

Economic-environmental Indicators – Air emissions accounts

1995-2015

Global Warming Potential increased 6.8% in 2015, above the growth of economic activity

In 2015, the Global Warming Potential increased 6,8%, the Acidification Potential 3.0% and the Troposphere Ozone Formation Potential 3.1%, above the growth of economic activity (Gross Value Added, at basic prices, increased 1.2%).

Portugal presented, in 2014, the fourth lowest *per capita* Global Warming Potential of the EU28.

Statistics Portugal publishes Air Emission Accounts data for 2015 and revised data for the period 1995 to 2014. This revision was essentially motivated by the incorporation of the revisions of the National System of Emissions and Environmental Pollutants Removal Inventory (NSEEPRI) made by the Portuguese Environmental Agency.

On the Statistics Portugal website, in the National Accounts release area (section of Satellite Accounts¹) tables with more detailed information are available.

Air Emissions Accounts allow for an analysis of the environmental implications of the country production standards, since their results, which are consistent with the National Accounts, enable the development of an integrated environmental-economic analysis.

1. ENVIRONMENTAL INDICATORS

For the assessment of environmental effects of various gases emitted by economic activity and households there are three important indicators: Global Warming Potential (GWP), Acidification Potential (ACID) and Troposphere Ozone Formation Potential (TOFP). Chart 1 presents the evolution of these three environmental indicators for the period 1995-2015.

In 2015, as a result of the rise in the emissions of almost all the gases contributing to its calculation, these three indicators increased. This resulted from the need to offset the decline in renewable energy production in 2015, with the production of electricity from fossil fuels increasing significantly, namely coal that because of its lower price is still preferred to natural gas. This breakdown of renewable energy production was due to the fact that 2015 was characterized as extremely dry (the sixth driest year since 1931 and the fourth since 2000), with an average annual total precipitation much inferior to the normal value (599.6 mm, which corresponded to an anomaly of -282.5 mm in relation to the average 1971-2000 value)², with evident effects on the production of hydroelectric energy. It should also be noted that 2014 had been a particularly rainy year, enabling a high level of hydropower production.

¹ [Statistics Portugal](#)

² According to the 2015 Annual Climate Bulletin of the Portuguese Institute for Sea and Atmosphere, I. P...

The average change rate of the **Global Warming Potential** (GWP) from 1995 to 2015 was -0.3%. In 2015, the GWP increased by 6.8% compared to 2014 and reversed the downward trend started in 2006. The growth of GWP resulted from increased emissions on the three gases that contribute to this indicator: mainly of the carbon dioxide emissions (CO₂), which had an increase of 8.5% and intensified the upward movement that began in 2014; but also of the small increases of methane (CH₄), with 1.1%, and of nitrous oxide (N₂O), with 0.2%.

GWP increased significantly from 1997 to 1999 and observed an irregular behaviour in the period 2000-2005 (reference to the peaks of 2002 and 2005, justified by the low level of water in reservoirs, with consequent change in the mode of electricity production, using more polluting energy sources than water). After this period, until 2014, the indicator has recorded successive decreases, largely explained by the introduction of natural gas (diminishing the consumption needs of coal and fuel oil), by efficiency improvements in industrial production processes and by the increase in the percentage of resources of renewable origin in the production of electricity, mainly since 2005 with the increase of installed capacity for electricity production from wind and solar photovoltaic.

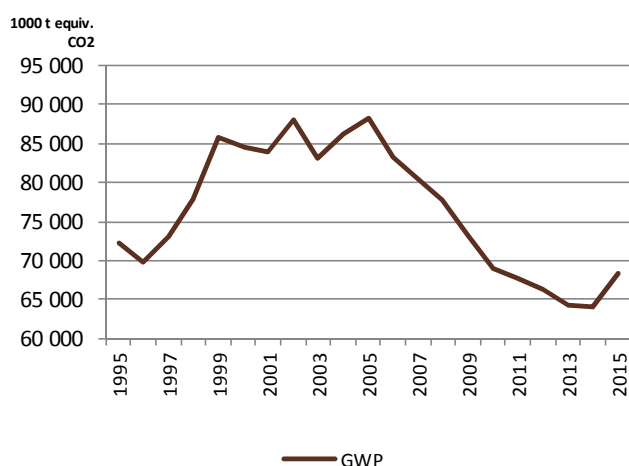
Acidification Potential (ACID) increased by 3.0% in 2015, breaking the downward continuous movement that began in 2006. This raise is mainly due to the increases in emissions of the three gases contributing to this indicator: 3.5% of oxides of nitrogen (NO_x), 2.7% of sulphur oxides (SO_x) and 2.4% of ammonia (NH₃). These increases are associated with the growth of economic activity in 2015, as well as the increase in electricity production from burning fossil fuels. The average change rate in the period 1995 to 2015 was -4.1%.

