Article title	Critical evaluation of functional aspects of evaporation barriers through environmental and economics lens for evaporation suppression - A review on milestones from improved technologies
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Abstract	Climate change models predict an increase in rainfall variability, leading to floods and drought events, hence intensifying the need for reservoirs. However, up to 50% of reservoirs' capacity is lost by evaporation, affecting their function of ensuring water availability and stability. Over decades biological, chemical and physical barriers “covers” were developed for inhibiting evaporation. Such barrier's efficiency and applicability are still a matter of discussion, given their economic efficiency, environmental consequences, and operational difficulties are accounted for. In this review, we discussed the efficiency, applicability, and environmental suitability of these covers. Compared to the physical covers, the chemical and biological solutions tend to be less efficient. However, the use of physical covers is multidisciplinary, involving climate, material, and hydrological sciences, and are more efficient. Among the physical covers, the use of suspended covers and free-floating elements decreases evaporation to the tune of 85 and 80.0%, respectively. However, the economic efficiency of free-floating elements remains an open question since all studies overlooked their water footprint (water used in the manufacturing process of these covers), which was found to be very high. The use of these covers decreases heat storage, gas exchange rate, and light availability that could adversely influence dissolved oxygen, water quality, aquatic organisms, and the water ecosystem's function. These ecological consequences have not yet been investigated. The exception is the suspended covers, which have had determinate effects on dissolved oxygen and algae growth. Due to light weight, floating elements' operation is unstable and vulnerable to move due to wind effects. Therefore, such covers must be engineered to increase their stability. Free-floating elements could provide a visible and scalable solution to evaporation suppression when considering their economic visibility, environmental effects, and stability against wind and wave effects under the field conditions. However, these covers can be viable only when water availability is the limiting factor in crop production. We found that studies at reservoir scale are highly limited, therefore, investigations at reservoirs' scale emphasizing ecological aspects, cover stability and cost efficiency, are urgently needed.
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