A Framework of Uncertainty Analysis for Ecological Risk Assessment

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ABSTRACT

In recent years, Kenting in southern Taiwan was polluted accidentally by oil-spills from a stranded cargo boat and the coastal ecological condition was in danger by sticky oil and delayed clean-ups. After striking, however, none of a well-considerate planning on the collection of the ecological sampling or the ecological monitoring is setup there. The estimation of risk is still scarce even ecological conditions were deteriorated. Ecological Risk Assessment (ERA) demonstrates a systematized framework to predict the potential risks of ecological adversity more confidently that might be less concerned through the general biological ecology monitoring. The key point concerning that assessment is valid or not is based on credible ecological risk estimation. However, the uncertainty of estimating the result of risk can lie on how rigorous and intact the assessment processing, how reliable and complete the data referring, and how precise and durable the condition monitoring ? In this study the setup of a framework on uncertainty analysis for ERA is carried out. The major part of research aims at how to describe the uncertainty factors qualitatively, how to seek the key of uncertainty produced, how to confirm the precision of inferring information, how to increase credibility, and how to reduce uncertainty, etc. The Kriging estimation for spatial interpolation is applied to reduce the uncertainty induced by less density of sampled points. Also, the method of Monte Carlo simulation offers a kind of settlement in credibility of analyzing under the shortage of the information, as well as estimating uncertainty quantitatively. Due to lack of information in the ERA, the cases applied in air quality and water quality studies for Kriging estimation and Monte Carlo Simulation are compared. The results of study show that the interpolation by kriging estimation can actually be achieved in estimating the shortage of the data. Monte Carlo simulation can also present the uncertainty quantitatively to tell the difference through lack of data. We can expect that ERA and risk management can be done more precisely and offer the reference on a countermeasure of the emergency more accurately in the future through a well-considerate and proper framework on uncertainty analysis.

Keywords : Ecological risk assessment ; Uncertainty ; Kriging estimation ; Monte Carlo simulation

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