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# Editorial: The nexus between innovation and environmental sustainability

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## Editorial on the Research Topic

### The nexus between innovation and environmental sustainability

Osborn (1948) notably discussed environmental destruction by humankind, and since then, we have only faced growing concerns about resource over-consumption and environmental degradation. In the last few decades, it has become more evident that natural environments are increasingly stressed, potentially harming human communities even in the short to medium term (Steffen et al., 2015). At a global scale, humanity consumes natural resources 1.8 times faster than the rate at which those resources are generated. The consumption rate differs enormously between countries, ranging from 9 in Qatar to 0.3 in Yemen. The two most powerful global economies also show substantial differences: 5.1 (United States) and 2.4 (China) (Global Footprint Network, 2018). Such differences can be explained by factors related to production models and economic maturity, as well as collective lifestyles and behavioral patterns, which must be understood in the right context (Balsa-Barreiro et al., 2022a; Balsa-Barreiro et al., 2022b). Despite technological breakthroughs in recent decades, many scholars emphasize that global economic growth has not been decoupled from environmental impacts and resource needs (Parrique et al., 2019; Hickel and Kallis, 2020). As a result, many countries in the early stages of *economic maturity*, such as China and other Southeast Asian countries, are still willing to pay high environmental costs for economic growth (Balsa-Barreiro et al., 2019). The trend for the coming years will depend on the implementation of successful eco-innovative approaches, the shift to more mature economies in certain regions, and potentially other factors, such as the emergence of a new geopolitical scenario related to an eventual *deglobalization* (Balsa-Barreiro et al., 2020) and the emergence of major changes in the labor market (Rossi and Balsa-Barreiro, 2020).

In order to maximize benefits while reducing environmental costs, societies will have to cope with crucial transformations based on eco-innovative approaches. Environmental sustainability requires innovative methods to promote industrial upgrading, clean energy, green financing, and social responsibility toward the environment (Madaleno et al 2022). Many of these transformations will be technologically driven, but must still incorporate

multiple dimensions. Fukasaku (2020) refers to the key role of innovation policies, whereas Wiedmann et al. (2020) refer to lifestyle changes complementing technological shifts. Along this direction, we are observing how the most advanced countries are recently moving from linear economies to circular ones (Almeida and Cardoso, 2022; Nygaard, 2022) in order to shift away from the infinite-growth paradigm to alternative economic models that are compatible with ecological integrity.

The goal of this Research Topic is to analyze the link between innovation and environmental sustainability by evaluating factors such as knowledge (Dong et al.), finance policies (Gao et al.), trading (Andriamahery et al.), green financing (Zhang et al.), and environmental regulations (Sun; Chen et al.). These studies are conducted at different scales, from individuals (An et al.), to small datasets related to companies (Dong et al.; Zhang et al.), to wide regions in China (Dong et al.; Gao et al.; Sun et al.; Yin et al.) and Africa (Andriamahery et al.; Chukwudi et al.). Zhang et al. (evaluating 49 countries) and Chen et al. (discussing OECD and Non-OECD economies) conducted the largest studies. In short, this Research Topic features 10 articles with contributions from 32 authors. Some highlights are summarized below:

Dong et al. evaluated 36 unicorn enterprises in China to study the relationship between knowledge and open innovation. Zhang et al. evaluated 176 innovative enterprises and demonstrated how the talent ecosystem and collaborative innovation positively affect innovation performance.

In China, Gao et al. evaluated the impact of science and technology finance policy on urban green development at the city level. They found that this impact varies by region and depends on the level of urban innovation, being more evident in the highly innovative cities located in the Midwestern region. Yin et al. analyzed how the innovation environment affected the transformation of resource-based cities in the Gansu Province during the last decade. Sun et al. estimated the impact of environmental regulations on innovation and productivity related to green agricultural technology across 30 provinces and cities. Results showed that as the level of regional economic development gradually increases, environmental regulation can have a significant impact on both innovation and productivity.

In Africa, Andriamahery et al. analyzed the relationship between trade and environmental quality in Sub-Saharan Africa. They estimated a set of trade variables such as income *per capita* growth, energy intensity, foreign direct investment, human capital, and CO<sub>2</sub> emissions. The results showed that trading has a consistently negative impact on the environment by increasing N<sub>2</sub>O, ACH<sub>4</sub>, and CO<sub>2</sub> emissions across the whole region, but also across the different income groups. Chukwudi et al. analyzed the asymmetric impact of technological innovation on CO<sub>2</sub> emissions in South Africa for the last six decades. They found that technological innovation helps reduce CO<sub>2</sub> emissions, whereas trade openness is

environmentally harmful over the long term, despite the fact that it can be beneficial in the short term.

Zhang et al. discussed how technological innovation and green finance can contribute to clean energy transition, carbon emission reduction, and climate change mitigation in 49 countries with green bonds. Chen et al. examined the combinatory impact of environmental policies and technological innovation on the ecological footprint both for OECD and Non-OECD economies. An et al. demonstrated the positive impact of Internet payment technology on environmental sustainability by evaluating 623 individuals in China.

The articles published on this Research Topic contribute to a better understanding of the “*Nexus between innovation and environmental sustainability*”. Now that this Research Topic is completed, we will endeavor in next special issues to open new approaches by facilitating trans-disciplinary discussion on this and/or closely related Research Topic aimed to improve human welfare by respecting ecological integrity for future generations.

## Author contributions

JB-B drafted the manuscript and the rest of authors reviewed it. All authors contributed to the editorial article and approved the submitted version.

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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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