OSPAR COMMISSION

Riverine Inputs and Direct Discharges to Convention Waters

OSPAR Contracting Parties' RID 2011 Data Report

Monitoring and Assessment Series

2013

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Union and Spain.

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par l'Union européenne et l'Espagne.

Acknowledgement

This report has been prepared by Annelene Pengerud, Paul Andreas Aakerøy and Eva Skarbøvik (Bioforsk)

Bioforsk

Norwegian Institute for Agricultural and Environmental Research

Photo cover page: © Audrey Baconnais-Rosez

Contents

Annexes

Addendum

http://www.ospar.org/html_documents/ospar/html/National_RID_2011_data_reports.zip

Note: The Addendum 1 is a compilation of the extensive national reports provided by the following Contracting Parties: Denmark, France, Germany, Iceland, Ireland, Norway, Spain, Sweden and the United Kingdom. Contracting Parties include in these reports more details on methodologies and results of the monitoring undertaken and also, to varying degrees, results of national statistical analyses.

GLOSSARY

Catchment	The whole of an area having one common outlet for its drainage water. A catchment area could be subdivided into a monitored and unmonitored area, depending on where the monitoring point is located.
Cd	Cadmium
Cu	Copper
Direct discharges	A mass of a determinant discharged to the Maritime Area from point sources (sewage effluents, industrial effluents or other) per unit of time at a point on a coast or to an estuary downstream of the point at which the riverine estimate of inputs is made.
Heavy metals	Refers to the five metals whose direct discharges and riverine inputs were studied in this assessment namely: cadmium, copper, lead, mercury and zinc
Hg	Mercury
LOD	Limit of Detection is, according to the definitions (IUPAC, IS/TR 13530), “the limit of detection (LOD) is, in broad terms, the smallest amount or concentration of an analyte in the test sample that can be reliably distinguished from zero”.
LOQ	The limit of quantification (LOQ) is the smallest amount or concentration of analyte in the test sample which can be determined with a fixed precision, e.g. relative standard deviation s_{rel} = 33,3 %. This means in other words, that a substance can only be correctly qualified from LODs, while it only can be quantified from LOQs.
Main river	A river to be monitored at least once a month (12 datasets) every year in accordance with the objectives of the Comprehensive Study. Main rivers should be major load bearing rivers.
Monitored area	The catchment upstream of the river monitoring point.
Nutrients	Refers to the nutrients whose direct discharges and riverine inputs were examined in this assessment, namely total Nitrogen and total Phosphorus
Pb	Lead
RID	Comprehensive Study of Riverine Inputs and Direct Discharges (reference number: 1998-5), as amended by ASMO 2005 (Annex 5 to the ASMO 2005 Summary Record, ASMO 05/13/1).
Riverine inputs	A mass of a determinant carried to the Maritime Area by a watercourse (natural river or man-made watercourse) per unit of time
SPM	Suspended Particulate Matter
Total inputs	Sum of direct discharges and riverine inputs.
Total-N	Total Nitrogen
Total-P	Total Phosphorus

Tributary river A river with separate catchment from a main river and with an outlet directly to the maritime area or to a main river downstream of a river monitoring point. A tributary river should be a minor load bearing river and can be sampled at a frequency determined by each Contracting Party.

Unmonitored area Defined as any sub-catchment(s) located downstream the riverine monitoring points within catchments and any areas between catchments. The unmonitored areas may contribute to the losses/discharges of substances downstream of the monitoring point or directly to the sea (OSPAR Maritime Area).

Zn Zinc

1 Introduction

The Comprehensive Study on Riverine Inputs and Direct Discharges (RID; agreement 1998-5, update 2005)[1] forms one element within the wider Joint Assessment and Monitoring Programme of OSPAR. The purpose of the RID Study is to assess, as accurately as possible, all riverine inputs and direct discharges of selected pollutants to Convention waters on an annual basis. The RID Principles set out the monitoring regime to be employed for generating and reporting input data (Annex I). This report presents the national RID reporting in 2011 in the form of annual overview tables (*hereafter* AA tables; Annex II). The OSPAR Convention area is divided into five main regions (Figure 1). Table 1 shows the Contracting Parties (CPs) draining into each region.

For the years 2005, 2006 and 2007, comprehensive reports were developed based on the RID data. Here, challenges of the RID programme were presented; including uncertainties, knowledge gaps, lack of documentation on harmonised practises, approaches and methodologies among CPs (Skarbøvik and Borgvang 2007; Borgvang et al. 2008; Borgvang et al. 2009a). In 2009, a RID Database on Access format was prepared; and since then most of the work of the RID data centre (Bioforsk) has focused on the installation and functioning of this database, as well as validation of historical (1989-2008) RID data. Thus, for the years 2008-2010, the reported data were presented without any further assessment of the data (Skarbøvik et al. 2010; Pengerud and Skarbøvik 2011; Pengerud and Skarbøvik 2012). This decision was further supported by the fact that a comprehensive assessment and trend analysis of the RID data for the period 1990 - 2006 was performed in 2009 (Borgvang et al. 2009b).

Nevertheless, following the recommendations of the OSPAR INPUT Meeting in London in 2012, the annual RID data report for 2011 has been extended as compared to the reports from 2008-2010. Annex III of this report therefore includes a presentation of selected parameters as time series (1990-2011) for direct discharges and riverine inputs, for OSPAR Regions I-IV. The selected parameters include cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb), zinc (Zn), nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorus (P) and suspended particulate matter (SPM). It is important to note that (i) the data are presented as they have been reported by the respective CPs; (ii) no statistical assessment of trends has been performed; and (iii) for riverine inputs, no flow normalisation is done. The discussions on time series have, thus, been based on visual observations of reported data.

In addition to the above, and also as a follow-up of the recommendations of INPUT 2012, CPs were encouraged to submit trend analyses of their pollutant inputs and discharges when submitting the annual reports. Hence, Annex IV gives trend analyses submitted in national reports from two CPs, France and Norway.

[1] At its Tenth Meeting (Lisbon, 1988) the Paris Commission[1] (PARCOM) adopted the Principles of the Comprehensive Study on Riverine Inputs (PARCOM 10/10/1, § 4.25 (e)). Such a comprehensive study was conducted for the first time in 1990. The RID Principles were reviewed in 1998 and 2005, and there is an ongoing review now in 2011-2014.

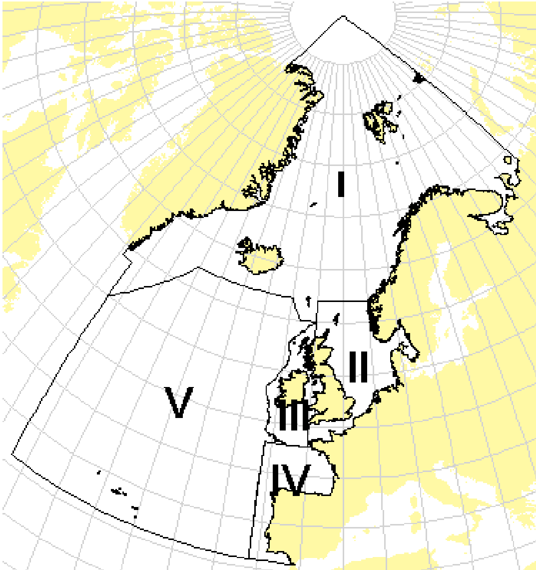


Figure 1. OSPAR Maritime Area and Regions. I: Arctic Waters, II: Greater North Sea, III: Celtic Seas, IV: Bay of Biscay and V: Wider Atlantic.

Table 1. Assignment of countries and sea areas to OSPAR Regions.

Country / Sea Area	**OSPAR Region**	**Country / Sea Area**	**OSPAR Region**
Belgium		Norway	
- North Sea (BE)	II	- Norwegian Sea (NO)	I
Denmark		- Barents Sea (NO)	I
- Skagerrak (DK)	II	- Skagerrak (NO)	II
- Kattegat (DK)	II	- North Sea (NO)	II
- North Sea (DK)	II	Portugal	
France		- Bay of Biscay and Iberian Coast (PO)	IV
- Channel	II	Spain	
- Atlantic	IV	- Atlantic (ESP)	IV
Germany		Sweden	
- North Sea (GER)	II	- Kattegat (SWE)	II
Iceland		- Skagerrak (SWE)	II
- Atlantic	I	UK	
Ireland		- North Sea (North)	II
- Irish Sea	III	- North Sea (South)	II
- Celtic Sea	III	- Channel	II
- Atlantic	III	- Irish Sea	III
Netherlands		- Celtic Sea	III
- North Sea (NL)	II	- Atlantic	III

2 Submission of RID data for 2011

Tables 2 and 3 provide an overview of the status of submitted 2011 RID data by Contracting Parties (CPs). All CPs except Denmark had a deadline of November 1st, whereas Denmark had a deadline of December 1st for submitting data and text reports. As in the two previous years, all countries were asked to report based on the template format generated by the RID database. The national data tables (Tables 5a - 9) were imported to the RID database, and thereafter the database export files were sent to the respective CPs for validation.

Table 2. Overview of submitted information by Contracting Parties.

Contracting Party	RID 2011 Report submitted	RID 2011 Data submitted	RID 2011 Data validated
Belgium	-	-	-
Denmark	-	X	X
France	X	X	X
Germany	X	X	-
Iceland	-	X	-
Ireland	-	X	X
Netherlands	-	-	-
Norway	X	X	X
Portugal	-	-	-
Spain	X	X	X
Sweden	X	X	X
United Kingdom	X	X	X

Table 3. Overview of information for 2011 on inputs to the OSPAR Maritime Area reported by Contracting Parties (green = data submitted; red = no data submitted; NA = not applicable).

Contracting Party	Sewage effluents	Industrial effluents	Main rivers	Tributary rivers
Belgium [1]	NA	NA	red	red
Denmark	green	green	green	green
France	red	red	green	green
Germany	green	green	green	green
Iceland	red	red	green	red
Ireland	green	green	green	green
Netherlands	red	red	red	red
Norway	green	green	green	green
Portugal	red	red	red	red
Spain [2]	green	green	green	green
Sweden	green	green	green	green
UK [3]	green	green	green	green

[1] Belgium claims that no sewage or industrial effluents discharge directly to Belgium's Convention Waters.
[2] For direct discharges, Spain reports on calendar years (i.e. 2011), whereas for riverine inputs data are reported for hydrological years (i.e. Oct 2010 – Sept 2011).
[3] UK does not report inputs from main and tributary rivers separately, as they report on areas rather than individual rivers.

3 References

Borgvang, S.A., Skarbøvik, E. and Pengerud, A. 2008. Comprehensive Study on Riverine Inputs and Direct Discharges (RID): Presentation and Assessment of the OSPAR Contracting Parties' RID 2006 Data. ISBN 978-1-906840-17-4. OSPAR Publication Number: 376/2008.

Borgvang. S.A., Stålnacke, P.G. and Pengerud, A. 2009a. Comprehensive Study on Riverine Inputs and Direct Discharges (RID): Presentation and Assessment of the OSPAR Contracting Parties' RID 2007 Data. ISBN 978-1-906840-90-7. OSPAR Publication Number: 450/2009.

Borgvang, S.A. et al. 2009b. Trends in waterborne inputs. Assessment of riverine inputs and direct discharges of nutrients and selected hazardous substances to OSPAR maritime area in 1990-2006. OSPAR Commission 2009, Monitoring and Assessment Series no 448/2009; ISBN 978-1-906840-88-4. 113 pp.

Pengerud, A. and Skarbøvik, E. 2011. Riverine Inputs and Direct Discharges to Convention Waters: OSPAR Contracting Parties' RID 2009 Data Report. ISBN 978-1-907390-81-4. OSPAR Publication Number: 540/2011.

Pengerud, A. and Skarbøvik, E. 2012. Riverine Inputs and Direct Discharges to Convention Waters: OSPAR Contracting Parties' RID 2010 Data Report. ISBN 978-1-907390-82-1. OSPAR Publication Number: 565/2012.

Skarbøvik, E. and Borgvang, S.A. 2007. Comprehensive Study on Riverine Inputs and Direct Discharges (RID): Overview of the RID 2005 Data and an Analysis of the Reliability, Accuracy, Comparability and Completeness of the Data OSPAR Commission. ISBN 978-1-905859-65-8, OSPAR Publication No 326.

Skarbøvik, E., Gjemlestad, L., Stålnacke, P., Sonesten, L., Svendsen, L. and Larsen, S.E. 2010. Riverine Inputs and Direct Discharges to Convention Waters: OSPAR Contracting Parties' RID 2008 Data Report. 978-1-907390-53-1. OSPAR Publication Number: 512/2010.

Annex I Details about the RID Principles

1. Under the RID Principles, Contracting Parties should aim to monitor, on a regular basis, 90 % of the inputs of each selected pollutant.

2. The following determinants are to be monitored on a mandatory basis:

- Total Mercury (Hg)
- Total Cadmium (Cd)
- Total Copper (Cu)
- Total Zinc (Zn)
- Total Lead (Pb)
- Ammonia, expressed as N
- Nitrates, expressed as N
- Orthophosphates, expressed as P
- Total N
- Total P

3. The following determinants are recommended for monitoring on a voluntary basis:

   a. Hydrocarbons, in particular PAHs[2] and mineral oil[3] (strongly recommended);

   b. PCBs (the following congeners: IUPAC Nos 28, 52, 101, 118, 153, 138, 180);

   c. Other hazardous substances (particularly organohalogen compounds - in order to determine which organohalogen compounds should be included in future input studies)[4]."

4. Contracting Parties are requested to report the relevant data annually (by 1 November) and to provide, for a selection of their main rivers, information on the annual mean/median concentration of selected pollutant.

5. Sources for monitoring and reporting of direct discharges under the RID Principles include sewage effluents, industrial effluents and mariculture. As far as practicable, estimate inputs from unmonitored areas (including diffuse sources, and minor direct sources and rivers) should complement the percentage monitored to 100 %.

6. Contracting Parties are requested to report their annual RID data together with an explanatory text report using the reporting format appended to the RID Principles. The results of annual RID data reporting are published by OSPAR each year.

7. RID data are to be reviewed periodically with the objective of determining temporal and long-term trends of contaminant concentrations and inputs as a basis for trend assessment. Such an assessment of data collected under RID in 1990 – 2002 was carried out by the Environmental Assessment and Monitoring Committee (ASMO) in 2005 (publication number: 2005/233). A further assessment is currently being prepared for 2009.

---

[2] These are as follows: phenanthrene, anthracene, fluoranthene, pyrene, benzo[*a*]anthracene, chrysene, benzo[*a*]pyrene, benzo[*ghi*]perylene, indeno[*1,2,3-cd*]pyrene.

[3] Provided that a suitable method is available.

[4] INPUT November 1995 agreed not to advocate routine monitoring of riverine inputs of pesticides Convention-wide, but to address specific requests from SIME or DIFF* on a case by case basis. (* Secretariat note: DIFF was discontinued by OSPAR 2000. The work formerly undertaken by DIFF has been carried out by SPDS until 2004/2005 and, since then, by HSC.)

Annex II Annual Overview Tables 2011 (AA Tables)

AA Table 1a. Information Received on Inputs to the Maritime Area of the OSPAR Convention in 2011

Country	Direct Discharges			Riverine Inputs	
	Sewage Effluents	Industrial Effluents	Coastal Areas	Main Rivers	Tributary Rivers
Belgium					
- North Sea (BE)	NI	NI		NI	NI
Denmark					
- Skagerrak (DK)	+	+		+	NI
- Kattegat (DK)	+	+		+	NI
- North Sea (DK)	+	+		+	NI
France					
- Channel	NI	NI		+	+
- Atlantic	NI	NI		+	+
Germany					
- North Sea (GER)	+	+		+	+
Iceland					
- Atlantic	NI	NI		+	NI
Ireland					
- Irish Sea	+	+		+	+
- Celtic Sea	+	+		+	+
- Atlantic	+	+		+	+
Netherlands					
- North Sea (NL)	NI	NI		NI	NI
Norway					
- Norwegian Sea (NO)	+	+		+	+
- Barents Sea (NO)	+	+		+	+
- Skagerrak (NO)	+	+		+	+
- North Sea (NO)	+	+		+	+
Portugal					
- Bay of Biscay and Iberian Co	NI	NI		NI	NI
Spain					
- Atlantic (ESP)	+	+		+	+
Sweden					
- Kattegat (SWE)	+	+		+	+
- Skagerrak (SWE)	+	+		+	+
UK					
- North Sea (North)	+	+		+	NI
- North Sea (South)	+	+		+	NI
- Channel	+	+		+	NI
- Irish Sea	+	+		+	NI
- Celtic Sea	+	+		+	NI
- Atlantic	+	+		+	NI

\+ = Information available
NI = No information

AA Table 1b. Determinands reported by Contracting Parties in 2011

Country	Determinands													
	Cd	Hg	Cu	Pb	Zn	g-HCH	PCBs	NH4-N	NO3-N	PO4-P	N-Tota	P-Tota	SPM	others
Belgium														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
Denmark														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	+	+	+	+	+	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	+	+	+	+	+	+	
France														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	R+	R+	R+	R+	R+	R+	NI	R+	R+	R+	R+	R+	R+	
Germany														
- direct inputs	R+	R+	R+	R+	R+	R+	R+	R+	R+	+	+	+	+	
- riverine inputs	R+	R+	R+	R+	R+	R+	R+	R+	+	R+	+	+	R+	
Iceland														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	+	+	+	+	+	NI	NI	NI	+	+	+	+	NI	
Ireland														
- direct inputs	+	NI	+	+	+	NI	NI	NI	NI	NI	+	+	+	
- riverine inputs	R+	R+	R+	R+	+	NI	NI	R+	R+	R+	R+	R+	NI	
Netherlands														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
Norway														
- direct inputs	+	+	+	+	+	NI	+	+	+	+	+	+	+	As,Total Cr,Ni,TOC
- riverine inputs	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	As,Total Cr,Ni,TOC
Portugal														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
Spain														
- direct inputs	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	
- riverine inputs	R+	R+	R+	R+	R+	R+	NI	R+	R+	R+	R+	R+	R+	
Sweden														
- direct inputs	R+	R+	R+	R+	R+	NI	NI	R+	NI	NI	R+	R+	NI	
- riverine inputs	R+	R+	R+	R+	R+	NI	NI	R+	R+	R+	R+	R+	NI	
UK														
- direct inputs	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	
- riverine inputs	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	R+	

+ : Data provided
R: Estimate given as a range
NI: No information

AA Table 2. Direct Discharges to the Maritime Area of the OSPAR Convention in 2011 by Country

Country	Region		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM [kt/a]
Belgium	North Sea (BE)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Denmark [1]	Kattegat (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.046	0.417	0.026	0.462	0.04	NI
		upper	NI	NI	NI	NI	NI	NI	NI	0.046	0.417	0.026	0.462	0.04	NI
	North Sea (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.011	0.102	0.011	0.114	0.016	NI
		upper	NI	NI	NI	NI	NI	NI	NI	0.011	0.102	0.011	0.114	0.016	NI
	Skagerrak (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.002	0.015	4E-04	0.017	6E-04	NI
		upper	NI	NI	NI	NI	NI	NI	NI	0.002	0.015	4E-04	0.017	6E-04	NI
France	Atlantic	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
	Channel	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Germany	North Sea (GER)	lower	0.002	5E-04	1.634	0.72	8.304	0.011	0.03	1.668	1.981	0.062	3.987	0.399	1.142
		upper	0.064	0.041	1.862	1.749	8.441	0.271	3.84	1.668	1.981	0.062	3.987	0.399	1.142
Iceland	Atlantic	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Ireland	Atlantic	lower	0.007	NI	0.83	0.39	7.7	NI	NI	NI	NI	NI	0.702	0.206	4.323
		upper	0.007	NI	0.83	0.39	7.7	NI	NI	NI	NI	NI	0.702	0.206	4.323
	Celtic Sea	lower	0.023	NI	3.2	4.4	21.5	NI	NI	NI	NI	NI	2.671	0.654	18.59
		upper	0.023	NI	3.2	4.4	21.5	NI	NI	NI	NI	NI	2.671	0.654	18.59
	Irish Sea	lower	0.06	NI	7.5	3.3	63	NI	NI	NI	NI	NI	6.833	1.575	38.13
		upper	0.06	NI	7.5	3.3	63	NI	NI	NI	NI	NI	6.833	1.575	38.13
Netherlands	North Sea (NL)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Norway [1]	Barents Sea (NO)	lower	0	5E-04	0	0	0	NI	NI	0.184	0.012	0.019	0.245	0.032	0.022
		upper	0	5E-04	0	0	0	NI	NI	0.184	0.012	0.019	0.245	0.032	0.022
	North Sea (NO)	lower	0.065	0.003	0.976	0.979	9.006	NI	NI	2.992	0.199	0.263	3.99	0.438	7.582
		upper	0.065	0.003	0.976	0.979	9.006	NI	NI	2.992	0.199	0.263	3.99	0.438	7.582
	Norwegian Sea (N	lower	0.067	0.004	1.347	3.902	3.529	NI	0.187	3.402	0.227	0.306	4.537	0.509	8.627
		upper	0.067	0.004	1.347	3.902	3.529	NI	0.187	3.402	0.227	0.306	4.537	0.509	8.627
	Skagerrak (NO)	lower	0.053	0.009	9.776	0.659	15.21	NI	44.37	4.276	0.285	0.111	5.701	0.185	1.929
		upper	0.053	0.009	9.776	0.659	15.21	NI	44.37	4.276	0.285	0.111	5.701	0.185	1.929
Portugal	Bay of Biscay and	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Spain [1]	Atlantic (ESP)	lower	0.111	0.405	7.285	0.39	36.64	0.073	0.509	9.442	1.751	0.838	15.63	1.95	304
		upper	5.7	1.146	24.62	22.09	44.64	32.91	41.8	9.478	1.935	0.846	15.64	1.957	304.1
Sweden [2]	Kattegat (SWE)	lower	0.037	0.005	1.86	0.186	5.117	NI	NI	1.122	NI	NI	1.786	0.074	NI
		upper	0.037	0.005	1.86	0.186	5.117	NI	NI	1.122	NI	NI	1.786	0.074	NI
	Skagerrak (SWE)	lower	5E-04	0.001	0.207	0.341	0.603	NI	NI	0.203	NI	NI	0.323	0.008	NI
		upper	5E-04	0.001	0.207	0.341	0.603	NI	NI	0.203	NI	NI	0.323	0.008	NI
UK [1]	Atlantic	lower	0.332	0.004	10.49	1.545	17.93	1.38	NI	3.77	1.323	0.989	6.831	1.121	18.84
		upper	0.333	0.006	10.49	1.549	17.93	1.38	NI	3.77	1.358	0.989	6.848	1.121	18.85
	Celtic Sea	lower	0.086	0.016	2.176	4.274	162.6	0.016	0.274	3.815	0.455	0.305	4.122	0.305	4.888
		upper	0.107	0.018	2.178	4.661	162.6	1.758	0.348	3.848	0.517	0.322	4.184	0.322	4.888
	Channel	lower	0.01	0.003	4.192	0.515	8.726	0.121	0.142	5.464	2.029	0.695	7.578	0.695	11
		upper	0.015	0.004	4.196	0.642	8.73	4.438	5.989	5.506	2.068	0.73	7.603	0.73	11.01
	Irish Sea	lower	1.035	0.046	2.548	3.074	12.89	0.001	0	0.388	0.373	0.184	0.769	0.241	8.705
		upper	1.055	0.053	2.548	3.092	13.03	0.001	0.291	0.405	0.401	0.187	0.777	0.244	8.962
	North Sea (North)	lower	0.028	0.017	13.65	1.665	25.69	1.113	0	9.668	3.17	1.347	15.8	1.847	24.09
		upper	0.031	0.021	13.65	1.752	25.69	4.695	7.418	9.669	3.211	1.359	15.8	1.859	24.13
	North Sea (South)	lower	0.055	0.068	14.93	3.703	50.82	0	0	3.594	8.66	1.604	12.66	1.604	116
		upper	0.12	0.072	15.01	4.602	51.43	17.67	30.42	3.607	8.681	1.607	12.66	1.607	116.1

[1] Denmark, Norway, Spain and UK also report inputs from aquaculture/fish farming. AA Table 2 is generated by the RID database as the sum of national data tables 5a and 5b. As inputs from aquaculture/fish farming are reported in other tables (5c or 5d) these inputs are not included in the totals presented here.

[2] Sweden reports inputs from stormwater overflows in addition to sewage effluents in table 5a. As table 5a is taken into account when generating AA Table 2, the totals presented here do also include this additional source reported by Sweden.

