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RIVERINE INPUTS AND DIRECT DISCHARGES TO NORWEGIAN COASTAL WATERS – 2011

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Prepared by:

NIVA Norsk institutt for vannforskning

Bioforsk

NVE

Riverine inputs and direct discharges to Norwegian coastal waters – 2011

Norwegian Institute for Water Research

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REPORT

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Abstract

Riverine inputs and direct discharges to Norwegian coastal waters in 2011 have been estimated in accordance with the requirements of the OSPAR Commission. Due to high water discharges in 2011, the riverine inputs of both nutrients and metals were greater than 2010. Analyses of data since 1990 from nine main rivers in the program revealed downward trends both for nutrients and metals, with an exception of upwards trends for nitrogen in one river. Fish farming continued to be a major source of nutrients and copper to coastal waters. Inputs of PCBs and the pesticide lindane were, as in previous years, insignificant.

4 keywords, Norwegian	4 keywords, English
1. Elvetilførsler 2. Direkte tilførsler 3. Norske kystområder 4. Overvåking	1. Riverine inputs 2. Direct discharges 3. Norwegian coastal waters 4. Monitoring

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Preface

This report presents the results of the 2011 monitoring of riverine and direct discharges to Norwegian coastal waters (RID). The monitoring is part of a joint monitoring programme under the “OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic”.

Klif (the Climate and Pollution Agency) has commissioned the Norwegian Institute for Water Research (NIVA), the Norwegian Institute for Agricultural and Environmental Research (Bioforsk), and the Norwegian Water Resources and Energy Directorate (NVE) to carry out the work. The contact person at Klif has been Pål Inge Hals.

At NIVA, Kari Austnes has co-ordinated the RID programme in 2011. Other co-workers at NIVA include John Rune Selvik and Torulv Tjomsland (direct discharges and modelling with TEOTIL), Tore Høgåsen (databases, calculation of riverine loads), Liv Bente Skancke (quality assurance of sampling and chemical analyses) and Marit Villø and Tomas A. Blakseth (contact persons at NIVAlab).

At Bioforsk, Eva Skarbøvik has been the main responsible for the 2011 reporting. Per Stålnacke has carried out and reported the statistical trend analyses with the assistance of Paul Andreas Aakerøy.

At NVE, Trine Fjeldstad has been responsible for the local sampling programmes, Stein Beldring has carried out the hydrological modelling, and Morten N. Due has been the administrative contact.

Overall quality assurance of the annual report has been carried out by Richard F. Wright, NIVA.

The sampling has been performed by several fieldworkers; their names are given in Appendix II. Sub-contractors and data sources include the Norwegian Meteorological Institute (met.no) for precipitation and temperature data; Statistics Norway (SSB) for effluents from wastewater treatment plants with a connection of > 50 p.e. (person equivalents); the Climate and Pollution Agency (Klif) for data on effluents from industrial plants; the Directorate of Fisheries (Fdir) for data on fish farming.

Oslo, November 2012

Kari Austnes

Project co-ordinator

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Summary

This report presents the 2011 results of the Norwegian Programme on Riverine Inputs and Direct Discharges to coastal waters (RID). The programme is part of the OSPAR Convention for the protection of the North Atlantic, and has been on-going since 1990. The four coastal areas included in the reporting are Skagerrak, the North Sea, the Norwegian Sea and the Barents Sea.

The methodology of the programme in 2011 was, on the whole, similar to that in 2010 and as reported by Skarbøvik *et al.* (2011a). Thus, ten rivers, termed 'main' rivers, were monitored monthly or more often, whereas 36 rivers were monitored four times a year (termed 'tributary rivers' although they drain directly to the sea). In addition, loads were estimated from 109 rivers based on data from earlier monitoring (1990-2003). Nutrient loads from unmonitored areas were modelled. These areas comprise 92 rivers never monitored by this programme, areas located downstream of the sampling locations, and coastal areas. Direct discharges were estimated from the unmonitored areas, and include three sources: Industry, sewage treatment plants, and fish farming.

Substances monitored were the same as last year, and included six fractions of nutrients (total phosphorus, orthophosphates, total nitrogen, ammonium, nitrate and silicate); eight heavy metals (copper, zinc, cadmium, lead, chromium, nickel, mercury and arsenic); one pesticide (lindane); seven PCB compounds (PCB7); and four other parameters (suspended particulate matter, pH, conductivity and total organic carbon).

The year 2011 was characterised by temperatures and precipitation above normal, and this resulted in high water discharges in most rivers. For Norway as a total the flow was 28 % greater than 2010. Rivers Orreelva and Vefsna had the highest, and Rivers Glomma and Drammenselva the second highest annual water discharges observed during the entire monitoring period (1990-2011).

Inputs to all coastal Norwegian waters in 2011 were estimated to about 12 000 tonnes of phosphorus, 172 000 tonnes of nitrogen, 532 000 tonnes of silicate, 670 000 tonnes of total organic carbon, 1 157 000 tonnes of suspended particulate matter, 242 kg of mercury, 2.8 tonnes of cadmium, 31 tonnes of arsenic, 49 tonnes of lead, 86 tonnes of chromium, 151 tonnes of nickel, 831 tonnes of zinc and 1106 tonnes of copper. PCB7 and lindane were, as in former years, low in Norwegian waters, and were seldom found in quantities above the detection limit of the analytical methods.

In comparison with 2010, both nutrient and metal inputs from rivers were larger. This is due to the higher water discharges in 2011. For the direct discharges, there were less pronounced changes. For nutrients, there was a small decrease in discharges from industry and an even smaller decrease from sewage treatment plants; whereas there was a small increase from fish farming. Changes since 2010 in metal inputs from industry and sewage treatment plants were negligible. Copper from aquaculture has remained relatively stable, but high, since the mid-2000s.

Source apportioning was similar to previous years. Fish farming was the most important source of all nutrients, except for the Skagerrak region where riverine inputs are the main nutrient source, followed by sewage treatment plants. For all metals except copper, the

riverine loads account for about 80-90% of the total inputs to Norwegian coastal waters. The high proportion of copper in the direct discharges derives from fish farming.

Long-term (1990-2011) trend analyses of loads from nine main rivers revealed mainly downward trends, with one exception: nitrogen loads in River Numedalslågen. Downwards trends include:

- Nitrogen loads (total and nitrate) have decreased in Rivers Skienselva, Vefsna and Altaelva;
- Ammonium loads have decreased in Rivers Glomma, Vefsna, Orrelva and Altaelva;
- Total phosphorus loads have decreased in Rivers Vefsna and Altaelva;
- Orthophosphate loads have decreased in Rivers Otra and Vefsna;
- Copper loads have decreased in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva;
- Zinc loads have decreased in Rivers Orkla, Vefsna, Numedalslågen, Skienselva and Otra.

For the other metals there are uncertainties related to the trend analyses, and for PCB7 and lindane trend analyses are moot as concentrations in most samples were below the detection limit.

Sammendrag

Resultater fra Elvetilførselsprogrammet (RID) i 2011 er presentert i denne rapporten. Programmet er en del av OSPAR-programmet og har pågått siden 1990. Fire havområder inngår i Norges rapportering. Disse er Skagerrak, Nordsjøen, Norskehavet og Barentshavet.

Det var ingen vesentlige endringer i metodikk siden 2010-rapporteringen. Til sammen 46 vassdrag overvåkes. I tillegg er tilførsler beregnet fra det resterende landområdet som drenerer til Atlanterhavet, herunder 201 vassdrag som ikke er overvåket i 2011, samt områder nedstrøms prøvetakingsstedene og langs kysten. Direkte utslipp fra industri, kloakkrenseanlegg og akvakulturanlegg er beregnet for de områdene som ikke er overvåket.

I 2011 omfattet overvåkningen følgende parametere: Seks fraksjoner av næringssalter (totalfosfor, ortofosfat, total nitrogen, ammonium, nitrat og silikat); åtte tungmetaller (kobber, sink, kadmium, bly, krom, nikkel, kvikksølv og arsen); ett pesticid (lindan); sju PCB-stoffer (PCB7); og fire generelle parametere (suspendert partikulært materiale, pH, ledningsevne og totalt organisk karbon).

Vannføring i 2011 var høyere enn normalt i mange vassdrag pga. høy nedbør. Tilførsler til norske kystområder i 2011 omfattet om lag 12 000 tonn fosfor, 172 000 tonn nitrogen, 532 000 tonn silikat, 670 000 tonn total organisk karbon, 1 157 000 tonn suspendert sediment, 242 kg kvikksølv, 2,8 tonn kadmium, 31 tonn arsenikk, 49 tonn bly, 86 tonn krom, 151 tonn nikkel, 831 tonn sink og 1106 tonn kobber. Mengden av tilført PCB7 og lindan er ubetydelig, med alle verdier under deteksjonsgrensen.

