Emission Inventory

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Methodology

The optimal methodology to set up an emission inventory would imply the direct quantification, by means of direct measurements, of all emissions from different typologies of sources in the appointed area during the selected time frame.

However this approach cannot be used practically, because inventories generally concern extremely huge territories (i.e. a whole region), and some typologies of emissions (i.e. emissions from agricultural activities) for their own nature are hardly completely quantifiable by means of measurements.

The "analytical" approach is a fundamental tool only for few particular typologies of sources, typically big industrial plants (i.e. thermal power plants, waste incinerators, cement industries) whose emissions are generally relevant and for this reason are checked by means of in-continuous monitoring systems. Data collected by these systems are suitable to be statistically elaborated in order to provide the total emission of the source.

It is more problematic to use data checked in smaller industrial plants, as they derive from periodical measurements, often not very frequent due to costs and operative difficulties, carried out with other aims, such as verifying emission limits imposed by law. For example data are often collected in emission registers which are available at county level and contain information about respect for law limits imposed by DPR 203/88, and then allow only the estimate of maximum emissions allowed by law. Also this information is useful, but it could be lesser realistic as the effective real emissions are low and far from allowed maximums.

It is then necessary to apply another approach, which carries out the evaluation of emissions by means of an indicator that characterizes the source activity and by means of an emission factor that is specific for the typology of the source, of the industrial process and of the adopted purification technology. This method is based on a linear relation between source activity and the emission, following a relation that can be generally outlined as follows:

$$E_i = A * FE_i \quad (1)$$

where:

E_i = emission of the pollutant i (g year $^{-1}$);

A = activity indicator (i.e. produced amount, fuel consumption, number of heads of cattle);

FE_i = emission factor for the pollutant i (i.e. g t $^{-1}$ of product, kg/kg of solvent, g inhabitant $^{-1}$).

Thus, the reliability of this estimate depends on the precision of the "emission factors", which is the bigger the more the detail of the single production processes is considered, using specific emission factors which are characteristic of the plant typology, as described in the following sections.

As activity indicator for combustion processes fuel consumption is generally chosen, while preferential indicators for industrial processes are the quantity of product processed per time unit or the number of employees in the sector whose emission is to be assessed. Also in industrial cycles based on combustion (e.g. cement industries) contact with materials

can alter, sometimes substantially, the expected emission from combustion without contact. It is of course used the same indicator to which the emission factor is referred.

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