working draft

EEA Core Set of Indicators - CSI 019

Oxygen consuming substances in rivers

May 2005 assessment

About this document
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If you would like to see further background information about this indicator, you can see the published specification at:
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European Environment Agency

Key policy question: Is the pollution of rivers by organic matter decreasing?

Key message: Concentrations of organic matter and ammonium generally decreased (decrease at 50 % of stations) in European rivers during the 1990s, reflecting improvements in wastewater treatment. However, there were increasing trends at 10 % of stations over the same period (Figure 1). Northern European rivers have the lowest concentrations of these indicators but concentrations are higher in rivers in some of the new EU and Accession countries where wastewater treatment is not so advanced. Ammonium concentrations in some rivers in both EU and Accession countries are still above background levels.

There has been a decrease in BOD and ammonium concentrations in the old EU countries, reflecting the implementation of the Urban Waste Water Treatment Directive and hence an increase in the levels of treatment of wastewater (Figures 2 and 3, respectively). BOD and ammonium concentrations also declined in the new EU and Accession countries, partly due to improved wastewater treatment but also due to economic reform resulting in a decline in polluting manufacturing industries. However, levels of BOD and ammonium are higher in the new EU and Accession countries where wastewater treatment is still less advanced than in the old EU countries.Ammonium concentrations in some EU and Accession countries are considerably higher than background concentrations of around 15micro gN/l.

The decline in the level of BOD is evident in nearly all countries for which data are available(Figure 2).The steepest declines are observed in those countries with the highest levels of BOD at the beginning of the 1990s (i.e. the new EU and Accession countries). However, some of these countries, such as Hungary, the Czech Republic and Bulgaria, although showing steep declines, have the highest concentrations. There have also been dramatic decreases in the level of ammonium in some of the new EU and Accession countries, such as Poland and Bulgaria (Figure 3).The new EU and Accession countries have a wide range of median concentration values, with Poland and Bulgaria above 300 micro g N/l, but Latvia and Estonia below 100 micro g N/l. Levels are generally still highest in the Eastern European countries and lowest in the Northern European countries.

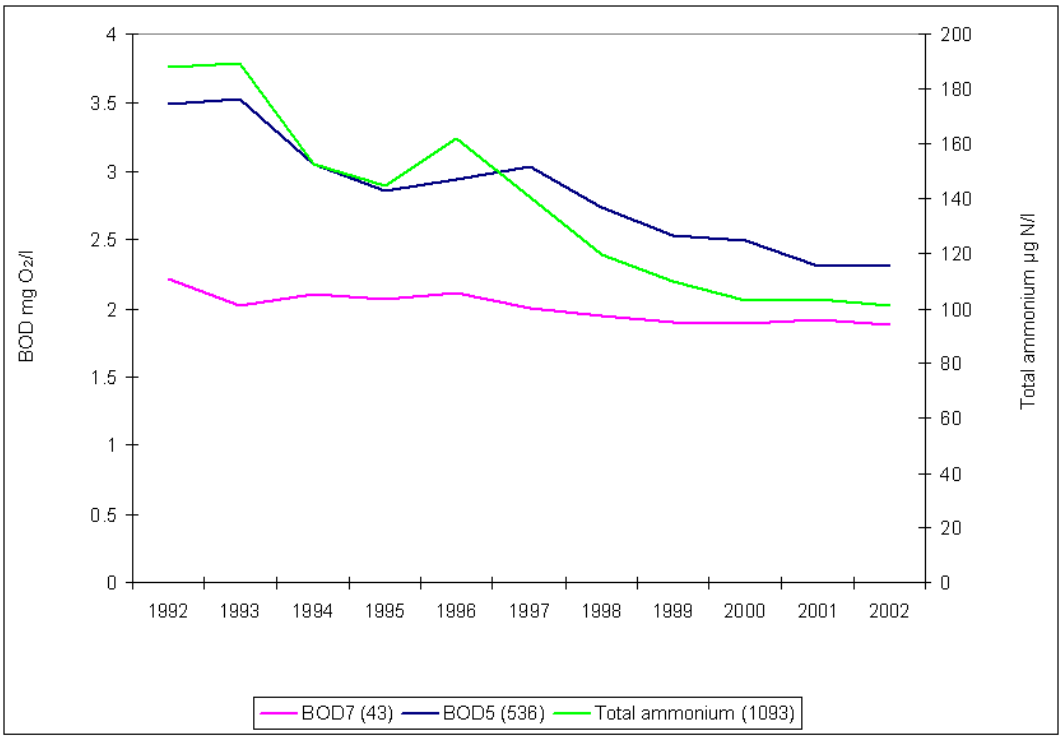
Between 1992 and 2002, Austria, Slovenia and Italy (of the 15 countries with available information) had no stations with significant upward trends in BOD concentrations (Figure4), and Denmark, Italy, Luxembourg and Slovenia (of the 18 countries with available information) had no stations with significant upward trends in ammonium concentrations (Figure 5).Latvia (38 %) and Sweden (25 %) had the highest proportion of stations with upward trends in BOD and ammonium, respectively. Austria (77 %) and Lithuania (90 %) had the highest proportion of stations with downward trends in BOD and ammonium, respectively.

