frontiers | Frontiers in Environmental Science

TYPE Editorial
PUBLISHED 18 July 2023
DOI 10.3389/fenvs.2023.1238572

OPEN ACCESS

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RECEIVED 12 June 2023
ACCEPTED 22 June 2023
PUBLISHED 18 July 2023

CITATION
Ren S and Yang X (2023), Editorial: Land use management and carbon abatement in a sustainable development perspective.
Front. Environ. Sci. 11:1238572.
doi: 10.3389/fenvs.2023.1238572

Editorial: Land use management and carbon abatement in a sustainable development perspective

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KEYWORDS

land use management, carbon abatement, sustainable development, climate change, urban transformation

Editorial on the Research Topic
Land use management and carbon abatement in a sustainable development perspective

Since the 1980s, global warming has gradually attracted the attention of governments and scholars. The average growth rate of global fossil CO_2 emissions since 2010 has slowed to 0.9% per year. Atmospheric CO_2 emissions amount to 34.04 billion tons in 2019. However, in 2020, global embargo caused by new crown epidemic contributes to sharpest-ever drop in CO2 emissions (see Figure 1). It is a widely acknowledged fact that global heating caused by anthropogenic carbon emission is one of the most challenging global crises with the capacity to cause existential threats to mankind. Additionally, unsustainable land use (deforestation, grassland reclamation, swamp transformation) has changed the balance of the carbon and oxygen cycle, leading to an increase in atmospheric CO_2 concentration. This climate change, in turn, has detrimental impacts on both human health and the natural environment.

Data resource: https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/pdfs/energy-economics/statistical-review/bp-stats-review-2021-full-report.pdf (BP Statistical Review of World Energy 2021).

As the most basic natural resource and economic factor, land is the material basis for human survival and the spatial carrier for social activities, industrial development and urban construction (Lambin and Meyfroidt, 2010). Through the influence transmission of land use, land cover change, ground nature change and climate change, mankind's land use activities have produced adverse consequences that clearly affect global climate change (Pašakarnis and Maliene, 2010; Ulucak and Khan, 2020). In this process, the land resource allocation not only directly participates in the carbon emission process of the ecosystem, but also indirectly affects the regional carbon emissions, which is of great positive significance for economic sustainable development at this stage (Lai et al., 2016). This Research Topic is committed to explore the mechanisms and processes of carbon reduction in land use management, and expect to find some channels to control carbon dioxide by optimizing land resources use.

This Research Topic aims to explore the main ways of land resource utilization and management at present, and find effective measures to alleviate the contradiction between disorderly land use and urban sustainable development. A total of 11 relevant papers are included in our Research Topic. These works provide a detailed discussion and analysis of

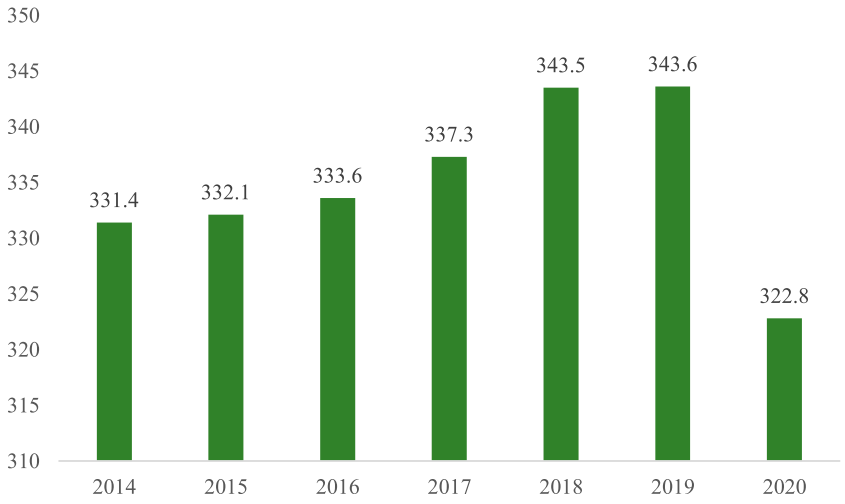

FIGURE 1
Global carbon dioxide emissions from 2014 to 2020 (Unit: 100 million tons).

the relationship between land use management and sustainable economic development. Following these works, we summarize the following significant insights and contributions.