The sulphur oxides (SO_x) emissions result mainly from the burning of coal and fuel oil by Industry and Energy, water and sanitation industries. The decrease of these emissions in recent years is explained by the replacement of these fuels by natural gas and by the technological adaptations, following the entry into force, in 2000, of legislation that limits the sulphur emissions from certain types of liquid fuels derived from petroleum. Nitrogen oxides (NO_x), the component with higher relative weight and that has as major emission sources the Industry and Transport industries, interrupted, in 2014 and 2015, their descendent continuous trend presented since 2006. This downwards trend was largely explained by technical developments in engines, which made them less polluting, in compliance with existing European legislation in this field. Ammonia emissions (NH₃), which mainly result from agriculture, forestry and fisheries, increased by 2.4% in 2015, following the increase of GVA of that industry (6.8%).

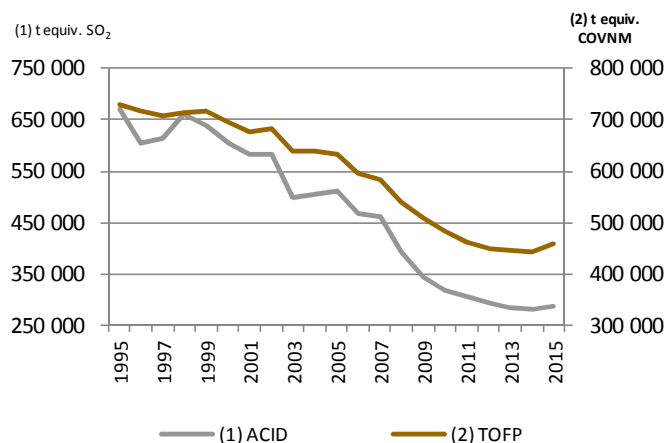
The downward trajectory of the **Troposphere Ozone Formation Potential** (TOFP) presented since 2000 (average rate in the period 1995-2015 was -2.3%) was interrupted in 2015, with an increase of 3.1%. The behavior of this indicator was determined by the increases in 2015 of almost all components of this indicator, mainly non-methane volatile organic compounds (NMVOCs), with 3.7%, and oxides of nitrogen (NO_x), with 3.5%, but also methane (CH₄), with 1.1%. Only carbon monoxide (CO) declined in 2015 (-2.2%).