There is a general relationship between the degree of wastewater treatment in a country (relative treatment levels with the proportion of a country's population connected to treatment), and the relative concentrations of ammonium and BOD in the country's rivers: the less the wastewater treatment, the higher the BOD and ammonium concentrations (Figures 6 and 7, respectively). This is the case for Luxembourg that has high levels of BOD and around 20 % of its population's waste only having primary treatment (Figure 6). This is also the case in many of the new EU countries that, in general, have less of their population connected to treatment (see indicator CSI024), and when treatment is applied it is mainly primary or secondary treatment.

An exception to this are the Netherlands having a very high proportion of secondary and tertiary

treatment of their wastewater, but high levels of BOD and ammonium in rivers. However, the Netherlands have very high numbers of livestock and it is likely that the relative high levels of BOD and ammonium in rivers arise from this source. Poland also has high levels of livestock husbandry and concentrations of BOD and ammonium are also relatively high.

Fig. 1: BOD and total ammonium concentrations in European rivers between 1992 and 2002



Data source: Waterbase

Note: Number of river monitoring stations included in analysis noted in brackets.

BOD5 data from Austria, Bulgaria, Czech Rep., Denmark, France, Hungary, Luxembourg, Slovak Rep. and Slovenia.

BOD7 data from Estonia.

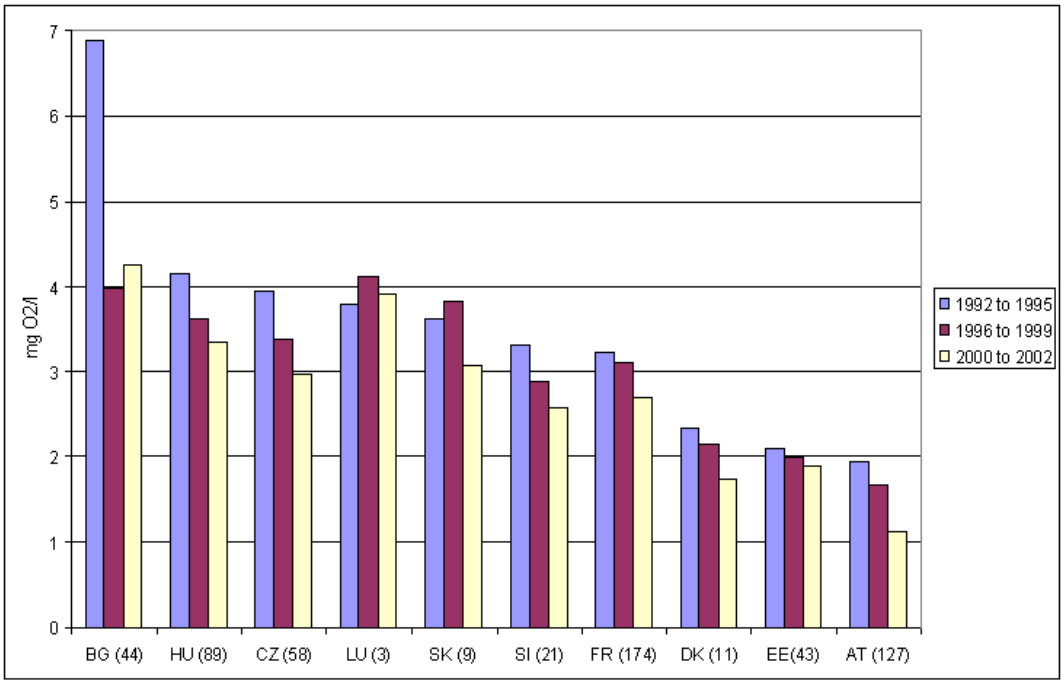
Ammonium data from Austria, Bulgaria, Denmark, Estonia, Finland, France, Germany, Hungary, Latvia, Luxembourg, Poland, Slovak Rep., Slovenia, Sweden and the UK.

Concentrations are expressed as median of annual average concentrations.

Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.

