Fuzzy risk assessment for identifying significant environmental aspects

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ABSTRACT

Risk assessment can be a solid basis for environmental assessments, including environmental impact assessment, identification of environmental aspects, life cycle assessment and so on. In accordance with the steps of risk analysis developed by the Department for Environment, Food and Rural Affairs of UK, this study proposed a seven-step fuzzy risk analysis: (1)Hazard identification, including risk sources, receptors, effects and damages. The life cycle impact assessment will help to develop their causal relationships; (2) Estimation of the severity of hazards. Fuzzy logic is utilized to mimic the assessors ’ reasoning; (3) Estimation of the probability of hazards. Fuzzy probability is used for situations of no solid statistics; (4) Estimation of the Probability of the receptors being exposed to the hazard. Considering the influence and their paths exporting to receptors simultaneously, probability is fuzzified for situations of no solid statistics; (5)Estimation of the Probability of harm resulting from exposure to the hazard, probability is fuzzy for situations of no solid statistics; (6) Estimation of the risk of the harm. Vertex method is employed to aggregate these severity and fuzzy probabilities as a fuzzy risk score；(7) Evaluating the significance of a risk. The significance of a risk is assessment through multi-criteria and multi-connection comprehensive assessment (MCCA). Finally, two cases are illustrated for impact assessment and identification of environmental aspects.

Keywords : Fuzzy risk analysis; Life cycle assessment; Fuzzy logic; Multi-connection comprehensive assessment

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