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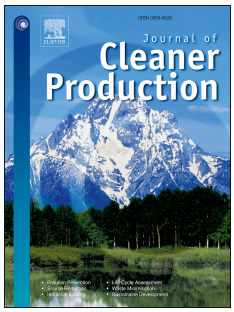

Water-energy-food nexus: Concepts, questions and methodologies

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Water-energy-food nexus: concepts, questions and methodologies

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Abstract

The water-energy-food nexus has gained increasing attention in the research communities as the security of water, energy and food becomes a very high concern due to future uncertainties. Studies pertaining to calculations of flows and dependencies between different resources, assessments of technology and policy applications, and quantifications of system performance have been conducted to understand their interlinkages and develop management options. This paper provides a state-of-the-art review on the concepts, research questions and methodologies in the field of water-energy-food. First, two types of nexus definition are compared and discussed to understand the nature of nexus research issues. Then, nexus research questions are summarized into three themes: internal relationship analysis, external impact analysis, and nexus system evaluation. Eight nexus modelling approaches are discussed in terms of their advantages, disadvantages and applications, and guidance is provided on the selection of an appropriate modelling approach. Finally, future research challenges are identified, including system boundary, data uncertainty and modelling, underlying mechanism of nexus issues and system performance evaluation. This review helps bring research efforts together to address the challenging questions in the nexus research and develop sustainable and resilient water, energy and food systems.