Consistent time series trends calculated, using only stations that have recorded concentrations for each year included in the time series (see Methodology section for further details).

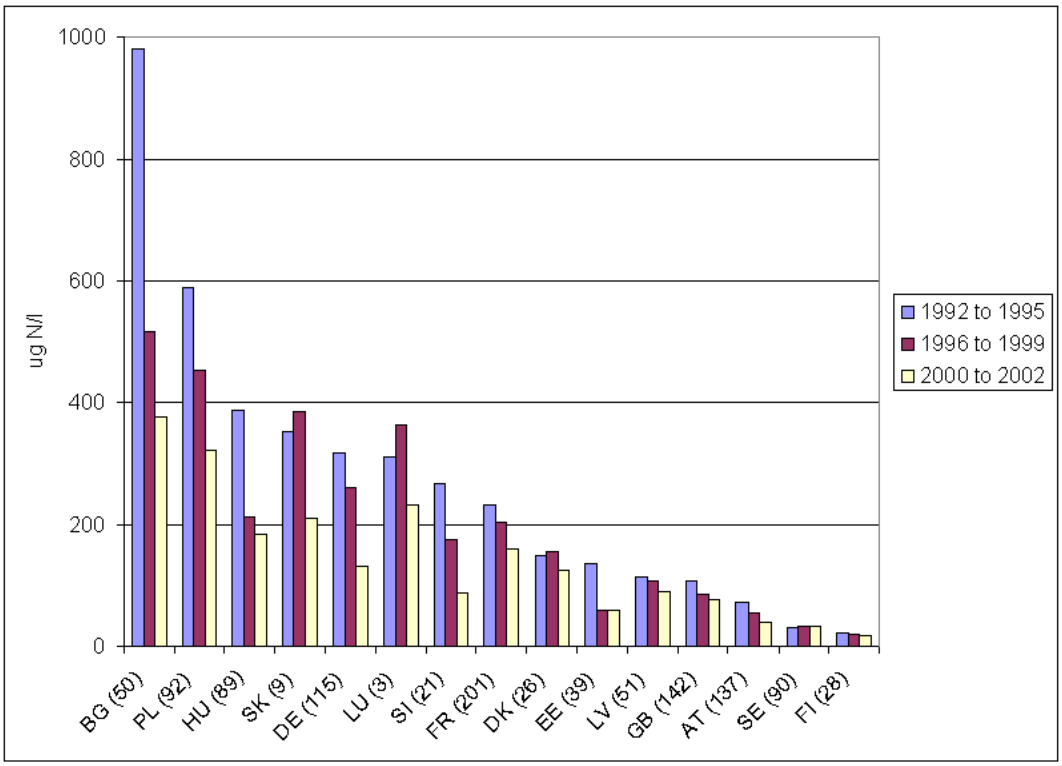
Fig. 2: Trends in the concentration of BOD in rivers and between 1992 and 2002



Data source: Waterbase

Note: Number of river monitoring stations included in analysis noted in brackets.
BOD5 data used for all countries except Estonia where BOD7 data used.
Concentrations are expressed as median of annual average concentrations.
Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.
Consistent time series trends calculated, using only stations that have recorded concentrations for each year included in the time series (see Methodology section for further details). Consistent time series then averaged for the 3 time periods 1992 to 1995, 1996 to 1999 and 2000 to 2002.

Fig. 3: Trends in the concentration of total ammonium in rivers and between 1992 and 2002 in different countries of Europe



Data source: Waterbase

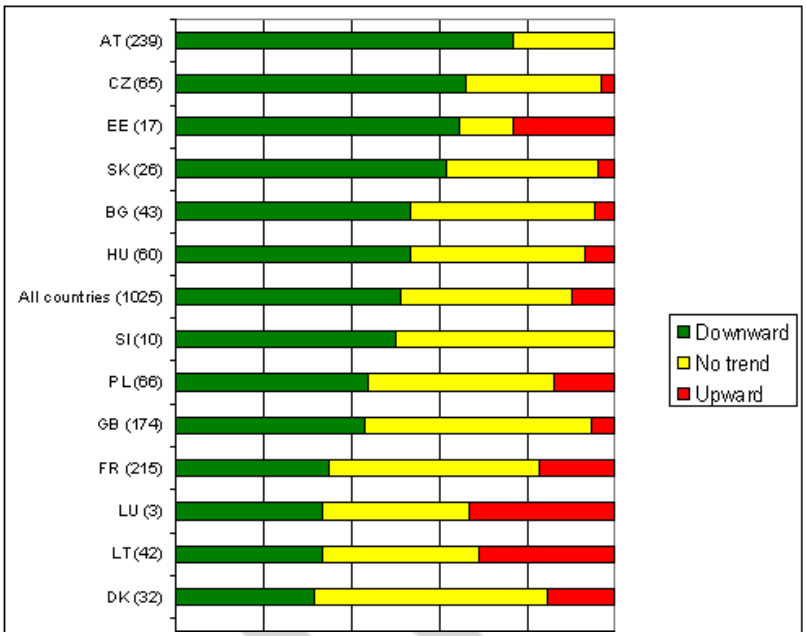
Note: Number of river monitoring stations included in analysis noted in brackets.