I forhold til 2010 var tilførsler av både næringsstoffer, sediment og metaller høyere i 2011. Dette skyldes sannsynligvis høyere vannføring i elvene. For direktetilførslene fra industri og kloakkrenseanlegg var det bare små endringer både for næringsstoff og metaller. Utslipp fra fiskeoppdrett (næringsstoffer og kobber) er fortsatt høy. Forholdet mellom de ulike kildene endret seg lite siden 2010.

Trendanalyser for tilførsler fra ni hovedelver perioden 1990-2011 tyder på en generell nedgang i elvetilførsler både når det gjelder næringsstoffer og metaller, med ett unntak, nemlig økning i tilførsler av total nitrogen i Numedalslågen. Av signifikante nedadgående trender kan nevnes tilførsler av næringsstoffer i flere vassdrag, herunder

- nitrogen (total nitrogen og nitrat) i Skienselva, Vefsna og Altaelva;
- ammonium i Glomma, Vefsna, Orrelva og Altaelva;
- totalfosfor i Vefsna og Altaelva; og
- ortofosfat i Otra og Vefsna.

For metaller var det nedgang i tilførsler av

- kobber i Numedalslågen, Altaelva, Vefsna, Orkla og Skienselva; og
- sink i Orkla, Vefsna, Numedalslågen, Skienselva og Otra.

1. Introduction

The RID Programme is part of the OSPAR Commission for the protection of the marine environment of the North-East Atlantic. The Norwegian RID programme estimates pollutant inputs and direct discharges to the four Norwegian coastal areas. This report presents the results from 2011, as well as developments in inputs and discharges since 1990.

1.1 The RID Programme

The Riverine Inputs and Direct Discharges to Norwegian coastal waters (RID) is part of the OSPAR Programme for which the general principles, background and reporting requirements are given in Appendix I. The programme has been on-going since 1990.

This report presents the 2011 results of the monitoring of 46 rivers in Norway, as well as estimated loads from the remaining land area draining into the Atlantic Ocean, including 201 unmonitored rivers, areas downstream sampling points, and coastal areas (see Figure 1 for the different RID areas). The report also gives direct discharges from industry, sewage treatment plants and fish farming in unmonitored areas.

In 2011, the following parameters were monitored:

- Six fractions of nutrients (total phosphorus, orthophosphate, total nitrogen, ammonium, nitrate and silicate)
- Eight heavy metals (copper, zinc, cadmium, lead, chromium, nickel, mercury and arsenic)
- One pesticide (lindane)
- Seven PCB compounds (CB28, CB52, CB101, CB118, CB138, CB153, CB180)
- Four other parameters; suspended particulate matter (SPM), pH, conductivity and total organic carbon (TOC).

The four coastal areas included in Norway's reporting include:

I. Skagerrak:	From the Swedish border to Lindesnes (the southernmost point of Norway), at about 57°44'N
II. North Sea:	From Lindesnes northwards to Stadt (62° N)
III. Norwegian Sea:	From Stadt to the county border of Troms and Finnmark (70°30'N)
IV. Barents Sea:	From 70°30'N to the Russian border.

The total length of the coastline, including fjords and bays, is 21 347 km. The four coastal areas are shown in Figure *2*.

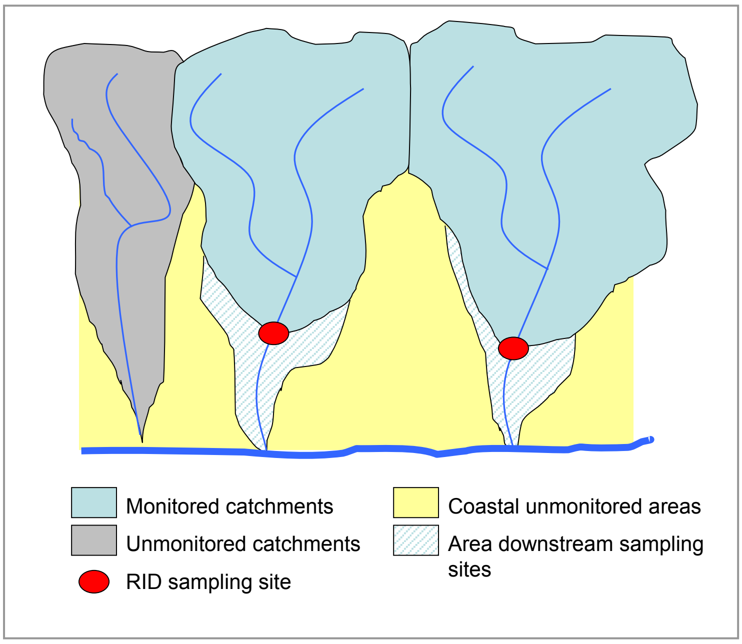


Figure 1. Illustration of RID areas. Areas covered by RID monitoring stations (blue); areas downstream of the sampling sites (blue shaded); coastal areas between catchments (yellow); and unmonitored catchments (grey).

1.2 Riverine inputs, direct discharges and unmonitored areas

The Norwegian river basin register system "REGINE" (NVE; www.nve.no) classifies the Norwegian river basins into 262 main catchment areas, of which 247 drain into coastal areas. These rivers range from River Haldenvassdraget in the south east (river no. 001) to River Grense Jakobselv in the north east (river no. 247). A subset of these rivers has been selected to fulfil the RID requirements, and in 2011 ten 'main' rivers were monitored monthly or more often; and 36 'tributary' rivers were monitored quarterly. It is important to note that the name 'tributary' is only used to signify that these rivers are monitored less often than the main rivers; they all drain directly into the sea. The programme has not undergone any major alterations since 2010. Details on former changes of the RID monitoring programme are given in Appendix IV.

The main types of land cover in Norway are forest, agriculture and other surfaces impacted by human activities, mountains and mountain plateaus, and lakes and wetlands (Figure 3). Mountains and forests are the most important land cover categories, and this is reflected in the land cover distribution of the 10 main RID rivers (Figure 4). More information on the catchments of the 46 monitored rivers is given in Appendix III.

Unmonitored areas include areas downstream the sampling points of the 46 RID rivers, as well as unmonitored rivers and coastal areas (cf. Figure 1). In the unmonitored areas the inputs are calculated, partly based on data from former years, partly on the TEOTIL model, and partly by using reported discharges from point sources such as industry, sewage treatment plants and fish farming.

1.3 Outline of the 2011 RID Report

The 2011 RID Report is organised as follows:

- Chapter 2: The methodology of the RID Programme;
- Chapter 3: The results, including riverine inputs and direct discharges in 2011 as well as climatic and water discharge conditions this year;
- Chapter 4: Discussion, including comparisons with last year's results and long-term trend analyses of riverine loads and concentrations since 1990;
- Chapter 5: Conclusions.

In order to improve the readability of the report some of the more detailed text, tables and figures have been placed in appendices.

An addendum to the report gives, as in former years, the three most important data tables of the programme, namely an overview of all concentrations and water discharge values in all rivers during sampling in 2011; the calculated annual loads of each river in 2011; as well as overview tables of all loads to the four coastal areas of Norway in 2011.