AA Table 3. Riverine Inputs to the Maritime Area of the OSPAR Convention in 2011 by Country

Country	**Sea Area**		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM [kt/a]
Belgium	North Sea (BE)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Denmark [1]	Kattegat (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.692	16.26	0.289	19.83	0.697	19.04
		upper	NI	NI	NI	NI	NI	NI	NI	0.692	16.26	0.289	19.83	0.697	19.04
	North Sea (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.573	11.38	0.145	14.06	0.575	30.97
		upper	NI	NI	NI	NI	NI	NI	NI	0.573	11.38	0.145	14.06	0.575	30.97
	Skagerrak (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.075	1.146	0.021	1.403	0.086	9.581
		upper	NI	NI	NI	NI	NI	NI	NI	0.075	1.146	0.021	1.403	0.086	9.581
France	Atlantic	lower	0.951	2.681	47.11	2.195	138.8	8.773	NI	1.884	127.9	0.94	120.5	2.889	632.8
		upper	5.092	6.38	63.19	19.49	205.2	90.4	NI	2.205	127.9	1.37	153.9	3.014	636.9
	Channel	lower	0	0	47.66	42.07	222.2	7.565	NI	3.635	114.1	1.553	116.6	2.638	397.6
		upper	15.74	8.056	48.53	43.94	222.6	328.6	NI	3.724	114.1	1.606	133	2.638	398.1
Germany	North Sea (GER)	lower	5.738	1.842	202.4	135.2	1145	19.8	0	7.649	171.3	1.991	207.5	7.733	1521
		upper	5.961	1.945	202.4	138.3	1154	38.5	22.16	7.649	171.3	2.035	207.5	7.733	1603
Iceland	Atlantic	lower	0.028	0.023	10.69	0.39	11.58	NI	NI	NI	0.764	0.282	1.337	0.386	NI
		upper	0.028	0.023	10.69	0.39	11.58	NI	NI	NI	0.764	0.282	1.337	0.386	NI
Ireland	Atlantic	lower	0	0	28.8	0.654	113.1	NI	NI	0.214	14.47	0.462	26.03	0.614	NI
		upper	2.011	0.974	29.63	10.09	113.1	NI	NI	0.673	15.99	0.482	26.21	0.642	NI
	Celtic Sea	lower	0.02	0	34.07	2.975	148.5	NI	NI	0.856	43.34	0.741	57.6	1.005	NI
		upper	2.559	1.281	35.37	14.92	148.5	NI	NI	0.908	43.34	0.753	58.72	1.137	NI
	Irish Sea	lower	0.235	0	12.48	2.51	79.87	NI	NI	0.219	13.62	0.136	16.94	0.29	NI
		upper	0.688	0.261	12.48	4.667	79.87	NI	NI	0.226	13.62	0.142	16.94	0.304	NI
Netherlands	North Sea (NL)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Norway	Barents Sea (NO)	lower	0.236	0.021	21.3	1.151	21.87	0	0	0.156	0.317	0.038	3.636	0.113	40.72
		upper	0.263	0.031	21.31	1.167	21.89	0.586	4.166	0.164	0.318	0.041	3.636	0.114	40.76
	North Sea (NO)	lower	0.496	0.054	29.63	9.879	91.68	0	0	0.498	6.911	0.152	13.37	0.349	97.51
		upper	0.533	0.079	29.65	9.883	91.71	0.807	5.841	0.506	6.913	0.163	13.37	0.35	97.57
	Norwegian Sea (N	lower	0.563	0.065	74.1	7.78	143.1	0	0	0.473	4.808	0.334	12.49	0.539	400.1
		upper	0.667	0.102	74.11	7.819	143.2	1.947	14.28	0.488	4.809	0.351	12.5	0.542	400.3
	Skagerrak (NO)	lower	1.366	0.087	111.5	24.45	546.6	0	0	1.346	19.08	0.539	36.32	1.16	600.4
		upper	1.369	0.121	111.5	24.45	546.6	12.87	102	1.346	19.08	0.547	36.32	1.16	600.4
Portugal	Bay of Biscay and	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Spain	Atlantic (ESP)	lower	4.245	0.066	31.48	1.297	271.1	8.067	NI	0.661	24.68	0.606	18.96	0.538	276.2
		upper	14.16	0.39	138.9	20.02	386.6	111.7	NI	0.95	24.76	0.725	21.88	1.35	295.5
Sweden [1]	Kattegat (SWE)	lower	0.42	0.084	40.9	11.4	115	NI	NI	1.193	17.28	0.28	27.88	0.698	NI
		upper	0.42	0.084	40.9	11.4	115	NI	NI	1.193	17.28	0.28	27.88	0.698	NI
	Skagerrak (SWE)	lower	0.061	0.013	4.354	1.26	13.91	NI	NI	0.152	1.082	0.051	2.619	0.116	NI
		upper	0.061	0.013	4.354	1.26	13.91	NI	NI	0.152	1.082	0.051	2.619	0.116	NI
UK	Atlantic	lower	0.363	0.096	31.94	26.34	108.6	NI	NI	0.988	13.14	1.004	19.24	2.665	363.2
		upper	0.404	0.175	32.21	26.64	108.8	NI	NI	1.329	13.65	1.101	19.61	2.668	370.7
	Celtic Sea	lower	0.488	0.036	36.74	24.97	196.2	0.411	0	0.753	29.8	1.005	30.93	1.005	350.4
		upper	1.242	0.124	37.11	33.3	206.8	31.3	29.56	0.871	29.88	1.058	30.97	1.058	353
	Channel	lower	0.277	0.03	24.23	10.92	90.21	0.061	0	0.202	18.73	0.555	20.89	0.555	96.61
		upper	0.416	0.071	24.27	11.99	96.47	15.65	38.38	0.269	18.73	0.564	20.89	0.564	99.21
	Irish Sea	lower	1.08	0.099	78.44	52.42	326.2	0.156	0	2.336	31.67	1.942	40.05	2.315	521.6
		upper	1.562	0.226	78.83	57.16	335.3	42.96	71.99	2.675	31.85	2.091	40.05	2.407	530.6
	North Sea (North)	lower	0.845	0.077	42.25	71.17	301.4	0.007	0.016	0.76	26.19	0.607	36.74	1.319	490.9
		upper	0.956	0.206	43.26	71.7	303.1	10.68	26.74	0.941	26.64	0.756	36.75	1.357	504.6
	North Sea (South)	lower	0.702	0.049	34.66	43.83	166.4	0.386	0	1.107	52.06	2.735	53.45	2.735	144.1
		upper	0.943	0.117	34.7	44.49	170.8	27.38	67.47	1.139	52.06	2.743	53.46	2.743	145.9

[1] For Sweden and Denmark the inputs also include unmonitored areas.

AA Table 4a. Sum of Direct (Table 2) and Riverine (Table 3) Inputs to the Maritime area of the OSPAR Convention in 2011 by Country

See footnotes to Tables 2 and 3 for explanations to possible deviations from the reported data.

Sea Area	Region		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM [kt/a]
Belgium	North Sea (BE)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Denmark	Kattegat (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.738	16.68	0.315	20.29	0.737	19.04
		upper	NI	NI	NI	NI	NI	NI	NI	0.738	16.68	0.315	20.29	0.737	19.04
	North Sea (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.584	11.48	0.156	14.17	0.591	30.97
		upper	NI	NI	NI	NI	NI	NI	NI	0.584	11.48	0.156	14.17	0.591	30.97
	Skagerrak (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.077	1.161	0.021	1.42	0.087	9.581
		upper	NI	NI	NI	NI	NI	NI	NI	0.077	1.161	0.021	1.42	0.087	9.581
France	Atlantic	lower	0.951	2.681	47.11	2.195	138.8	8.773	NI	1.884	127.9	0.94	120.5	2.889	632.8
		upper	5.092	6.38	63.19	19.49	205.2	90.4	NI	2.205	127.9	1.37	153.9	3.014	636.9
	Channel	lower	0	0	47.66	42.07	222.2	7.565	NI	3.635	114.1	1.553	116.6	2.638	397.6
		upper	15.74	8.056	48.53	43.94	222.6	328.6	NI	3.724	114.1	1.606	133	2.638	398.1
Germany	North Sea (GER)	lower	5.74	1.843	204	135.9	1153	19.81	0.03	9.317	173.3	2.053	211.5	8.132	1522
		upper	6.025	1.986	204.2	140	1162	38.77	26	9.317	173.3	2.097	211.5	8.132	1604
Iceland	Atlantic	lower	0.028	0.023	10.69	0.39	11.58	NI	NI	NI	0.764	0.282	1.337	0.386	NI
		upper	0.028	0.023	10.69	0.39	11.58	NI	NI	NI	0.764	0.282	1.337	0.386	NI
Ireland	Atlantic	lower	0.007	0	29.63	1.044	120.8	NI	NI	0.214	14.47	0.462	26.73	0.82	4.323
		upper	2.018	0.974	30.46	10.48	120.8	NI	NI	0.673	15.99	0.482	26.91	0.848	4.323
	Celtic Sea	lower	0.043	0	37.27	7.375	170	NI	NI	0.856	43.34	0.741	60.28	1.659	18.59
		upper	2.582	1.281	38.57	19.32	170	NI	NI	0.908	43.34	0.753	61.39	1.791	18.59
	Irish Sea	lower	0.295	0	19.98	5.81	142.9	NI	NI	0.219	13.62	0.136	23.77	1.865	38.13
		upper	0.748	0.261	19.98	7.967	142.9	NI	NI	0.226	13.62	0.142	23.77	1.879	38.13
Netherlands	North Sea (NL)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Norway	Barents Sea (NO)	lower	0.236	0.021	21.3	1.151	21.87	0	0	0.34	0.329	0.057	3.881	0.145	40.74
		upper	0.263	0.031	21.31	1.167	21.89	0.586	4.166	0.348	0.33	0.06	3.881	0.146	40.78
	North Sea (NO)	lower	0.561	0.057	30.61	10.86	100.7	0	0	3.49	7.11	0.414	17.36	0.787	105.1
		upper	0.597	0.082	30.63	10.86	100.7	0.807	5.841	3.498	7.112	0.426	17.36	0.788	105.2
	Norwegian Sea (N	lower	0.63	0.069	75.44	11.68	146.6	0	0.187	3.875	5.035	0.639	17.02	1.048	408.7
		upper	0.734	0.106	75.46	11.72	146.7	1.947	14.46	3.891	5.036	0.657	17.03	1.051	408.9
	Skagerrak (NO)	lower	1.418	0.095	121.3	25.11	561.9	0	44.37	5.622	19.37	0.65	42.02	1.345	602.3
		upper	1.422	0.129	121.3	25.11	561.9	12.87	146.4	5.622	19.37	0.658	42.02	1.345	602.3
Portugal	Bay of Biscay and	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Spain	Atlantic (ESP)	lower	4.356	0.471	38.77	1.688	307.8	8.14	0.509	10.1	26.43	1.444	34.59	2.487	580.2
		upper	19.86	1.536	163.5	42.11	431.3	144.6	41.8	10.43	26.69	1.571	37.52	3.307	599.5
Sweden	Kattegat (SWE)	lower	0.457	0.089	42.76	11.59	120.1	NI	NI	2.315	17.28	0.28	29.66	0.772	NI
		upper	0.457	0.089	42.76	11.59	120.1	NI	NI	2.315	17.28	0.28	29.66	0.772	NI
	Skagerrak (SWE)	lower	0.062	0.014	4.561	1.601	14.51	NI	NI	0.355	1.082	0.051	2.942	0.124	NI
		upper	0.062	0.014	4.561	1.601	14.51	NI	NI	0.355	1.082	0.051	2.942	0.124	NI
UK	Atlantic	lower	0.696	0.1	42.43	27.89	126.5	1.38	NI	4.759	14.46	1.992	26.07	3.786	382.1
		upper	0.737	0.181	42.71	28.19	126.7	1.38	NI	5.099	15.01	2.089	26.46	3.788	389.5
	Celtic Sea	lower	0.574	0.052	38.91	29.24	358.8	0.427	0.274	4.568	30.26	1.31	35.06	1.31	355.3
		upper	1.35	0.142	39.29	37.96	369.4	33.06	29.9	4.719	30.4	1.38	35.16	1.38	357.8
	Channel	lower	0.287	0.033	28.42	11.44	98.94	0.182	0.142	5.666	20.76	1.25	28.47	1.25	107.6
		upper	0.431	0.075	28.47	12.63	105.2	20.09	44.37	5.775	20.8	1.294	28.5	1.294	110.2
	Irish Sea	lower	2.115	0.145	80.99	55.5	339.1	0.157	0	2.724	32.05	2.126	40.82	2.556	530.3
		upper	2.617	0.279	81.38	60.25	348.4	42.96	72.28	3.08	32.25	2.278	40.83	2.65	539.6
	North Sea (North)	lower	0.873	0.094	55.9	72.83	327.1	1.121	0.016	10.43	29.36	1.954	52.54	3.166	515
		upper	0.987	0.227	56.91	73.45	328.8	15.37	34.15	10.61	29.85	2.115	52.55	3.216	528.7
	North Sea (South)	lower	0.758	0.117	49.6	47.53	217.2	0.386	0	4.701	60.72	4.339	66.11	4.339	260.1
		upper	1.063	0.189	49.71	49.1	222.2	45.05	97.89	4.745	60.74	4.351	66.12	4.351	262

AA Table 4b. Sum of Direct and Riverine Inputs to the Maritime area of the OSPAR Convention in 2011 by Sea Area

See footnotes to Tables 2 and 3 for explanations to possible deviations from the reported data.

Sea Area		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM [kt/a]
Arctic Ocean	lower	0.236	0.021	21.3	1.151	21.87	0	0	0.34	0.329	0.057	3.881	0.145	40.74
	upper	0.263	0.031	21.31	1.167	21.89	0.586	4.166	0.348	0.33	0.06	3.881	0.146	40.78
Atlantic Ocean	lower	0.703	0.1	72.06	28.93	247.4	1.38	NI	4.972	28.93	2.454	52.8	4.606	386.4
	upper	2.754	1.155	73.17	38.67	247.5	1.38	NI	5.772	31	2.571	53.37	4.637	393.9
Bay of Biscay and Iberian Coast	lower	5.307	3.152	85.88	3.883	446.6	16.91	0.509	11.99	154.4	2.385	155.1	5.376	1213
	upper	24.95	7.916	226.7	61.59	636.5	235	41.8	12.63	154.6	2.941	191.4	6.321	1236
Celtic Sea	lower	0.617	0.052	76.18	36.62	528.8	0.427	0.274	5.424	73.6	2.052	95.33	2.969	373.9
	upper	3.932	1.423	77.86	57.28	539.4	33.06	29.9	5.627	73.75	2.133	96.55	3.171	376.4
Channel	lower	0.287	0.033	76.08	53.5	321.1	7.747	0.142	9.301	134.9	2.803	145.1	3.888	505.2
	upper	16.17	8.13	77	56.57	327.8	348.7	44.37	9.5	134.9	2.9	161.5	3.932	508.3
Irish Sea	lower	2.41	0.145	101	61.31	481.9	0.157	0	2.944	45.67	2.262	64.59	4.421	568.4
	upper	3.365	0.54	101.4	68.22	491.2	42.96	72.28	3.306	45.87	2.42	64.6	4.529	577.7
Kattegat	lower	0.457	0.089	42.76	11.59	120.1	NI	NI	3.053	33.96	0.595	49.95	1.509	19.04
	upper	0.457	0.089	42.76	11.59	120.1	NI	NI	3.053	33.96	0.595	49.95	1.509	19.04
North Sea (main body)	lower	7.931	2.11	340.1	267.1	1798	21.32	0.046	28.52	282	8.915	361.7	17.02	2433
	upper	8.672	2.484	341.5	273.5	1814	100	163.9	28.76	282.5	9.143	361.7	17.08	2531
Norwegian Sea	lower	0.63	0.069	75.44	11.68	146.6	0	0.187	3.875	5.035	0.639	17.02	1.048	408.7
	upper	0.734	0.106	75.46	11.72	146.7	1.947	14.46	3.891	5.036	0.657	17.03	1.051	408.9
Skagerrak	lower	1.48	0.109	125.8	26.71	576.4	0	44.37	6.054	21.61	0.722	46.38	1.556	611.9
	upper	1.483	0.144	125.8	26.71	576.4	12.87	146.4	6.054	21.61	0.73	46.38	1.556	611.9

Annex III Time series in direct discharges and riverine inputs (1990-2011)

Direct discharges 1990-2011

Total direct discharges as reported by CPs for the time period 1990-2011 are presented in Figures A.III.1-8. The data are presented for cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb), zinc (Zn), nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorus (P) and suspended particulate matter (SPM) for OSPAR Regions I-IV.

Total direct discharges include the sum of sewage and industrial effluents as reported in Tables 5a (sewage effluents) and 5b (industrial effluents) of the RID reporting format, but may also for some CPs include additional sources such as storm water overflows when such sources are included in one of the above-mentioned tables. Any additional direct discharges (e.g. aquaculture discharges) reported in Tables 5c (total direct discharges) or 5d (aquaculture discharges) are not included.

When assessing these time series (non-statistical) of discharges it is important to note the actual number of CPs that has reported for the respective years. This information is included on a secondary axis in all figures and the information is also summarised in Table A.III.1. Determinand coverage may also in some cases vary between years, but this is assumed to have limited influence on the overall totals in discharges.

Table A.III.1. Overview of missing reporting for direct discharges data (sewage and industrial effluents) 1990-2011.

Contracting Party	Sewage effluents	Industrial effluents
Belgium	1990, 1994, 1996-2011	1990, 1997-2011
Denmark	1999	1997, 1999,
France	1990-2002, 2006-2008, 2010-2011	1990-2003, 2006-2008, 2010-2011
Germany		
Iceland	1990, 1992-2005, 2007-2011	1990-2005, 2007-2011
Ireland[1]		
Netherlands	1994, 2007, 2010, 2011	1994, 2007, 2010, 2011
Norway		
Portugal	1990, 1992, 1993, 1996, 1998-2011	1990-1993, 1999-2011
Spain	1990-1997	1990-1997
Sweden		
UK	2011	2011

[1] All direct discharges reported by Ireland are 1990 data since the basis for calculation remains unchanged.

OSPAR Region I: Arctic Waters

Reported direct discharges to OSPAR Region I include discharges reported by Norway (Norwegian Sea and Barents Sea) and Iceland (Atlantic). The only reported direct discharges by Iceland are discharges of Cu, Pb and Zn in 1991. It is important to note that aquaculture discharges reported by Norway are not included in the figures presented here as these inputs included in the RID Database. This is particularly important for determinands such as Cu and nutrients where aquaculture contributes a dominant fraction of the overall totals.

There has been some increase in reported heavy metal discharges to OSPAR Region I, in particular for the determinands Hg, Cu and Pb. Reported discharges of Cu and Pb in 2011 were high as compared to previous years.

There was some increase in nutrient and SPM discharges in the mid 1990s, but after that discharges have remained relatively constant.

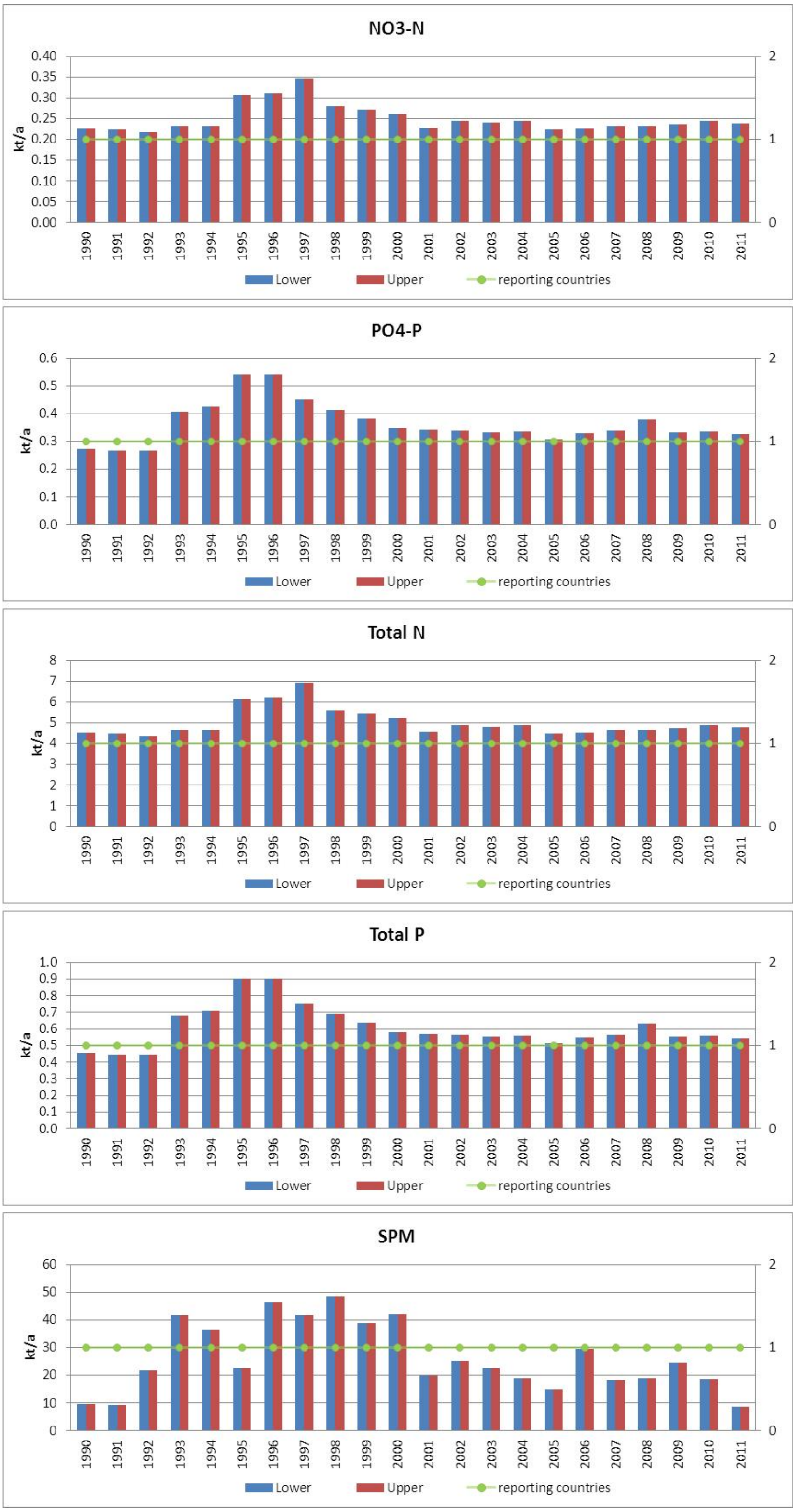


Figure A.III.2. Reported direct discharges of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region I 1990-2011. Right-hand axis shows the number of reporting CPs.

OSPAR Region II: Greater North Sea

Reported direct discharges to OSPAR Region II include discharges reported by Belgium (North Sea), Denmark (Skagerrak, Kattegat and North Sea), France (Channel), Germany (North Sea), Netherlands (North Sea), Norway (Skagerrak and North Sea), Sweden (Kattegat and Skagerrak) and UK (North Sea and Channel). Of these, Belgium does not report direct discharges, and so the maximum number of CPs reporting is seven. Reporting coverage for the selected determinands varies between two and seven countries per year. For 2011 data coverage remains low, and this makes it difficult to compare this year to previous years.

There has been a general decline in reported heavy metal discharges to OSPAR Region II during the reporting period. High metal discharges were reported in the early 1990s, whereas low discharges have been reported from 2000 onwards. Even in years with a higher reporting coverage (2009), there is no apparent increase in discharges of heavy metals.

There has been a small decline in reported nutrient and SPM discharges during the reporting period.

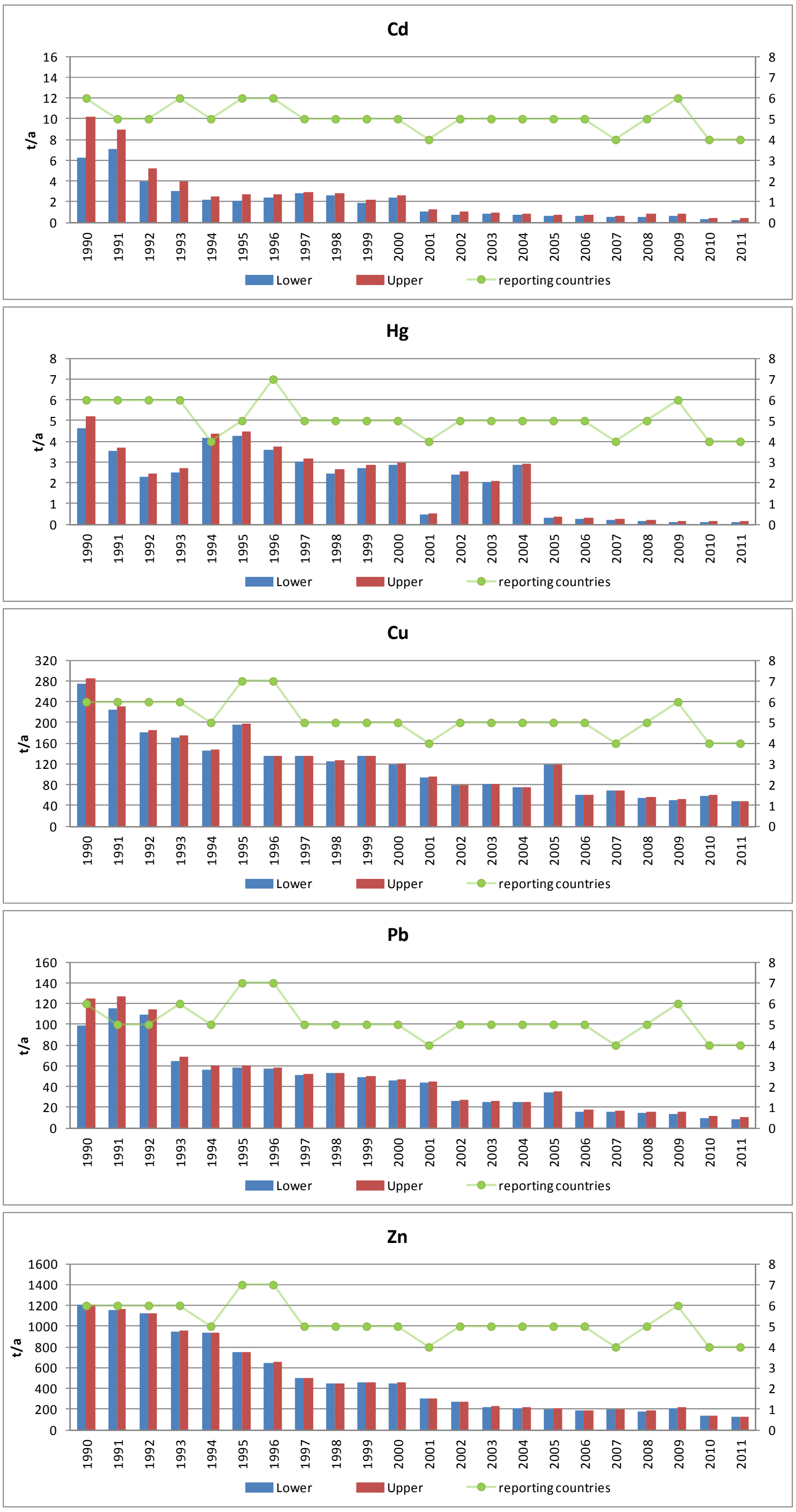


Figure A.III.3. Reported direct discharges of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region II 1990-2011. Right-hand axis shows the number of reporting CPs.

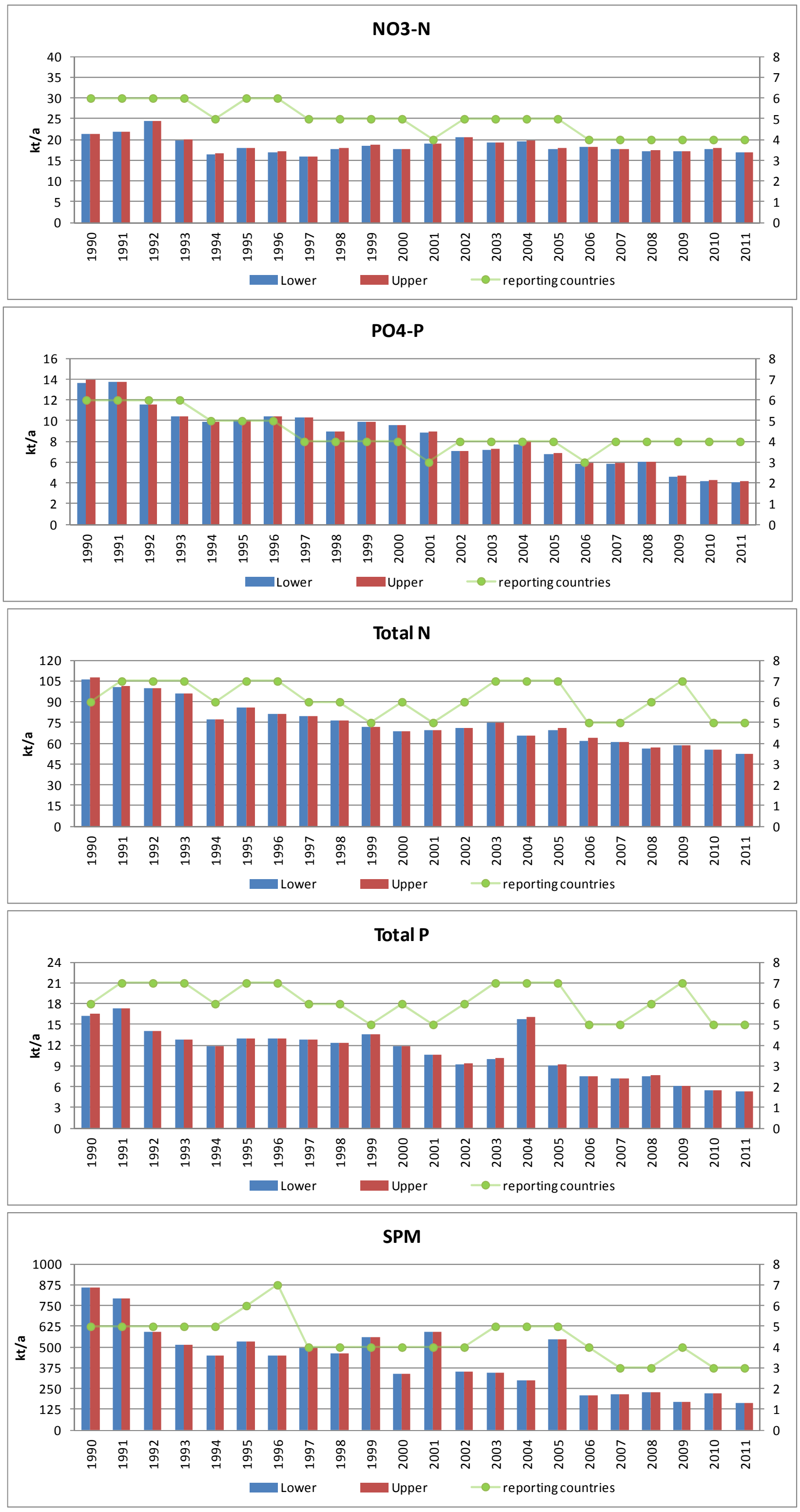


Figure A.III.4. Reported direct discharges of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region II 1990-2011. Right-hand axis shows the number of reporting CPs.