Concentrations are expressed as median of annual average concentrations.

Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.

Consistent time series trends calculated, using only stations that have recorded concentrations for each year included in the time series (see Methodology section for further details). Consistent time series then averaged for the 3 time periods 1992 to 1995, 1996 to 1999 and 2000 to 2002.

Fig. 4: Trends in BOD concentrations at river stations in European countries between 1992 and 2002



Data source: Waterbase

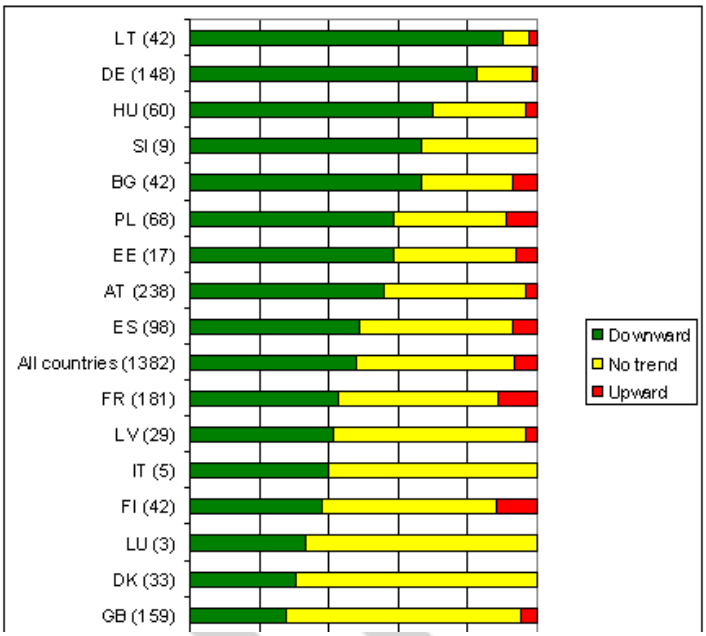
Note: Number of river monitoring stations included in analysis noted in brackets.

BOD5 data used for all countries except Estonia where BOD7 data used.

Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.

Time series trends calculated, using only stations that have recorded concentrations for at least 4 of the years included in the time series. Sen's Test then applied to determine statistically significant trends in the data (see Methodology section for further details).

Fig. 5: Trends in total ammonium concentrations at river stations in European countries between 1992 and 2002



