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Unconventional Water Resources: A golden opportunity to mitigate the mismatch between water supply and water demand

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Water scarcity is a serious socio-environmental challenge for sustainable development which is recognized as a potential cause of social conflict within and between countries. It is expected to intensify due to increasing water demands from increasing populations, rapid urbanization, industrialization, and climate changes. With predictions of dire global water scarcity, attention is turning to Unconventional Water Resources (UWRs) which are considered as supplementary water resources that need specialized processes to be used as water supply. The literature encompasses a vast number of studies on various UWRs and their usefulness in certain environmental and/or socio-economic contexts. Considering the increasing importance of UWRs in the global push for water security, the current study intends to offer a nuanced understanding of the existing research on UWRs by summarizing the key concepts in the literature. The number of articles published on UWRs have increased significantly over time and most publications were authored from researchers based in the USA or China, India, Iran, and Spain. Here, twelve general types of UWRs including fog, dew, rainwater harvesting, and cloud seeding as Atmospheric Unconventional Water (AUW); artificial recharge, fossil water as Unconventional Ground Water (UGW); iceberg water and virtual water as Transferred Unconventional Water (TUW), and wastewater, desalinated water, and agricultural drainage water as Processed Unconventional Water (PUW), were used to assess their global distribution, showing that climatic conditions are the main driver for the application of certain UWRs. Overall, the literature review demonstrated that, even though UWRs provide promising possibilities for overcoming water scarcity, current knowledge is patchy and points towards UWRs being, for the most part, limited in scope and applicability due to geographic, climatic, economic, and political constraints. Future studies focusing on improved quantitative documentation and demonstration of the physical and socio-economic potential of various UWRs could help in strengthening the case for some, if not all, UWRs as avenues for the sustainable provision of water.

Keywords: Water scarcity; UWRs; distribution maps; literature review