APPROACHES FOR QUANTITATIVE ECOLOGICAL RISK ASSESSMENT OF INDUSTRIAL ACCIDENTS

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This poster investigates approaches that exist in literature to quantify ecological risks associated with industrial accidents, especially leakage of oil, gas and its derivatives to the ocean. Ecological Risk Assessments evaluate the likelihood that changes that are considered undesirable because they alter valued structural or functional characteristics of ecosystems (adverse ecological effects) may occur or are occurring as a result of exposure to stressors. Industries are increasingly interested in Quantitative Ecological Risk Assessment (QERA) because involvement in activities that hurt natural environments bring negative publicity and damage control after a large spill involves great sums of money. QERA helps either prove that the activities do not threaten living beings or assess just how much, so that management can be made to reduce ecorisks involved.

Many QERA approaches for quantifying risks of regularly occurring events (e.g. use of pesticides, waste discharge) have already been much developed and defined even though surely events usually cause minor ecological damage if compared to ones that rarely occur (i.e. industrial accidents). The PROTEUS model was pioneer in applying QERA to industrial facilities as a means of quantifying risk to the local ecosystem. It takes into account operational factors (maintenance, working procedures, level of education), management factors and technical design to estimate the probability of an incident. Duarte's Methodology links different specific areas of expertise such as fate and transport models, reliability analysis, ecotoxicology, and ecological modeling into a single methodology (with wider scope than a model).

An interesting way to explore the strengths of each approach would be to integrate parts of both into one assessment. Since the methodology has a wider scope, and is more complex, it is easier to include the model as a part of it. Seeing that PROTEUS is an excellent estimator of probability of risk, its procedures could be included in place of the frequency estimation step of the methodology. Given the thoroughness of the model in finding possible chemical escape routes, it is important to exclude the very low-risk scenarios so as to avoid an excessive number of accidental scenarios. Also, the model's output includes volume of contaminated water and other indicators of exposure, which can be used in place of the exposure assessment phase of the methodology. However, special attention would have to be given to the new outputs. Expert opinion would have to be explored to construct a function that links these environmental indicators to the species adverse effects indicators (e.g. fecundity, mortality) used by the methodology. The improved frequency estimation and exposure assessment can then be added to the population model developed by the risk assessor.

KEYWORDS: Quantitative Risk Assessment, Ecological Risk, Industrial accidents