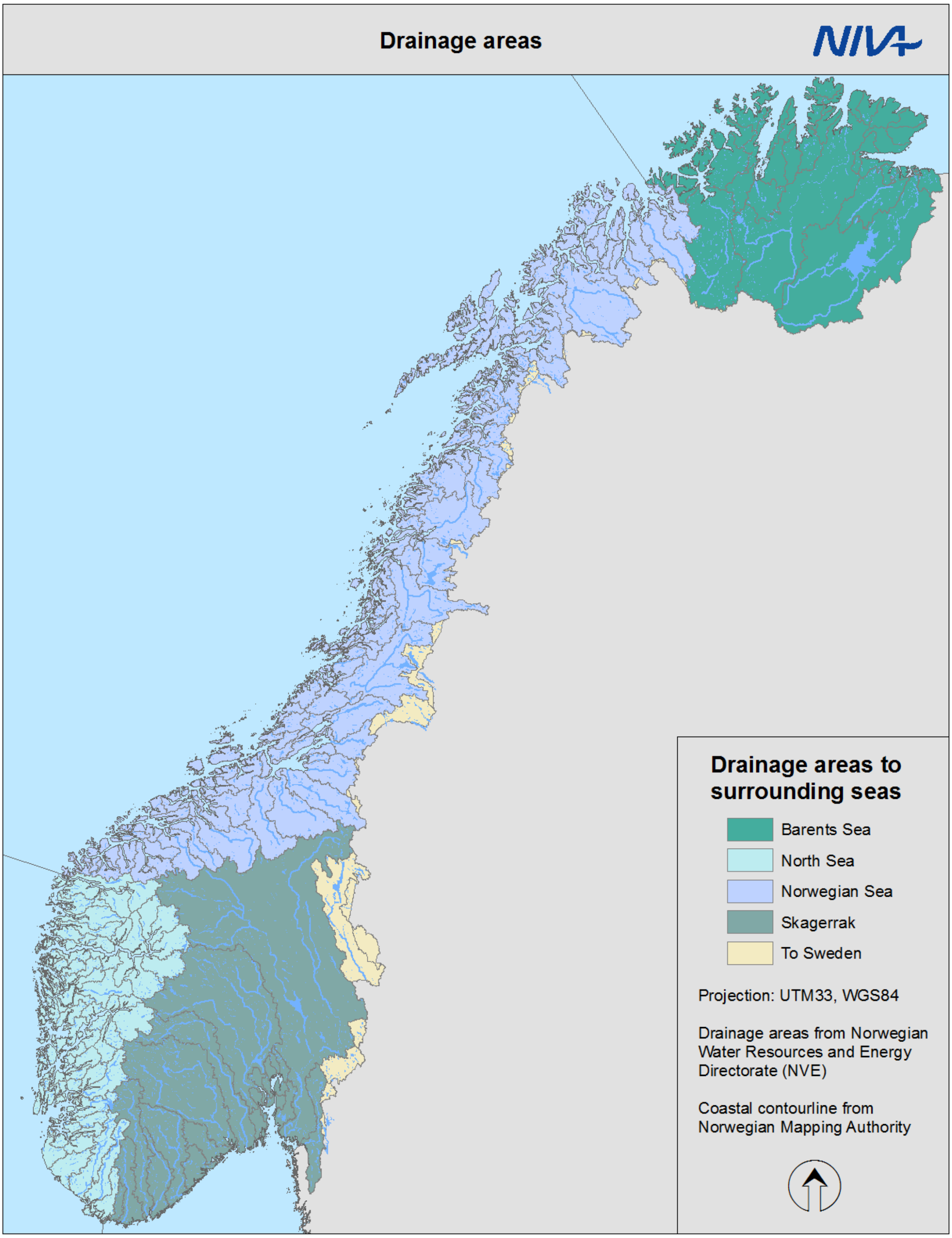


Figure 2. Norway has been divided into four drainage areas, i.e. Skagerrak, North Sea, Norwegian Sea and the Barents Sea. Minor parts of Norway drain to Sweden.

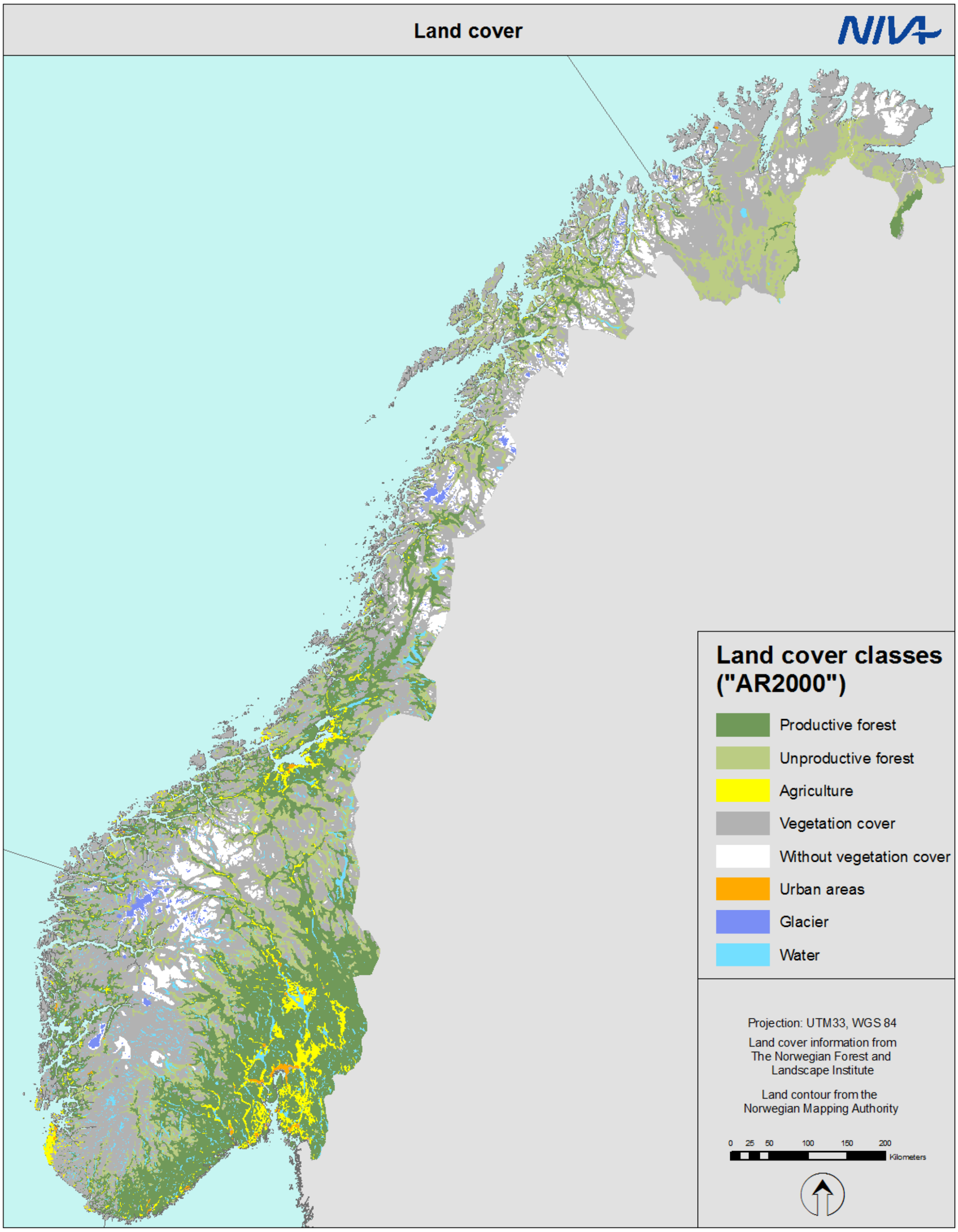


Figure 3. Land cover map of Norway. See also Figure 4 in which the land use in the catchments of the 10 main RID rivers is shown.

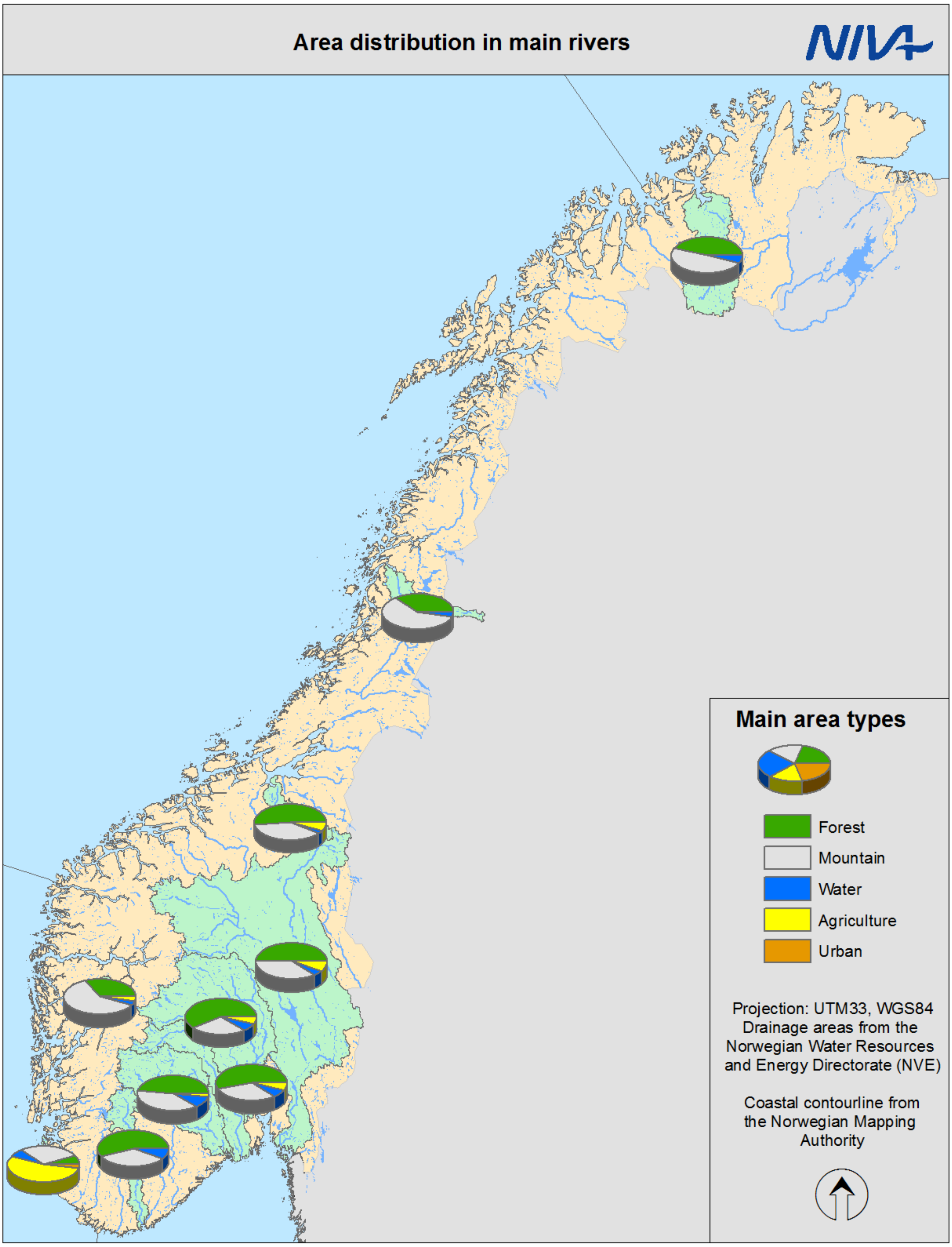


Figure 4. Land use in the catchment areas of the 10 main rivers. "Water" refers to lakes in the catchment; "Mountains" include moors and mountain plateaus not covered by forest. Based on data from The Norwegian Forest and Landscape Institute.