OSPAR Region III: Celtic Seas

Reported direct discharges to OSPAR Region III include discharges reported by two countries: Ireland (Irish Sea, Celtic Sea, and Atlantic) and UK (Atlantic, Irish Sea and Celtic Sea). The reporting coverage has remained relatively constant throughout the reporting period.

There has been a marked decrease in reported discharges of heavy metals to OSPAR Region III during the reporting period. High metal discharges were reported in the early 1990s, whereas low discharges have been reported from 2000 onwards.

A high upper estimate for Cu was reported in 2007. This is explained by the reported sewage effluents from the UK to the Irish Sea, where the difference between the upper and lower estimate is at 72 tonnes per year. This large difference is due to concentrations below limit of quantification (LOQ) for one discharge area (NI2), where the reported LOQ for sewage effluent samples was at 20 µg Hg/L in 2007.

For this region, there has also been a substantial decrease in reported discharges of PO4-P, total P and SPM.

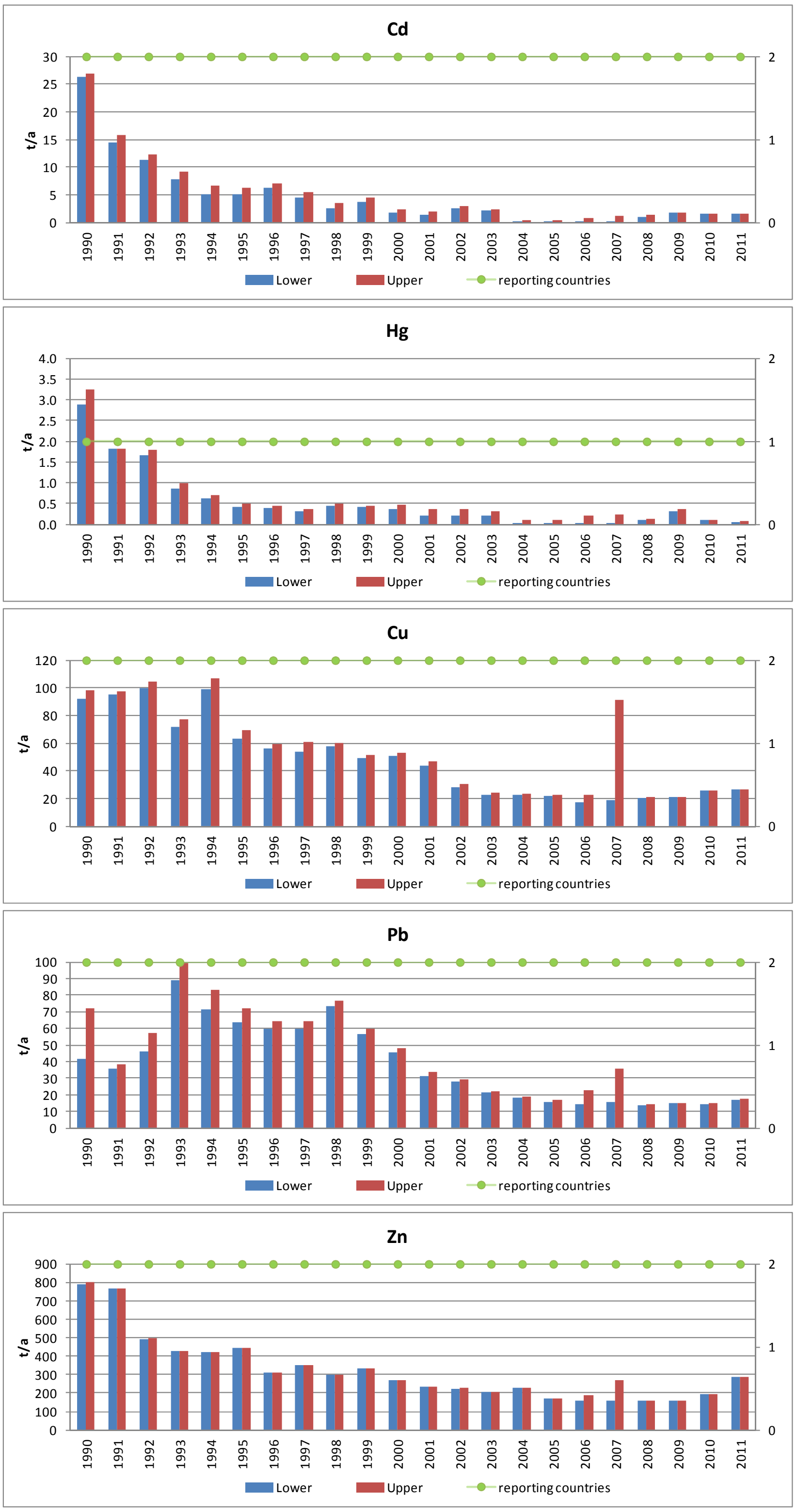


Figure A.III.5. Reported direct discharges of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region III 1990-2011. Right-hand axis shows the number of reporting CPs.

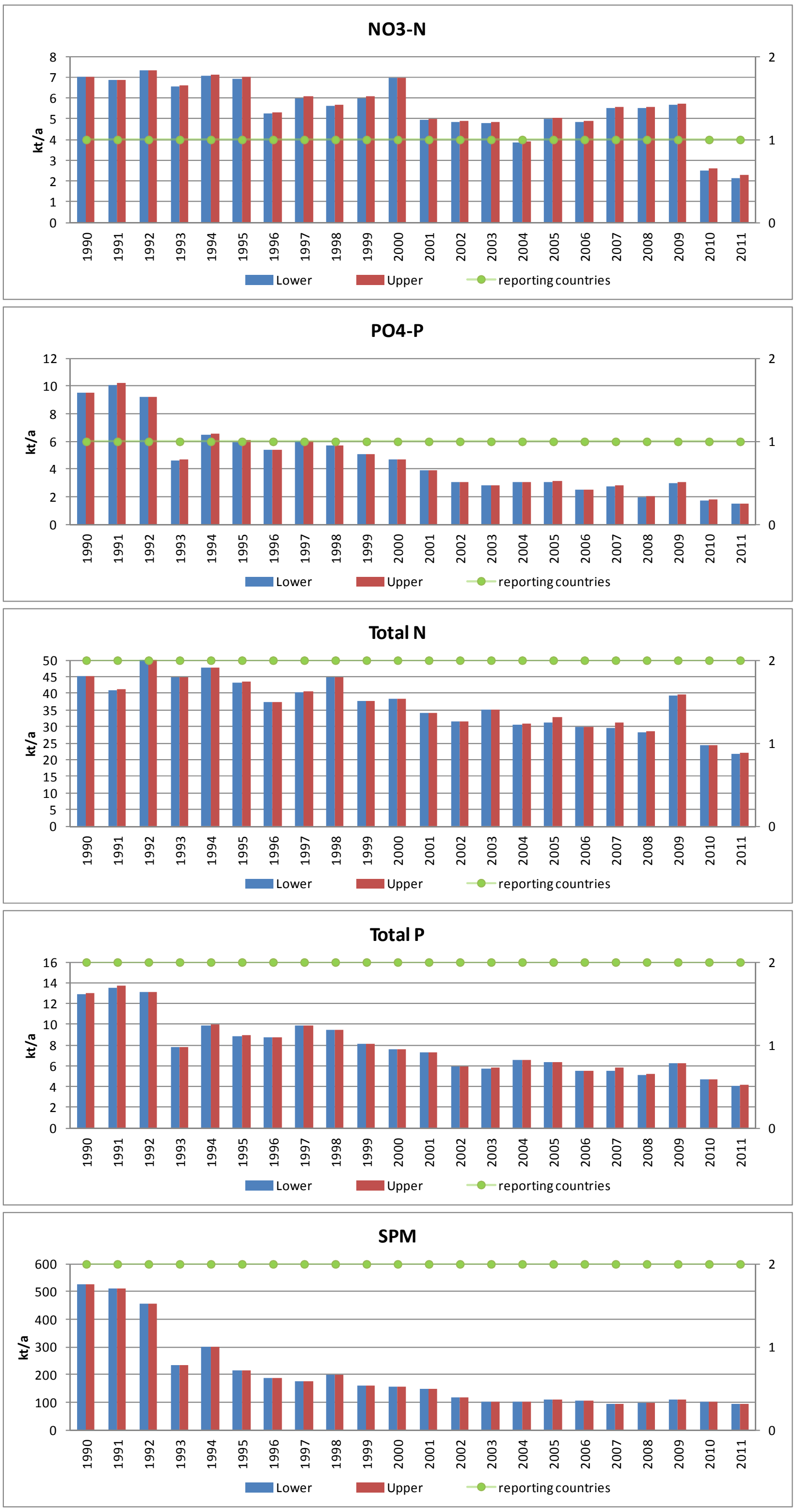


Figure A.III.6. Reported direct discharges of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region III 1990-2011. Right-hand axis shows the number of reporting CPs.

OSPAR Region IV: Bay of Biscay

Reported direct discharges to OSPAR Region IV include discharges reported by three countries: France (Atlantic), Portugal (Bay of Biscay and Iberian Coast), and Spain (Atlantic); however, France reported direct discharges in 2009 only. There were no reported discharges of metals (except Hg), NO3-N and PO4-P to OSPAR Region IV during the period 1990-1997. Portugal reported discharges of Hg from 1994, but these are so small (~0.1 t/a) that the bars do not appear on the graph.

There seem to be no general trends in reported discharges to OSPAR Region IV during the period 1998-2011. Even with the reported discharges from France in 2009, there is no apparent increase in total discharges.

Overall, there are large differences between lower and upper estimates for the reported heavy metal discharges. This reflects problems related to high limits of detection (LOD) and/or quantification (LOQ) for direct discharge samples and a number of samples with concentrations below these limits.

The peak in total N and P in 2000 is explained by the reported contribution from Spain (Atlantic). Reported discharges for the Galicia Costa (coastal area) were 286 kt/a and 17.5 kt/a for total N and P, respectively. If these are actual discharges, or if there could be a unit-error is not known. High SPM discharges were reported in 2009-2011.

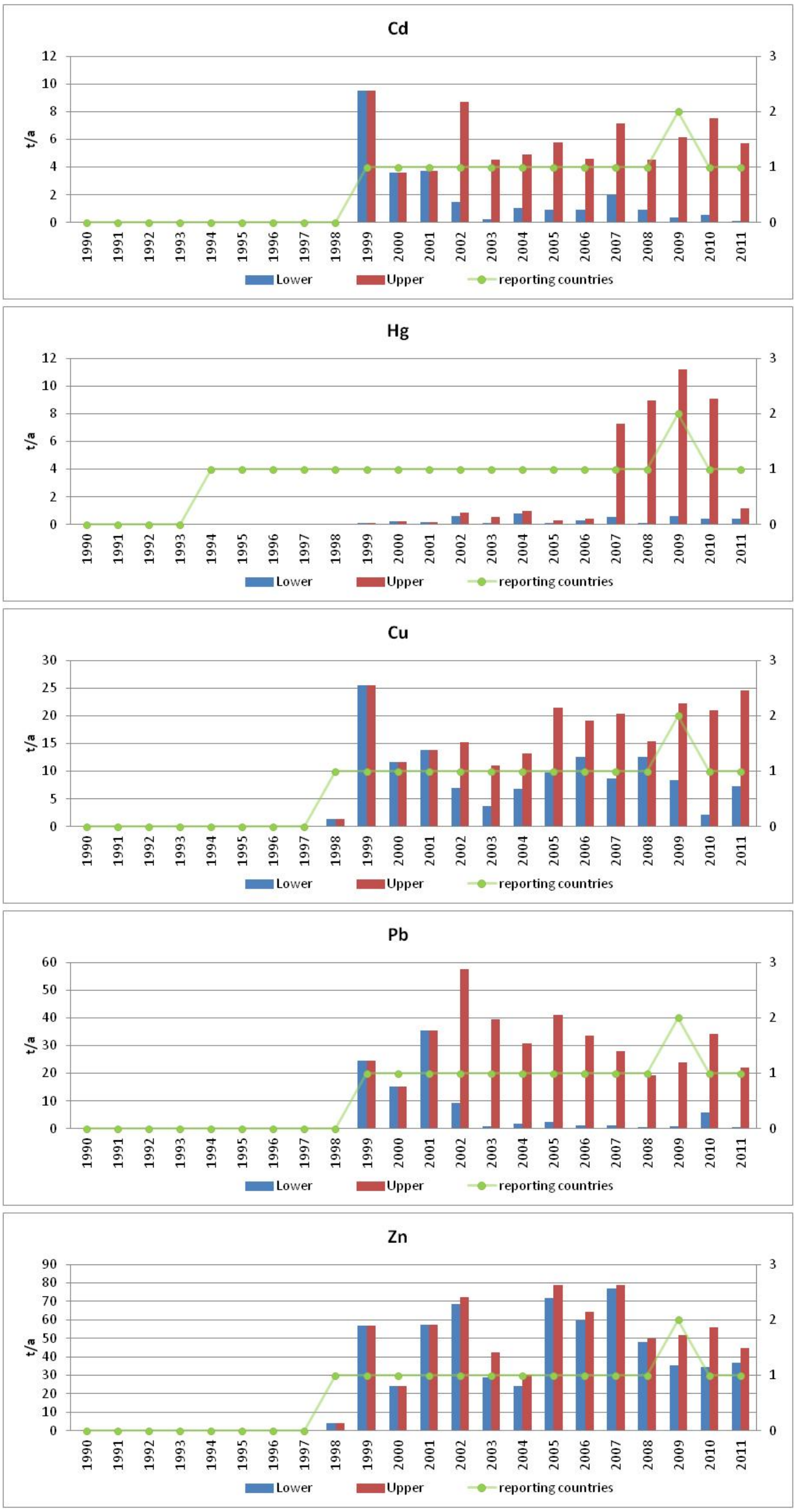


Figure A.III.7. Reported direct discharges of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region IV 1990-2011. Right-hand axis shows the number of reporting CPs.

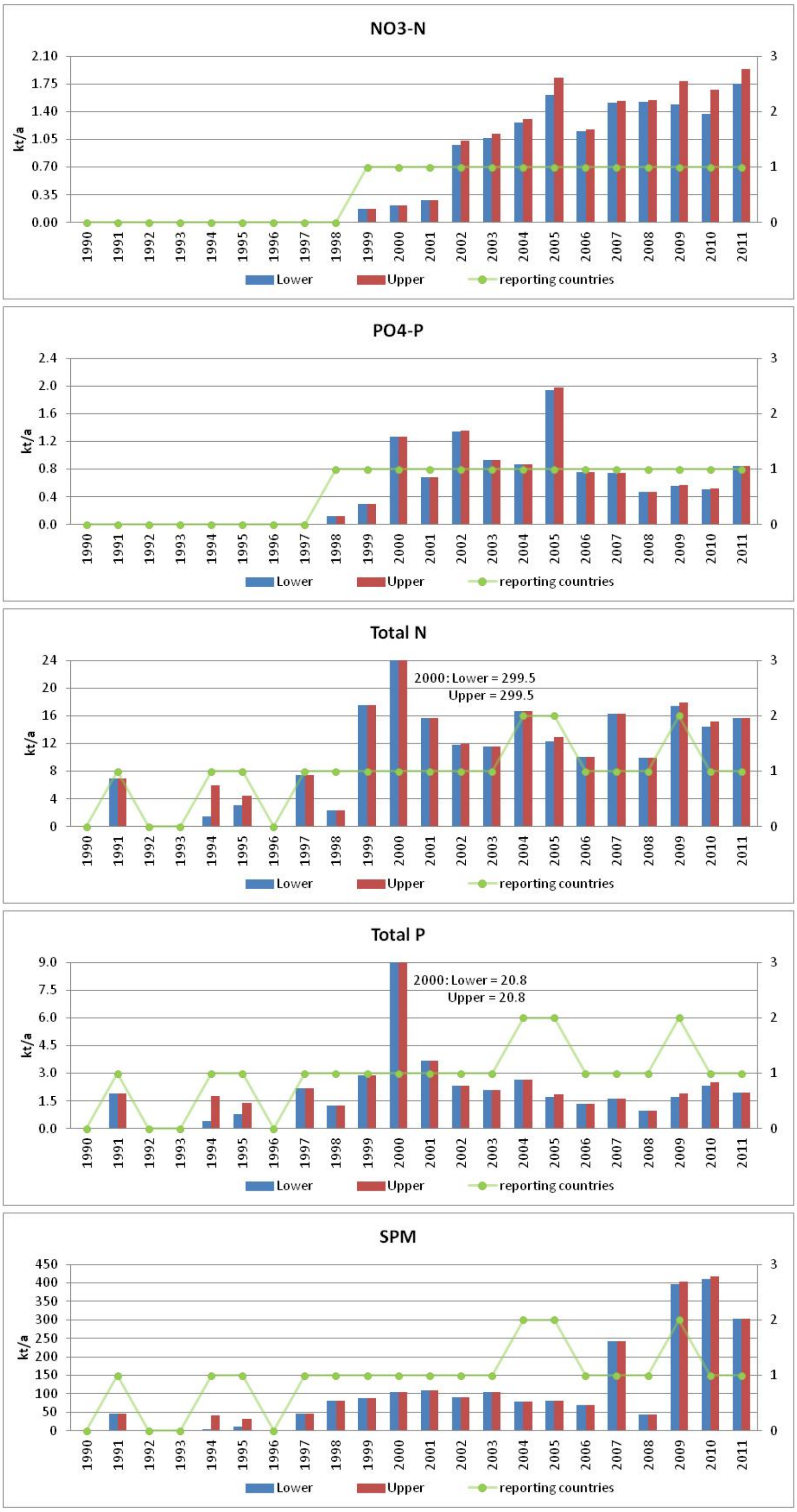


Figure A.III.8. Reported direct discharges of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region IV 1990-2011. Right-hand axis shows the number of reporting CPs.

Riverine inputs 1990-2011

Total riverine inputs as reported by CPs for the time period 1990-2011 are presented in Figures A.III.9-16. The data are presented for cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb), zinc (Zn), nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorus (P) and suspended particulate matter (SPM) for OSPAR Regions I-IV.

Total riverine inputs include the sum of inputs from main and tributary rivers (cf. glossary, page 4-5) as reported in Tables 6a (main rivers) and 6b (tributary rivers) of the RID reporting format, but may also for some CPs include additional sources such as unmonitored areas when such sources are included in one of the above-mentioned tables.

It is important to emphasise that the presented inputs are not flow-normalised. Between year variations in flow is a factor that might highly influence the apparent trends.

When assessing these time series (non-statistical) of inputs it is also important to note the actual number of CPs that has reported for the respective years. This information is included on a secondary axis in all figures and the information is also summarised in Table A.III.2. Determinand coverage may also in some cases vary between years, but this is assumed to have limited influence on the overall totals and trends in inputs.

Table A.III.2. Overview of missing reporting for riverine inputs data (main and tributary rivers) 1990-2011.

Contracting Party	Main rivers	Tributary rivers
Belgium	2010, 2011	2010, 2011
Denmark		
France		
Germany		
Iceland	1990-1996, 2006-2009	1990-2011
Ireland		
Netherlands	2011	1990, 2011
Norway		
Portugal	1992, 1993, 2002, 2005, 2011	1990, 1992, 1993, 2000-2011
Spain		1990-1996
Sweden		
UK		

OSPAR Region I: Arctic Waters

Reported riverine inputs to OSPAR Region I include inputs reported by Norway (Norwegian Sea and Barents Sea) and Iceland (Atlantic). There were no reported inputs from Iceland during the period 1990-1996.

There has been some decline in reported inputs of heavy metals to OSPAR Region I during the reporting period, particularly for Cd and Pb. Large differences between upper and lower estimates for Hg is due to a number of samples with Hg concentrations below limit of detection (LOD). In 2011, all the 3 monitored Norwegian main rivers draining to OSPAR Region I had less than 70% of samples with Hg concentrations above LOD. The reported LOD was 1.0 ng Hg/L.

The reported inputs of nutrients and SPM have remained relatively constant throughout the reporting period, with some increase in the last two reporting years, 2010 and 2011. The apparent shift in PO4-P and total P inputs from 1997 onwards is due to the added inputs from Iceland. This shift is not that apparent for other determinands where the contribution from Iceland is small as compared to the overall total.

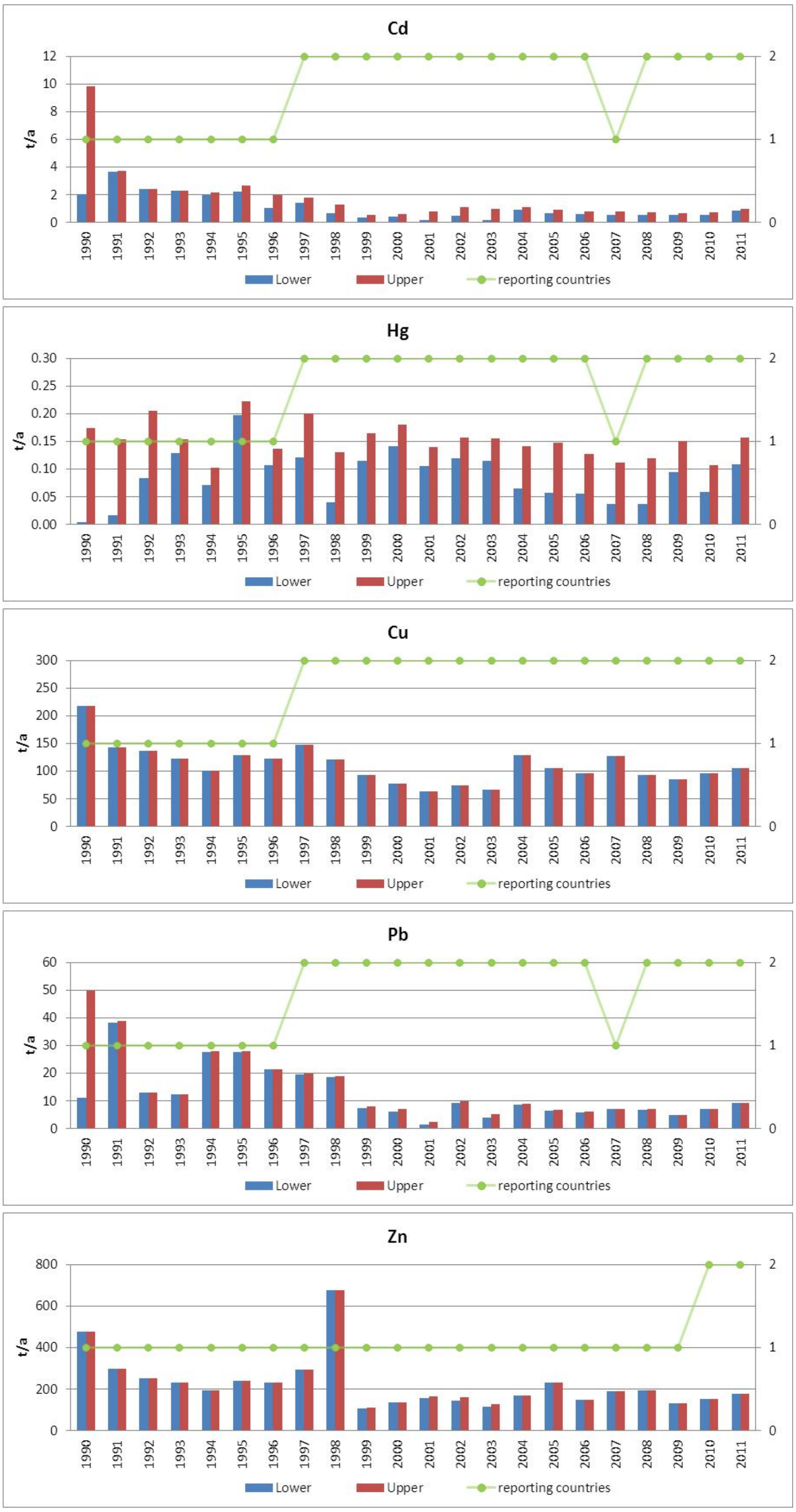


Figure A.III.9. Reported riverine inputs of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region I 1990-2011. Right-hand axis shows the number of reporting CPs.

