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Editorial: Interplay between climate change, land use change, and human health: opportunities and challenges

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Editorial on the Research Topic

[Interplay between climate change, land use change, and human health: opportunities and challenges](#)

The phenomena associated with climate change and land use change form a mix with dangerous and unpredictable consequences for human life on this planet. The anthropic effects of the hazardous processes of transformation of the territory that developed countries underwent during the 20th century can be observed today in the form of floods in Central European countries (Zander et al., 2023), debris flows in luxury urbanizations in California (Serra-Llobet et al., 2023), coastal regressions on Mediterranean beaches (Bianco et al., 2020), and environmental crises due to water loss in wetlands and internationally protected natural parks (García-Ayllón and Radke, 2021).

However, this situation of increased risks to human life and ecosystems is not limited to developed countries. The dangerous cocktail of anthropic changes in land use and climate change throughout recent decades is having even more serious consequences on the vulnerability of the land to natural risks. Landslides in Brazil (Marengo et al., 2023), floods in Bangladesh (Azeem et al., 2023), droughts in Africa (Ahmed, 2020), and wildfires in India (Mansoor et al., 2022) are just some of the first consequences that the absence of large-scale measures to mitigate these phenomena will lead to in the future.

Therefore, the need for studies concerning the application of adaptive strategies to climate change in relation to the anthropic effects of changes in land use is one of the great future challenges facing our global civilization. The major growth in cities around the planet (Wang et al., 2023), which will absorb almost 70% of the population by 2050, forces us to rethink how to make territorial planning a tool to ensure our environment is more sustainable in the face of the effects of climate change.

In this field, the enormous development in recent years of spatial analysis tools based on geographic information systems, calculation routines aided by artificial intelligence, and land cover evaluation procedures thanks to remote sensing, undoubtedly represent a great ally in achieving this objective through the study of current phenomena from a scientific perspective. It is for these issues that it was necessary to develop a Research Topic that addresses the latest advances on this subject. Then, a call for papers was opened to address how global climate change significantly affects human life and land use change (LUC). The aim was to analyze how the

expansion of urban construction through urbanization in developing countries is prominent, and LUC is one of the major sources of carbon emissions growth, causing increased vulnerability to the environment.

In this context, contributions such as that by Yang et al. provided details on maintaining the integrity and sustainable development of the ecosystems of the Lancang River in China, quantitatively calculating the contribution rate of human factors and climate factors to runoff change by source area of the river through the Budyko method. A similar interesting methodological approach, but based on the surface parameter and the Normalized Difference Vegetation Index, was carried out by Gao et al. in assessing the influence of vegetation variation in the upper reaches of the Luanhe River (China) on streamflow, showing that the effect of vegetation change on the water cycle requires further study.

A different approach to addressing the problems arising from the interaction between the phenomenon of territorial anthropization and climate change is found by Niu et al., through the development of specialized villages for rural revitalization and the provision of practical strategies for their development in underdeveloped areas of China. However, the most relevant phenomenon in developing countries regarding this issue is undoubtedly the hydrological problem. In addition to the numerous droughts in African countries, the phenomena related to flooding in Asia are especially relevant (Mori et al., 2021; Try et al., 2023).

In such scenarios, the use of spatial analysis tools to observe the spatiotemporal evolution of hydrological phenomena is particularly interesting, as pointed out by Liu et al. in their analysis of multi-temporal scale changes of streamflow in the source area of the Lancang River in China with a seasonal scale. Using the trend-free pre-whitening Mann-Kendall (TFPW-MK) test method, the concentration degree and the concentration period, and Bernaola-Galvan (BG) segmentation algorithms, they demonstrate that under the influence of climate change and human activities, the intra-annual distribution characteristics of streamflow have changed, directly affecting the exploitation of water resources and the health of ecosystems.

Finally, another no less important phenomenon is the environmental impact that soil transformation processes can generate in conjunction with climate change. Ye et al. alert us that floating object pollution in the Three Gorges Reservoir area in China is a serious environmental problem; using remote sensing images to obtain the distribution of floating objects and combining it with current land use data, they study the relationship between land use and river floating objects.

Another innovative methodological approach is that of the study by Li et al. about the spatial and temporal distribution characteristics and prediction analysis of nitrogen and phosphorus surface source

pollution in Shandong Province in China under climate and land use changes. Based on precipitation data under three different global climate models and two shared socioeconomic pathways, land use data were used to simulate and predict the non-point source pollution of N and P in Shandong Province in 2030, providing a useful theoretical basis for the prevention and control of non-point source pollution in the future.

We can verify that the interaction between climate change and land use changes generates very heterogeneous derivatives. As we have seen, there is also a varied catalog of new ways to address this problem due to technological advances in the field of spatial analysis of anthropic phenomena in recent years. Society is not always aware of the origins of the issues associated with the complex feedback between land use transformation and climate change. Nevertheless, we are accepting our responsibility for the need to act on the effects of its consequences, which affect the whole planet. For the moment, it is at least encouraging that several relevant research tools from the scientific field are already available to address mitigation and adaptation strategies to deal with this problem. The challenge for the future is therefore to ensure that our authorities take advantage of all this scientific knowledge.

Author contributions

SG-A: Conceptualization, Validation, Writing–original draft, Writing–review and editing.

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