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# Environmental No Impact Factor for Decision Making on Pollutants

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**Abstract:** *The decision making process based on environmental impacts of pollutants can be mathematically expressed. It will be helpful for taking right decisions on discharge of water pollutants and emissions of air pollutants in the environmental recipient components. No effect release can be made possible by reducing the pollutants with suitable decision making for which the indicators for potential impacts from the produced pollutant release has to be developed as Environmental No Impact Factor (ENIF). With the development of suitable mathematical models, NEIF can be applied to different pollutant releases in order to select the best option for reducing the potential impacts from the released/discharged pollutants. The present paper describes the scientific aspects in brief for such model applicable for discharge of water pollutants, emission of air pollutants and release of soil pollutants by which decision making becomes easier.*

**Keywords:** Environmental Pollutants, Decision making, Pollutant release, Pollutant discharges, Environmental Effects, Environmental Impact Assessment, modeling.

## I. Introduction

When materials and goods are produced or finished, the pollutants are separated and discharged or released into the environment in the forms of air pollutants, soil pollutants or water pollutants. These contaminants may of organic or inorganic nature in the forms of different compounds. These pollutants may represent a potential for causing harmful impacts on the environmental components, mainly the biota in the recipient environment. The amount of pollutants discharged/released will normally at a later stage too and may exceed the limits of their assimilation in that environmental component. Therefore it becomes of a major concern for the environment and its management. This calls for the development of a suitable method for evaluating the potential environmental risks associated with these pollutants arising from their discharges/emissions or release.

The proposed method gives a quantitative measure of the potential risks and thus is able to form a strong basis for the reduction of such impacts in a scientific and systematic manner. This is based on the calculation of No Environmental Impact Factor similar to Dose related Risk and Effect Assessment model. The No Environmental Effect Factor is based on a Predicted Environmental Effect Concentration (PEEC) and Predicted Environmental No Effect Concentration (PENEC) assumptions. In this concept, the Predicted Environmental Effect Concentration (PEEC) of the pollutant under consideration for the discharge/emission/release is to be compared with some threshold limits of Predicted Environmental No Effect Concentration (PENEC) for those pollutants. If the PEEC (Predicted Environmental Effect Concentration) is higher than the threshold PNEEC (Predicted Environmental No Effect Concentration), then there can be a risk for damaging impact. If the PEEC (Predicted Environmental Effect Concentration) is lower than the threshold PENEC (Predicted Environmental No Effect Concentration) then the probable risk for damaging impact can be considered as 'Acceptable'.

## II. Predicted Environmental Concentration

The PEEC (Predicted Environmental Effect Concentration) is time dependant variable concentration resulted in the receiving environmental component due to discharge/emission/release of pollutants. It can be calculated for all sort of pollutants and containment compounds which have potential for harmful effects on the biological components. These calculations can be made as per Does related Risk and Effect Assessment. It is helpful for calculating the behavior of pollutant in the receiving environmental component under the influence of various forces, processes like mixing, turbulence, temperature, degradation etceteras which may get generated for dynamic changes.

## III. Predicted Environmental No Effect Concentration:

The Predicted Environmental No Effect Concentration (PENEC) denotes the lower limit at which the effect of pollutant under consideration on the recipient environmental component is encountered. Such level is almost derived for all major pollutants and is available in publically available common literatures. Such levels are obtained by experimental investigations after laboratory and field testing for each of these pollutants under considerations just like Lethal Dose 50, Lethal Concentration 50 or similar tests and No Observed Effect concentrations are derived and then the Predicted No environmental Effect Concentrations are obtained. For practical decision making assessment process, the considerable data from the work done is to be collected and reliability is to be tested and then assessment is to be carried out.

## IV. The Environmental Impact Factor:

The No Environmental Impact factor is related to recipient environmental component like air, soil or water for which the Ratio of PEEC (Predicted Environmental Effect Concentration) to PENEC (Predicted Environmental No Effect Concentration is greater than 1 for any pollutant or group of pollutants or contaminant compounds. This ratio is related to the probability of damaging effect on the environmental recipients. If this ratio equals to 1, the probability of damage is equal to 5 percent. This ratio method has a major benefit over the other methods like screening of chemicals that it considers and can calculates the risk associated from the sum of chemicals or individual pollutants those are discharged/emitted or released. For calculating the total risk from a sum of pollutants, the Cumulative Risk is calculated by using the following probability relationship.

$$P(A + B) = P(A) + P(B) - P(A) * P(B)$$

Where, P(A) is the probability of environmental risk for compound A and P(B) is the probability of risk for compound B. For small risks (that is, P(A) and P(B) are both small), the risks can be considered to be linearly additive, approximately. The total risk for a given discharge is calculated by means of the Dose Related Risk and Effect Model. The total risk contribution (in %) is calculated by this model for every point and time within the complete domain of the model. The total sum of risks for every individual pollutant and time is then summarized and converted back to a corresponding Ratio of PEEC (Predicted Environmental Effect Concentration) to PENEC (Predicted Environmental No Effect Concentration

The Environmental Impact Factor is defined as the total mass of recipient environmental component where the PEC/PNEC > 1, divided by a unit volume of recipient component. In addition, the Environmental Impact Factor for recipient mass is adjusted upwards by a factor of two for those polluting compounds which have a small biodegradation factor combined with a large bioaccumulation factor (Johnsen et al., 2000) Such studies for produced oil and its impacts have been conducted and different aspects have been widely developed by various filed workers (Johnsen et.al., 2000; Rye et.al., 2004; Reed et.al., 2001; Singsaas et.al., 2008; EU, 1996; EU, 2003; EU, 2006; Karman, 1994, Karman, 1996; Karman and Reerink, 1997; Holguin-Veras, 1993)

An attractive feature of the Environmental Impact Factor consideration is that the method is also able to discriminate between the various pollutant contributors for environmental risks. In addition to show that the actual number for the Environmental Impact Factor, it can also show which of the polluting compounds, constituent chemicals or compound groups contribute to the environmental risks. This makes the present method more attractive in particular when the measures have to be chosen in order to arrive at the zero discharge/emission or release alternative option.

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