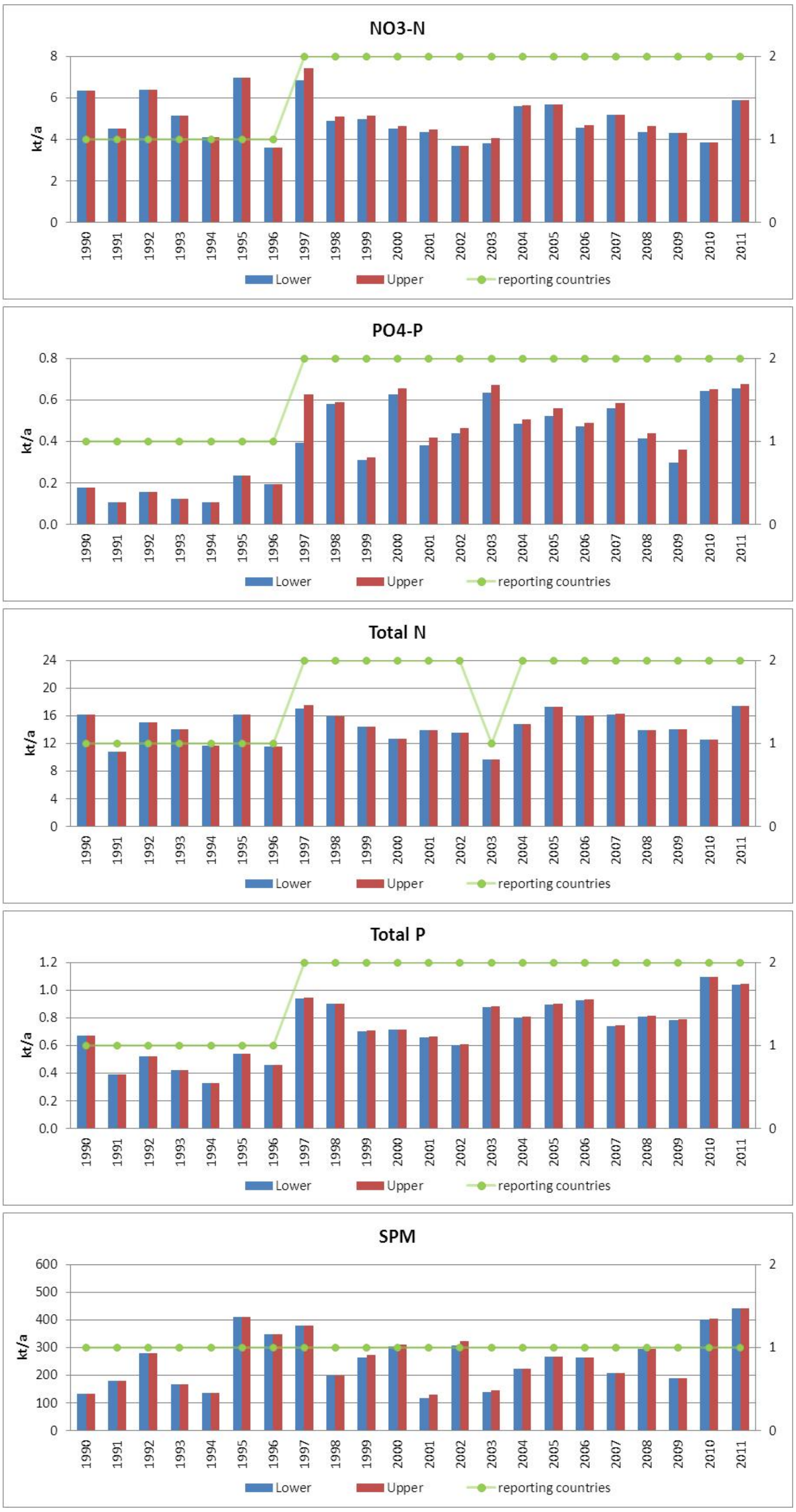


Figure A.III.10. Reported riverine inputs of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region I 1990-2011. Right-hand axis shows the number of reporting CPs.

OSPAR Region II: Greater North Sea

Reported riverine inputs to OSPAR Region II include inputs reported by the following eight CPs; Belgium (North Sea), Denmark (Skagerrak, Kattegat and North Sea), France (Channel), Germany (North Sea), Netherlands (North Sea), Norway (Skagerrak and North Sea), Sweden (Kattegat and Skagerrak) and UK (North Sea and Channel). Reporting coverage have remained relatively constant throughout the reporting period (seven out of eight countries have reported for most years).

There has been a general decline in reported heavy metal inputs to OSPAR Region II during the reporting period. The peak in reported inputs of Zn in 1993 is due to very high reported inputs by France (Channel). The reported inputs for one main river (II-AP-SO-SOMME) and one tributary river (II-AP-SO-Canche) were 24 192 t/a and 8 799 t/a, respectively. If these are actual inputs or a potential unit-error is not known.

There has been a slight decline in reported inputs of nutrients and SPM, with generally lower inputs reported after 2005. In this case, the figures for 2010 and 2011 should be interpreted with caution as relatively few countries have reported data for these two years.

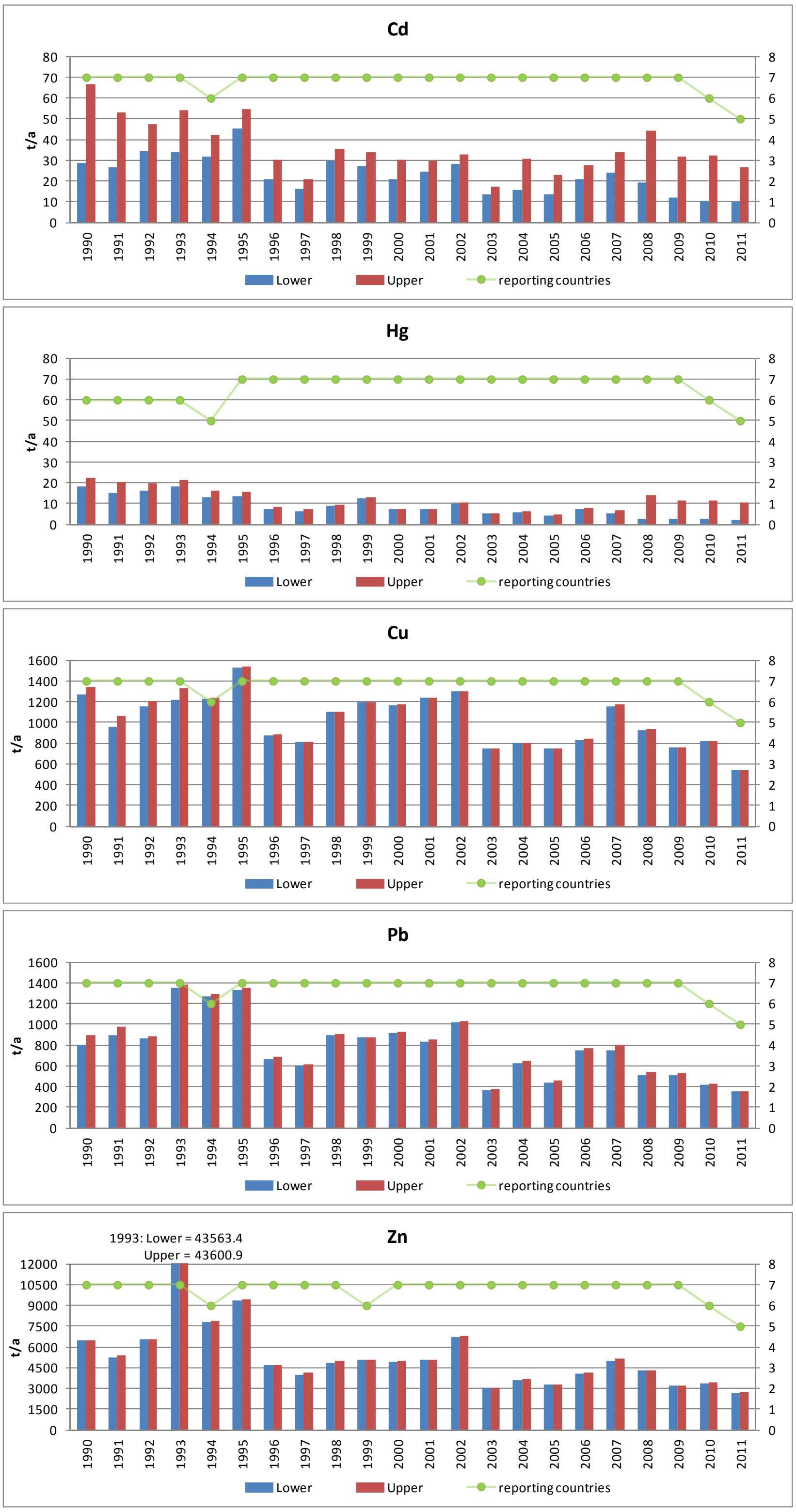


Figure A.III.11. Reported riverine inputs of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region II 1990-2011. Right-hand axis shows the number of reporting CPs.

Figure A.III.12. Reported riverine inputs of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region II 1990-2011. Right-hand axis shows the number of reporting CPs.

OSPAR Region III: Celtic Seas

Reported riverine inputs to OSPAR Region III include inputs reported by two CPs: Ireland (Irish Sea, Celtic Sea and Atlantic) and UK (Atlantic, Irish Sea and Celtic Sea).

There has been a large variation between years in reported heavy metal inputs to OSPAR Region III, and there seem to be no overall trend in inputs. Large differences between upper and lower estimates for Cd and Hg is due to many samples with concentration below limit of detection (LOD) and/or quantification (LOQ). Ireland reported inputs of Hg in 1991-1992, 2004-2006 and 2009-2011 (years with high inputs based on upper estimates). Most of the measured concentrations were below limit of detection (LOD). In these cases a zero (0) concentration was used to give the lower estimate, whereas the LOD concentration was used to give the upper estimate. The reported LOD was 0.15 µg Hg/L in 2004.

Inputs of NO3-N and total N have remained relatively constant throughout the reporting period. Ireland did not report inputs of total N in 1997-2001. There has been a decline in reported inputs of PO4-P and total P from 2000 onwards, and a large variation in reported SPM inputs between years.

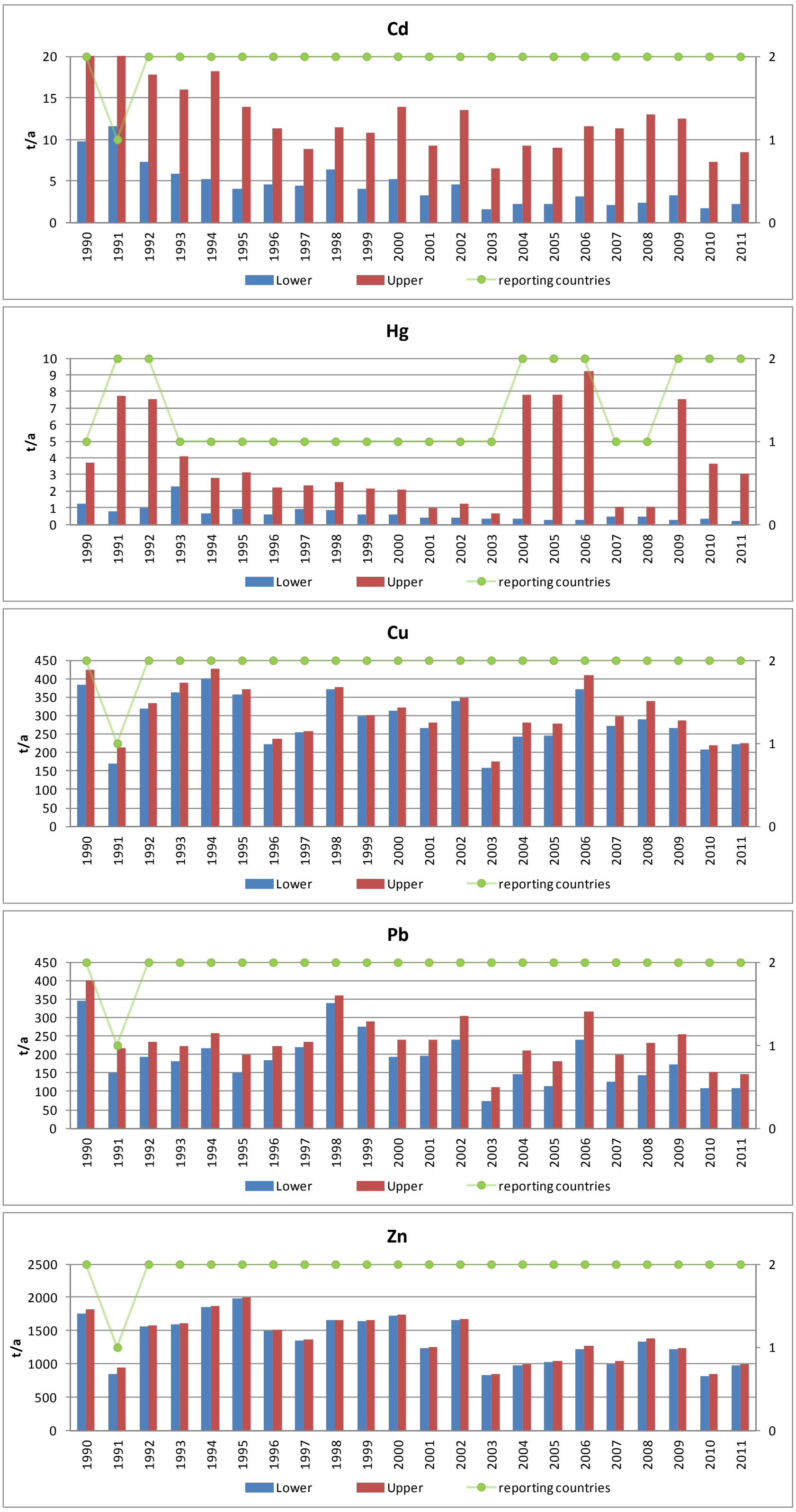


Figure A.III.13. Reported riverine inputs of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region III 1990-2011. Right-hand axis shows the number of reporting CPs.

Figure A.III.14. Reported riverine inputs of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region III 1990-2011. Right-hand axis shows the number of reporting CPs.

OSPAR Region IV: Bay of Biscay

Reported riverine inputs to OSPAR Region IV include inputs reported by three CPs; France (Atlantic), Portugal (Bay of Biscay and Iberian Coast) and Spain (Atlantic). For this region, it is difficult to discuss any trends in inputs due to a large variation in data coverage between years for all determinands.

For all heavy metals, the reported inputs to OSPAR Region IV were particularly high in 2003-2006. This is due to the reported inputs for two Spanish main rivers, Tinto and Odiel. These rivers have high natural concentrations of heavy metals and have therefore been excluded from the reported total inputs (i.e. reported totals by Spain). However, the contribution from these rivers is included in the totals generated by the RID database that provide the basis for the figures presented in this report.

A number of samples below limit of detection (LOD) and/or quantification (LOQ) give a large difference between reported upper and lower estimates for Cd and Hg.

The peak in reported inputs of PO4-P in 1996 is explained by high reported inputs by France (Atlantic). The reported contribution for one main river (IV-AG-GD-DORDOGNE) was 15 kt/a.

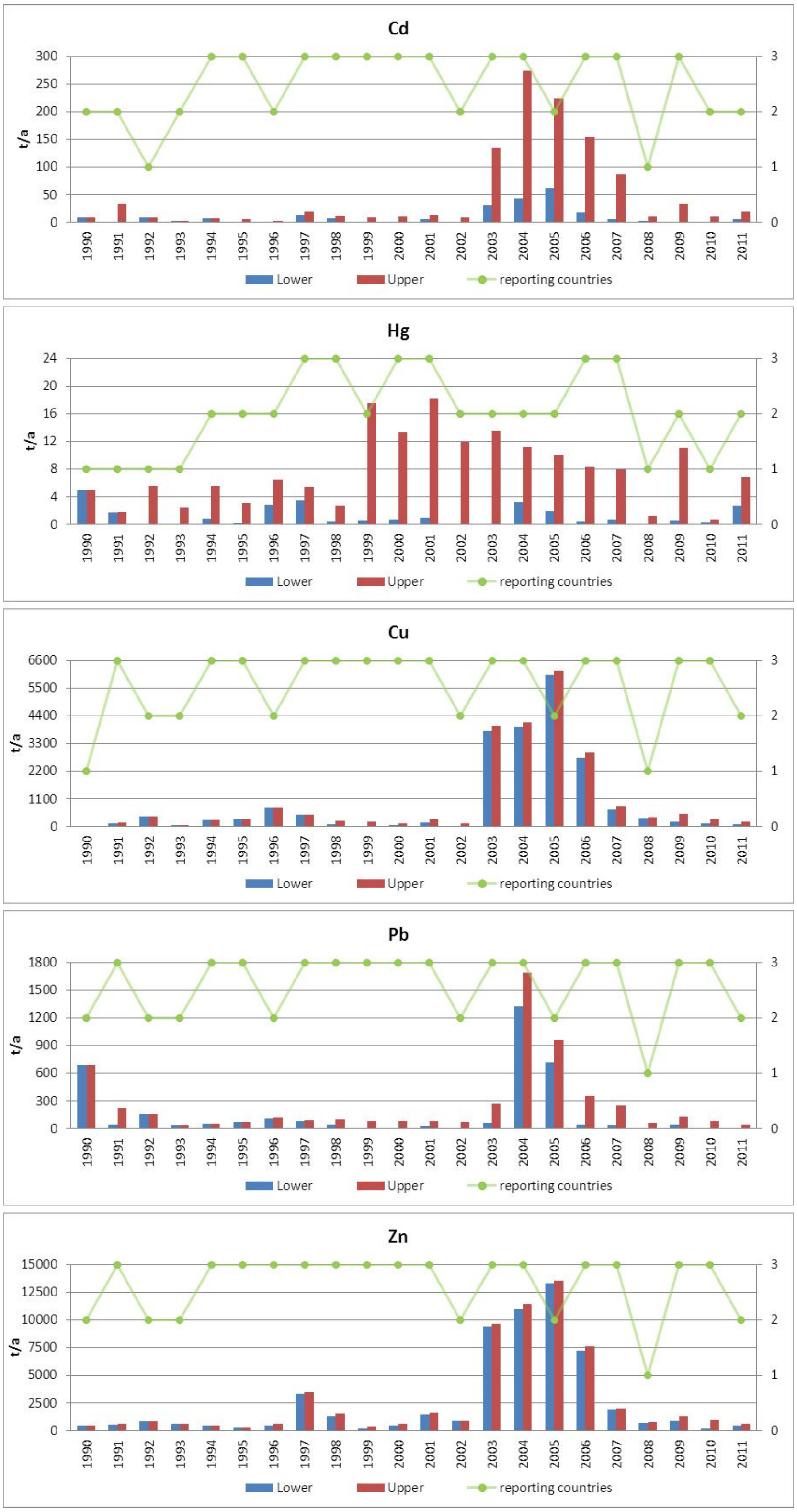


Figure A.III.15. Reported riverine inputs of cadmium (Cd), mercury (Hg), copper (Cu), lead (Pb) and zinc (Zn) to OSPAR Region IV 1990-2011. Right-hand axis shows the number of reporting CPs.

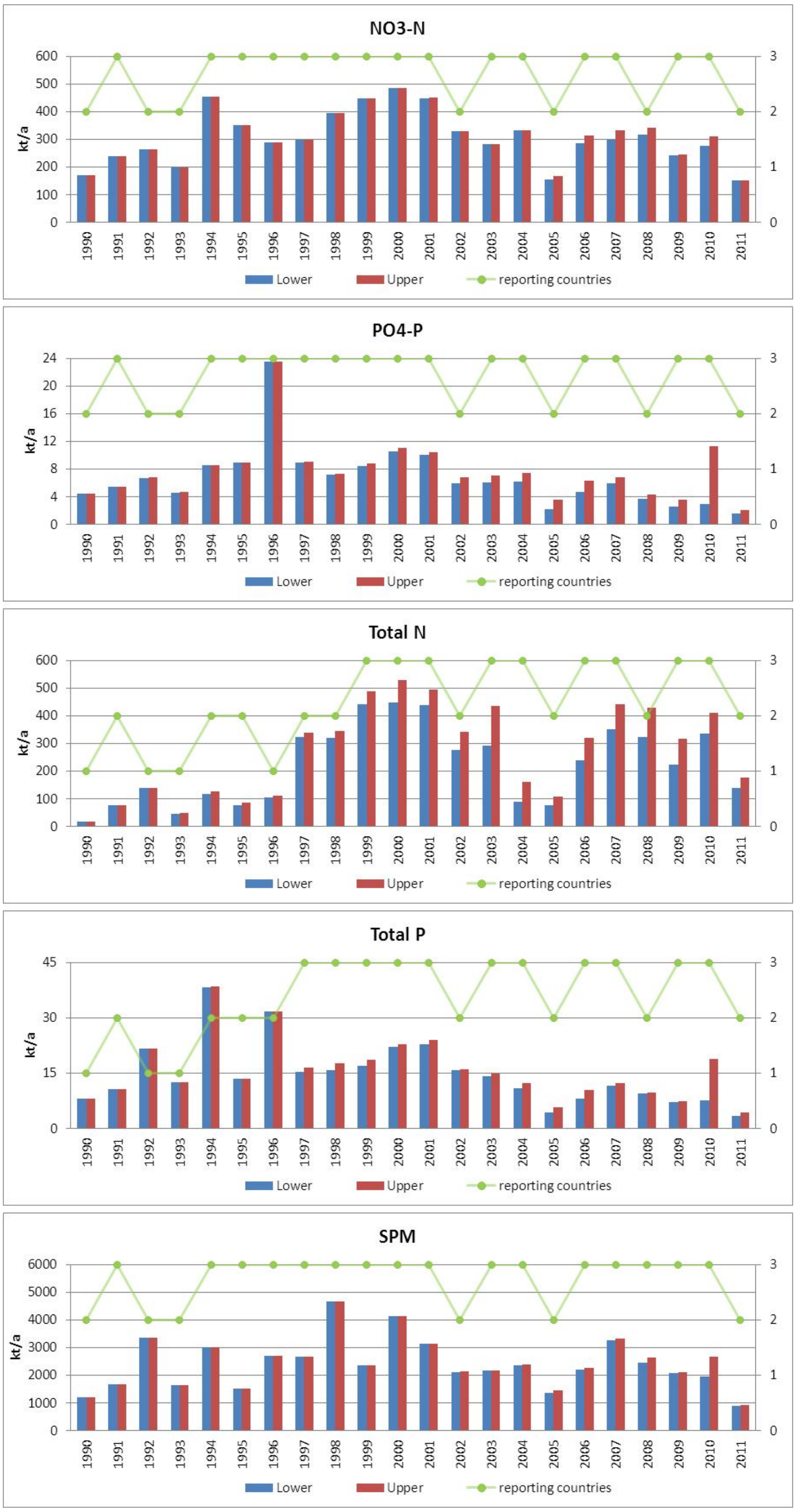


Figure A.III.16. Reported riverine inputs of nitrate-N (NO3-N), phosphate-P (PO4-P), total nitrogen (N), total phosphorous (P) and suspended particulate matter (SPM) to OSPAR Region IV 1990-2011. Right-hand axis shows the number of reporting CPs.

Annex IV Trend analysis results as submitted by CPs with the 2011 data reports

Trend analysis results submitted by France (*copied from the French 2011 text report*)

D. Riverine inputs for the year: 2011

Main Rivers (Tables 6a and 7a)

D.1 Describe the methods of measurement and calculation used, including information on the number of samples and the concentration (Table 7a) upon which the measurement is based (ref.: Section 6 of the RID Principles), including for those under voluntary reporting:

As indicated in the previous reports, the monitoring and gauging stations were chosen according to the RID principles. The monitoring stations are under the responsibility of Water Agencies, that carry out the monitoring program on a delimited basin. Our cutting in sub-regions is based on this organisation: Artois-Picardie, Seine-Normandie, Loire-Bretagne and Adour-Garonne are the four Water Agencies concerned by OSPAR. The analyses are performed by registered laboratories by French ministry for Environment[1], one of the condition is to be accredited.

The frequency of the analyses varies from a station to another: the table 7 indicates, for each monitored area, the number of measurements that were used for the input calculation.

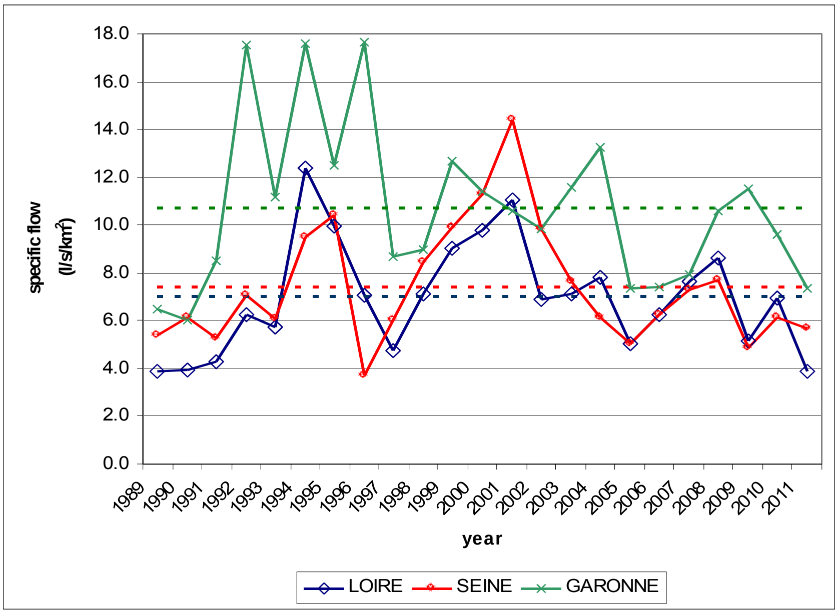
For the calculation itself, the software Rtrend is used with its interface of conventional load calculation. All the methods CM1 to CM6 are tested but for the final calculation, the results obtained with CM4 are reported for the main rivers or the tributaries if the number of measurements is enough (>12 per year). Otherwise, the method CM2 that adjusts the flows to limit over or under-estimations, is used.

D.4 Give general comments on the inputs from main rivers (e.g. significant changes in inputs, concentrations and flows compared to previous years):

The study of inputs has to be related to the river flows that suffered especially between 2003 and 2006 from weak precipitation.

---

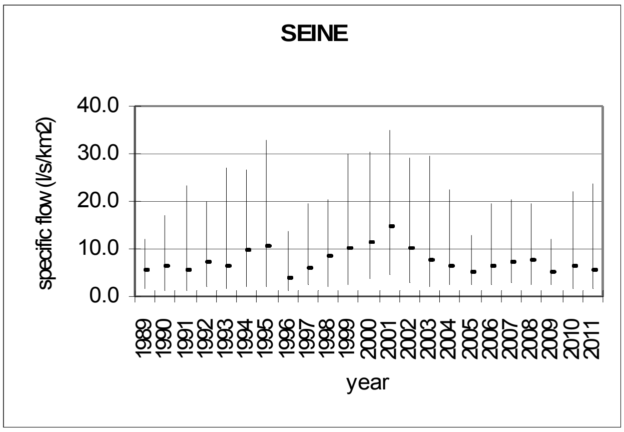
[1] Current demand since the orders taken on the 29th of November, 2006 and on the 27th of October, 2011 dealing with terms of registration of laboratories carrying out water analysis.

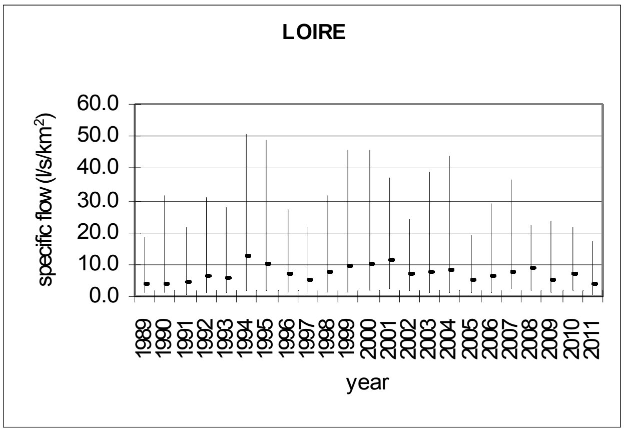


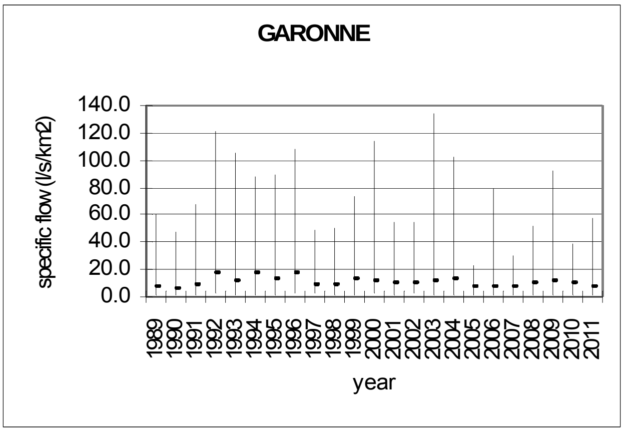
Evolution of main rivers specific flows

The specifics flows of the three main rivers increased between 2005 and 2008. But in 2009, the flows of the Loire and the Seine decreased because of weak precipitation, and in 2010 they increased again. Between 2005 and 2008, the main rivers Loire and Seine followed a linear increase, decreased under the mean in 2009 and then, in 2010, reach it again. On the contrary, the flow of the main river Garonne increased from 2007 till 2009 (+45%), reached the average in 2009, and finally decreased in 2010, on the contrary to the two others.