Chart 1. Evolution of environmental indicators

Global Warming Potential

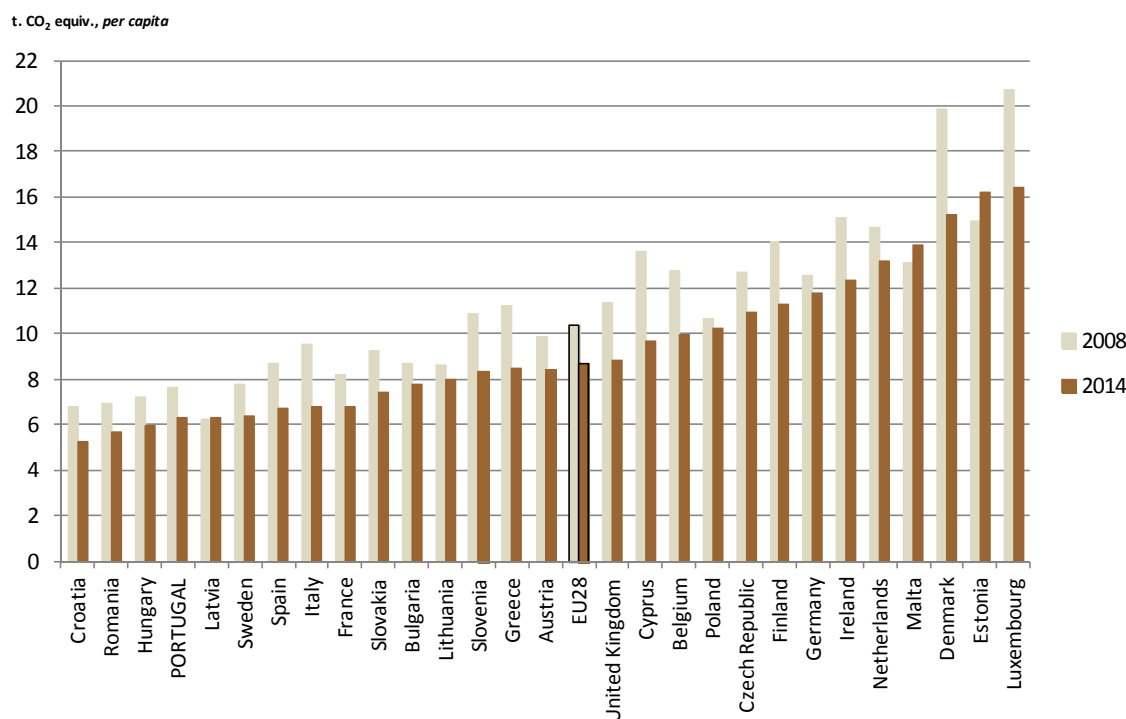


Acidification Potential and Troposphere Ozone Formation Potential



The indicator "GWP *per capita*" for Portugal has been showing lower values comparing to most countries in the EU28, presenting the fourth lowest value in 2014 (last year with available information for the EU). In 2014, the EU28 average was 8.7 tonnes of CO₂ equivalent *per capita* while in Portugal it was 6.3 tonnes of CO₂ equivalent *per capita*, i.e. 72.0% of the European average.

Chart 2. GWP *per capita* in EU28, in 2008 and 2014



2. ENVIRONMENTAL-ECONOMIC INDICATORS

The assessment of the environmental efficiency of the economy in the particular domain of atmospheric emissions can be carried out by comparing physical environmental data with economic data using the same classifications and rules of the National Accounts.

In 2015, the three environmental indicators presented higher increases compared to the GVA (1.2%), interrupting the downward trend observed in the last decade. On Chart 3 it can be observed that, in cumulative terms, all the environmental indicators registered decreases between 1995 and 2015, contrarily to the GVA, that presented an increase of 25.9%. The GWP showed a general upward trend up to 2005, following the evolution of the GVA, and then, between 2006 and 2014, showed a behaviour contrary to the economic indicator.

Chart 3 – Evolution of environmental indicators and GVA, in volume (1995 = 100)