2. Materials and methods

There were no major changes in the RID Programme's methodology in 2011. More details on the methodology can be found in Appendix IV.

2.1 Selection of RID Rivers

Table 1 gives an overview of the major "types" of Norwegian rivers draining into coastal areas, as defined within the RID Programme. The selection of the 10 + 36 RID rivers is more thoroughly described in Appendix IV, but a short overview is given here:

- The 10 main rivers have been selected due to their size and loads. Eight of these were selected because they were assumed to be the most important load-bearing rivers, whereas two are relatively unpolluted and included for comparison reasons.
- The 36 rivers sampled 4 times a year have been selected due to their size and loads.
- The total drainage area of the 46 monitored rivers is about 180 000 km^2, which constitutes about 50% of the total Norwegian land area draining into the convention seas.

From 2008 onwards, River Vosso replaced River Suldalslågen as a main river. This change has had some implications for the comparisons of main rivers with former years, and for the long-term database. For the long term trend analyses, rivers Vosso and Suldalslågen will be omitted until River Vosso again has a sufficient number of years of monthly observations. However, most year-to-year comparisons are done on all rivers or all inputs, and will therefore not be much affected by this change.

Prior to 2004, the RID Programme sampled the 36 rivers once a year, in addition to 109 other rivers. After 2004, the 109 rivers have not been sampled by the programme. Of the total of 247 rivers draining into the sea, 92 have never been sampled by the RID Programme (Table 1). However, the RID Programme uses models to estimate inputs from the entire Norwegian area draining into convention waters, except from Spitsbergen.

Table 1. Norwegian rivers draining into coastal areas and the methods used to estimate loads from these rivers.

Type of river	**Number**
Total number of rivers draining into Norwegian coastal areas	247
Main rivers, monitored at least monthly	10
Tributary rivers, monitored quarterly since 2004	36
Tributary rivers, monitored once a year in 1990-2003; modelled from 2004 onwards	109
Rivers that have never been monitored by the RID Programme (loads are modelled)	92

2.2 Water sampling methodology

The methodology for water sampling described in the Commission's Document "Principles of the Comprehensive Study on Riverine Inputs" (PARCOM, 1988; 1993) has been followed. Sampling has been carried out in the same manner as the previous year (Skarbøvik *et al.*, 2011a).

The quarterly sampling has been designed to cover four main meteorological and hydrological conditions in the Norwegian climate. These include the winter season with low temperatures, snowmelt during spring, summer low flow season, and autumn floods/high discharges.

Table 2 and Table 3 show the sampling frequency and dates of sampling for the 10 rivers monitored at least monthly, and the 36 rivers monitored quarterly, respectively. The sampling sites are indicated in Figure 5. PCB7 and lindane are monitored four times a year in the main rivers. Due to an error, samples for these two constituents were not collected in May 2011 for five of the 10 rivers.

Table 2. Sampling frequency and dates of sampling in 2011 in the 10 main rivers. Dates for analyses of PCB7 and lindane are shown in bold.

River	Glomma	Drammen	Numedals-lågen	Skienselva	Otra	Orreelva	Vosso	Orkla	Vefsna	Altaelva
Date dd.mm	03.01	04.01	06.01	10.01	11.01	05.01	10.01	05.01	06.01	10.01
	07.02	**08.02**	**03.02**	**09.02**	**08.02**	**01.02**	**31.01**	**07.02**	**08.02**	**10.02**
	07.03	08.03	07.03	03.03	03.03	07.03	15.03	07.03	04.03	09.03
	04.04	05.04	06.04	05.04	06.04	05.04	05.04	04.04	07.04	06.04
	09.05	03.05	**09.05**	19.05	04.05	**16.05**	02.05	**09.05**	**06.05**	**10.05**
	18.05	12.05								
	28.05	26.05								
	06.06	07.06	07.06	15.06	07.06	06.06	06.06	09.06	07.06	10.06
	16.06	14.06								
	26.06	25.06								
	04.07	05.07	05.07	05.07	05.07	04.07	05.07	05.07	14.07	08.07
	08.08	**09.08**	**03.08**	**11.08**	**09.08**	**02.08**	**01.08**	**04.08**	**18.08**	**11.08**
	12.09	06.09	05.09	08.09	12.09	05.09	05.09	06.09	06.09	12.09
	03.10	**04.10**	**05.10**	**06.10**	**03.10**	**04.10**	**04.10**	**10.10**	**04.10**	**11.10**
	07.11	08.11	03.11	08.11	07.11	01.11	07.11	10.11	03.11	10.11
	05.12	06.12	06.12	05.12	07.12	05.12	05.12	06.12	01.12	08.12
Sum	16	16	12	12	12	12	12	12	12	12

Table 3. Sampling frequency and dates in 2011 in the 36 tributary rivers.

River	Tista	Tokkeelva	Nidelv (south)	Tovdalselva	Mandalselva	Lyngdalselva
Date dd.mm.yyy	07.02.2011	02.02.2011	31.01.2011	08.02.2011	09.02.2011	09.02.2011
	09.05.2011	04.05.2011	04.05.2011	04.05.2011	11.05.2011	11.05.2011
	08.08.2011	08.08.2011	08.08.2011	09.08.2011	08.08.2011	08.08.2011
	03.10.2011	19.10.2011	24.10.2011	09.10.2011	09.10.2011	09.10.2011
River	Kvina	Sira	Bjerkreimselva	Figgjoelva	Lyseelva	Årdalselva
Date	09.02.2011	09.02.2011	08.02.2011	01.02.2011	06.02.2011	15.02.2011
	11.05.2011	11.05.2011	04.05.2011	16.05.2011	08.05.2011	10.05.2011
	08.08.2011	08.08.2011	15.08.2011	02.08.2011	07.08.2011	16.08.2011
	09.10.2011	09.10.2011	11.10.2011	10.10.2011	16.10.2011	11.10.2011
River	Ulla	Sauda	Vikedalselva	Suldalslågen	Jostedøla	Gaular
Date	15.02.2011	31.01.2011	28.02.2011	31.01.2011	09.02.2011	11.02.2011
	10.05.2011	09.05.2011	09.05.2011	09.05.2011	12.05.2011	06.05.2011
	16.08.2011	08.08.2011	16.08.2011	02.08.2011	09.08.2011	16.08.2011
	11.10.2011	10.10.2011	17.10.2011	10.10.2011	10.10.2011	07.10.2011
River	Jølstra	Nausta	Breimselva	Driva	Surna	Gaula
Date	11.02.2011	11.02.2011	27.02.2011	28.02.2011	22.03.2011	10.02.2011
	06.05.2011	06.05.2011	30.05.2011	03.05.2011	06.06.2011	04.05.2011
	16.08.2011	16.08.2011	09.08.2011	05.08.2011	22.08.2011	11.08.2011
	07.10.2011	07.10.2011	29.10.2011	10.10.2011	17.10.2011	19.10.2011
River	Nidelva	Stjørdalselva	Verdalselva	Snåsa	Namsen	Røssåga
Date	10.02.2011	10.02.2011	10.02.2011	10.02.2011	07.02.2011	08.02.2011
	04.05.2011	04.05.2011	04.05.2011	04.05.2011	10.05.2011	11.05.2011
	11.08.2011	11.08.2011	11.08.2011	11.08.2011	08.08.2011	18.08.2011
	19.10.2011	19.10.2011	19.10.2011	19.10.2011	10.10.2011	07.10.2011
River	Ranaelva	Beiarelva	Målselv	Barduelva	Tanaelva	Pasvikelva
Date	08.02.2011	24.02.2011	07.02.2011	07.02.2011	01.02.2011	01.02.2011
	11.05.2011	30.05.2011	08.05.2011	08.05.2011	04.05.2011	04.05.2011
	18.08.2011	25.08.2011	09.08.2011	09.08.2011	08.08.2011	08.08.2011
	07.10.2011	25.10.2011	05.10.2011	05.10.2011	10.10.2011	10.10.2011

2.3 Chemical parameters – detection limits and analytical methods

The parameters monitored in 2011 are given in Chapter 1, Introduction. Information on methodology and limits of detection for all parameters included in the sampling programme are given in Appendix IV.

