Effects of Changes in Precipitation on Marine Ecosystems Due to Overstraining of Wastewater Treatment Plants

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Rainwater collected in the same pipes as wastewater increases inflow to the wastewater treatment plants (WWTP), reaching the capacity of WWTPs. When the WWTPs are overstrained, polluted water is by-passed to the ocean where the nutrients contribute to eutrophication and damage marine ecosystems. This study aims to understand correlations between precipitation and overflows at a WWTP to calculate future nutrient discharge. Furthermore, an examination of how nutrient discharge can affect the growth of microalgae commonly found on the west coast of Sweden was conducted. Data on rainfall from SMHI was compared to overflows at a WWTP to detect correlations. Results were used along with predictions on future precipitation based on two representative concentration pathways (RCP) climate scenarios to calculate future nutrient discharge. A strong correlation was observed between overflows at the WWTP and heavy rainfall. Future nutrient discharges vary depending on climate scenario and total precipitation. Compared to present nutrient discharge, nitrogen and phosphorus discharge are both projected to increase up to 10% for RCP4.5 and 17.5% for RCP8.5 by 2069-2098. A cultivation of three species of microalgae was introduced to brief intermittent nutrient discharges and growth was monitored by cell-counting. Green algae and diatoms showed high growth while the dinoflagellates showed no change. Without WWTPs adaptation to climate change, nutrient discharge will increase significantly. The response of ecosystems to increased nutrient discharge varies depending on the species composition of algae, biodiversity and water circulation, all of which will dictate the required degree of adaptation at WWTPs.

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