Diffusion model applied to assessment of children health impact

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Background

Children are a high-risk group in terms of the health effects of air pollution. Aim of the this study was the assessment of children health impact associated with the activities of an incinerator in the Tuscany region, Italy.

Methods

The building for the nursery school (0-6 years) will be built about 2 km far from the incinerator. Air pollutants fallout was assessed by Gaussian model WinDimula (ENEA 1980) and meteorological data by mathematical WRF-Chem Model (NCAR). The estimate of air pollutants fallout were performed considering as computational domain a grid of size 4x4 km with 100 m step. Pollutions data used in our study are the

emission levels of the 3rd quarter of 2014. The values obtained were first compared with the acceptability limits set by 2008/50/EU and WHO guideline levels (2005). Furthermore PCDD/F, PCB+PCT+PCN were evaluated according to WHO limits (1997).

Results

All of emission levels are below the limit values. The prevailing winds blew from east/south-east to north-west direction (20 %). Average temperature was 22°C, Pasquill atmospheric class was D. Reference points to assess pollutants fallout were represented by nursery school (A) and the area with maximum fallout observed (B). The average annual PM-tot value in point A was 0.02 µg/m3 and 0.1 µg/m3 in point B, both were below the limit of 10 µg/m3 (WHO 2005). The average yearly PCDD/PCDF value was 7x10-5 fg/m3 in point A, 5x10-4 fg/m3 in point B, both below the limit value of 16 fg/m3 (WHO 1997).

Conclusions

Gaussian models are considered to have high predictivity to evaluate pollutants fallout and they can serve to locate areas of expected high concentrations for correlation with health effects. Obtained results highlight no relevant risks for children; nonetheless it is necessary a more in-depth study on health impact assessment.

Key message

- Diffusion models can be employed in preconstruction evaluation of site for the location of new activities such as schools