In 2011, the specific flows of the three main rivers decreased, those of Loire and Seine correspond to the driest year of the period 1989-2011.







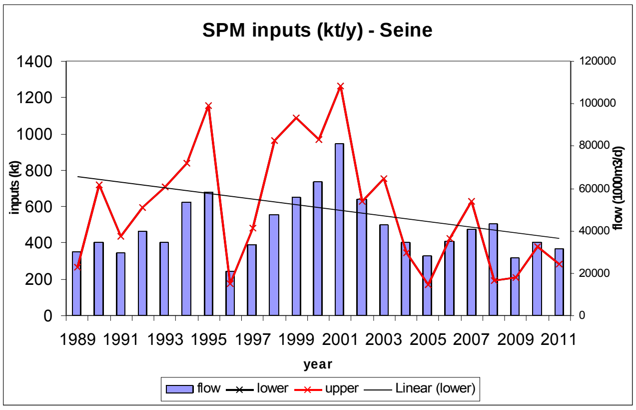
Range of the specific flows of the main rivers

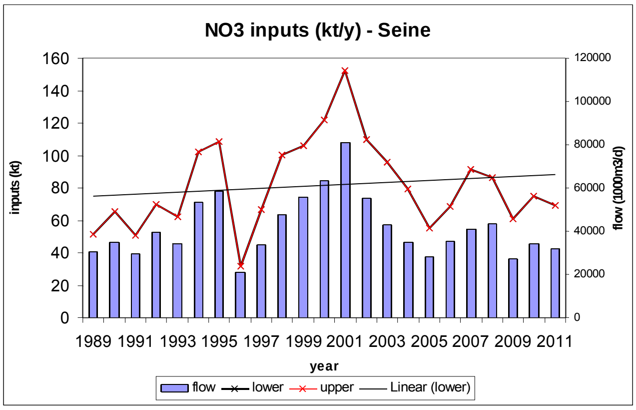
In 2011, the range of flows variations of the main river Seine was better than in 2010, whereas the average decreased. The extent of Loire flows decreases progressively between 2009 and 2011, although the mean of 2010 is upper than the two others. The statistics (mean, minimum and maximum) in 2011 are the lowest registered over the period.

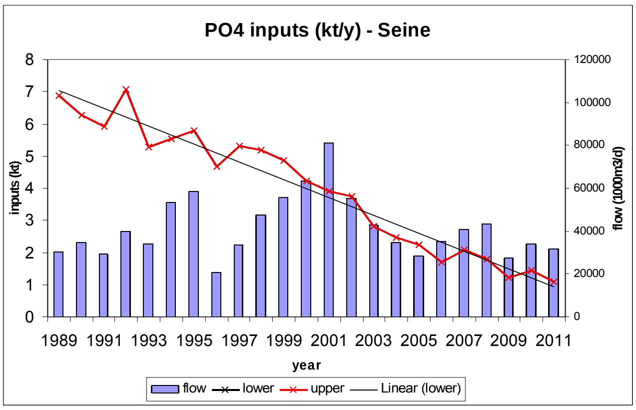
After having decreased a lot in 2010, the flow of the Garonne reached in 2011 a more normal range of variations. The mean flow is however lower.

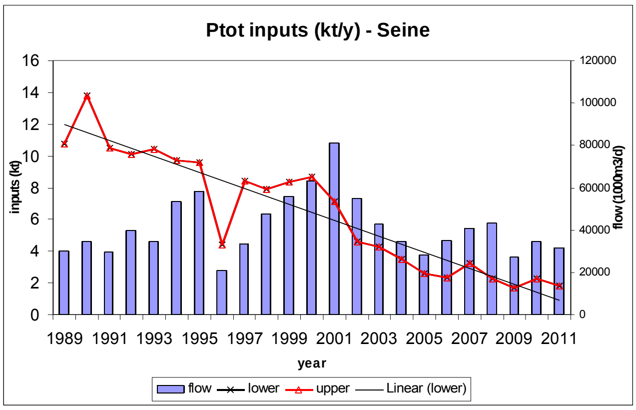
The inputs of the main river will be presented separately then added to give an idea of the trend since 1989, keeping in mind the strong correlation to the hydrometric conditions.

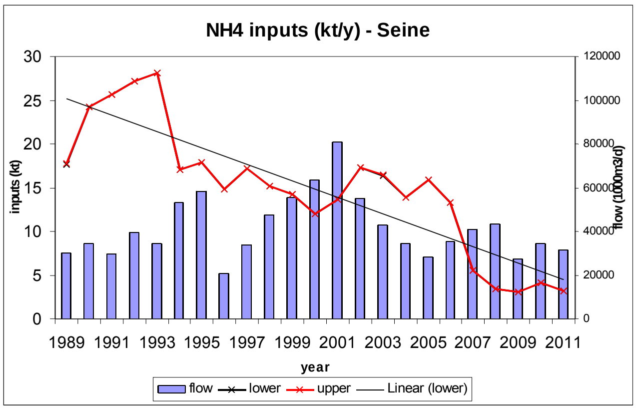
The study for Seine begins in 1989, except for atrazine and lindane, which analysis began only in 1997.











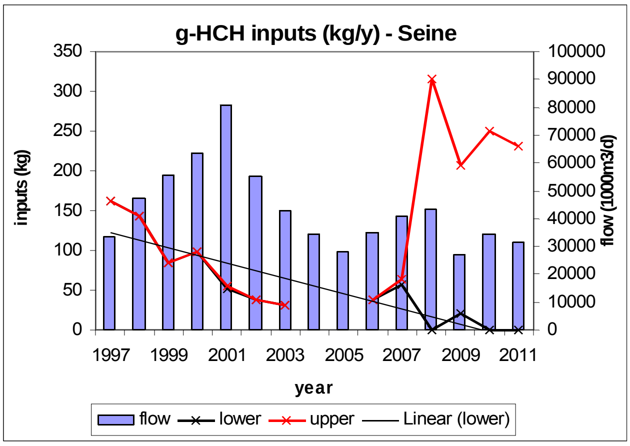
Inputs of some selected determinands (nutrients) from main river Seine

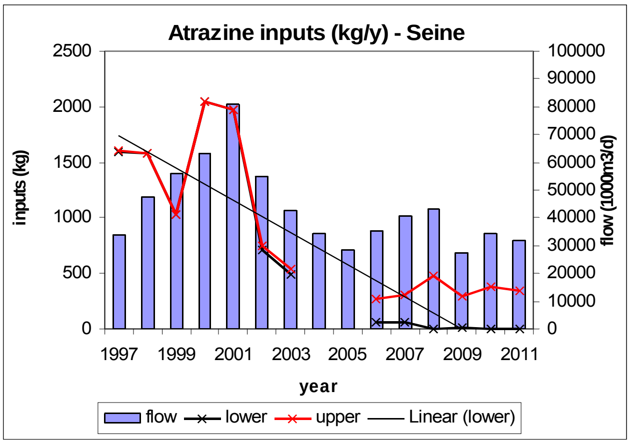
After having increased in 2010, nitrates inputs have decreased by 8% in 2011, in fact relating to a comparable decrease of flow. The trend over the whole period seams to increase but the variations depend on the evolution of the flow.

The inputs of ammonium have decreased by 23% in 2011 compared with previous year. The trend shows a decrease by 80% since 1989.

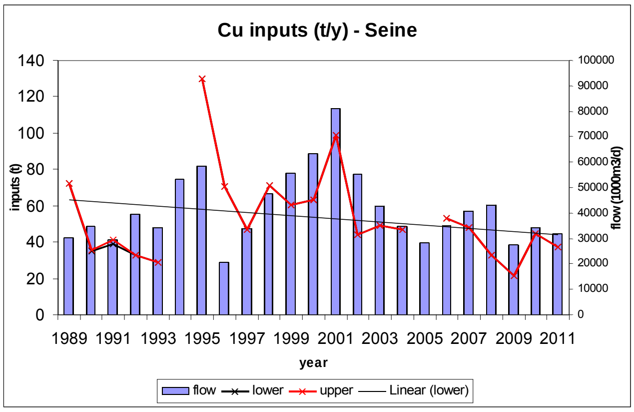
Phosphorus inputs have decreased by 20% in 2011 compared with 2010, confirming a decrease over the whole period by more than 80%.

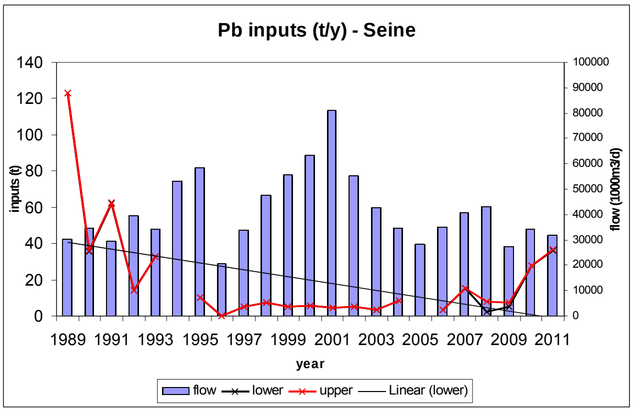
SPM have decreased in 2011 compared with 2010 (-25%).

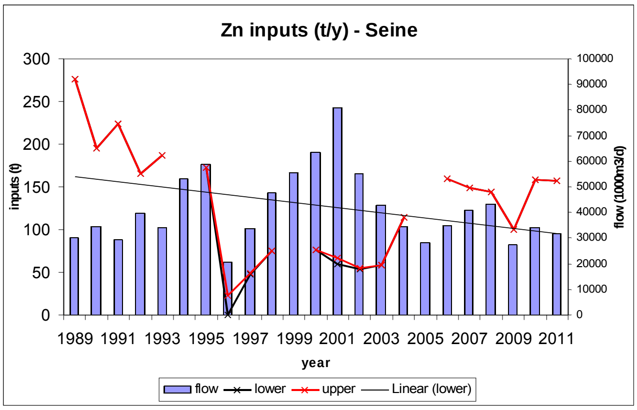


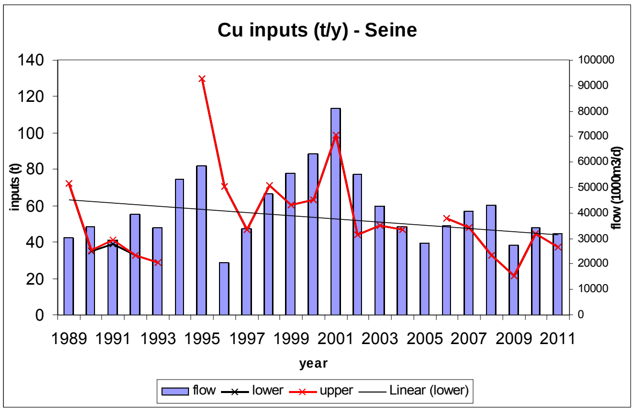


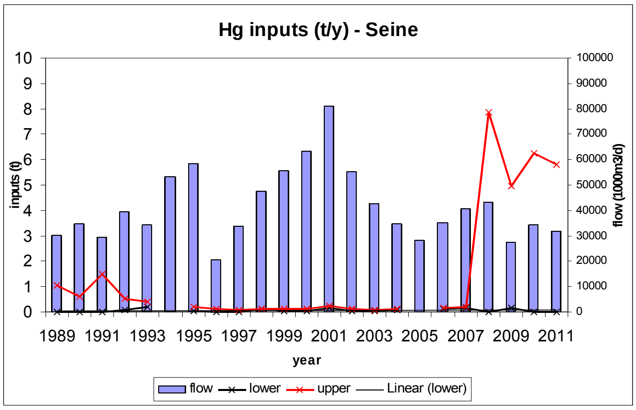
Atrazine and lindane inputs have decreased by more than 80 % since 1997. The two determinands are not quantified any more for 2 years.











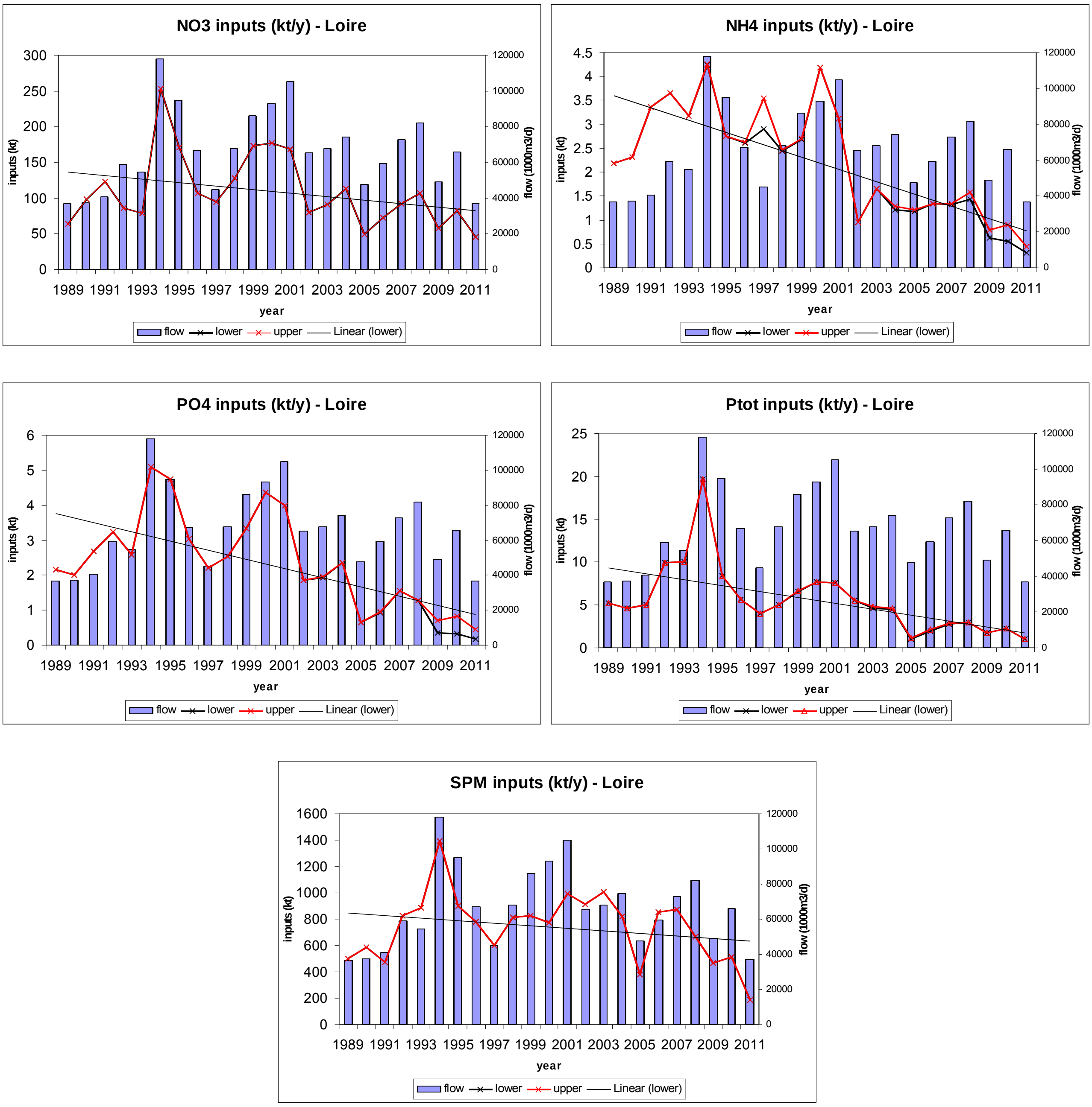
Inputs of some selected determinands (metals) from main river Seine

Cadmium and mercury are not quantified any more for 2 years: so it is difficult to conclude. The lower input of cadmium has been decreasing since 1989 however.

The input of zinc is quite stable in 2011 compared to 2010, in spite of a lower flow, and finally quite stable over the last 5 years.

Copper inputs are irregular since 1989. After a decrease between 2006 and 2009 (-60%), and an increase in 2010, copper inputs decreased by 15% compared with 2010.

The inputs of leads have been increasing for 2 years on the contrary to the flows.



<u>*Inputs of some selected determinands on main river Loire*</u>

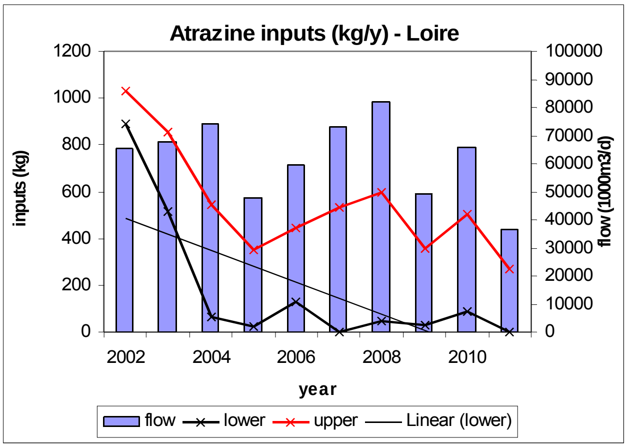
After an increase in 2010, the nitrogen inputs due to nitrates decrease in 2011 as the flow, by 45% compared with the previous year. The flows are comparable in 2011 and 1989 but the inputs due to nitrogen in 2011 are lower (- 30%).

In 2011, there are less differences between “lower” and “upper” nitrogen inputs due to nitrates compared with 2010. The decrease of ammonium inputs is confirmed in 2011: by 51% compared with 2010, confirming the global trend since 1989.

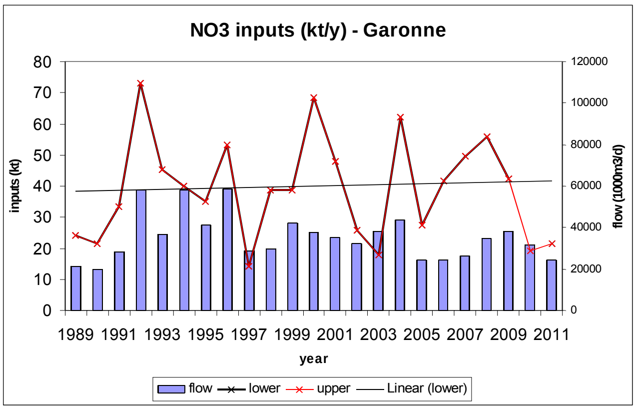
Regarding the orthophosphates, the inputs decreased by more than 75% between 2007 and 2011 and by 45% between 2010 and 2011. As for ammonium, there are less differences between the lower and the upper inputs of phosphorus due to orthophosphates in 2011 compared with 2010. The flows show a general tendency to decrease since 1989.

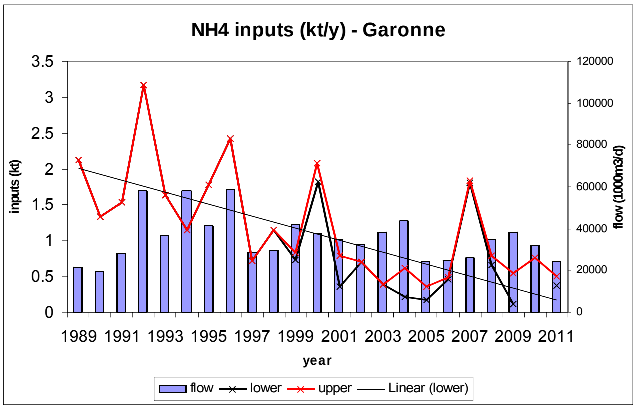
The input of the total phosphorus shows the same evolution: a decrease by half in 2011 and a global downward trend.

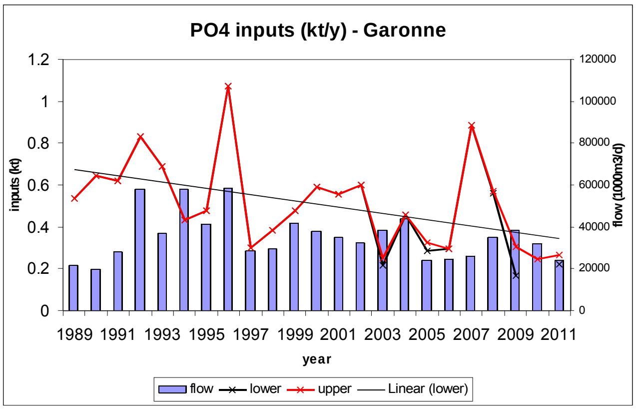
The inputs of SPM decreased by 65% compared with 2010, thanks to a lower flow and reached thus the lowest values since 1989.

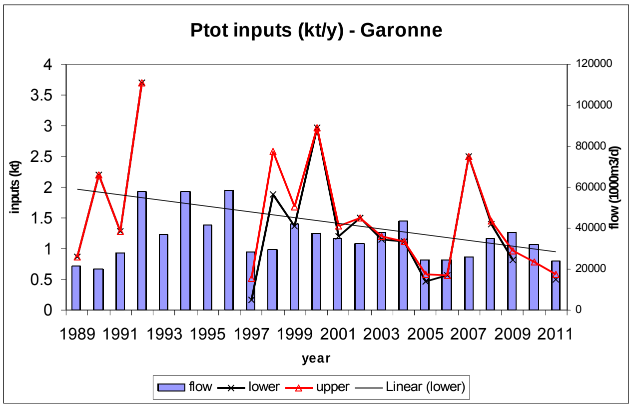


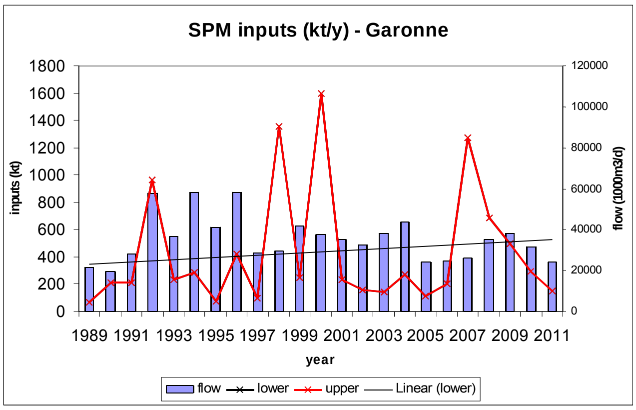
As for atrazine, the trend seems on the decrease since 2002. In 2011, contrary to the 3 previous years, there are no more quantified analysis, so a “lower” input equal to 0.











Inputs of some selected determinands on main river Garonne

In 2011, the nitrates inputs raised by 13.5% compared to the previous year despite a lower flow (-23%). Since 1989, the global trend is on the slight increase. But the inputs moved a lot from a year to another and the estimation in 2010 suffers from lacks of data.

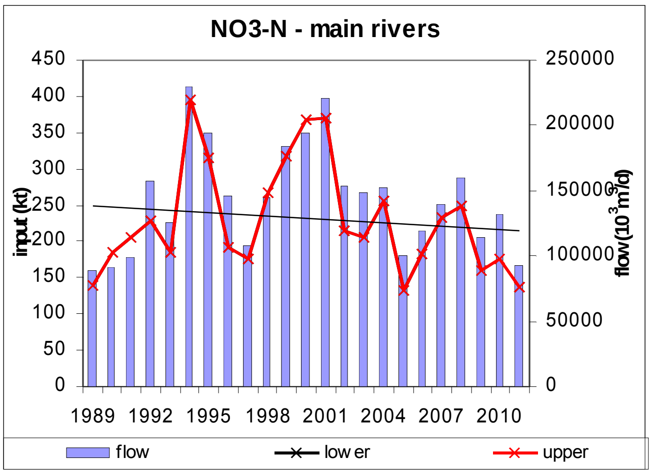
The input of ammonium has decreased since 2007. In 2011, it decreased by 34% compared with 2010. However the input “upper” in 2011 was comparable to 2009, whereas the flow was lower.

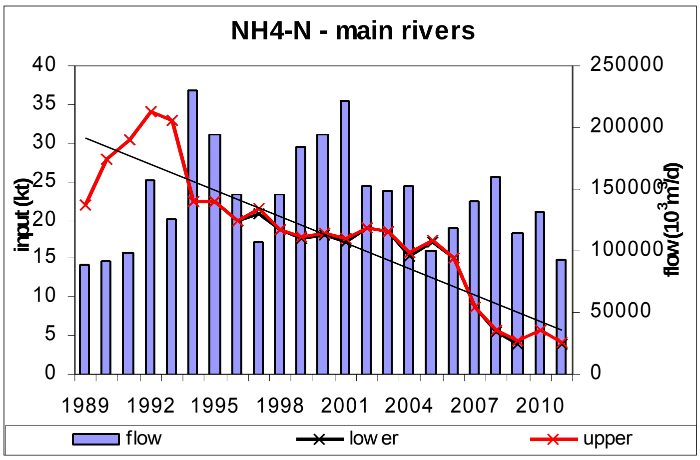
In the total nitrogen inputs, the ammonium proportion compared with nitrate is less and less important.

In 2011, the phosphorus input due to orthophosphates increased by 10%, in spite of a lower flow, nevertheless the general trend remained on the decrease, like for the total phosphorus.

Concerning the SPM, we notice in 2011 a decrease by 77% of inputs since 2007, decrease that seems to be independent of the flows evolution. The global trend since 1989 shows however a slight increase, principally because of peaks (floods).

Data for the 3 main rivers are only complete for some macropollutants: nitrates, ammonium, orthophosphates and SPM, over the whole RID period (1989 to 2011).





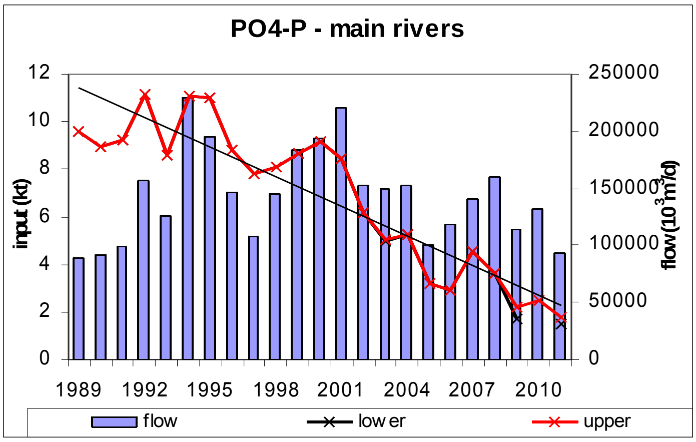
Nitrates inputs of the main rivers are strongly related to the flow. So in 2011 the trend is on a decrease, as the flow. The global trend is only on a slight decrease.

The distribution of nitrates inputs follows on average the flows one, half for Loire, third for Seine and the rest for Garonne.