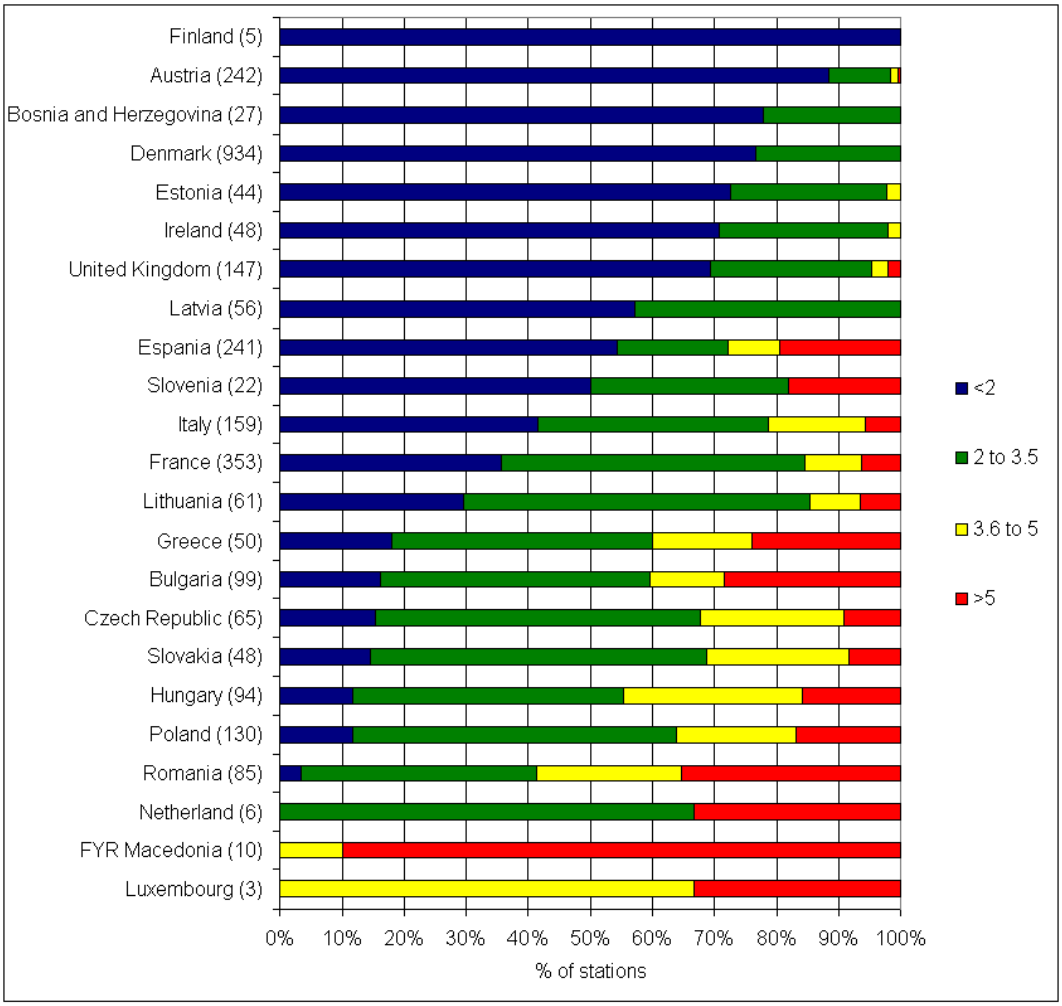
Data source: Waterbase

Note: Number of river monitoring stations included in analysis noted in brackets.

Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.

Time series trends calculated, using only stations that have recorded concentrations for at least 4 of the years included in the time series. Sen's Test then applied to determine statistically significant trends in the data (see Methodology section for further details).

Fig. 6: Present concentration of BOD5, BOD7 (mg O2/l) in rivers in European countries



Data source: Waterbase

Note: Number of river monitoring stations included in analysis noted in brackets.

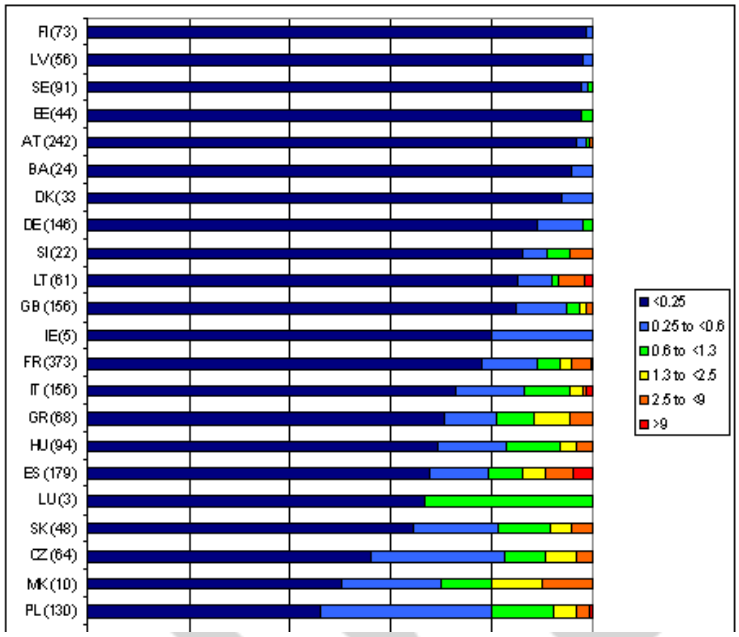
BOD5 data used for all countries except Estonia, Finland, Latvia and Lithuania where BOD7 data used.

Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.

The number of stations with annual means within each concentration band are calculated for the latest year for which data are available (see Methodology section for further details).

The latest year is 2002 for all countries except the Netherlands (1998), Ireland (2000) and Romania (2001).

Fig. 7: Present concentration of total ammonium (µg N/l) in rivers in European countries



Data source: Waterbase

Note: Number of river monitoring stations included in analysis noted in brackets.

Data are from representative river stations. Stations that have no designation of type are assumed to be representative and are included in the analysis.

The number of stations with annual means within each concentration band are calculated for the latest year for which data are available (see Methodology section for further details).

The latest year is 2002 for all countries except the Netherlands and Italy (1998) and Romania (2001).