The rapid and uncontrolled expansion of urban construction land has intensified the contradiction between land use and low-carbon development (Zhang et al.). With the spread of urban scale, the scale of land transfer and carbon emission are increasing in both quantity and space (Wu et al.). Urbanization has reduced the diversity of arable land types, leading to a gradual homogenization of arable land functions (Shi and Liu). The development of urbanization promotes the increase of carbon emissions, which is closely related to the large-scale population migration and the agglomeration of economic activities such as industry, construction and transportation in the urbanization process.

As an indispensable tool to improve the land use efficiency, intensive land use is an effective means to balance economic and environmental benefits. Land intensive use achieves carbon reduction mainly by promoting advanced industrial structure. Policymakers should expedite land intensive use development, appropriately synchronize land use levels across regions, and adequately leverage the role mechanisms of advanced industrial structure as a potent measure to promote carbon emission reduction.

Different types of socialized services have a significant impact on agricultural carbon emissions. Socialized services can provide basic services, production and operation services, financial services, and circulation services for the agricultural production chain, which can significantly reduce the agricultural carbon emissions intensity (Chen et al.). Social services can reduce the intensity of agricultural carbon emissions by promoting scale effects to break labor constraints. Although the diffusion of agricultural technologies can increase resource use efficiency, the diffusion of technologies can also lead to the use of elements such as high concentrations of chemicals and heavy agricultural implements, which may increase carbon emissions.

Agriculture is the second largest source of carbon emissions in the world. To achieve the strategic goals of "carbon neutrality", China proposed a series of agricultural policies at the beginning of the 21st century, which are important attempts to reduce agricultural pollution. The study found that the impact of rural tax reform on agricultural carbon emissions has important theoretical and practical implications. This tax reform can effectively reduce agricultural carbon intensity and improve agricultural carbon efficiency (Zhang et al.). In addition, in the process of land grant market reform, alleviating the contradiction between land use and low-carbon development is a key issue to achieve low-carbon development. The impact of marketization of land concessions on regional economic development is complex. Although the increased marketization of land concessions promotes carbon emissions, fixed asset investment will play a masking effect and an adjustment effect (Zhang et al.).

The major obstacle to reduce emission goals, however, is that the development and execution of environmentally friendly and economically sustainable strategies require major investment in energy-efficiency projects, which regrettably has been on a decline. The role of green finance in supporting R&D and innovation could be vital (Zhang et al.). Innovative technologies enable cleaner production and more efficient use of energy, while R&D can increase efficiency, cut production costs and improve productivity, which in turn reduces the capital cost, financing, and investment needed for energy-efficient projects. Moreover, technology and innovation could act as a catalyst to accelerate the financialization of natural and environmental resources, developing a system that is efficient in pricing and valuing different environmental resources and their role in fighting climate change. Only such an efficient green finance mechanism could help countries and organizations in reducing CO_2 emissions.

In summary, many prospective quantitative and qualitative analyses have been discussed in the literature from different research perspectives on the urban land use transition process, the transformation characteristics, the spatial and temporal patterns of carbon emissions, the influencing factors and related measurement methods. Scientific

literature related to this issue includes Nuissl et al. (2009), Nagendra et al. (2004), Fang et al. (2022), Houghton et al. (2012), Lai et al. (2016), etc. However, this research field is not without limitations that inspire further research. The available literature does not quantitatively analyze trends and inflection points in the land use transition process. There is little literature that analyses the process of stages and trending inflection points in the urban land use transition from a combination of qualitative and quantitative perspectives. Moreover, the existing literature ignores the influence of broader socio-economic variables, and there is little literature that combines socio-economic factors with land-use patterns to study their relationship with carbon emissions. Moreover, the existing literature ignores the influence of broader socio-economic variables and fails to integrate socio-economic factors with land use patterns to study the impact on carbon emissions. Therefore, it is an important research direction to study the spatial correlation between economic development, human capital, agricultural activities, and land use management. Further research can contributions on the subject of land use management and environmental management that use network structure theories, micro survey data analysis, and spatial econometric methodologies, from the viewpoints of corporate decision making, industrial structure upgrade, green technology, among others.

Author contributions

SR: Writing original draft. XY: Supervision, Conceptualization, data handling, and methodology. All authors contributed to the article and approved the submitted version.

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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