The ammonium inputs are evolving in several times: after having doubled between 1989 and 1993, inputs decreased suddenly in 1994, in spite of an important flow, then more regularly until 2006. Between 2006 and 2009, inputs have decreased again (-70 %), in spite of a raising flow until 2008. In 2010, they are on increase (+32% compared with last year).

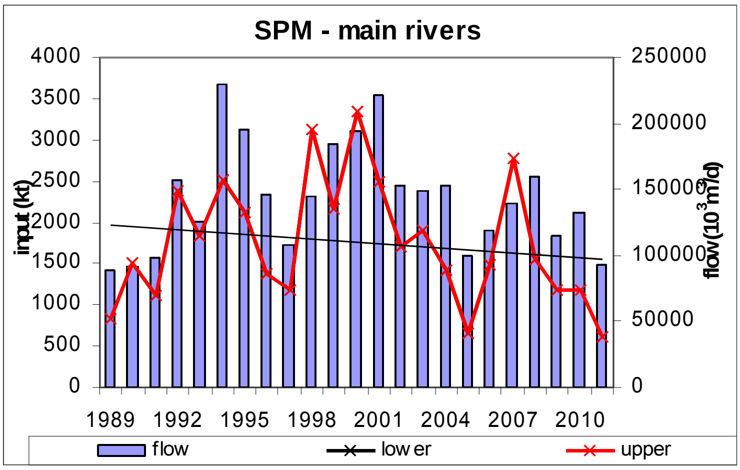
Finally, in 2011 the inputs decreased by 29% compared with 2010. Loads have finally decreased by 81% since 1989.

Seine is the major source of ammonium (80% of the total main rivers inputs on average).



Orthophosphates inputs have decreased this year, as the flow. The trend shows a decrease by 80% since 1989, more important after 1999.

The Seine represents on average 58 % of PO4-P inputs, whereas its contribution to the flow is twice less. The Loire represents only 34 % and Garonne 8 %.



Suspended particular matters inputs have strongly decreased in 2011, more than the flow. Hence, the global trend is on a decrease.

Over the whole period, inputs of the three main rivers, that represent half of the total riverine inputs, are on the decrease for ammonium and phosphorus, and according to the OSPAR proportions (- 50 %). On the contrary, SPM and nitrates inputs show only a slight decrease but mainly linked to the fall of flow.

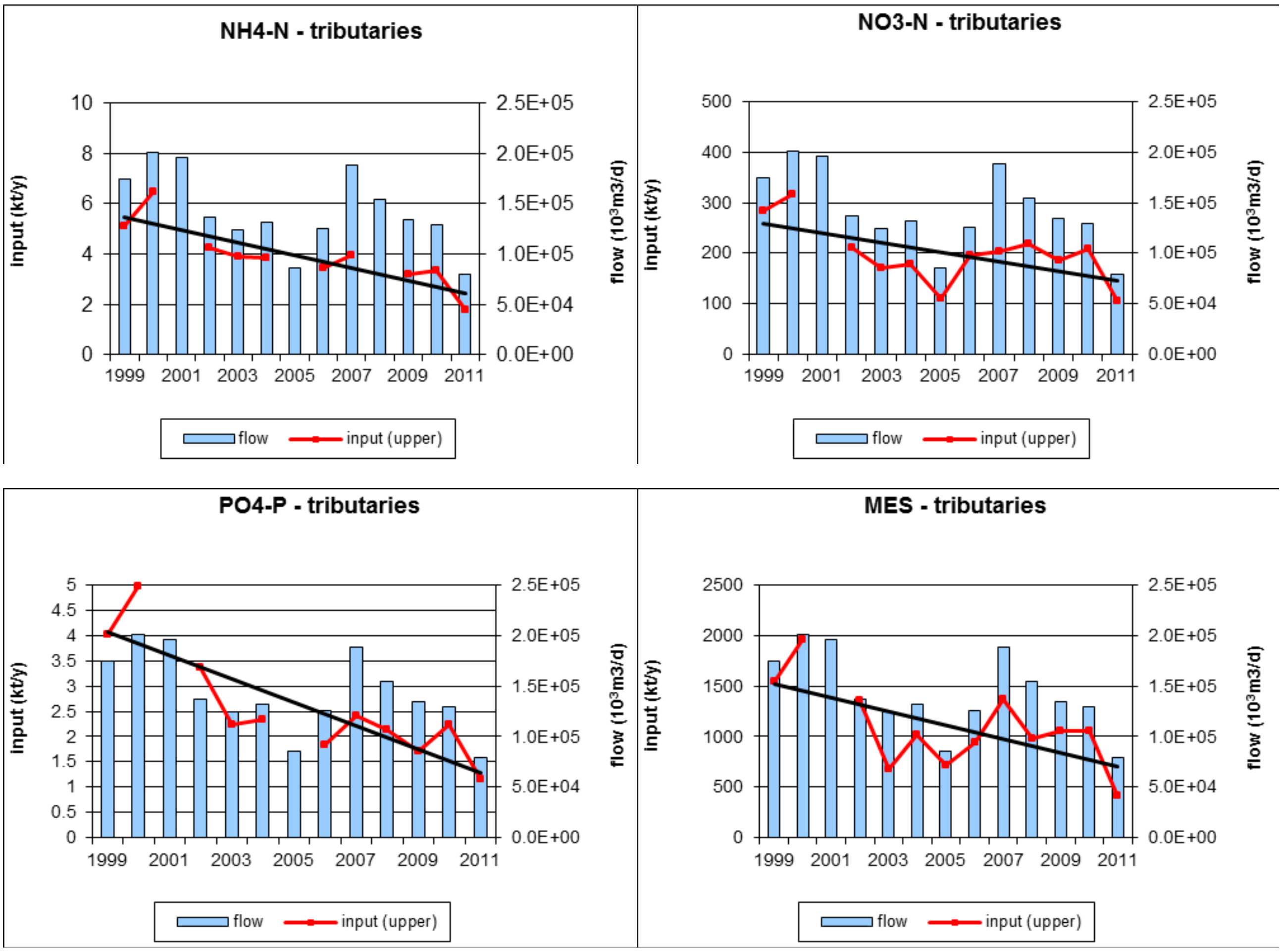
Tributary Rivers (Tables 6b and 7b)

D.5 Describe the methods of measurement and calculation used, including information on the number of samples and the concentration (Table 7b.) upon which the measurement is based (ref.: Section 6 of the Principles):

The methods and calculations are quite the same as for the main rivers: when 12 measurements are available, the method CM4 is reported, otherwise, method CM2.

D.9 Give general comments on the inputs from tributary rivers (e.g. significant change in inputs, concentrations and flows compared to previous years):

The inputs of the tributaries are complete since 1999 and only for some macropollutants: nitrates, ammonium, orthophosphates and SPM. Except for ammonium in 2008, “lower” and “upper” inputs are quite the same, that’s why only the “upper” inputs have been represented here. Because of high limits of quantification in 2008, the inputs of ammonium are not representative and so, not represented here.



Evolution of some macropollutant inputs on tributary rivers

In 2011, inputs of nitrates and ammonium and decrease compared with 2010 like the flow. The inputs of nitrogen due to ammonium remain negligible compared with the inputs of the nitrogen due to nitrates: 60 times smaller in 2011. The trend is also on a decrease since 1999 but more important for ammonium.

The phosphorus due to orthophosphates decrease more than the flow, by 70% since 1999 and by half in 2011 compared with 2010.

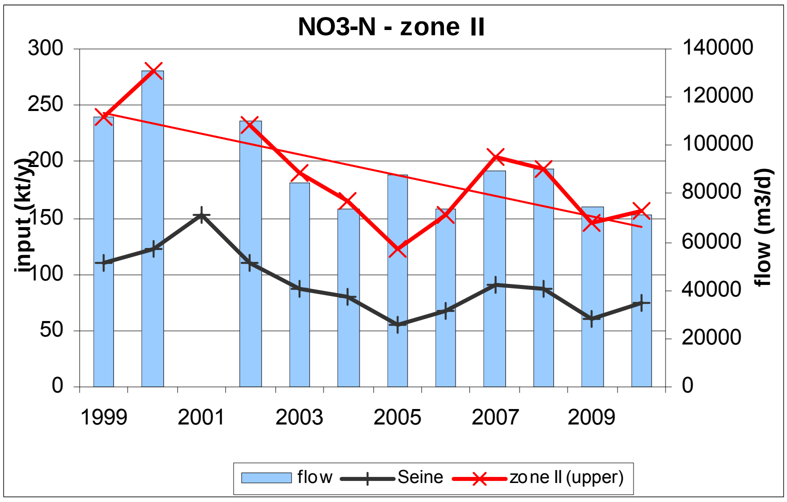
In 2011, the SPM inputs drop of 60% compared to 2010. The global trend shows a decrease, by half since 1999 like the flow.

Total riverine inputs (Table 6c)

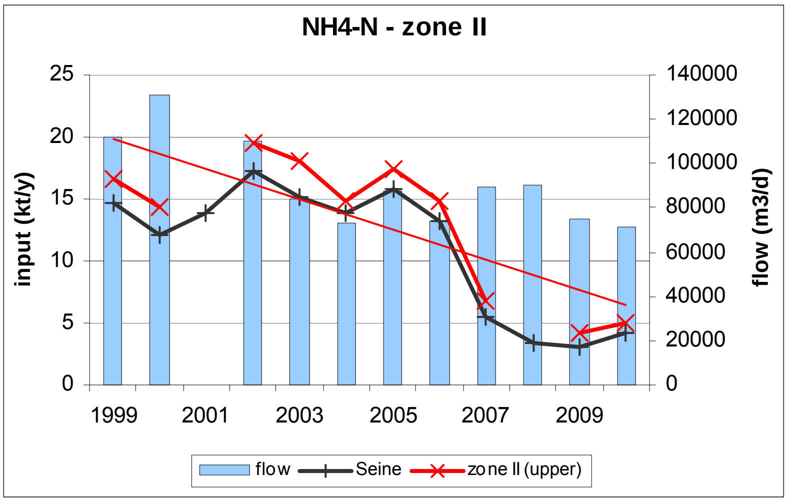
D.10 Give general comments on the total riverine inputs (e.g. significant change in inputs, concentrations and flows compared to previous years)

At first, the inputs of zones II and IV are considered separately. Then, they are added to get a global study of riverine inputs. Quality data enables to take into account only macropollutants (SPM, N and P) from 1999.

The Seine is the only main river in zone II. Yet, its basin represents a little more than half of its surface (53 %).

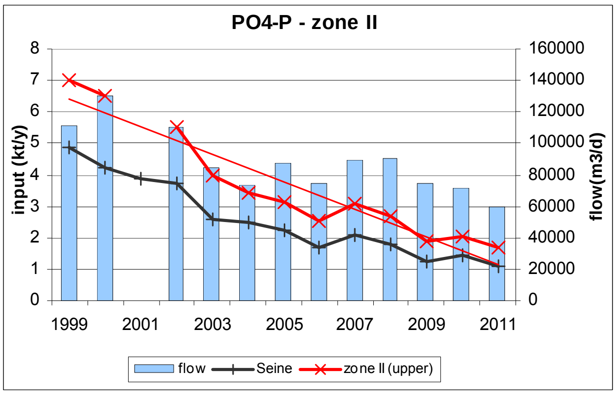


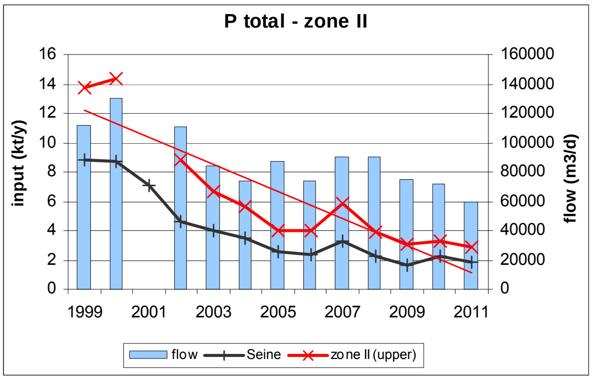
Nitrates inputs are lower in 2011 than in 2010 (-20 %) in fact like the flow (-16%). They are quite related to flow variations: the decrease since 1999 is comparable to the fall of flow. Seine represents half of nitrates inputs in zone II. The year 2011 was the driest year since 1999 regarding the flow.



Ammonium inputs have decrease by 23% between 2010 and 2011. Since 1999, ammonium inputs have decreased by 60% whereas the flows fall of 40%.

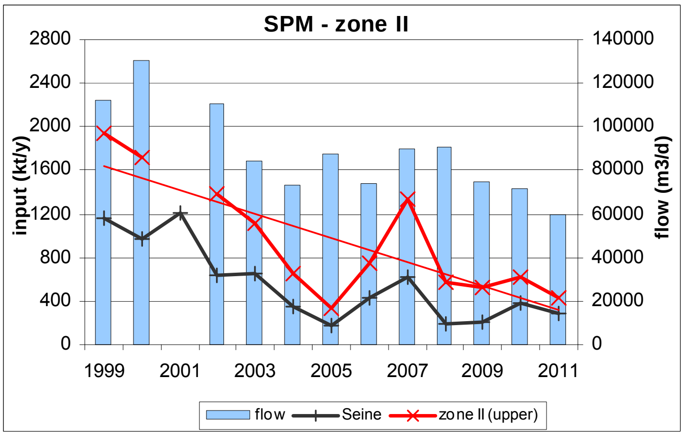
Seine is clearly predominant, it influences directly ammonium inputs in zone II.





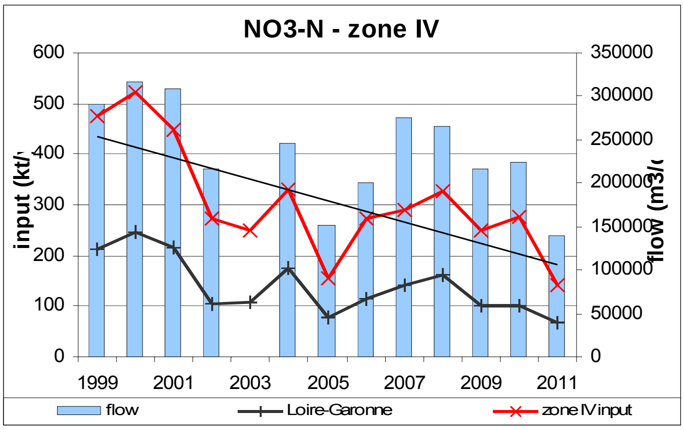
Orthophosphates and total phosphorus inputs follow the same evolution. They have decreased in 2011 by 15% so an order of magnitude near from the fall of flow. The global trend since 1999 is an important decrease (-90% with a linear tendency) more than the fall of flow.

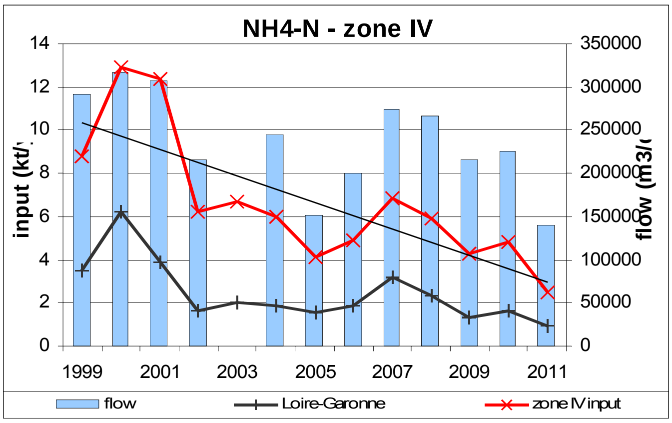
There is still a real correlation between inputs of zone II and inputs of the Seine which drains 60 % of the PO4.



And the trend is on the decrease too for SPM (-80 %). The Seine represents a little more than half of the global inputs in zone II.

Region IV includes 2 main rivers: Loire and Garonne. Both main rivers drain a little more than half of its surface (54 %).



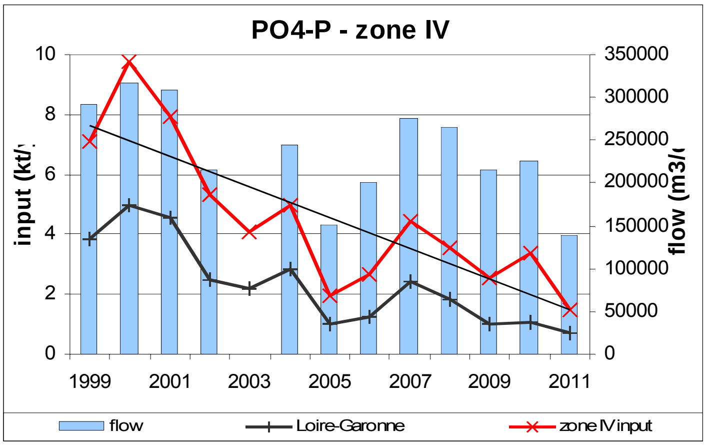


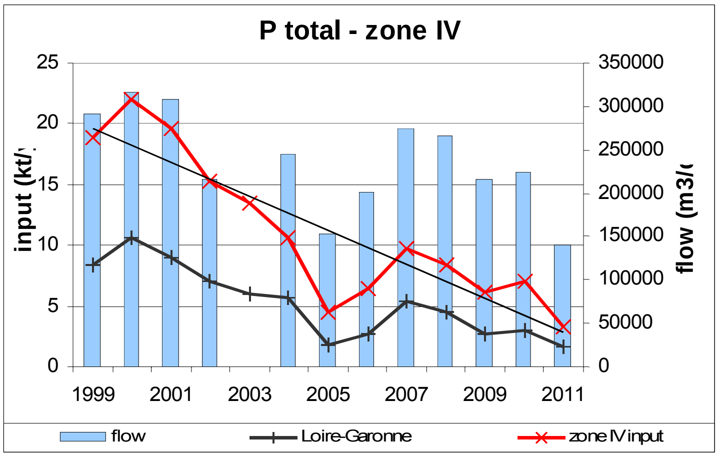
In 2011, the flow decreased by 38% in the region IV but the inputs of nitrate by 50%, compared to the previous year. This decrease is slightly lower for main rivers. The global trend is on a decrease since 1999: -58% more than the flow, -36%.

In 2011, the inputs of ammonium fall of half compared to previous year.

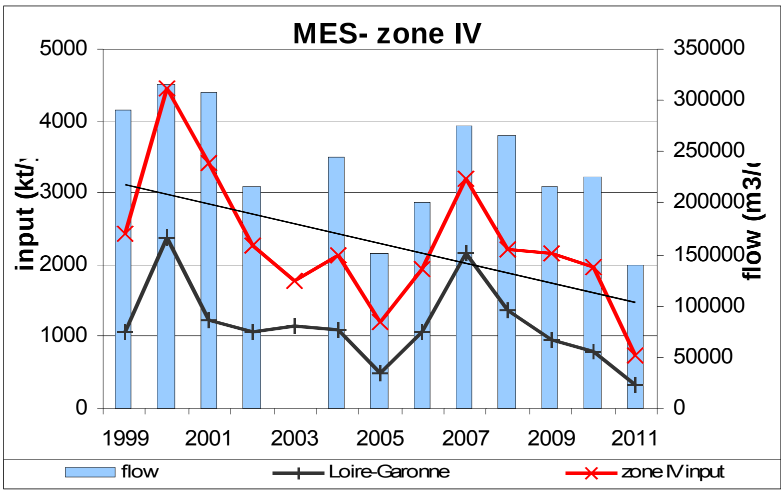
However, the inputs of ammonium are 50 times smaller than the nitrates one.

The global trend since 1999 is on a decrease, more than half, so with an order of magnitude more important than the flow.



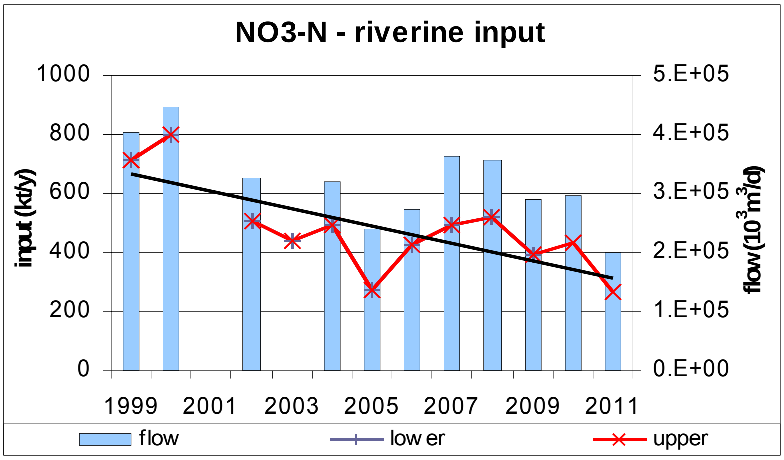


Orthophosphates and total phosphorus inputs decrease by half in 2011. The global trend since 1999 is on a decrease (-75%) more than the fall of flow.



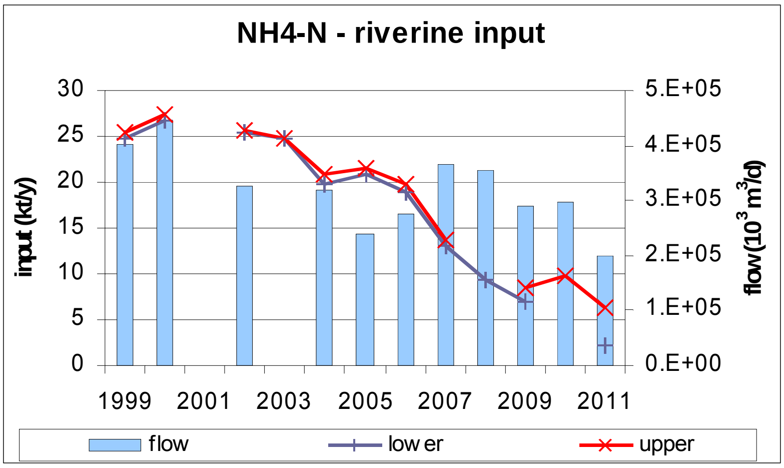
The SPM inputs due to the main rivers have been decreasing each year since 2007 (-77% between 2007 and 2011). In 2011, the inputs decreased more than half compared to 2010. The SPM inputs were directly influenced by peaks of flows of some rivers, for example in 2000 and 2007, year of important flows for Garonne.

Riverine inputs are now added on zones II and IV, to get the global evolution on the whole French OSPAR area. Considering the available data, the global study can only take some macropollutants into account: nitrates, ammonium, total phosphorus, orthophosphates and SPM. And it can only begin from 1999.

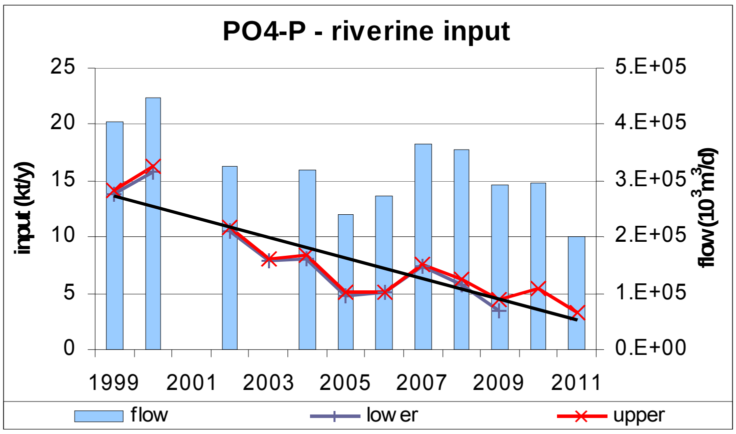


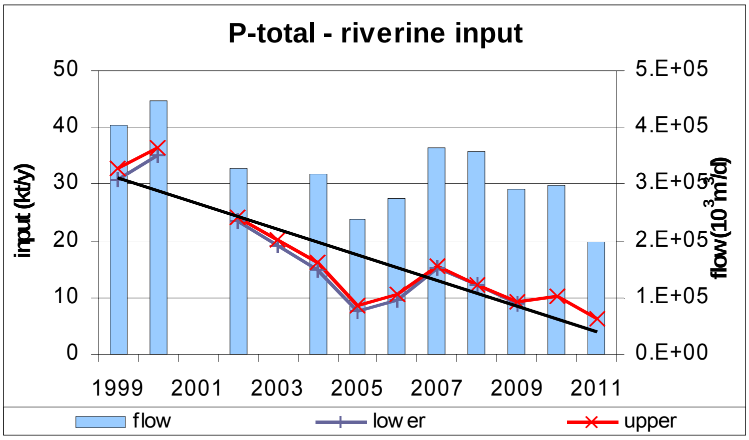
The total inputs of nitrates have been decreasing by half since 1999, more than the flow The inputs decreased in 2011 as the flow.

The inputs remain correlated with the flow.

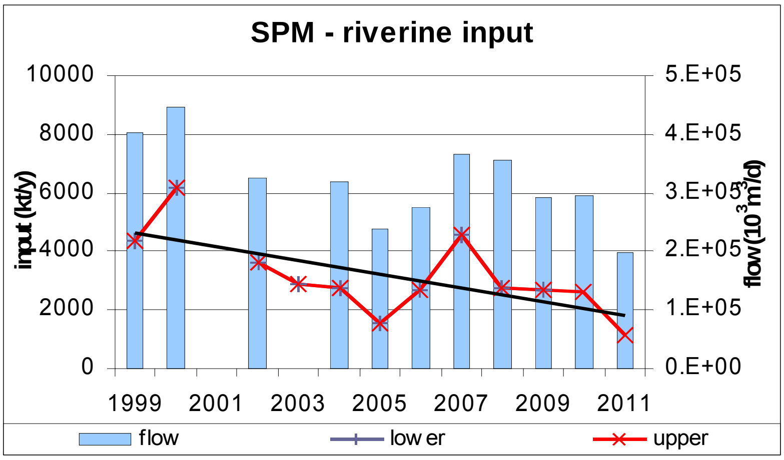


The trend is also on a decrease for the ammonium inputs, by 80% since 1999. In 2011 the inputs have been lower than in 2010.





Orthophosphates and total phosphorus follow the same evolution. Total loads have decreased respectively by 40% compared to 2010 and near 80% since 1999. The flows have an influence from a year to another but not on the global trend. The inputs of orthophosphates represent half the inputs of total phosphorus.



The total inputs of SPM have decreased by 55% in 2011compared to 2010, so, more than the fall of flow.

In 2011, all the inputs have decreased in relation with low flows.

Trend analysis results submitted by Norway

Trends in Norwegian rivers 1990-2011

Prepared by:

Per Stålnacke, Paul Andreas Aakerøy, Eva Skarbøvik

Bioforsk – the Norwegian institute for Agricultural and Environmental Research

Introduction

This is a summary of results of trend analyses carried out in nine Norwegian rivers monitored monthly. For the full report see Skarbøvik et al. (2012). Analyses have been performed on water discharge, nutrients, suspended sediments, and five heavy metals.

Methodology

The partial Mann-Kendall test (Libiseller and Grimvall, 2002) has been used to test for long-term monotonic[1] trends (including linear trends) in annual riverine inputs and monthly concentrations measured in nine of the ten main rivers. The method has its methodological basis in the seasonal Mann-Kendall-test (Hirsch and Slack, 1984) with the difference that water discharge is included as explanatory variable. The test also includes a correction for serial correlation up to a user-defined time span; in our case a span of one year was used. The method also offers convenient handling of missing values.

