, urban environmental influences, and the ecological ramifications of pollutants and invasive species. Through such comprehensive scrutiny, the research presented aims not only to document current changes but also to foster resilience and resistance within ecosystems, thereby aiding in the development of sustainable environmental policies and practices for the Anthropocene.

## 2 Major contributions

Our Research Topic brings together a diverse array of studies that delve deep into the dynamic interactions between global environmental changes and ecological systems. In

their exploration of aquatic protected areas (i.e., on the Qinghai-Tibet Plateau in China), Li et al. highlight the strategic establishment and location of these areas and the significant conservation gaps that they attempt to fill, underscoring the need for enhanced community-based conservation practices and increased research funding to protect threatened species. Similarly, the study by Doloiras-Laraño et al. examines how alterations in river flow affect microbial communities in hyporheic zones, and thereby demonstrates that changes in water discharge can significantly influence microbial diversity and ecosystem services such as nutrient cycling and pollutant degradation. This research points to the critical need for managing river flow regimes to sustain the ecological integrity of these vital zones. Further addressing the challenge of invasive species, Mu and Li use species distribution models to evaluate the risk posed by *Chelydra serpentina* in China. Their findings indicate a potential expansion of the species' habitat, which can heighten risks to local biodiversity. They also stress the importance of advanced monitoring techniques (i.e., with environmental DNA) for effective management. In the realm of biodiversity and ecosystem management, studies by Zhang et al., Chen et al., and Li et al. collectively address the impacts of global changes on species distributions and agricultural practices.

These studies show that strategic, adaptive management approaches can significantly influence biodiversity conservation, from optimizing species distributions under changing climates to enhancing arthropod diversity in rice agroecosystems through sustainable practices. Contributions that further our understanding of ecological dynamics, Yang et al. investigate how variations in precipitation affect nutrient dynamics and microbial activity in agroecosystem subsoils, emphasizing the importance of adaptive soil management strategies in response to climate variability. Additionally, Cambrone et al. apply random forest models to set global conservation priorities for the pigeons and doves of the family Columbidae, thus showcasing the usefulness of data-driven approaches to refining conservation efforts. Lastly, the opinion piece by Li et al. critiques current biodiversity modeling techniques and advocates for incorporating moderators into dissimilarity-based models, proposing a more sophisticated approach to predicting ecological changes. Their call for enhanced modeling accuracy underscores the ongoing need for innovation in ecological research methodologies.

Together, these studies illuminate the multifaceted approaches necessary to understand and combat the ecological impacts of global changes. They not only deepen our understanding of ecological systems but also showcase the effectiveness of interdisciplinary approaches in advancing conservation strategies and sustainable management practices across different ecological contexts.

### 3 Impact of research and conclusion

As the challenges posed by global ecological changes escalate, the need for a collaborative and integrated research approach becomes more evident. Consequently, our Research Topic profoundly enhances our comprehension of ecological responses to global changes. This Research Topic spans diverse ecosystems and

biological scales, illustrating the intricate interplay between human-induced pressures (e.g., climate change, urbanization, and biological invasions) and natural ecological dynamics. The findings from these studies are pivotal in advocating for and developing multidisciplinary approaches that blend cutting-edge scientific methodologies with practical conservation strategies. By doing so, they not only deepen our understanding of the ecological impacts of human activities and natural processes but also showcase effective strategies to enhance ecosystem resilience. For instance, the predictive models and conservation strategies highlighted throughout offer practical tools for forecasting and mitigating the impacts of environmental disturbances, which are crucial for policy-making and ecological management. This paradigm is essential for developing effective, sustainable responses that support the coexistence of human and natural systems in the Anthropocene.

### Author contributions

J-RL: Writing—original draft, Writing—review and editing. QC: Writing—review and editing. KW: Writing—review and editing. M-CC: Writing—original draft, Writing—review and editing. VR: Writing - original draft, Writing—review and editing.

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### Conflict of interest

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

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