Evaluation of odour emissions from a landfill through dynamic olfactometry, dispersion modelling and electronic noses (P/18)

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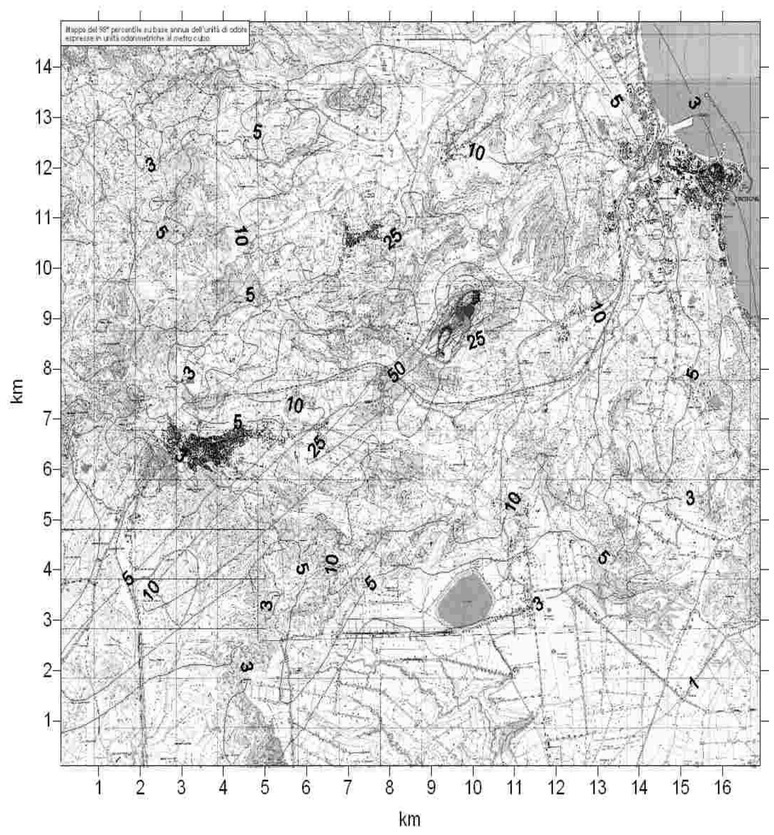
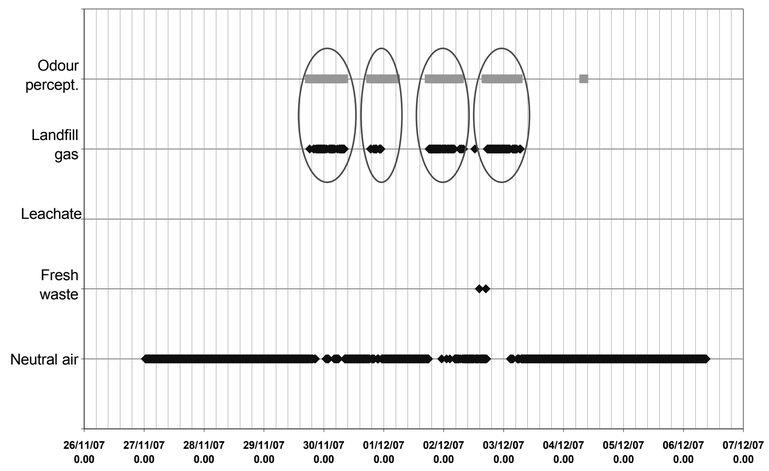
LOD
LABORATORIO OLFATTOMETRIA DINAMICA

Sample no.	Description	Odour conc. (ou_E/m^3)
1	Hazardous waste heaps	1350
2	Non-covered hazardous waste (15d)	170
3	Covered hazardous waste - post-operation	320
4	Tank for collection of leachate from haz. waste	110000
5	Tank for collection of leachate from MSW	4800
6	MSW heaps	1360
7	Covered MSW (1d)	200
8	LFG well on MSW landfill	27000
9	LFG pretreatment	3400
10	Covered MSW (2d)	200
11	Covered MSW (10d)	230
12	Covered MSW - post-operation	160



Olfactory class	No. of measurements	Detection frequency
Neutral air	619	73.2%
Landfill gas	136	16.1%
Fresh waste	91	10.8%
Leachate	0	0.0%

Olfactory class	No. of measurements	Detection frequency
Neutral air	757	84.3%
Landfill gas	139	15.5%
Fresh waste	2	0.2%
Leachate	0	0.0%



This poster describes the experimental approach adopted in order to evaluate the odour impact of a landfill in the South of Italy, having a surface of about 26 ha, divided in two parts, dedicated to the disposal of MSW and hazardous waste, respectively.
A complete and in depth study was conducted using three different approaches for odour impact determination: dynamic olfactometry, dispersion modelling and electronic noses. The results of the olfactometric analyses enabled quantify the landfill odour emissions in terms of odour concentration, and their use as input data for the application of a mathematical model for odour dispersion simulation allowed to evaluate the impact of landfill odours on the neighbouring land. Finally, two electronic noses, specifically developed for the continuous monitoring of environmental odours were used in order to instrumentally determine the landfill odour impact on a specific receptor.

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DYNAMIC OLFACTOMETRY

Dynamic olfactometry is a sensorial technique, which allows to determine odour concentration, which represents the number of dilutions with neutral air that is needed in order to bring an odorous sample to its odour detection threshold, and it is expressed in (ou_E/m^3). The analyses are carried out using a suitable dilution device, called olfactometer.

DISPERSION MODELLING

The model used for the simulation of the emission dispersion is the CALPUFF model. This model is realized by Earth Tech Inc. for the California Air Resources Board (CARB) and the U.S. Environmental Protection Agency (US EPA).
CALPUFF is a non-stationary puff atmospheric dispersion model. It is suitable for the estimation of emission from single or multiple industrial sources. It allows to calculate dry and wet deposition, building downwash, dispersion from point, area and volume sources, the gradual plume raising in function of the distance from the source, the influence of the soil orography on dispersion, and the dispersion in case of weak or absent wind.

ELECTRONIC NOSES

The time percentage during which the electronic nose EOS 20, installed at the receptor, detected the presence of odours from the landfill, is equal to 15.7% The time percentage during which the electronic nose EOS 28, installed at the landfill entrance, detected the presence of odours from the landfill, is equal to 26.8%

In both monitoring positions, the high percentage of measures attributed to the olfactory class "landfill gas", allow to affirm that the landfill gas emitted through the landfill surface or through the not perfectly airtight extraction wells represents the most important odour source of the landfill at issue.

CONCLUSIONS

The very good correspondence of the electronic nose responses with the meteorological data (wind speed and direction) relevant to the monitoring period, with the odour detections reported by the people living at the receptor, where the second electronic nose was installed, and with the result of the odour dispersion modelling allowed to confirm the reliability of the obtained results.