The trend analyses for nutrients and suspended particulate matter were performed on the upper estimates of the loads, except for orthophosphate where both upper and lower estimates were used. The trend analyses for metals were performed on both the upper and lower estimates of the loads. Statistical trend analyses were conducted only for some metals, given the problem with changed levels of detection (LOD) over time and/or a large number of samples reported at the LOD.

The trends were regarded as statistically significant at the 5%-level (double-sided test)[2]. Trend slopes were also computed according to Sen (1968).

In addition to the formal statistical test, a visual inspection of all the time series was performed.

[1] Monotonic is here defined as a consistent increase or decrease over time. Monotonic trends may be linear (the same slope over time) or non-linear.

[2] In statistics, a result is called significant if it is unlikely to have occurred by chance. "A statistically significant trend" simply means there is statistical evidence that there is a trend; it does not mean that the change necessarily is large, important or significant in the usual sense of the word. Thus, the 5%-level in this case, does not mean a 5% or larger change in concentrations.

Data selection

Chemical variables analysed for trends include cadmium (Cd), copper (Cu), lead (Pb), zinc (Zn), ammonium nitrogen (NH_4-N), nitrate nitrogen (NO_3-N), total nitrogen (TN), orthophosphate (PO_4-P), total phosphorus (TP) and suspended particulate matter (SPM). Trend analyses were also performed for mercury (Hg), but it should be noted that these results are highly uncertain because of the general high analytical uncertainty of this parameter and the change in analytical methods during the period 1999-2003 (Weideborg *et al.*, 2004). The same holds true for arsenic (As). PCB7 and lindane (g-HCH) are not analysed for trends due to too short time series, gaps in the series and/or a majority of the observations at or below LOD. Nickel (Ni), chromium (Cr), total organic carbon (TOC) and Silica (SiO_2) are not required pollutants in the RID-reporting and thus not included in this analysis.

Some important aspects to consider when assessing the long-term trends include:

- River Alta was sampled less than 12 times a year during the period 1990-1998.
- Some rivers have more frequent sampling during floods in some years (e.g., rivers Glomma and Drammenselva in 1995)
- All samples from 1990 up to 1998, and from 2004 to date, were analysed by the same laboratory, but samples in the period 1999-2003 were analysed by a different laboratory. Such changes in laboratory often mean changes in methods and detection limits.
- Some data were excluded from the dataset prior to the trend analyses; a detailed overview of excluded data is given in Skarbøvik *et al.* (2010). Examples are total phosphorus and mercury data 1999-2003 (see also Stålnacke *et al.,* 2009).

Another challenge is the statistical handling of observations below the detection limit, the so-called LOD values (Limit of Detection). This represents a particular problem in the Norwegian RID datasets, which includes several rivers with low contamination levels. Particularly noteworthy is the high number of observations below LOD for a number of metals in Norwegian rivers (see Skarbøvik *et al*., 2007 for details). There was a general increase in frequency of below LOD values for some metals, SPM and total phosphorus during the period 1999-2003 due to higher LOD (Skarbøvik *et al.,* 2007). In the period 1990-1998 many values below LOD were reported. These examples illustrate the importance of recording changes in laboratory procedures (see Skarbøvik and Borgvang, 2007.)

Trends in water discharge, nutrients and suspended sediments

An overview of the statistical trend tests for water discharge, nutrients and suspended particles (both loads and concentrations) is given in Table 1.

Variations in runoff explain most of the inter-annual variability in the riverine loads of nutrients and particles. A statistically significant upward trend in annual water discharge was detected in the Drammenselva ($p<0.05$) and tendencies of upward trends were also noted in Glomma and Numedalslågen ($p<0.1$) (Table 1).

Statistically significant trends in TN loads were detected in four out of nine rivers (Table 1; upper). Three of them were downward while the fourth was upward. For ammonium and nitrate loads, statistically significant *downward* trends were detected in five and four rivers, respectively. Almost the same trends were detected also for the concentrations series (Table 1; lower).

Statistically significant downward trends in total phosphorus loads were detected in two out of nine rivers (Table 1; upper). For concentrations, four rivers showed statistically significant trends (three downward and one upward trend; Table 1; lower). For the orthophosphate loads and concentrations, statistically significant downward trends were detected in three (upper estimates) and one river (lower estimate).Statistically significant downward trends in particulate matter were detected in two out of nine rivers; Otra and Vefsna for both loads and concentrations.

Table 1. Long-term trends in annual water discharge (Q; estimated on daily measurements), nutrient and particle loads and concentrations (upper estimates; upper and lower estimates given for orthophosphate) in nine Norwegian main rivers 1990- 2011. The table shows the p-values. The colours indicate the degree of statistical significance (see legend).

LOADS

River	Q	NH_4-N	NO_3-N	Tot-N	PO_4-P (1)	PO_4-P (2)	Tot-P	SPM
Glomma	0.059	0.001	0.468	0.463	0.639	0.597	0.313	0.209
Drammenselva	0.019	0.141	0.788	0.545	0.769	0.672	0.570	0.631
Numedalslågen	0.085	0.439	0.454	0.031	0.816	0.867	0.775	0.464
Skienselva	0.108	0.105	0.000	0.002	0.251	0.909	0.279	0.370
Otra	0.800	0.869	0.000	0.219	0.841	0.044	0.123	0.098
Orreelva	0.352	0.019	0.155	0.924	0.930	0.930	0.307	0.173
Orkla	0.446	0.037	0.468	0.187	0.977	0.513	0.587	0.698
Vefsna	0.632	0.000	0.000	0.004	0.058	0.039	0.000	0.086
Altaelva	0.714	0.023	0.005	0.004	0.035	0.022	0.005	0.162
All rivers	0.161	0.003	0.003	0.113	0.473	0.089	0.066	0.292

CONCENTRATIONS

River	NH_4-N	NO_3-N	Tot-N	PO_4-P (1)	PO_4-P (2)	Tot-P	SPM
Glomma	0.008	0.719	0.122	0.165	0.170	0.426	0.303
Drammenselva	0.294	0.609	0.061	0.510	0.593	0.175	0.553
Numedalslågen	0.464	0.087	0.010	0.921	0.989	0.024	0.382
Skienselva	0.490	0.000	0.000	0.092	0.448	0.610	0.469
Otra	0.826	0.003	0.133	0.090	0.007	0.014	0.002
Orreelva	0.171	0.047	0.194	0.982	0.989	0.594	0.652
Orkla	0.025	0.606	0.510	0.155	0.068	0.203	0.212
Vefsna	0.000	0.000	0.008	0.093	0.001	0.028	0.024
Altaelva	0.003	0.010	0.083	0.005	0.003	0.026	0.114
All rivers	0.012	0.001	0.164	0.317	0.040	0.505	0.138

Significant downward ($p<0.05$)

Downward but not significant ($0.05<p<0.1$)

Significant upward ($p<0.05$)

Upward but not significant ($0.05<p<0.1$)

PO_4-P(1) – upper estimates

PO_4-P(2) – lower estimates

Trends in metal loads and concentrations

The metals for which long-term trends are investigated are:

- Copper (Cu)
- Lead (Pb)
- Zinc (Zn)
- Cadmium (Cd)
- Mercury (Hg)

An overview of the statistical trend tests of the metals are given in Table 2 (upper estimates) and Table 3 (lower estimates).

Overall, out of 50 trend tests carried out for the metal loads, 38 were statistically significant downward ($p<0.05$) for the upper and 32 for the lower estimate, respectively. For the concentrations series, 40 downward trends were statistically significant ($p<0.05$) for the upper and 25 for the lower estimate, respectively.

No firm conclusions can be drawn about long-term changes in metal loads, except for copper, zinc and perhaps also lead. Possible visual trends in the data and figures are not necessarily explained by ‘real’ changes in loads. Thus, results and interpretations should in most rivers be used with great caution and should solely be used as an indication of the magnitude in loads and the uncertainty.

Table 2. Long-term trends for metal loads and concentrations in nine Norwegian main rivers 1990-2011. The table shows the p-values. The colours indicate the degree of statistical significance (see legend). The trend test was performed on the upper estimates.

LOADS

River	Q	Cd	Cu	Ni	Pb	Zn
Glomma	0.059	0.005	0.118	0.015	0.007	0.096
Drammenselva	0.019	0.000	0.981	0.416	0.163	0.413
Numedalslågen	0.085	0.001	0.049	0.014	0.010	0.016
Skienselva	0.108	0.000	0.019	0.000	0.125	0.004
Otra	0.800	0.001	0.089	0.001	0.095	0.017
Orreelva	0.352	0.018	0.354	0.000	0.107	0.992
Orkla	0.446	0.005	0.008	0.010	0.008	0.002
Vefsna	0.632	0.000	0.000	0.000	0.000	0.003
Altaelva	0.714	0.000	0.000	0.002	0.014	0.337
All rivers	0.161	0.000	0.002	0.000	0.000	0.000

CONCENTRATIONS

River	Cd	Cu	Ni	Pb	Zn
Glomma	0.001	0.058	0.007	0.002	0.082
Drammenselva	0.000	0.380	0.117	0.057	0.140
Numedalslågen	0.001	0.018	0.006	0.017	0.005
Skienselva	0.000	0.052	0.001	0.026	0.000
Otra	0.001	0.061	0.005	0.003	0.000
Orreelva	0.000	0.848	0.000	0.004	0.762
Orkla	0.005	0.007	0.001	0.001	0.000
Vefsna	0.000	0.000	0.000	0.000	0.000
Altaelva	0.000	0.002	0.004	0.000	0.005
All rivers	0.000	0.014	0.000	0.000	0.000

(dark green)	Significant downward (p<0.05)
(light green)	Downward but not significant (0.05<p<0.1)
(red)	Significant upward (p<0.05)
(orange)	Upward but not significant (0.05<p<0.1)

Table 3. Long-term trends for metal loads and concentrations in nine Norwegian main rivers 1990-2011. The table shows the p-values. The colours indicate the degree of statistical significance (see legend). The trend test was performed on the lower estimates.

LOADS

River	Q	Cd	Cu	Ni	Pb	Zn
Glomma	0.059	0.238	0.118	0.015	0.041	0.096
Drammenselva	0.019	0.000	0.981	0.839	0.201	0.413
Numedalslågen	0.085	0.010	0.049	0.277	0.032	0.016
Skienselva	0.108	0.006	0.022	0.049	0.172	0.004
Otra	0.800	0.191	0.089	0.001	0.220	0.017
Orreelva	0.352	0.117	0.354	0.000	0.144	0.992
Orkla	0.446	0.012	0.008	0.010	0.010	0.002
Vefsna	0.632	0.000	0.000	0.000	0.000	0.005
Altaelva	0.714	0.002	0.000	0.003	0.436	0.307
All rivers	0.161	0.003	0.002	0.000	0.001	0.000

CONCENTRATIONS

River	Cd	Cu	Ni	Pb	Zn
Glomma	0.478	0.058	0.007	0.106	0.082
Drammenselva	0.152	0.380	0.201	0.499	0.139
Numedalslågen	0.384	0.018	0.214	0.057	0.005
Skienselva	0.032	0.052	0.214	0.494	0.000
Otra	0.428	0.061	0.008	0.128	0.000
Orreelva	0.983	0.848	0.000	0.013	0.813
Orkla	0.195	0.007	0.001	0.114	0.000
Vefsna	0.002	0.000	0.001	0.004	0.000
Altaelva	0.038	0.003	0.024	0.188	0.026
All rivers	0.102	0.014	0.001	0.028	0.000

(dark green)	Significant downward ($p<0.05$)
(light green)	Downward but not significant ($0.05<p<0.1$)
(red)	Significant upward ($p<0.05$)
(orange)	Upward but not significant ($0.05<p<0.1$)

Conclusions

The main conclusions of the trend analysis on annual loads for the period 1990-2011 are summarised as follows:

- For water discharge, a statistically significant upward trend could be detected in the Drammenselva ($p<0.05$) and tendencies of upward trends could also be noted in Glomma and Numedalslågen ($p<0.1$).
- For nutrients:
  - In Rivers Skienselva, Vefsna and Altaelva, downward trends in nitrogen loads (total-N and nitrate-N);
  - In River Numedalslågen, an upward trend in total nitrogen loads;
  - In Rivers Glomma, Vefsna, Orrelva and Altaelva, downward trends in ammonium loads;
  - In Rivers Vefsna and Altaelva, downward trends in total phosphorus load
  - In Rivers Otra and Vefsna, downward trends in orthophosphate load (lower estimates).
- For suspended particles, downward trends were detected in Rivers Otra and Vefsa. For copper there were downward trends in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva.
- For zinc, downward trends were statistically significant in five of the nine investigated rivers for both the lower and upper estimate methods; i.e. Rivers Orkla, Vefsna, Numedalslågen, Skienselva and Otra.
- For lead, downward trends were detected in four rivers; Rivers Glomma, Numedalslågen, Vefsna and Orkla. A statistically-significant downward trend was also detected in River Altaelva for the upper load estimates. The LOD for lead has changed by a factor of 100 during the monitoring period (1990-2011), so no firm conclusions on the trend should be drawn.
- For the other metal loads (Hg, As, Cr, Ni), no firm conclusions can be drawn about long-term changes. For lindane and PCB, no conclusion about trends can be drawn. A majority of analyses were below LOD, and there have also been changes in the LOD during the monitoring period.

Similar conclusions as for the trends in loads can also be drawn for the concentrations with some minor exceptions. For example, out of 50 performed trend tests for the metal loads, 38 were downward statistically significant ($p<0.05$) for the upper and 32 for the lower estimate, respectively. For the concentrations series, 40 downward trends were statistically significant ($p<0.05$) for the upper and 25 for the lower estimate, respectively.

References

Hirsch, R.M. and Slack, J.R. 1984. A nonparametric trend test for seasonal data with serial dependence: Water Resources Research v. 20, p. 727–732.

Libiseller, C. and Grimvall A. 2002. Performance of Partial Mann Kendall Tests for Trend Detection in the Presence of Covariates, Environmetrics 13, 71-84.

Sen P.K. 1968. Estimates of the regression coefficient based on Kendall's tau. *Journal of the American Statistical Association*, 63, 1379-1389.

Skarbøvik, E. and Borgvang, S.A. 2007. Comprehensive Study on Riverine Inputs and Direct Discharges (RID): Overview of the RID 2005 Data and an Analysis of the Reliability, Accuracy, Comparability and Completeness of the Data. Commission for the Protection of the Marine Environment of the North-East Atlantic; OSPAR Report no. 326. ISBN 978-1-905859-65-8. 302 pp.

Skarbøvik, E. Stålnacke, P.G., Kaste, Ø., Selvik, J.R., Borgvang, S.A., Tjomsland, T., Høgåsen, T. and Beldring, S. 2007. Riverine inputs and direct discharges to Norwegian coastal waters – 2006. OSPAR Commission. Norwegian Pollution Control Authority (SFT). TA-2327/2007; NIVA Report 5511/2007. 142 pp.

Skarbøvik, E., Stålnacke, P.G., Kaste, Ø., Selvik, J.R., Tjomsland, T., Høgåsen, T., Aakerøy, P.A., and Beldring, S. 2010. Riverine inputs and direct discharges to Norwegian coastal waters – 2009. Climate and Pollution Agency TA-2726/2010; 75 pp.

Skarbøvik, E., Stålnacke, P., Austnes, K., Selvik, J.R., Aakerøy, P.A., Tjomsland, T., Høgåsen, T. and Beldring, S. 2012. Riverine inputs and direct discharges to Norwegian coastal waters – 2011. Klif rapport TA-2986/2012; SPFO-1134/2012; NIVA-rapport 6439-2012; 66 s.

Stålnacke, P., Haaland, S., Skarbøvik, E., Turtumøygard, S., Nytrø, T.E., Selvik, J.R., Høgåsen, T., Tjomsland, T., Kaste, Ø. and Enerstvedt, K.E. 2009. Revision and assessment of Norwegian RID data 1990-2007. Bioforsk Report Vol. 4 No. 138. SFT report TA-2559/2009. 20p.

Weideborg, M., Arctander Vik, E. and Lyngstad, E. 2004. Riverine inputs and direct discharges to Norwegian coastal waters 2003. Norwegian State Pollution Monitoring Programme. Report number 04-043A. TA 2069/2004.

Annex V Statistical information on river catchment areas

Statistical Information on River Catchment Areas

River	Catchment area [km2]	Countries	Share in catchment area [km2]	Share in catchment area [%]	Population (1990) [10E6]	Population (1990) [%]	LTA* [1000 m3/d]	LTA-period [a]
Statistical Information provided by Belgium:								
Coastal Area	**2675**				**~0.497**		**2367**	NI
Western	1689	*Belgium*	>1082	NI	>0,305	NI	708	
		France	NI	NI	NI	NI		
Middle	499	*Belgium*			0.014		501	
Eastern	487	*Belgium*			0.177		1158	
Scheldt basin								
Scheldt	**22004**				**~10**		**11139**	1949-2008
		Belgium (1)	13324	*61*	6.9			
		France	6680	*30*	~2,7			
		Netherlands (1)	2000	*9*	0.4			
		(1) Ghent-Terneuzen canal comprised						
Ghent-Terneuzen canal	**NI**						**1 885**	1991-2008
		Belgium	NI		NI			
		Netherlands	NI		NI			
Statistical Information provided by Denmark:								
Vid å	248.3	*DK*	*248*	*81*			300.5	78-07
Brøns å	94.1	*DK*	*94*	*100*		*100*	107.0	74-07
Ribe å	675	*DK*	*675*	*100*		*100*	756.6	33-07
Kongeaen	426.6	*DK*	*427*	*100*		*100*	627.0	90-07
Sneum å	223	*DK*	*223*	*100*		*100*	283.1	66-07
Varde å	815	*DK*	*815*	*100*		*100*	1048.8	69-07
Skjern å	1558.4	*DK*	*1558*	*100*		*100*	2108.2	74-07
Stor å	1096.7	*DK*	*1097*	*100*		*100*	1427.3	71-07
Brede å	290	*DK*	*290*	*100*		*100*	311.0	22-07
Omme å	612	*DK*	*612*	*100*		*100*	743.1	83-07
Grøn å	563	*DK*	*563*	*100*		*100*	606.2	59-07
Total	**10809**	**=Total of Danish rivers discharging to the North Sea**					**8230**	**71-90**
Liver å	249.8	*DK*	*250*	*100*		*100*	226.4	89-07
Uggerby å	347.5	*DK*	*348*	*100*		*100*	351.3	89-07
	1097	**=Total of Danish rivers discharging to the Skagerrak**					**863**	**71-90**
Karup å	626.8	*DK*	*527*	*100*		*100*	635.2	86-07
Jordbro å	110.9	*DK*	*111*	*100*		*100*	110.7	80-07
Skals å	556.4	*DK*	*556*	*100*		*100*	389.7	73-07
Simmersted å	214.9	*DK*	*215*	*100*		*100*	207.6	92-07
Elling å	132.2	*DK*	*132*	*100*		*100*	123.2	89-07
Voer å	238.7	*DK*	*239*	*100*		*100*	247.6	89-07
Ger å	153.8	*DK*	*154*	*100*		*100*	149.6	85-07
Lindeborg å	317.8	*DK*	*318*	*100*		*100*	310.3	83-07
Haslevgard å	75	*DK*	*75*	*100*		*100*	62.3	89-07
Kastbjerg å	96.3	*DK*	*96*	*100*		*100*	70.1	76-07
Guden å	2602.9	*DK*	*2 603*	*100*		*100*	2837.8	78-07
Ry å	285	*DK*	*285*	*100*		*100*	264.7	72-07
	15828	**=Total of Danish rivers discharging to the Kattegat**					**5284**	**71-90**

River	Catchment area	Countries	Share in catchment area		Population (1990)		LTA*	LTA-period
	[km2]		[km2]	[%]	[10E6]	[%]	[1000 m3/d]	[a]
Statistical Information provided by France:								
Coastal area	2308	*France*		*100*	0.61	*100*	2764	1989 - 2006
Canche	3895	*France*		*100*	0.38	*100*	4579	1961 - 2006
Somme	5916	*France*		*100*	0.59	*100*	3197	1963 - 2006
Béthune et Bresle	2153	*France*		*100*	0.16	*100*	2074	1998 - 2006
Saane	1718	*France*		*100*	0.16	*100*	2938	1996 - 2006
Seine	64953	*France*		*100*	13.94	*100*	44842	1974 - 2006
Andelle	789	*France*		*100*	0.05	*100*	691	1972 - 2006
Eure	6023	*France*		*100*	0.60	*100*	2246	1971 - 2006
Coastal area	2439	*France*		*100*	0.93	*100*	1599	1989 - 2006
Risle	2545	*France*		*100*	0.16	*100*	1642	1976 - 2006
Dives	1815	*France*		*100*	0.11	*100*	1296	1968 - 2006
Douve	1474	*France*		*100*	0.08	*100*	625	1989 - 2006
Orne	2976	*France*		*100*	0.40	*100*	2506	1984 - 2006
Seulles	547	*France*		*100*	0.06	*100*	346	1970 - 2006
Touques	1311	*France*		*100*	0.10	*100*	1037	1981 - 2006
Vire	2077	*France*		*100*	0.15	*100*	2246	1993 - 2006
Coastal area	1302	*France*		*100*	0.16	*100*	1174	1989 - 2006
Sélune et Sée	1623	*France*		*100*	0.09	*100*	1987	1994 - 2006
Sienne	1135	*France*		*100*	0.09	*100*	1328	1989 - 2006
Aulne	4312	*France*		*100*	0.52	*100*	6653	1969 - 2006
Rance et Couesnon	2848	*France*		*100*	0.27	*100*	2160	1983 - 2006
Coastal area	4961	*France*		*100*	0.49	*100*	3654	1989 - 2006
	119122	=Total of rivers discharging in ZONE II			20.10		91 582	
Blavet et Scorff	4649	*France*		*100*	0.50	*100*	5702	1982 - 2006
Coastal area	2868	*France*		*100*	0.32	*100*	4558	1989 - 2006
Vilaine	10144	*France*		*100*	0.90	*100*	5443	2001 - 2006
Coastal area	3636	*France*		*100*	0.82	*100*	2847	1989 - 2006
Loire	110178	*France*		*100*	6.67	*100*	73526	1868 - 2006
Sèvre Nantaise	4664	*France*		*100*	0.52	*100*	4234	1993 - 2006
Lay	4522	*France*		*100*	0.39	*100*	3456	1971 - 2006
Sèvre Niortaise	4363	*France*		*100*	0.42	*100*	4752	1992 - 2006
Coastal area	291	*France*		*100*	0.02	*100*	239	1989 - 2006
Boutonne	2141	*France*		*100*	0.14	*100*	1754	1989 - 2006
Charente	7526	*France*		*100*	0.43	*100*	5357	1979 - 2006
Coastal area	1172	*France*		*100*	0.09	*100*	446	1989 - 2006
Seudre	988	*France*		*100*	0.06	*100*	432	1971 - 2006
Eyre	2036	*France*		*100*	0.03	*100*	1814	1967 - 2006
Coastal area	2810	*France*		*100*	0.10	*100*	2264	1989 - 2006
Dordogne	14605	*France*		*100*	0.55	*100*	21859	1997 - 2006
Isle	8472	*France*		*100*	0.40	*100*	6912	1971 - 2006
Coastal area	870	*France*		*100*	0.09	*100*	647	1989 - 2006
Dropt	2672	*France*		*100*	0.21	*100*	1989	1989 - 2006
Garonne	38227	*France*		*100*	2.24	*100*	40003	1966 - 2006
Lot	11541	*France*		*100*	0.35	*100*	12614	2000 - 2006
Coastal area	3875	*France*		*100*	0.75	*100*	10983	1989 - 2006
Coastal area	3105	*France*		*100*	0.15	*100*	2501	1989 - 2006
Adour	7977	*France*		*100*	0.37	*100*	7690	1920 - 2006
Bidouze	1041	*France*		*100*	0.04	*100*	938	1989 - 2006
Gaves réunis	5504	*France*		*100*	0.32	*100*	17453	1925 - 2006
Luy	1367	*France*		*100*	0.10	*100*	1814	1966 - 2006
Nive	1153	*France*		*100*	0.12	*100*	3197	1968 - 2006
Coastal area	644	*France*		*100*	0.10	*100*	1825	1989 - 2006
	263040	=total of rivers discharging in ZONE IV			17.19		247 250	
Statistical Information provided by Germany:								
Ems	15552						7690	1941-2006
		Germany	13152	85.00	3.75	85		
		Netherlands	2400	15.00	0.6	15		
Weser	46306	*Germany*	-	-	9.0	-	31541	1941-2003
Elbe	148268		148268	100	25.11	-	74500	1926-2003
		Germany	*96932*	*65.38*	*19.09*	*76.03*		
		Czech Republic	*50176*	*33.84*	*5.97*	*23.78*		
		Austria	*920*	*0.62*	*0.05*	*0.20*		
		Poland	*240*	*0.16*	*NI*	*NI*		
Eider	2065	*Germany*	-	-	0.159	-	2391	1974-2006

River	Catchment area	Countries	Share in catchment area		Population (1990)		LTA*	LTA-period
	[km2]		[km2]	[%]	[10E6]	[%]	[1000 m3/d]	[a]
Statistical Information provided by Ireland:								
Boyne	2695	Ireland	-	-	NI	-	3280	1940-2006
Liffey	1256	Ireland	-	-	NI	-	1459	1900-2006
								1956-2006
Avoca	652	Ireland	-	0	NI	-	1562.112	1986-2006
Slaney	1762	Ireland	-	-	NI	-	3208.032	1990-2006
	6365	**=Total of main Irish rivers discharging to the Irish Sea**						
Barrow	3067	Ireland	-	-	NI	-	3784.32	1996-2006
Nore	2530	Ireland	-	-	NI	-	3602.016	1972-2006
Suir	3610	Ireland	-	-	NI	-	5889.024	1972-2006
								1953-2006
Blackwater	3324	Ireland	-	-	NI	-	7521.984	1955-2006
Lee	1253	Ireland	-	-	NI	-	3435.264	1957-2006
Bandon	608	Ireland	-	-	NI	-	1858	1975-2006
Deel	486	Ireland	-	-	NI	-	624.672	1982-2006
Maigue	1052	Ireland	-	-	NI	-	1513.728	1990-2006
Shannon Old Chan.	11700	Ireland	-	-	NI	-	4499.712	1990-2006
Shannon Tailrace		Ireland					13307.33	1947-2006
Fergus	1042	Ireland	-	-	NI	-	1 598	1956-2006
	28672	=Total of main Irish rivers discharging to the Celtic Sea						
Corrib	3138	Ireland	-	-	NI	-	9011.52	1973-06 excl. 86-90, 92-93
Moy	2086	Ireland	-	-	NI	-	5405.184	1974-2006
Erne	4372	**Ireland/UK**	2572/1800	60/40	NI	-	7 333	1951-2006
	9596	**=Total of main Irish rivers dischrging to the Atlantic**						
Statistical Information provided by The Netherlands (with assistance from Germany and Belgium)								
Rhine	185000				2) 55.6		4) 198720	1901-1995
		Switzerland	1) 28000	15	3.0	6		
		France	24000	13	3.7	7		
		Luxembourg	2500	1	0.3	1		
		Germany	105900	57	32.5	65		
		Netherlands	21000	11	10.9	21		
		Belgium	700	0				
		Austria	2500	1				
		Liechtenstein	300	0				
		Italy	100	0				
Meuse	33500				3) 7.15		5) 28080	1911-1995
		France	8500	25	0.50			
		Luxembourg	100	0	0.05			
		Belgium	13150	39	2.00			
		Germany	4300	13	1.00			
		Netherlands	7400	22	3.60			
Scheldt	22004				~10		9331	1949-1995
		France	6680	30.00	~2.7	~27		
		Belgium	13324	61.00	6.9	69		
		Netherlands	2000	9.00	0.4	4		
Ems	15552						7690	1941-2006
		Germany	13152	85.00	3.75	85		
		Netherlands	2400	15.00	0.6	15		

