



## **Water requirements of large-scale bioenergy plantations for limiting global warming to 1.5°C**

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We assess the freshwater limitations for terrestrial Carbon Dioxide Removal as a contribution to the aims of the COP21 negotiations to limit mean global warming to well below 2°C. This will possibly require substantial negative emissions within the 21st century (amounting to ~10 GtC per year or more), likely to put further pressure on freshwater systems globally. We analyze – spatially explicitly within a given area constrained by terrestrial ecosystem conservation priorities and agricultural land and using a dynamic global vegetation model – the availability of freshwater for irrigation of biomass plantations dedicated to achieving these negative emissions through CO<sub>2</sub> assimilation. We take account of the simultaneous water needs for agriculture, industries and households, also accounting for environmental flow requirements needed to safeguard aquatic ecosystems. Furthermore we assess to what extent different forms of improved water management on the suggested bioenergy plantations and on agricultural fields may relax the situation, i.e. increase yields without using more freshwater and without compromising ecosystem functioning. Results indicate that additional water withdrawals range between 200 and 1500 km<sup>3</sup>/yr, additional area demand ranges between 500 and 900 Mha depending on the irrigation scenario, conversion efficiency of the carbon capture and storage process and the amount of required negative emissions.