

## Seawater flooding is becoming more frequent on low-elevation islands: Strategies to mitigate impacts on groundwater supply

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### ABSTRACT

Seawater flooding of low-elevation islands is expected to increase in the future, and in some areas, freshwater recharge is expected to decrease. These changes are leading to increased vulnerability of critical freshwater-lens groundwater supplies and eventually, in some cases, to complete loss of the freshwater resource. Possible mitigation strategies for reducing the impact of future seawater flooding on the freshwater lens will extend the longevity of such groundwater supplies. Four key strategies are evaluated using three-dimensional numerical-model simulations. (1) Adding surplus captured rainwater as artificial recharge shortens the time for the freshwater-lens water quality to improve, with groundwater salinity remaining lower even during the dry season, a period during which no artificial recharge is applied. (2) Intensively withdrawing high-salinity groundwater (that infiltrated during seawater flooding) for a short period following the flood can significantly reduce the impact of flooding on water quality for an extended post-flood period. (3) Installing a levee above a constructed subsurface flow barrier reduces the frequency of flooding events, while permanently increasing the freshwater-lens thickness (providing better water quality during non-flood periods), thereby improving post-flood water quality and shortening the recovery period. (4) Installing an engineered ground-surface covering in an area surrounding the well and within the well's capture zone (that can be made impermeable by closing drains during flooding) reduces initial flooding salinization of the aquifer nearest the well, providing a direct benefit to post-flood water quality.

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