

RISK ASSESSMENT METHOD FOR A MUNICIPAL WASTE INCINERATOR LOCALIZED IN AN URBAN AREA

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Abstract: This paper debate the risk assessment from a municipal waste incinerator for population health and environmental. In the base of input date about "classical" pollutants emissions (SO₂, NO_x, CO, particles and their secondary aerosols such as sulfates) and toxic metals (As, Cd, Cr, Hg, Ni and Pb) to the atmosphere it is determinate the risk and the damage costs using the software RiskPoll . These aspects can be quantified using a transparent methodology, easy to implement and who requires just few input data values. The emphasis is to obtain a reasonably accurate and relevant approximation of the impacts using a "simplified" approach. The following steps are fundamentals: select an impact assessment model; specify input data; calculate impact estimates; review results; perform sensitivity analyses.

Keywords: risk, assessment, incinerator, population health.

1. INTRODUCTION

In this paper we want to present a simplified risk assessment method for a municipal waste incinerator localized in an urban area. We will use the software RiskPoll(version 1.051). The weight is to obtain a reasonably accurate and relevant approximation of the impacts using a "simplified" approach. The following steps are fundamentals:

1. Select an impact assessment model;
 2. Specify input data;
 3. Calculate impact estimates;
 4. Review results;
 5. Perform sensitivity analyses.
1. Select an impact assessment model is chose depending on constant emission rate, uniform local and regional population distributions, constant depletion velocity,) flat terrain, negligible local deposition rate uniform wind rose distribution and mean local meteorological statistics, etc
 2. The minimum specify input data requirements consist of Source coordinates (latitude and longitude), Source location (urban or rural site), Regional population density, Pollutant emission rate and depletion velocity, and a list of Exposure Response functions. Monetization of impact estimates is optional. Other optional data include: local meteorological conditions (mean statistics or hourly data) and local population statistics (density or 5 by 5 km resolution).
 3. To calculate the impacts we use the software Risk Poll (version 1.051).
 4. To review results the output data are summarized on the screen in tabular format. More information on a particular health impact category is the last column of the the row. Additional information includes: an approximate estimate of the impact breakdown according to local and regional scales, input data used in the calculations, and suggestions for sensitivity analyses.
When the impacts are monetized, the lower and upper bounds of the damage cost range will be eliminating.
 5. To perform sensitivity analyses will be uses the software Risk Poll (version 1.051) for variable parameters.

2. URBAN RISK ASSESSMENT METHOD

URBAN is considered a best estimation for primary pollutants. The major assumptions are: *urban source* with a constant emission rate, 5 by 5 km gridded local population distribution, uniform regional population, constant depletion velocity, linear, no threshold response dose (CRF), flat terrain, negligible local deposition rate, uniform wind rose distribution and mean local meteorological data.

The most important equation for this cost assessment is:

$$\text{Damage cost} = \frac{\text{Emission} \times \text{Receptor} \times \text{CRF}}{\text{Depletion velocity}} \times \text{Unit cost}$$

In contrast to the semi-empirical approaches in QUERI, the calculation routines in URBAN are closed-form analytical solutions of the damage function for certain weather and population distributions. A “simplified” expression for the Gaussian plume model is used for pollutant transport at the local scale. The URBAN model uses statistical averages as input data for local weather conditions and assumes a uniform wind rose distribution about the source. Although local and regional areas are treated separately (e.g., different pollutant transport models are used to calculate concentrations), uniform population distributions are assumed across each domain. The URBAN model can use statistical averages rather than hourly meteorological values to compute local concentrations for an urban source.

3. THE RISK ASSESSMENT RESULTS FOR A ROMANIAN WASTE INCINERATOR

The waste incinerator from Pro Air Clean Timișoara is the only in Romania who have the installation emissions in accordance with the European and national legislation. In 2000 year when the incinerator was built the authorities required limited the capacity to the lesser possible for the quantity of the waste produced in the Timișoara neighborhoods. Since the beginning the incinerator satisfied the HG 128/2002 request and the European directives.

Initially the installation has the capacity only for 9800 kg by day but now it is bigger. The most important type of waste burned here are:

- solid waste – 505 t/day;
- paste waste – 3.3 t/day;
- liquid waste – 1.0 t/day;
- packing waste – 1.0 t/day.

The installation was projected using the best available techniques for this type of waste and for this capacity. The incinerator didn't produce waste water. In the table number 1 are presented the emissions values measured in different periods by three laboratories, one Hungarian and the others Romanians. You can see that the values measured by ECOIND give up a problem. The emissions are depending by the incinerated materials and some time the sum of heavy metals could exceed the legal values in accordance with HG no. 128/2002.

We used the data measured when was prepared the environmental assessment study and the environmental balance in the software RiskPoll to evaluate the risk for the population health and environmental development.

We think that is important to quantify the possible impact for the population because this incinerator is localized in an area with a big density. The population density in this urban area is around 2500 person/ km².

The urban application requires data about geographic position (latitude and longitude degrees), source location, stack height and diameter, exhaust gas velocity, temperature and effective height, emissions rate (t/year), regional receptors density, local receptors density, radius of local domain and detailed meteorological data. If they are no data about medical service cost the monetary unit cost can't be calculated.

Unfortunately the medical costs and the detailed meteorological data aren't public. This was the reason for why we realized only the qualitative analyses.

Table 1 Pollutants emissions values generated by waste incinerator Pro Air Clean Timișoara

Parameter	Value Hungarian Laboratory (mg/m ³)	Value ECOIND (mg/m ³)	Value ICIM (mg/m ³)	Value H.G. No. 128/2002
NO _x	94,1	46	67,24	200
SO ₂	21,1	9,2	18,56	50
HCl	<0,95	0,41	0,60	10
HF	<0,1	-	<0,1	1
Total particles	0, 14 – 0,29	0, 43	0, 82	10
Mercury and his composes	<0,029	-	-	0,05
Cadmium and his composes	<0,014	<0,05	0,03	0,05
Antimonies and his composes	<0,087	-	-	
Arsenic and his composes	<0,115	<1,25	0,15	
Plumb and his composes	<0,115	<1,25	0,135	
Chromium and his composes	<0,029	<0,025	0,032	
Cobalt and his composes	<0,029	<0,025	0,028	
Cuprum and his composes	<0,029	<0,025	0,040	
Manganese and his composes	<0,014	<0,025	0,035	
Nickel and his composes	<0,029	0,52	0,038	
Vanadium and his composes	<0,029	-	-	
TOTAL heavy metals	<0,476	<3,095	0,458	1,0
<i>Dioxins and furans</i>	<0,027	-	<0,1	0,1

4. CONCLUSION

Using the software RiskPoll to analyze the risk assessment for the population health for the Timișoara area we realize the qualitative quantification of the impact.

In the normal operate of the incinerator the potential impact is insignificant for the population health and for the environmental. In order to the values measured by ECOIND we can see that is possible to have some excels of the legal values for the total emission of heavy metals. In this particular situation the results of the program simulation indicate a minimum impact to the respirator function of the population localized in the point with maximum concentrations of pollutants. The public costs of medical services available now indicate only the

price for every patient reclaimed in a hospital. The respirator irritations usually aren't reclaimed in hospital. This was the reasons for why we didn't estimate the monetary values of this damage.

In the accidental situation the all incineration installation is closed and the gas emissions couldn't determinate a dangerous situation for the people.

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