In the RID Programme, chemical concentrations are usually given as two values; i.e. the upper estimate and the lower estimate. These are defined as follows:

- For the lower estimates, samples with concentrations below the detection limit have been given a value of zero;
- For the upper estimates, samples with concentrations below the detection limit have been given a value equal to the detection limit.

This implies that if no samples are below the detection limit, the lower and upper estimates are identical. However, for compounds that have a high number of samples below the detection limit, the highest and lowest estimates may vary considerably.

According to the RID Principles, and in particular the document “Principles of the Comprehensive Study of Riverine Inputs and Direct Discharges” (PARCOM, 1988), it is necessary to choose an analytical method which gives at least 70 % of positive findings (i.e. no more than 30% of the samples below the detection limit). As in many former years, mercury and chromium did not achieve this requirement in 2011 (Table 4). Also as previously, PCB7 compounds and lindane were 100% below the detection limit. As the analytical methods used have acceptably low detection limits, the number of samples below the detection limit reflects that the concentrations of these compounds were low in Norwegian river waters in 2011.

2.4 Quality assurance and direct on-line access to data

Data from the laboratory analyses were transferred to a database and quality checked against historical data by researchers with long experience in assessing water quality data. If any anomalies were found, the samples were re-analysed. The data are available on-line at http://www.aquamonitor.no/rid, where users can view values and graphs of each of the 46 monitored rivers.

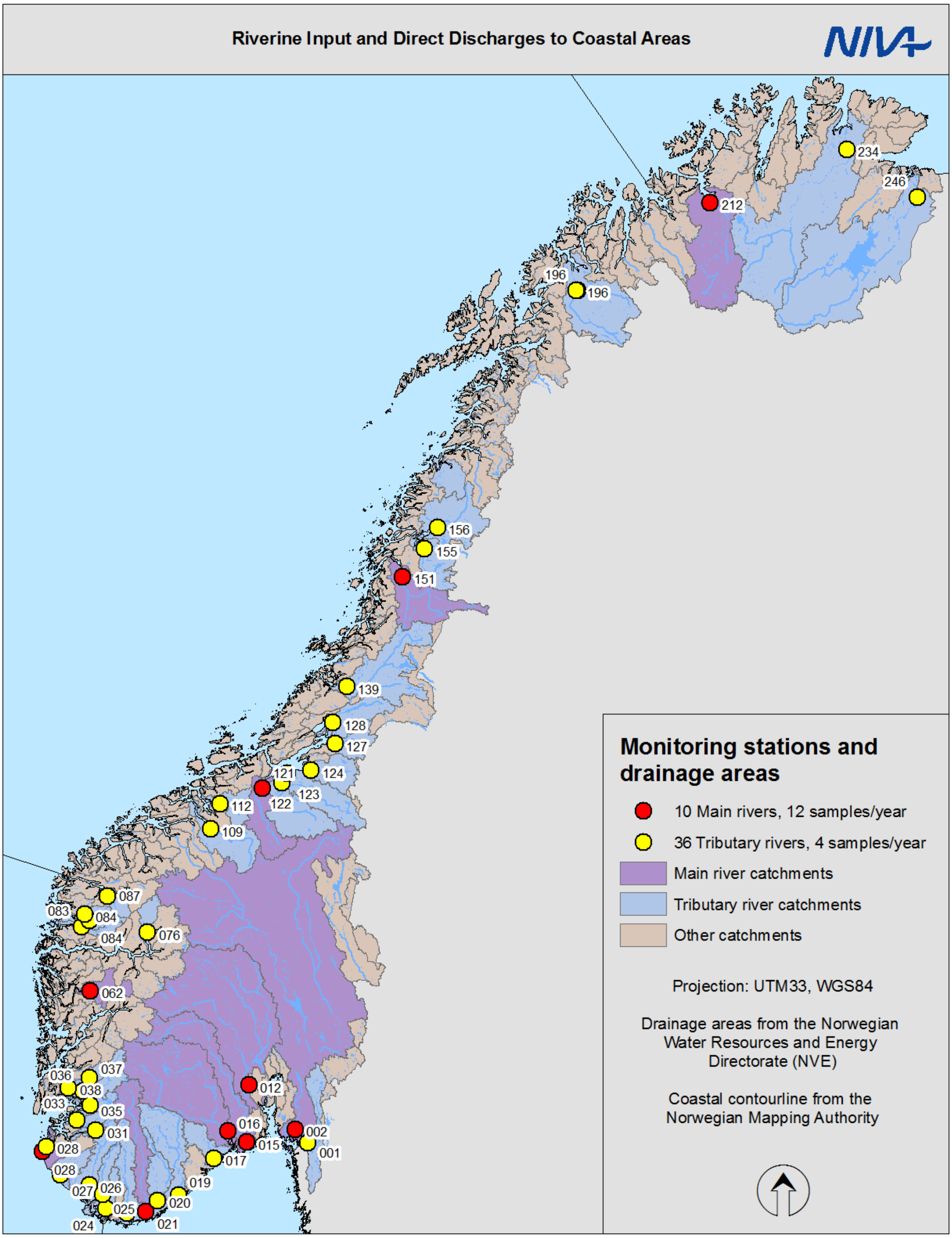


Figure 5. River sampling sites in the Norwegian RID programme. Red dots represent the 10 main rivers. Yellow dots represent the 36 'tributary' rivers. Numbers refer to the national river register (REGINE; www.nve.no).

Table 4. The proportion of analyses below the detection limit for all parameters included in the sampling programme in 2011. The detection limits are shown in Appendix IV.

Parameter	Unit	% below detection limit	Total no of samples	No of samples below detection limit
pH		0	272	0
Conductivity	mS/m	0	272	0
SPM	mg/l	1	272	4
TOC	mg C/l	0	272	0
TOT-P	µg P/l	2	272	5
PO_4-P	µg P/l	27	272	74
TOT-N	µg N/l	0	272	0
NO_3-N	µg N/l	1	272	4
NH_4-N	µg N/l	11	272	30
SiO_2	mg/l	0	272	0
Pb	µg/l	2	272	5
Cd	µg/l	23	272	63
Cu	µg/l	0	272	0
Zn	µg/l	1	272	2
As	µg/l	13	272	36
Hg	ng/l	56	272	153
Cr	µg/l	32	272	88
Ni	µg/l	3	272	9
Lindane(HCHG)	ng/l	100	35	35
PCB(CB101)	ng/l	100	35	35
PCB(CB118)	ng/l	100	35	35
PCB(CB138)	ng/l	100	35	35
PCB(CB153)	ng/l	100	35	35
PCB(CB180)	ng/l	100	35	35
PCB(CB28)	ng/l	100	35	35
PCB(CB52)	ng/l	100	35	35

2.5 Water discharge and hydrological modelling

For the 10 main rivers, daily water discharge measurements were, as in former years, used for the calculation of loads. Since the stations for water discharge are not located at the same site as the water quality stations, the water discharge at the water quality sampling sites have been calculated by up- or downscaling, proportional to the respective drainage areas.

For the 36 rivers monitored quarterly, as well as the remaining 109 rivers monitored once a year before 2004, water discharge has been simulated with a spatially distributed version of the HBV-model (Beldring *et al.*, 2003). The use of this model was introduced in 2004. Appendix IV gives more information on the methodology. There have been no amendments or changes in this method since last year’s reporting (Skarbøvik *et al.,* 2011a).

For each of the 46 rivers that have been monitored in 2011, as well as for the 109 rivers monitored earlier, the water discharge has been calculated at the location where the water samples are collected. This is the water discharge that is used to calculate riverine inputs.

2.6 Calculating riverine loads

As outlined in Stålnacke *et al.* (2009), the RID calculation formula has been slightly modified from the original formula recommended by the RID/OSPAR Programme (PARCOM, 1988), and the following formula is now used:

$$Load = Q_r \frac{\sum_{1}^{n} Q_i \bullet C_i \bullet t_i}{\sum_{1}^{n} Q_i \bullet t_i}$$

where Q_i represents the water discharge at the day of sampling (day i);
C_i the concentration at day i;
t_i the time period from the midpoint between day i-1 and day i to the midpoint between day i and day i+1, i.e., half the number of days between the previous and next sampling; and
Q_r is the annual water volume.

The main improvement with this modified method is that it handles irregular sampling frequency in a better way and allows flood samples to be included in the annual load calculations.

For the 109 rivers monitored once a year in the period 1990-2003, but not from 2004 onwards, the calculation of loads was conducted as follows:

- For nutrients, sediments, silica and total organic carbon, the modelled annual water volume in 2011 was multiplied with average concentration for the period 1990-2003.
- For metals, the modelled annual water volume in 2011 was multiplied with average concentration for the period 2000-2003 (earlier data were not used due to high detection limits).

