A mathematical model for pollution in a river and its remediation by aeration

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\textbf{ABSTRACT}

We present a simple mathematical model for river pollution and investigate the effect of aeration on the degradation of pollutant. The model consists of a pair of coupled reaction–diffusion–advection equations for the pollutant and dissolved oxygen concentrations, respectively. The coupling of these equations occurs because of reactions between oxygen and pollutant to produce harmless compounds. Here we consider the steady-state case in one spatial dimension. For simplified cases the model is solved analytically. We also present a numerical approach to the solution in the general case. The extension to the transient spatial model is relatively straightforward. The study is motivated by the crucial problem of water pollution in many countries and specifically within the Tha Chin River in Thailand. For such real situations, simple models can provide decision support for planning restrictions to be imposed on farming and urban practices. © 2008 Elsevier Ltd. All rights reserved.