What it is

Air pollution sources

Air pollution takes place when chemicals contaminate the atmosphere affecting its structure and composition and producing significant harmful effects on human health, animals, vegetation and environmental quality.
Air pollutants can be classified according to their origin:

- **anthropogenic** (man-made) sources, which are the result of various human activities;
- **natural** sources such as fire particles, volcanic eruptions and degradation of organic matter.

Contaminants can also be classified as:

- **primary pollutants**, such as sulphur dioxide or nitrogen monoxide, which are directly emitted into the atmosphere from its sources;
- **secondary pollutants**, as ozone, which are formed as a result of chemical reactions in the atmosphere.

Anthropogenic pollution is caused by major stationary point sources as industries, incinerators and thermoelectric plants, minor stationary point sources as domestic heating systems, and by mobile point sources such as vehicular traffic.

Consequences of air pollution

Some pollutants, if they are present in excessive quantities, can produce chemical and physical alterations of the air, hampering its capacity to “work” correctly and guarantee our survival functions. Men’s activity usually originates pollutants (anthropogenic origin), although in some cases natural sources contribute significantly. Most of human-origin air pollution derives either from fossil fuels (their combustion is necessary to produce energy) or from industrial chemical processes. The environmental impact of air pollutants is variable: some compounds mainly act at local level, where they are produced and distributed, while others affect entire regions.
Some others have an impact on the whole planet. In fact, some atmospheric agents have a short life (a few hours or a few days) and after that they fall on the ground, while other pollutants keep active for long periods and can spread on a wider area. This type of pollutants can have an influence on environmental conditions at a continental, sometimes even planetary level, with a negative impact on human health, even in places that are far away from the source of pollution. In most cases, the type and quantity of pollutants emitted into the atmosphere depend on the nature of the energy sources that are used (see the corresponding section on natural resources) and on the raw materials that men use during production processes.

Air monitoring

To shape national development on the principle of environmental sustainability it’s compulsory to refer to a comprehensive environment status report regarding specific geographical areas within each national district in order to define and implement a set of measures (which can be defined as “environmental policies”).
At a later stage, the causes of environmental decay should be identified and a concrete set of measures should be pushed forward to stimulate environmental recovery and limit or abolish pollution sources. Monitoring atmospheric composition in a set area requires a thorough, long-term analysis carried out by an integrated air quality monitoring network formed by a number of measurement stations on this given area producing continuous results on pollutants found in the lower atmosphere. Traditional measurement techniques are based on physical, chemical and microbiological analyses indicating pollutant concentration and type. Air quality controls allow to observe atmospheric pollutant concentration and verify if legally-binding air quality limits are observed. Limit values (or guideline values) set for individual pollutants are measured according to national criteria. In every state these limits are always determined by

concerns over environmental safeguard and human health protection. Only a small portion of atmospheric pollutants are monitored as only in these cases high-resolution measurement techiques are sufficiently accurate to allow ongoing monitoring. This type of monitoring allows anyhow an accurate estimate of air pollutant levels.
Biomonitoring is a new air quality evaluation technique, enforced in the past few years, which is carried out alongside traditional measurement. Biomonitoring techniques supply information on the extent of pollution evaluating the morphological or physiological response of living organisms - defined as biological monitors (or biomonitors) – to pollutant concentration.

Italian Legislation

Law N. 615 of July 13, 1966, “Measures against Environmental Pollution” is the first Italian systematic law on environmental pollution and defines fresh air as a public good that needs to be protected through restrictions. The latter was replaced by Decree N. 203 of May 24, 1988 of the President of the Republic (DPR) meeting four European guidelines on air quality and pollution. The subsequent 203/88 Presidential Decree laid the real foundation for Italian legislation until the implementation in 1999 of the European Framework Directive on “Ambient Air Quality Monitoring and Management”. This D.P.R. introduces the principle of environmental preservation and human health safeguard, which was lacking in previous legislation. Moreover, it clearly defines the characteristics of environmental pollution as “every change to the structure or composition of the atmosphere caused by the presence of one or more substances in a quantity able to affect normal environmental conditions and air quality; which can pose a direct or indirect risk to human health; which can jeopardize recreational activities and other legitimate activities within this given environment; which negatively affect biological resources, ecosystems, public and private goods”. As it also sets air quality limit values and guideline values and adopts the Anglo-saxon principle on the use of the best available technology (BAT) to prevent pollution. The 96/62/CE European Directive issued in 1996 aims to create a common strategy to evaluate and manage air quality and define air quality standards to prevent or reduce the negative impact of pollutants on human health and the environment. The latter is a Framework Directive as it governs general and common policies for all Member States on air monitoring and management. Several subsequent ‘daughter’ directives were also adopted establishing air quality limit values and standard measurement criteria for specific pollutants. In Italy, Legislative Decree N. 351 “Implementation of the 96/62/CE Directive on Ambient Air Quality and Environment Monitoring and Management” passed August 4, 1999 transposed this Framework Directive. Legislative Decree 351/99 allocates responsibilities between the State and the Regions. Regions must implement air quality monitoring, action plans (in areas exceeding air quality standards) and protection programmes (in areas with very low levels of pollution), whilst the State must establish limit values and quality goals introducing an integrated strategy within national territory. Several other laws comply with 96/62/CE daughter directives, as:

- Ministerial Decree N. 60 of April 2, 2002 of the Ministry for the Environment and Protection of the Land, implementing the first daughter directive which sets limit values for NOx, SO2, Pb and PM10; and implementing the second daughter directive which relates to benzene and carbon monoxide;
- Ministerial Decree N. 183 of May 21, 2004 implementing the third daughter directive on ozone levels;
- Ministerial Decree N. 152 of August 3, 2007 implementing the fourth daughter directive which targets a list of pollutants posing a risk to human health (as cadmium, mercury, nickel, and polycyclic aromatic hydrocarbons)

Finally, Legislative Decree N. 155 of August 13, 2010 enforces “Directive 2008/50/CE on Ambient Air Quality and Cleaner Air for Europe”. This Directive revises and combines separate existing pieces of legislation and sets a common legislative framework on ambient air quality monitoring and management.