2.7 Unmonitored areas

For the unmonitored areas (the 92 rivers that drain to the sea but have not been monitored by RID either this or former years, areas downstream the sampling points, and coastal areas), the nutrient loads were calculated by means of the TEOTIL model (e.g. Tjomsland and Bratli, 1996; Bakken *et al.,* 2006; Hindar and Tjomsland, 2007). The model has been utilised for pollution load compilations of nitrogen and phosphorus in catchments or groups of catchments. The model estimates annual loads of phosphorus and nitrogen from point and diffuse sources. The point source estimates are based on national statistical information on sewage, industrial effluents, and aquaculture (see Chapter 2.8). Nutrient loads from diffuse sources (agricultural land and natural runoff from forest and mountain areas) are modelled by a coefficient approach (Selvik *et al.*, 2007; Skarbøvik *et al.*, 2011b). Area specific export coefficients for nutrients have been estimated for agricultural land in different geographical regions. The coefficients are based on empirical data from agricultural monitoring fields in Norway and are adjusted annually by Bioforsk based on reported changes in agricultural practice (national statistics). For forest and mountain areas, concentration coefficients for different area types and geographical regions have been estimated based on monitoring data from reference sites. The annual loads of natural runoff vary from year to year depending on the annual discharge. The model adjusts for retention in lakes between the source and the sea. Only the nutrient loads originating from diffuse sources are reported under "Unmonitored areas". The nutrient loads from point sources are reported as part of the direct discharges (see Chapter 2.8).

There is no relevant model available to estimate metal or organic pollutant loads from diffuse sources. Point source discharges of these substances in the unmonitored areas were included in the estimates of the direct discharges to the sea (see Chapter 2.8).

2.8 Direct discharges to the sea

The direct discharges comprised point sources in the unmonitored areas. The estimates were based on national statistical information, including:

- Sewage; Municipal wastewater and scattered dwellings (Statistics Norway - SSB / KOSTRA);
- Industry (The Climate and Pollution Agency - Klif/Forurensning)
- Aquaculture; Nutrients (The Directorate of Fisheries / ALTINN (altinn.no)) and copper (sales statistics of antifouling products made available by Klif)

The details on how these data were extracted are given in Appendix IV. The location of the reporting units of point source pollution is shown in Figure 6 (industry), Figure 7 (sewage treatment plants), and Figure 8 (fish farming). The discharges of nutrients from point sources in unmonitored areas were estimated using the TEOTIL model, as explained in Chapter 2.7.

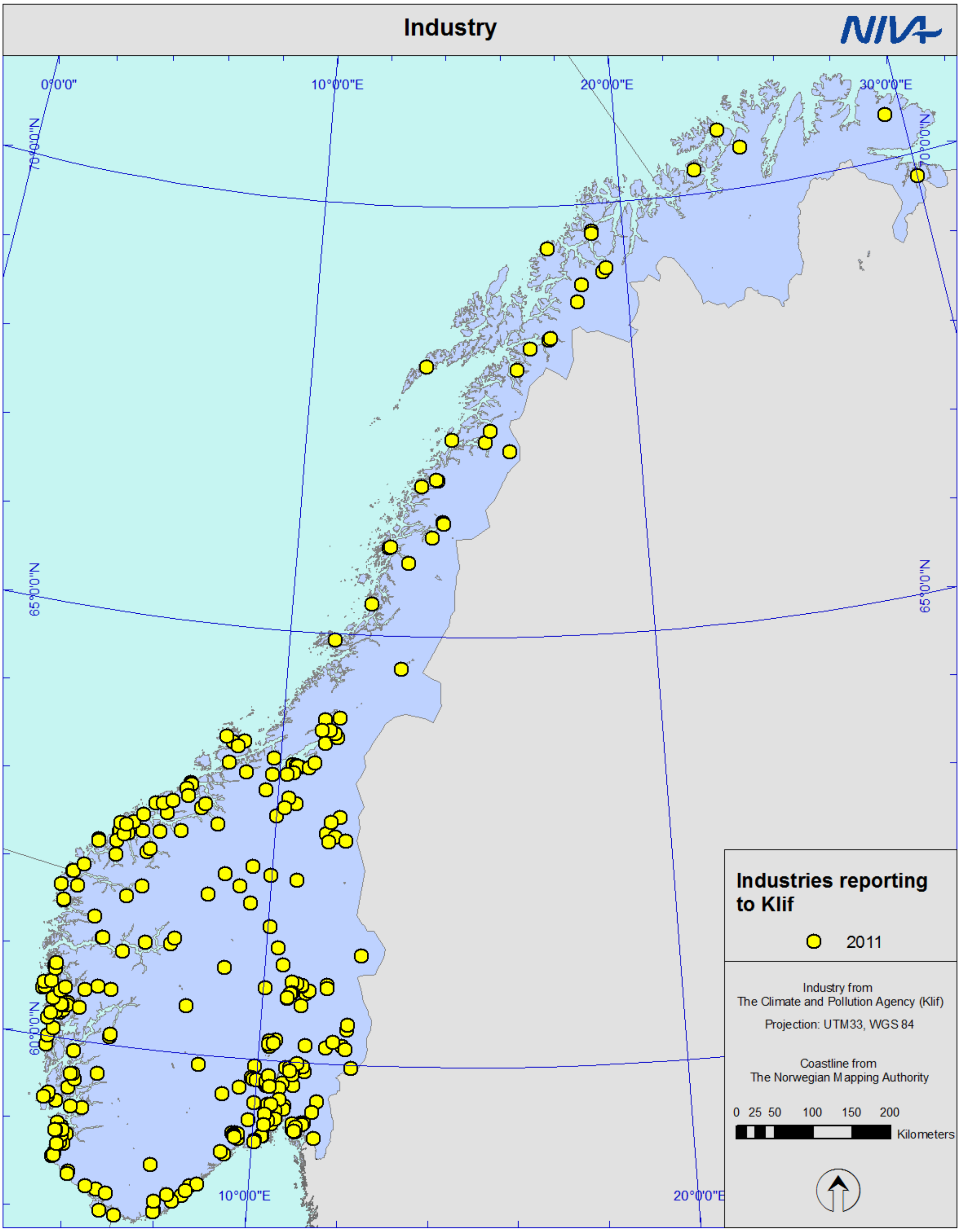


Figure 6. Industrial units reporting discharges of nitrogen and phosphorus to freshwater systems in 2011. Data from Klif's database 'Forurensning'.

