

## Impacts of nitrogen use in Mediterranean Europe

Scientists involved in the European Nitrogen Assessment report that Nitrogen pollution in Mediterranean countries is affecting the region's air and water quality. Nitrates released from agricultural activities is ending up in the rivers and groundwater, polluting the increasingly scarce water resources of this dry and highly populated European region. Implementation of good agricultural practices and sustainable fertilization is clearly needed in order to protect drinking water resources in the future. Moreover, gaseous N compounds are worsening air quality and contributing to global warming.

### Key findings include:

- Three quarters of nitrogen (N) pollution in Mediterranean countries is a result of agricultural activities. The majority of this (75%) is from the use of fertilizers.
- Most of the N applied as organic or chemical fertilizers is not taken up by crops and about half of this unused N enters rivers and aquifers. However, only 10-25% ends up in coastal waters. This is due to the fact that Mediterranean rivers are strongly regulated by irrigation, energy generation and drinking water extraction, which alters the natural circulation of water and results in a recycling of N in inland areas.
- Unlike Northern Europe, the Mediterranean Sea has few algal blooms, largely because nutrients that include nitrogen are transferred from the Mediterranean Sea to the Atlantic Ocean. Nitrogen levels and indicators of algal blooms such as chlorophyll concentration are low in most Mediterranean coastal areas (with some exceptions, such as the Po river mouth in Italy).
- Many rivers and aquifers have become polluted by irrigation runoff from farms, threatening drinking water safety and human health. In Spain and Italy, 80% of the population obtains its drinking water from groundwater resources, and more than half of the population lives in regions with rivers polluted by nitrates. About a fifth of all underground water monitoring stations in Spain register nitrate concentrations above the level recommended by the EU (50 mg/l)<sup>1</sup>. This has led to the designation of about 13% of the total surface of the country as Nitrate Vulnerable Zones. (Figure 1). Nitrate contamination of drinking water is related to blood diseases and some types of cancer.

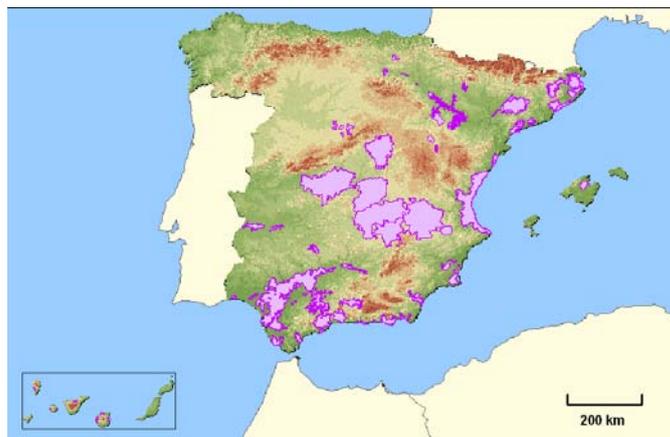


Figure 1. Map of the main sensitive areas to nitrate pollution (Spanish Ministry of the Environment and Rural Affairs, MARM).

- Agricultural sources contribute more than 70% of the emissions of the greenhouse gas nitrous oxide (N<sub>2</sub>O) in Spain and Italy.
- In addition to agriculture, other sectors of the Mediterranean economy release considerable amounts of nitrogen pollutants into the atmosphere. Industrial combustion processes and transport are responsible for releasing most nitrogen oxides (NO<sub>x</sub>), which create smog. Over three-quarters of the Mediterranean population lives in urban environments and a significant proportion is frequently exposed to high concentrations of N pollutants, which threaten respiratory and heart health.
- In Madrid, where people are exposed to high levels of fine particulate matter in the air, there is an increase in the mortality rate due to respiratory diseases, according to a study published last year<sup>2</sup>. Particulate emissions of diesel cars are one of the main contributors but NO<sub>x</sub> emissions also play a significant role in the formation of particulates.
- In the driest Mediterranean areas, atmospheric deposition of N pollutants such as NH<sub>3</sub> and NO<sub>x</sub> spurs the growth of shrubs and grass, especially where traditional land management has been abandoned. This is promoting an accumulation of flammable vegetation, which can lead to an increase in forest fire frequency. When these fires occur close to populated areas they represent a threat to both human well-being and the economy.
- Agriculture is responsible for 90% of European ammonia emissions. Spain and Cyprus have seen ammonia emissions increase by 18 and 25%, respectively, over the last 20 years. This is in contrast to the rest of Europe, where emissions have declined due to restructuring of European agriculture, the implementation of cleaner farming methods and improved land management strategies.

## References

- 1) Spanish Ministry of the Environment and Rural Affairs, MARM  
[http://servicios2.marm.es/sia/indicadores/ind/ficha.jsp?cod\\_indicador=32&factor=estado](http://servicios2.marm.es/sia/indicadores/ind/ficha.jsp?cod_indicador=32&factor=estado)
- 2) Maté, T., Guaita, R., Pichiule, M., Linares, C., Díaz, J., 2010. Short-term effect of fine particulate matter (PM<sub>2.5</sub>) on daily mortality due to diseases of the circulatory system in Madrid (Spain). *Science of the Total Environment*, 408(23), 5750-5757.

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