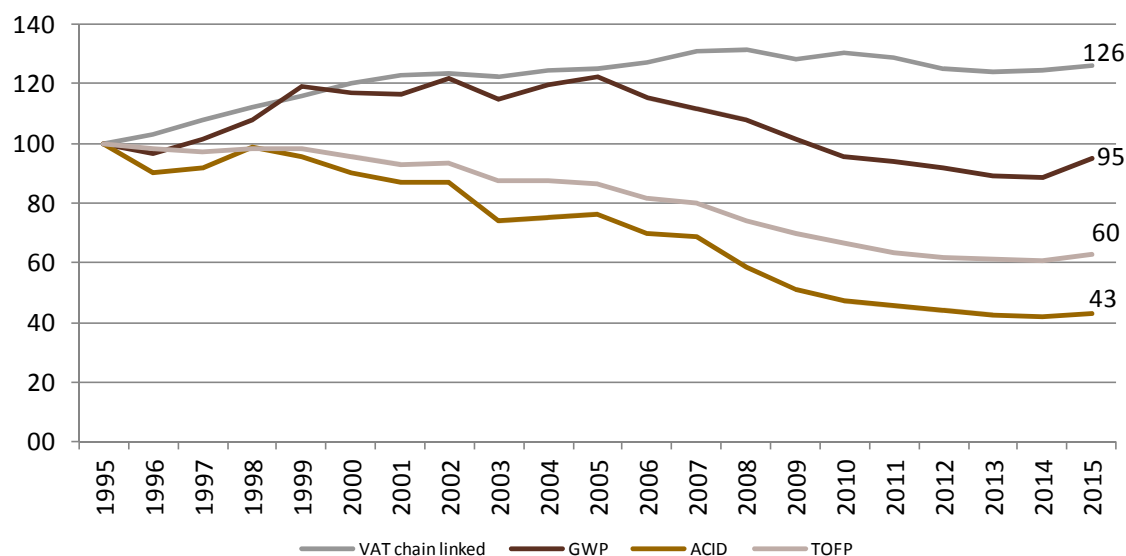
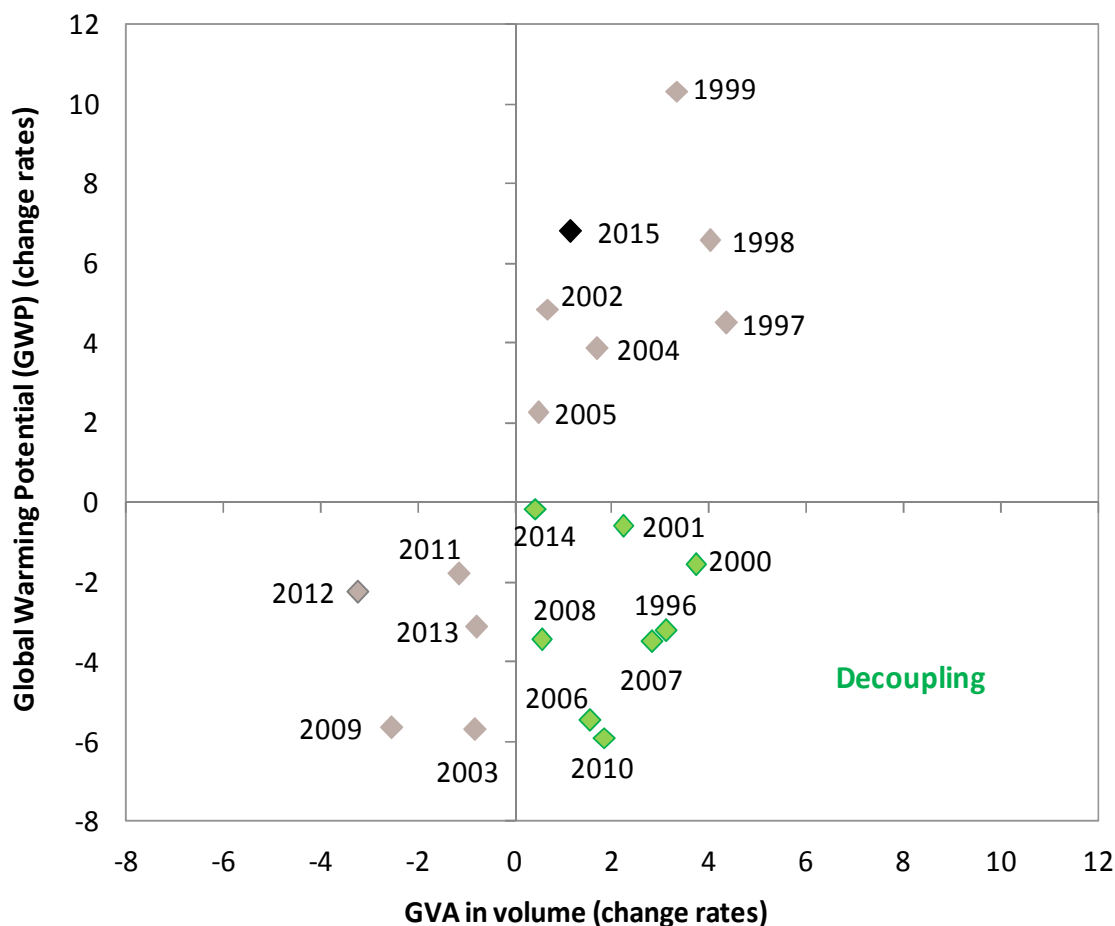


Chart 4 shows that in 2015 a situation of increased emissions and economic growth was observed, a situation similar to what had happened in 1997-99, 2002 and 2004-2005. It should be noted that, in the series under analysis, only 1999 showed a differential between GWP growth and GVA above the one of 2015 (6.8% vs. 1.2%)

The emissions level is highly dependent on the types of energy used by Industry and Energy, water and sanitation, since they are the industries with the highest relative weight, representing, on average, about 57.6% of GWP total emissions on the series. The water source has a significant weight in Energy, water and sanitation, being strongly conditioned by the levels of rainfall registered in each year. However, this constraint has been diminishing gradually since 2005, with the gradual increase in the share of wind energy production in total electricity production. In 2015, the production of renewable energy in Portugal accounted for less than half of the electricity produced (48.7%), a decrease of 21.3% in relation to 2014. The decrease in precipitation throughout the territory was decisive for these results, with a 40.3% decrease in hydroelectric energy, compared to 2014.

Chart 4 – Decoupling between GWP and GVA (volume change rates)



The ACID and the TOFP showed downwards trends since 1995 (the beginning of the series) in dissociation with economic activity, i.e. decrease of the environment indicators with an economic activity growth, most of the years.