1) Catchment areas rounded off to the nearest hundred km2
2) Population Rhine catchment per country requires further analysis
3) Population Meuse catchment: rough estimates
4) Estimated discharge at outlet: 2.300 m3/s * 24 h/d * 3600 s/h
5) Estimated discharge at outlet: 325 m3/s * 24 h/d * 3600 s/h

River	Catchment area	Countries	Share in catchment area		Population (1990)		LTA*	LTA-period
Statistical Information provided by Norway:								
Glomma (1)	41918	Norway		100.00	0.62	100	61350	1961-1990
Drammenselva (2)	17034	Norway		100.00	0.2	100	28850	1961-1990
Numedalslågen (3)	5577	Norway		100.00	0.04	100	10200	1961-1990
Skienselva (4)	10772	Norway		100.00	0.11	100	23535	1961-1990
Otra (5)	3738	Norway		100.00	0.03	100	12870	1961-1990
	79039	**=Total of Norwegian rivers discharging to the Skagerrak**						
Orreelva (6)	105	Norway		100.00	0.01	100	335	1961-1990
Suldalslågen (7)	1457	Norway		100.00	0.003	100	7420	1961-1990
	1562	**=Total of Norwegian rivers discharging to the North Sea**						
Orkla (8)	3053	Norway		100.00	0.02	100	5710	1961-1990
Vefsna (9)	4122	Norway		100.00	0.01	100	15655	1961-1990
	7175	**=Total of Norwegian rivers discharging to the Norwegian Sea**						
Altaelva (10)	7373	Norway		100.00	0.005	100	7495	1961-1990
	95149	**Total catchment for main rivers discharging to all four regions**						
	126706	**Total catchment for tributary rivers discharging to all four regions**						
	221855	**Total catchment for monitored rivers**						
Statistical Information provided by Portugal:								
Tejo	80149	Portugal	24380	30.8	2.89	32.0	15900	50
		Spain	55769	69.2	6.14	68.0	34800	50
Douro	97600	Portugal	18600	19.1	1.76	43.5	22500	50
		Spain	79000	80.9	2.28	56.5	40900	50
Miño/Minho	17000	Portugal	900	5.3	0.07	7.9	6000	15
		Spain	16100	94.7	0.86	92.1	29000	15

River	Catchment area	Countries	Share in catchment area		Population (1990)		LTA*	LTA-period
	[km2]		[km2]	[%]	[10E6]	[%]	[1000 m3/d]	[a]
Statistical Information provided by Spain:								
Oyarzun	74	Spain	74	100	0.055	100	166	
Urumea	266	Spain	266	100	0.176	100	633	
Oria	860	Spain	860	100	0.020	100	740	
Cadagua		Spain						
Asua		Spain						
Galindo		Spain						
Ibaizabal		Spain						
Urola	342	Spain	342	100	0.082	100	447	
Deva	531	Spain	531	100	0.146	100	694	
Artibay	106	Spain	106	100	0.016	100	NI	
Lea	81	Spain	81	100	0.010	100	NI	
Oca	132	Spain	132	100	0.022	100	NI	
Butron	175	Spain	175	100	0.024	100	NI	
Barbadun	135	Spain	135	100	0.020	100	NI	
Nervión	1764	Spain	1764	100	0.997	100	1 105	
Pas	620	Spain	606	97				
Eo	818	Spain	715	87				
Saja	955	Spain	955	100	0.104	100	1 166	
Nalón	4866	Spain	4866	100	0.539	100	6 977	
Miera	291	Spain	291	100	0.016	100	352	
Sella	1246	Spain	1246	100	0.035	100	832	
Masma	291	Spain	291	100	0.014	100	404	1970-2005
Oro	189	Spain	189	100	0.007	100	389	1970-2005
Landro	270	Spain	270	100	0.017	100	629	1975-2005
Sor	202	Spain	202	100	0.007	100	528	1996-2005
Mera	127	Spain	127	100	0.007	100	435	1970-2005
Forcadas	68	Spain	68	100	0.000	100	183	1970-2005
Grande de Jubia	182	Spain	182	100	0.004	100	318	1970-2005
Belelle	60	Spain	60	100	0.003	100	1 484	1970-2005
Eume	470	Spain	470	100	0.013	100	1 696	1970-2005
Mandeo	457	Spain	457	100	0.039	100	771	1970-2005
Mero	345	Spain	345	100	0.042	100	456	1984-2005
Allones	516	Spain	516	100	0.049	100	988	1970-2005
Grande	283	Spain	283	100	0.002	100	647	1970-2005
Castro	140	Spain	140	100	0.004	100	167	1970-2005
Jallas	504	Spain	504	100	0.022	100	739	1970-2005
Tambre	1530	Spain	1530	100	0.059	100	3828	1994-2005
Furelos		Spain						
Deza		Spain						
Traba	122	Spain	122	100	0.004	100	316	1970-2005
Ulla	2803	Spain	2803	100	0.104	100	1337	1971-2005
	156	Spain	156	100				
Umia	440	Spain	440	100	0.052	100	846	1970-2005
Lerez	450	Spain	450	100	0.085	100	1249	1970-1999
Verdugo	334	Spain	334	100	0.021	100	484	1970-2005
Miño	17247	Spain	16347	94.8	0.881		25716	1975-95
		Portugal	900	5.2				
Duero	97670	Spain	78960	80.8	3.093			
		Portugal	18710	19.2				
Tajo	80190	Spain	55810	69.6	6.459			
		Portugal	24380	30.4				
Guadiana	67122	Spain	55597	82.8	1.800		8556	1.912 - 1.995
		Portugal	11525	17.2				
Piedras	550	Spain	550	100	0.034	100	61	
Odiel	2417	Spain	2417	100	0.211	100	1 200	1967-1995
Guadaira		Spain						
Tinto	1727	Spain	1727	100	0.090	100	178	1966-1995
Guadalquivir	63241	Spain	63241	100	4.966	100	3423	1942-88
Guadiamar								
Guadalete	3360	Spain	3360	100	0.555	100	413	
TOTAL	**356726**	**Spain**	**301093**	**84.4**	**20.907**	**NI**	**70553**	
		Portugal	**55515**	**15.6**	**NI**			
		TOTAL	**356608**	**100**				

River	Catchment area	Countries	Share in catchment area		Population (1990)		LTA*	LTA-period
	[km2]		[km2]	[%]	[10E6]	[%]	[1000 m3/d]	[a]
Statistical Information provided by Sweden:					2005			
Vege å (95)	498	Sweden	498	100	0.0430	100	440	1961-1990
Rönne å (96)	1890	Sweden	1890	100	0.0903	100	2030	1961-1990
Stensån (97)	284	Sweden	284	100	0.0065	100	350	1961-1990
Lagan (98)	6444	Sweden	6444	100	0.1181	100	7410	1961-1990
Genevadsån (99)	225	Sweden	225	100	0.0046	100	350	1961-1990
Fylleån (100)	359	Sweden	359	100	0.0092	100	650	1961-1990
Nissan (101)	2682	Sweden	2682	100	0.0834	100	3690	1961-1990
Suseån (102)	441	Sweden	441	100	0.0074	100	640	1961-1990
Ätran (103)	3343	Sweden	3343	100	0.0657	100	5070	1961-1990
Himleån (104)	214	Sweden	214	100	0.0127	100	330	1961-1990
Viskan (105)	2201	Sweden	2201	100	0.1236	100	2760	1961-1990
Rolfsån (106)	723	Sweden	723	100	0.0281	100	1030	1961-1990
Kungsbackaån (107)	310	Sweden	310	100	0.0404	100	410	1961-1990
Göta älv (108)	50230	Sweden	42780.00	85.20	0.8776	ni	50530	1961-1990
		Norway	7450.00	14.80	ni	ni		
	69844	**=Total of Swedish rivers discharging to the Kattegat**						
Bäveån (109)	302	Sweden	302	100	0.0226	100	350	1961-1990
Örekilsälven (110)	1327	Sweden	1327	100	0.0138	100	2050	1961-1990
Strömsån (111)	253	Sweden	253	100	0.0056	100	390	1961-1990
Enningsdalsälven (112)	704	Sweden	704	100	0.0029	100	1360	1961-1990
	2586	**=Total of Swedish rivers discharging to the Skagerrak**						
Statistical Information provided by the United Kingdom:								
Ness (SC2b)	NI	-	-	-	NI	-	7 600	NI
Conon (SC2b)	NI	-	-	-	NI	-	NI	NI
Baeuly (SC2b)	NI	-	-	-	NI	-	NI	NI
Findhorn (SC2b)	NI	-	-	-	NI	-	NI	NI
Shin (SC2b)	NI	-	-	-	NI	-	NI	NI
Helmsdale (SC2b)	NI	-	-	-	NI	-	NI	NI
Naver (SC2b)	NI	-	-	-	NI	-	NI	NI
Thurso (SC2b)	NI	-	-	-	NI	-	NI	NI
Brora (SC2b)	NI	-	-	-	NI	-	NI	NI
Oykel (SC2b)	NI	-	-	-	NI	-	NI	NI
Nairn (SC2b)	NI	-	-	-	NI	-	NI	NI
Carron (Sutherland) (SC2	NI	-	-	-	NI	-	NI	NI
Wick (SC2b)	NI	-	-	-	NI	-	NI	NI
Halladale (SC2b)	NI	-	-	-	NI	-	NI	NI
Hope (SC2b)	NI	-	-	-	NI	-	NI	NI
Alness (SC2b)	NI	-	-	-	NI	-	NI	NI
Cassley (SC2b)	NI	-	-	-	NI	-	NI	NI
Fleet (SC2b)	NI	-	-	-	NI	-	NI	NI
Berriedale Water (Sc2b)	NI	-	-	-	NI	-	NI	NI
Borgie (SC2b)	NI	-	-	-	NI	-	NI	NI
Forss Water (SC2b)	NI	-	-	-	NI	-	NI	NI
Loch of Stenness (SC2b)	NI	-	-	-	NI	-	NI	NI
Glass (SC2b)	NI	-	-	-	NI	-	NI	NI
Strathy (Sc2b)	NI	-	-	-	NI	-	NI	NI
Mickle Burn (SC2b)	NI	-	-	-	NI	-	NI	NI
Dunbeath Water (SC2b)	NI	-	-	-	NI	-	NI	NI
Spey (SC3)	NI	-	-	-	NI	-	5 600	NI

UK cont.

River	Catchment area	Countries	Share in catchment area		Population (1990)		LTA*	LTA-period
	[km2]		[km2]	[%]	[10E6]	[%]	[1000 m3/d]	[a]
Dee (Grampian) (SC3)	NI	-	-	-	NI	-	NI	NI
Don (SC3)	NI	-	-	-	NI	-	NI	NI
Deveron (SC3)	NI	-	-	-	NI	-	NI	NI
Ythan (SC3)	NI	-	-	-	NI	-	NI	NI
Ugie (SC3)	NI	-	-	-	NI	-	NI	NI
Bervie Water (SC3)	NI	-	-	-	NI	-	NI	NI
Lossie (SC3)	NI	-	-	-	NI	-	NI	NI
Tay (SC4)	NI	-	-	-	NI	-	14 000	NI
Earn (SC4)	NI	-	-	-	NI	-	NI	NI
North Esk (Tayside) (SC4	NI	-	-	-	NI	-	NI	NI
South Esk (Tayside) (SC4	NI	-	-	-	NI	-	NI	NI
Eden SC4)	NI	-	-	-	NI	-	NI	NI
Lunan Water (SC4)	NI	-	-	-	NI	-	NI	NI
Dighty Water (SC4)	NI	-	-	-	NI	-	NI	NI
Tweed (SC5)	NI	-	-	-	NI	-	NI	NI
Forth (SC5)	NI	-	-	-	NI	-	4 300	NI
Whiteadder Water (SC5)	NI	-	-	-	NI	-	NI	NI
Leven (Fife) (SC5)	NI	-	-	-	NI	-	NI	NI
Almond (SC5)	NI	-	-	-	NI	-	NI	NI
Esk (Lothian) (SC5)	NI	-	-	-	NI	-	NI	NI
Tyne (SC5)	NI	-	-	-	NI	-	3 900	NI
Allan Water (SC5)	NI	-	-	-	NI	-	NI	NI
Devon (SC5)	NI	-	-	-	NI	-	NI	NI
Carron (Falkirk) (SC5)	NI	-	-	-	NI	-	NI	NI
Avon (SC5)	NI	-	-	-	NI	-	NI	NI
Eye Water (SC5)	NI	-	-	-	NI	-	NI	NI
Water of Leith (SC5)	NI	-	-	-	NI	-	NI	NI
Tweed (E1)	NI	-	-	-	NI	-	NI	NI
Coquet (E1)	NI	-	-	-	NI	-	NI	NI
Wansbeck (E1)	NI	-	-	-	NI	-	NI	NI
Blyth (E1)	NI	-	-	-	NI	-	NI	NI
Tyne (E2)	NI	-	-	-	NI	-	NI	NI
Derwent (E2)	NI	-	-	-	NI	-	NI	NI
Team (E2)	NI	-	-	-	NI	-	NI	NI
Wear (E3)	NI	-	-	-	NI	-	NI	NI
Skerne (E5)	NI	-	-	-	NI	-	NI	NI
Tees (E5)	NI	-	-	-	NI	-	NI	NI
Tot.N.Sea (N) catch.	50000						89300	1960 to 1990
Aire (E8)	NI	-	-	-	NI	-	NI	NI
Derwent (E8)	NI	-	-	-	NI	-	NI	NI
Don (E8)	NI	-	-	-	NI	-	NI	NI
Ouse (E8)	NI	-	-	-	NI	-	NI	NI
Wharfe (E8)	NI	-	-	-	NI	-	NI	NI
Ancholme (E8)	NI	-	-	-	NI	-	NI	NI
Trent (E8)	NI	-	-	-	NI	-	7800	NI
Idle (E8)	NI	-	-	-	NI	-	NI	NI
Welland (E9)	NI	-	-	-	NI	-	NI	NI
Nene (E9)	NI	-	-	-	NI	-	NI	NI
Ouse (E9)	NI	-	-	-	NI	-	NI	NI
Witham (E9)	NI	-	-	-	NI	-	NI	NI
Glan (E9)	NI	-	-	-	NI	-	NI	NI
Hundred Foot River (E9)	NI	-	-	-	NI	-	NI	NI
Ten Mile River (E9)	NI	-	-	-	NI	-	NI	NI
Bure (E10)	NI	-	-	-	NI	-	NI	NI
Wensum (E10)	NI	-	-	-	NI	-	NI	NI
Stour (E10)	NI	-	-	-	NI	-	NI	NI
Gipping (E10)	NI	-	-	-	NI	-	NI	NI
Waveney (E10)	NI	-	-	-	NI	-	NI	NI
Yare (E10)	NI	-	-	-	NI	-	NI	NI
Colne (E11)	NI	-	-	-	NI	-	NI	NI
Chalmer (E11)	NI	-	-	-	NI	-	NI	NI
Blackwater (E11)	NI	-	-	-	NI	-	NI	NI
Thames (E12)	NI	-	-	-	NI	-	6700	NI

UK Cont.

Beam (E12)	NI	-	-	-	NI	-	NI	NI
Beverley Brook (E12)	NI	-	-	-	NI	-	NI	NI
Brent (E12)	NI	-	-	-	NI	-	NI	NI
Crane (E12)	NI	-	-	-	NI	-	NI	NI
Ingrebourne (E12)	NI	-	-	-	NI	-	NI	NI
Lee (E12)	NI	-	-	-	NI	-	NI	NI
Ravensbourne (E12)	NI	-	-	-	NI	-	NI	NI
Roding (E12)	NI	-	-	-	NI	-	NI	NI
Wandle (E12)	NI	-	-	-	NI	-	NI	NI
Tot.N.Sea (S) catch.	62000						32300	1960 to 1990
Medway (E13)	NI	-	-	-	NI	-	NI	NI
Stour (E13)	NI	-	-	-	NI	-	1130	NI
Rother (E13)	NI	-	-	-	NI	-	NI	NI
Adur (E14)	NI	-	-	-	NI	-	NI	NI
Ouse (E14)	NI	-	-	-	NI	-	NI	NI
Cuckmere (E14)	NI	-	-	-	NI	-	NI	NI
Arun (E14)	NI	-	-	-	NI	-	NI	NI
Itchen (E15)	NI	-	-	-	NI	-	NI	NI
Test (E15)	NI	-	-	-	NI	-	NI	NI
Blackwater (E15)	NI	-	-	-	NI	-	NI	NI
Frome (E16)	NI	-	-	-	NI	-	NI	NI
Stour (E16)	NI	-	-	-	NI	-	NI	NI
Avon (E16)	NI	-	-	-	NI	-	1330	NI
Axe (E17)	NI	-	-	-	NI	-	NI	NI
Dart (E17)	NI	-	-	-	NI	-	NI	NI
Exe (E17)	NI	-	-	-	NI	-	1360	NI
Gara (E17)	NI	-	-	-	NI	-	NI	NI
Otter (E17)	NI	-	-	-	NI	-	NI	NI
Teign (E17)	NI	-	-	-	NI	-	NI	NI
Cober (E18)	NI	-	-	-	NI	-	NI	NI
Erme (E18)	NI	-	-	-	NI	-	NI	NI
Fal (E18)	NI	-	-	-	NI	-	NI	NI
Fowey (E18)	NI	-	-	-	NI	-	NI	NI
Gara (E18)	NI	-	-	-	NI	-	NI	NI
Lynher (E18)	NI	-	-	-	NI	-	NI	NI
Par (E18)	NI	-	-	-	NI	-	NI	NI
Plym (E18)	NI	-	-	-	NI	-	NI	NI
Porthleven (E18)	NI	-	-	-	NI	-	NI	NI
St Austel (E18)	NI	-	-	-	NI	-	NI	NI
Tavy (E18)	NI	-	-	-	NI	-	NI	NI
Tamar (E18)	NI	-	-	-	NI	-	1940	NI
Tot.Channel catch.	22000						16500	1960-1990
Camel (E19)	NI	-	-	-	NI	-	NI	NI
Hayle (E19)	NI	-	-	-	NI	-	NI	NI
Menalhyl (E19)	NI	-	-	-	NI	-	NI	NI
Red River (E19)	NI	-	-	-	NI	-	NI	NI
Taw (Yeo) (E19)	NI	-	-	-	NI	-	NI	NI
Taw (2) (E20)	NI	-	-	-	NI	-	NI	NI
Torridge (E20)	NI	-	-	-	NI	-	NI	NI
Parrett (E21)	NI	-	-	-	NI	-	NI	NI
Tone (E21)	NI	-	-	-	NI	-	NI	NI
Bristol Avon (E22)	NI	-	-	-	NI	-	NI	NI
Severn (2) (E22)	NI	-	-	-	NI	-	9100	NI
Wye (E23)	NI	-	-	-	NI	-	6200	NI
Usk (E23)	NI	-	-	-	NI	-	NI	NI
Rhymney (E23)	NI	-	-	-	NI	-	NI	NI
Ely (E23)	NI	-	-	-	NI	-	NI	NI
Afon Lwyd (E23)	NI	-	-	-	NI	-	NI	NI
Ebbw Fawr (E23)	NI	-	-	-	NI	-	NI	NI
Taff (E23)	NI	-	-	-	NI	-	NI	NI
Cadoxton (E24)	NI	-	-	-	NI	-	NI	NI
Neath (E24)	NI	-	-	-	NI	-	NI	NI
Ogmore (E24)	NI	-	-	-	NI	-	NI	NI
Thaw (E24)	NI	-	-	-	NI	-	NI	NI
Tawe (E24)	NI	-	-	-	NI	-	NI	NI
Ewenny (E24)	NI	-	-	-	NI	-	NI	NI
Nant Y Fendrod (E24)	NI	-	-	-	NI	-	NI	NI
Thaw Kenson (E24)	NI	-	-	-	NI	-	NI	NI
Dafen (E25)	NI	-	-	-	NI	-	NI	NI

UK Cont.

W Cleddau (E25)	NI	-	-	-	NI	-	NI	NI
Tywi (E25)	NI	-	-	-	NI	-	3700	NI
Taf (E25)	NI	-	-	-	NI	-	NI	NI
Loughor (E25)	NI	-	-	-	NI	-	NI	NI
Tot.Celtic S. catch.	32000						36400	1960-1990
Teifi (E26)	NI	-	-	-	NI	-	NI	NI
Ystwyth (E26)	NI	-	-	-	NI	-	NI	NI
Rheidol (E26)	NI	-	-	-	NI	-	NI	NI
Mawddach (E26)	NI	-	-	-	NI	-	NI	NI
Dyfi (E26)	NI	-	-	-	NI	-	NI	NI
Glaslyn (E26)	NI	-	-	-	NI	-	NI	NI
Afon Goch (2) (E27)	NI	-	-	-	NI	-	NI	NI
Clwyd (E27)	NI	-	-	-	NI	-	NI	NI
Cefni (E27)	NI	-	-	-	NI	-	NI	NI
Conwy (E27)	NI	-	-	-	NI	-	NI	NI
Dee (E27)	NI	-	-	-	NI	-	3020	NI
Nant Glywdyr (E27)	NI	-	-	-	NI	-	NI	NI
Alt (E28)	NI	-	-	-	NI	-	NI	NI
Mersey (E28)	NI	-	-	-	NI	-	3540	NI
Weaver (E28)	NI	-	-	-	NI	-	NI	NI
Darwen (E29)	NI	-	-	-	NI	-	NI	NI
Douglas (E29)	NI	-	-	-	NI	-	NI	NI
Ribble (E29)	NI	-	-	-	NI	-	NI	NI
Kent (E29)	NI	-	-	-	NI	-	NI	NI
Lune (E29)	NI	-	-	-	NI	-	3020	NI
Wyre (E29)	NI	-	-	-	NI	-	NI	NI
Leven (E29)	NI	-	-	-	NI	-	NI	NI
Derwent (E30)	NI	-	-	-	NI	-	NI	NI
Eden (E30)	NI	-	-	-	NI	-	4320	NI
Nith (SC1)	NI	-	-	-	NI	-	NI	NI
Annan (SC1)	NI	-	-	-	NI	-	NI	NI
Dee (Solway) (SC1)	NI	-	-	-	NI	-	NI	NI
Esk (Solway) (SC1)	NI	-	-	-	NI	-	NI	NI
Cree (SC1)	NI	-	-	-	NI	-	NI	NI
Bladnoch (SC1)	NI	-	-	-	NI	-	NI	NI
Water of Luce (SC1)	NI	-	-	-	NI	-	NI	NI
Urr Water (SC1)	NI	-	-	-	NI	-	NI	NI
Lochar Water (SC1)	NI	-	-	-	NI	-	NI	NI
Newry (NI2)	NI				NI	-	NI	NI
Quoile (NI2)	NI				NI	-	NI	NI
Lagan (NI2)	NI				NI	-	NI	NI
Tot.Irish Sea catch.	35000						48400	1960-1990
Clyde (SC2)	NI	-	-	-	NI	-	4 000	NI
Awe (SC2)	NI	-	-	-	NI	-	NI	NI
Leven (Loch Lomond (SC	NI	-	-	-	NI	-	NI	NI
Ayr (SC2)	NI	-	-	-	NI	-	NI	NI
Irvine (SC2)	NI	-	-	-	NI	-	NI	NI
Kelvin (SC2)	NI	-	-	-	NI	-	NI	NI
Stinchar (SC2)	NI	-	-	-	NI	-	NI	NI
Doon (SC2)	NI	-	-	-	NI	-	NI	NI
Water of Girvan (SC2)	NI	-	-	-	NI	-	NI	NI
White Cart Water (SC2)	NI	-	-	-	NI	-	NI	NI
Garnock (SC2)	NI	-	-	-	NI	-	NI	NI

UK cont.

Etive (SC2)	NI	-	-	-	NI	-	NI	NI
Eachaig (SC2)	NI	-	-	-	NI	-	NI	NI
Black Cart Water (SC2)	NI	-	-	-	NI	-	NI	NI
Gryfe (SC2)	NI	-	-	-	NI	-	NI	NI
Add (SC2)	NI	-	-	-	NI	-	NI	NI
Lochy (SC2a)	NI	-	-	-	NI	-	5 400	NI
Ewe (SC2a)	NI	-	-	-	NI	-	NI	NI
Shiel (SC2a)	NI	-	-	-	NI	-	NI	NI
Leven (Lochaber) (SC2a)	NI	-	-	-	NI	-	NI	NI
Morar (SC2a)	NI	-	-	-	NI	-	NI	NI
Inver (SC2a)	NI	-	-	-	NI	-	NI	NI
Carron (Wester Ross (SC	NI	-	-	-	NI	-	NI	NI
Gruinard (SC2a)	NI	-	-	-	NI	-	NI	NI
Broom (SC2a)	NI	-	-	-	NI	-	NI	NI
Kirkaig (SC2a)	NI	-	-	-	NI	-	NI	NI
Ling (SC2a)	NI	-	-	-	NI	-	NI	NI
Laxford (SC2a)	NI	-	-	-	NI	-	NI	NI
Abhainn Ghriomarstaidh	NI	-	-	-	NI	-	NI	NI
Aline (SC2a)	NI	-	-	-	NI	-	NI	NI
Loch Linnhe (SC2a)	NI	-	-	-	NI	-	NI	NI
Bush (NI1)	NI				NI		NI	NI
Bann (NI1)	NI				NI		7900	NI
Roe (NI1)	NI				NI		NI	NI
Faughan (NI1)	NI				NI		NI	NI
Burn Dennet NI1	NI				NI		NI	NI
Mourne (NI1)	NI				NI		NI	NI
Finn (NI1)	NI				NI		NI	NI
Tot.Atlantic catchm.	42000						49700	1960-1990

***) LTA = Long-term average**

OSPAR COMMISSION

Victoria House
37-63 Southampton Row
London WC1B 4DA
United Kingdom

t: +44 (0)20 7430 5200
f: +44 (0)20 7242 3737
e: secretariat@ospar.org
www.ospar.org

OSPAR's vision is of a clean, healthy and biologically diverse North-East Atlantic used sustainably

ISBN 978-1-909159-31-0
Publication Number: 598/2013

© OSPAR Commission, 2013. Permission may be granted by the publishers for the report to be wholly or partly reproduced in publications provided that the source of the extract is clearly indicated.

© Commission OSPAR, 2013. La reproduction de tout ou partie de ce rapport dans une publication peut être autorisée par l'Editeur, sous réserve que l'origine de l'extrait soit clairement mentionnée.