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Effects of climate change on water temperature and its consequences for drinking water production

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The average water temperature of the Rhine at Lobith has increased in the past hundred years by 3 [U+F0B0] C, as a result of thermal discharges and climate change. Also, a growing trend in the number of days per year that the water temperature reaches values above 25°C is observed, exceeding the temperature standard for drinking water production as imposed by the European Drinking Water Directive. During the heat wave of 2006, the water temperature at Lobith increased above 25°C during almost the entire month of July. Besides the risks for the production of drinking water, this limits the potential for the cooling capacities of the water for the industrial and energy sectors. The main objective of this study is providing insight into the change of water temperature in the Dutch main rivers caused by climate change and the consequences for the drinking water production at selected intake sites. Two KNMI'06 climate scenarios (W and W+) based on a global temperature rise of 2 [U+F0B0] C, were applied to the Dutch Temperature Model (DTM) to simulate the water temperature change around 2050 relative to the current situation (1970-2000). The DTM is a SOBEK River application and appropriate for calculating the regional effects of the natural warming and the warming due to cooling water discharges on the daily water temperature of Dutch rivers.

According to the analysis of model results, more days with a higher water temperature are expected for both scenarios around 2050 in comparison with the current situation. In the most extreme scenario (W+) the inter-annual variation of water temperature will be higher. In the Rhine and in the Meuse, the temperature rise in winter will be about 2.1°C and will reach values above 2.5°C in the summer months at the selected locations. At all intake sites for the water supply the temperature standard is exceeded in the current situation in less than 0.5% of the time (2 days). For the W and W+ scenarios the predicted duration of exceeding the drinking water standard at the site with the highest increase is 5 and 11 days, respectively. In these cases, only measures such as cooling between intake and final product in reservoirs or a temporary intake stop may prevent exceeding the legal standard.