Which Justice in the Energy-Biodiversity Nexus: Exploring the Recognitional and Restorative Potential of Integrated Nature-based Solutions in Cities

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Abstract Urbanization is transforming landscapes, reshaping the lives of both humans and more-than-humans.While cities have driven economic growth and well-being,they have also deepened socio-economic inequalities and contributed to biodiversity loss through the expansion of the built environment.Moreover,meeting the growing energy needs of urban populations places additional pressure on ecosystems.Yet,cities also offer potential for coexistence,providing opportunities to support both human well-being and biodiversity through integrated approaches to conservation and urban design.For many years, biodiversity conservation received limited attention in urban planning and policy.This began to shift in 2024,when the European Union introduced the Nature Restoration Law (NRL), aiming to ensure the long-term and sustained recovery of biodiversity also in urban areas.The NRL also suggests that restoration of biodiversity should be considered in renewable energy strategies to address the dual challenges of biodiversity loss and climate change.To accomplish this goal,the NRL promotes Nature-based Solutions (NbS) as key instruments to restore degraded ecosystems and enhance biodiversity,also in synergy with renewable energy production.However,while their positive contribution from an environmental perspective has never been questioned, there has been criticism regarding the anthropocentric lens used in their application. This perspective recognized only the several benefits that nature provides to humans in term or economic,health, recreation and well-being without recognizing the role of more-than human as subjects of justice.This study adopts an ecological justice lens to examine the role that NbS planning can play in restoring and improving biodiversity in urban areas. It also explores,through the dimension of recognitional justice, whether NbS can address the needs and rights of both more-than-human nature and socio-economic vulnerable groups.To this end,this study employs Q-methodology, a mixed method approach that allows to investigate diverse individuals' perspectives on human-nature relationship.Indeed, in a first phase,literature review and semi-structured interviews lead to the creation of a series of statements which comprehend all the recognitional and restorative justice potential of NbS.In a second phase,a subset of selected stakeholders will sort and rank the statements based on their preferences, adding further explanation for their choices.The NbS case study focuses on community gardens,municipally owned land made available to citizens for urban agriculture, and to be integrated with PV systems, enabling the simultaneous restoration of biodiversity,food cultivation,and renewable energy production.The renewable energy generated would be allocated to socio-economic vulnerable groups,exploring how such multifunctional NbS can contribute to both ecological and social justice in urban settings.