# Soil and groundwater contamination in the red river delta plain and numerical modeling of the contaminant transport

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**Abstract**

*The Red River delta plain is an area where various types of industry are concentrated and where the densely populated and important economic triangle of Hanoi, Haiphong and Quangninh is located. Environmental degradation of the Red River delta plain is consequently, a reality. The total population in the delta plain is approximately 17 million, of which 19.84% represents the urban population. The natural land area of the Red River delta plain is approximately 1.5 million ha. Of this, 1.25 million ha is currently utilized of which agricultural land constitutes 0.8 million ha. There are numerous industrial plants and factories together with a great number of so-called "traditional craft" industries, the waste management and treatment of which have not been appropriate. Solid waste and wastewater that has not been properly treated are dangerous for the soil and groundwater environment. Meanwhile, there are abundant groundwater sources in the plain, both in term of quantity and quality. Groundwater has been abstracted for domestic use and other economic purposes for a long time over the whole of the plain. Therefore, environmental management and protection are essential for protecting the soil and the groundwater resources in the area. The authors have made an overview of the environmental loading caused by different economic activities, presented some data of soil and groundwater contamination, generalized the groundwater potential of the plain and present a scenario for possible groundwater contamination by migration of the contaminants from waste by numerical modeling.*

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