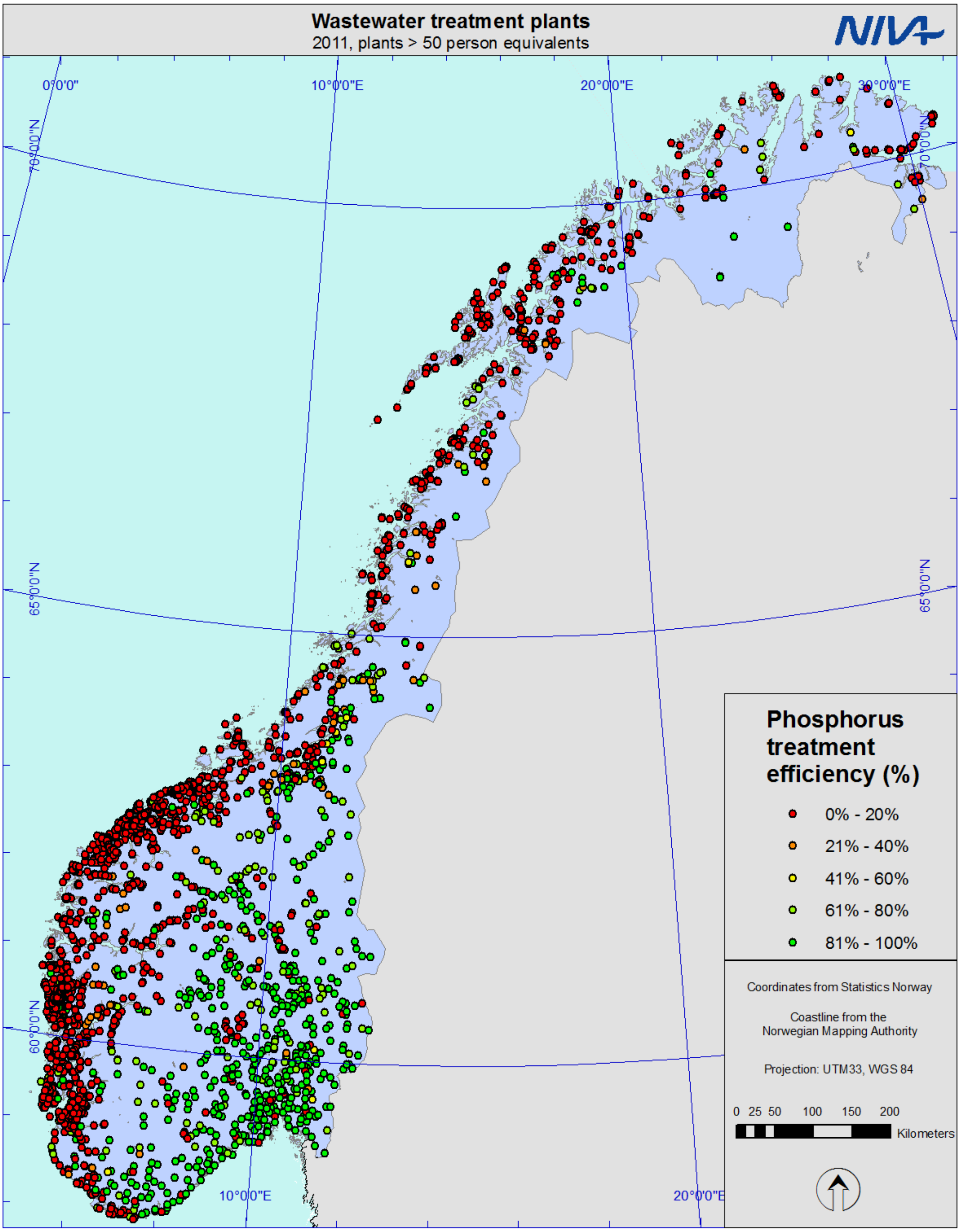


Figure 7. Sewage treatment plants in Norway in 2011 and phosphorus treatment efficiency. Data from KOSTRA/SSB (Statistics Norway).

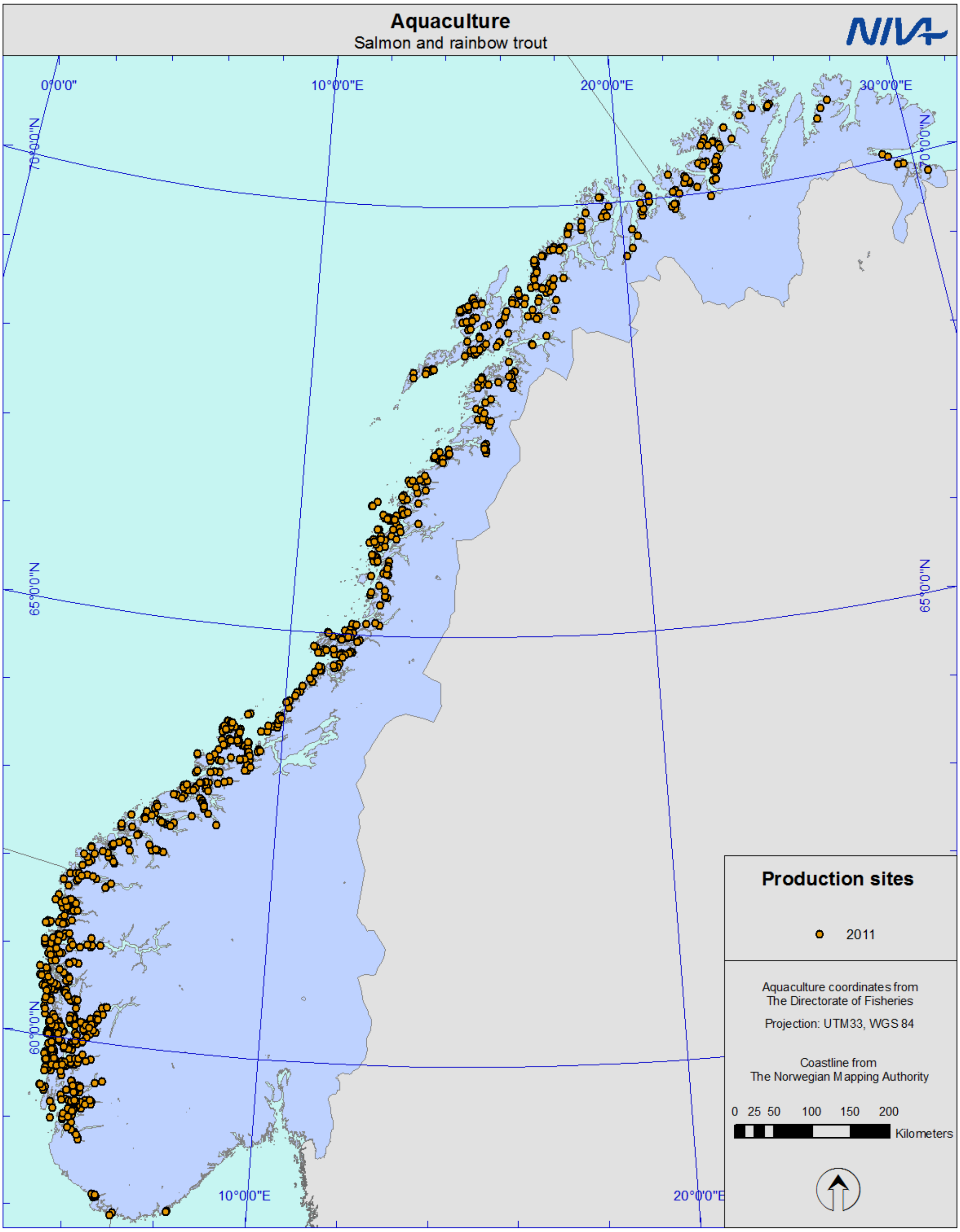


Figure 8. Fish farms for salmon and trout in Norway in 2011. Based on data from the Directorate of Fisheries/ALTINN.

Estimated inputs of nutrients from fish farming followed the same procedure as in recent years, but the nutrient content of the fish fodder has been adjusted (see Appendix IV). The loads from fish farming were first included in the grand total values in 2000, i.e. originally these loads were not included in the input figures for the period 1990-1999. However, in the recalculation project in 2007, a time series for nitrogen, phosphorus and copper from aquaculture was established, and covered the entire period from 1990 to 2007 (Stålnacke *et* *al.*, 2009). Then, in 2011 another adjustment was made: Over the years the nutrient content in fish fodder has been reduced. In 2011 a table showing changes in nutrient content over the period 2000-2010 was established, in cooperation with Klif (see Skarbøvik *et al.*, 2011b). As a result, nutrient loads were adjusted from the year 2000 onwards. The current report is the first annual report from the RID programme where the new nutrient content data have been applied in the load calculations. Tables of direct discharges to the sea for total phosphorus, total nitrogen, and copper in all years since 1990 are given in Appendix VII.

The sales statistics from Norwegian Statistics (SSB) with regard to trout and salmon show that there has been a steady increase since 1995 (see Figure 9).

Figure 9. Quantities of sold trout and salmon for the period 1995-2011 Based on data from SSB (Statistics Norway).

In terms of copper loads from fish farming, the quantification of discharges is based on sales statistics for a number of antifouling products in regular use. New figures on this have recently been calculated for all years (Figure 10). Klif assumes that 85% of the copper is lost to the environment. The quantity used per fish farm is not included in official statistics, but for the RID Programme, a theoretical distribution proportional to the fish production has been used. The chart shows the total discharges, and not only discharges released downstream RID river sampling locations; the latter amounted to 758 tonnes in 2011, as reported in Table 3.

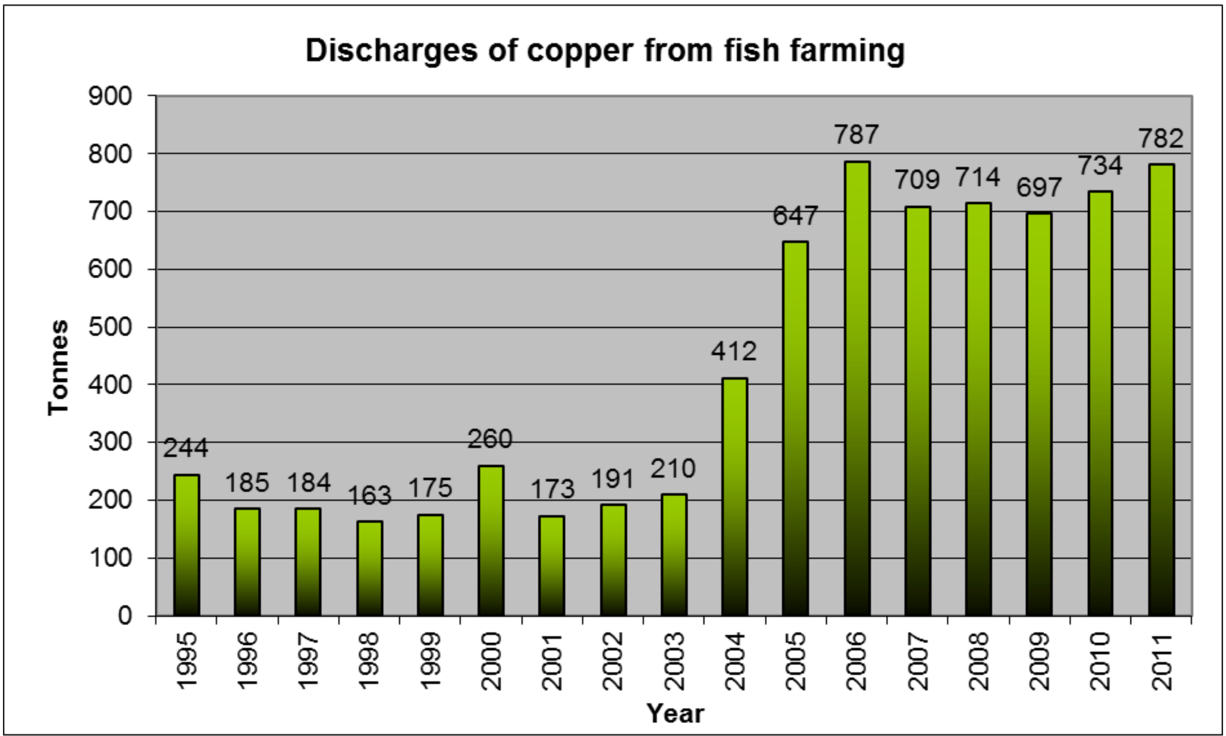


Figure 10. Discharge of copper from fish farming, deriving from antifouling impregnation of net cages, in the period 1995-2011. Figures represent total losses, including those above the RID rivers' sampling locations.

