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The potential impact of climate tipping points on drinking water supply planning and management in Europe

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In recent decades, substantial advancements have been achieved in state-of-the-art climate models, signifying commendable progress by the scientific community. These models have proven invaluable in comprehending and forecasting anthropogenic climate change. Nevertheless, their efficacy is limited when examining the intricate dynamics of tipping elements and their potential ramifications for overall climate stability. This limitation results in the absence of these tipping elements in widely adopted climate projections utilized by the drinking water industry to assess system resilience.

Despite the prevailing insufficiencies, there is a growing body of evidence indicating the existence and, conceivably, the imminent activation of certain tipping elements. The drinking water sector, characterized by its inherently slow-paced nature due to infrastructure designed for extended operational lifespans, faces a critical challenge. The rapid timescales associated with potential changes resulting from tipping element activations surpass the typical lifespan of drinking water infrastructure. Consequently, the water sector cannot afford to wait for scientific consensus to emerge.

This contribution asserts that climate tipping points pose a latent, underexplored, and potentially underestimated risk for the water sector. To address this concern, we introduce a straightforward model that explores potential magnitudes and timescales of abrupt climate changes linked to tipping element activations. Our investigation focuses on Europe, aiming to scrutinize the effects and consequences on drinking water supply. Specifically, we incorporate an assessment of the potential collapse of the Atlantic Meridional Overturning Circulation, deemed most pertinent for Europe based on projected effects, associated timescales, and implications for the water sector.

Our findings underscore the necessity of integrating tipping scenarios into the decision-making processes within the drinking water sector, given the profound uncertainty and far-reaching consequences associated with these events.