

Impact of brine on the marine environment and how it can be reduced

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ABSTRACT

Seawater desalination is a potential solution for addressing water shortages. The number of desalination plants projected and constructed in some regions has substantially increased in recent decades. However, desalination process poses some undesirable environmental impacts in terms of energy consumption, land use, and seawater intake, but particularly the most significant impacts are related with effluent disposal and discharge. Thus, the challenge for the desalination industry is to produce new water resources without increasing pressure on the marine environment. The effluent characteristics depend on the feed water and desalination technology used. Negative environmental impacts of brine discharge from a desalination plant can be minimized by appropriate planning. The countermeasures should vary depending on plant size and type, the biological communities in the discharge area, and the area's hydrogeological features. This study overviews the available information about minimizing the harmful effects of the desalination industry. It highlights that an appropriate discharge location must be selected and the mixing of brine with ambient seawater must be maximized to reduce the environmental impacts of brine. Moreover, it is helpful to establish a carefully designed environmental monitoring program to assess brine plume distribution over time while monitoring biota. Frequent environmental monitoring programs of desalination plants normally show that the impacts are small, localized, and unimportant; however, significant effects have been detected in some cases. In these cases, effects can be mitigated by introducing devices that increase the mixing of effluent and surrounding seawater or/and by diluting the effluent before discharge.

Keywords: Desalination impact; Monitoring; Mitigation

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