2.9 Statistical methodology for trends in riverine inputs

Long-term trends in riverine pollutant inputs are reported in Chapter 4.3, but the methodology is given here. Only main rivers[1] are included in these trend analyses, due to the lower sampling frequency for the tributary rivers.

All annual loads were recalculated by Stålnacke *et al.* (2009). Some concentrations were removed from the riverine datasets prior to the concentration trend analyses; an overview of these is given in Skarbøvik *et al.* (2010). For the trend analyses, the loads were estimated based on extrapolation or interpolation of the trend line wherever concentrations were missing. The bars with estimated loads (extrapolated or interpolated) have been given different colours in the charts in Appendix V, to separate them from the loads based on measured concentration values.

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 lower and upper estimates are, however, given in graphs supplemented with a qualitative assessment based on a visual inspection of these graphs and underlying data (Appendix V).

The partial Mann-Kendall test (Libiseller and Grimvall, 2002) has been used to test for long-term monotonic[2] trends (including linear trends) in annual riverine inputs and monthly

[1] Neither River Suldalslågen nor River Vosso have been analysed for trends due to incomplete datasets.
[2] 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.

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.

The trends were regarded as statistically significant at the 5%-level (double-sided test)[3]. 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 (cf. graphs in Appendix V).

[3] 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.

3. Results

The year 2011 was both wetter and warmer than normal, and the riverine water discharges were therefore also high. In the southern part of the country the water discharges were particularly high in late summer and early autumn. These high water discharges were reflected in the relatively high riverine loads of substances in 2011. There were no marked changes from earlier years in the proportion of loads of substances from different sources, and fish farming is still the most important nutrient source, except for the Skagerrak region. Similarly, there were no significant changes in the proportion of loads to each maritime area.

3.1 Climatic conditions in 2011

The year 2011 was both warmer and wetter than normal (Meteorologisk institutt, 2012). Precipitation was 30 % above normal for the entire country. Furthermore, 2011 was, together with 1990 and 2006, the warmest year registered, with a mean annual temperature 1.8 degrees above normal. The highest deviations from the normal air temperature occurred in mid- and northern Norway.

3.2 Water discharges in 2011

The high precipitation in 2011 resulted in correspondingly high water discharges. Discharges to the Norwegian coastal regions were considerably higher in 2011 than in 2010 (Table 5), and for Norway as a total the flow increased was 28 % higher than 2010. The largest change from 2010 to 2011 occurred in the North Sea region, where discharges were 42 % higher than 2010.

Table 5. River water discharges (1000 m^3/d) to the Norwegian coast in 2011 and 2010. The data are based on the main rivers (10) and tributary rivers (36+109). Changes greater than 5% are marked in orange (increase) and green (decrease).

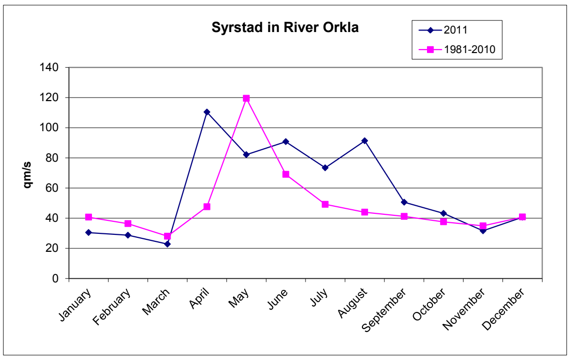
	Total Norway	Skagerrak	North Sea	Norwegian Sea	Barents Sea
2011	614 350	206 449	161 966	191 472	54 463
2010	442 161	163 764	93 261	133 801	51 335
% change	28	21	42	30	6

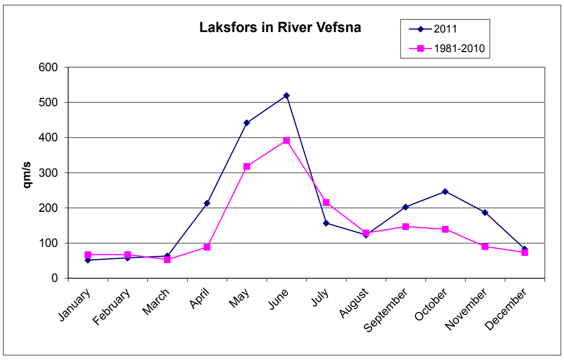
Hydrological stations in nine of the ten main rivers have historical data that can be used to assess changes. The monthly mean water discharges in 2011 in these stations have been compared to the mean water discharges in the 30-year normal (1971-2000) and in 2010 (Table 6). In addition, comparisons with the mean water discharges in the previous 30-year period 1981-2010 are given in Figure 11. In four of the five rivers draining to the Skagerrak area there was a marked increase in water discharge relative to 2010 (16-19 %). The exception was River Otra, where there was very little change. In the three rivers draining to the North and Norwegian Sea there were high increases in water discharge of 33-49 %; whereas the hydrological station in River Alta showed only little difference from 2010 to 2011. In the rivers in the Skagerrak region particularly high discharges as compared to the previous 30 years came in late summer and early autumn (Figure 11). A similar pattern, although not as pronounced, can be seen in River Orkla.

Table 6. Average annual water discharges in the 30-year period 1971-2000, in 2010, and 2011. Note that these water discharges derive directly from the hydrological stations and are not adjusted to the RID sampling sites. Changes greater than 5% are marked in orange (increase) and green (decrease).

Station	30 year normal 1971-2000	2010	2011	Difference 2010-2011	Maritime area
	m^3/s	m^3/s	m^3/s	%	
Solbergfoss in Glomma	678.0	720.1	891.2	19	Skagerrak
Døvikfoss in Drammenselva	281.3	312.0	387.2	19	
Holmsfoss in Numedalslågen	104.7	107.4	130.5	18	
Norsjø in Skienselva	259.5	269.1	321.3	16	
Heisel in Otra	145.6	146.8	145.4	-1	
Bulken in Vosso	72.8	46.4	91.0	49	North Sea
Syrstad in Orkla	48.5	39.2	58.1	33	Norwegian Sea
Laksfors in Vefsna	150.0	113.9	195.7	42	
Kista in Alta	75.4	75.8	77.8	3	Barents Sea

(Figure 11; see caption on next page)





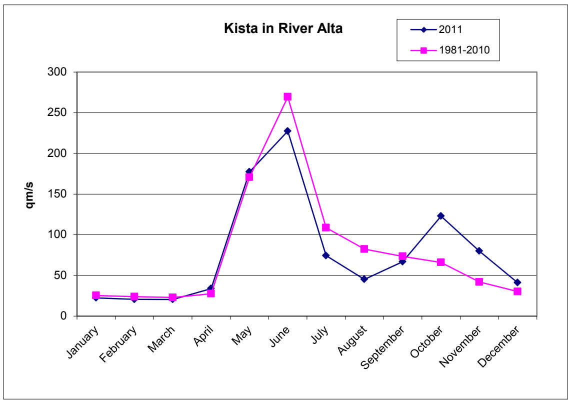


Figure 11. Monthly mean water discharge in 2011 and as a mean of 30 years (1981-2010), derived from hydrological stations in 9 of the rivers monitored monthly (data from the Norwegian Water Resources and Energy Directorate, NVE).

3.3 Total nutrient and particle inputs in 2011

The total nutrient inputs[4] to coastal Norwegian waters in 2011 were estimated to about 12 000 tonnes of phosphorus and about 172 000 tonnes of nitrogen (Figure 12). Total silicate inputs were estimated to about 532 000 tonnes and total organic carbon (TOC) to about 670 000 tonnes. The input of suspended particulate matter amounted to about 1 157 000 tonnes.

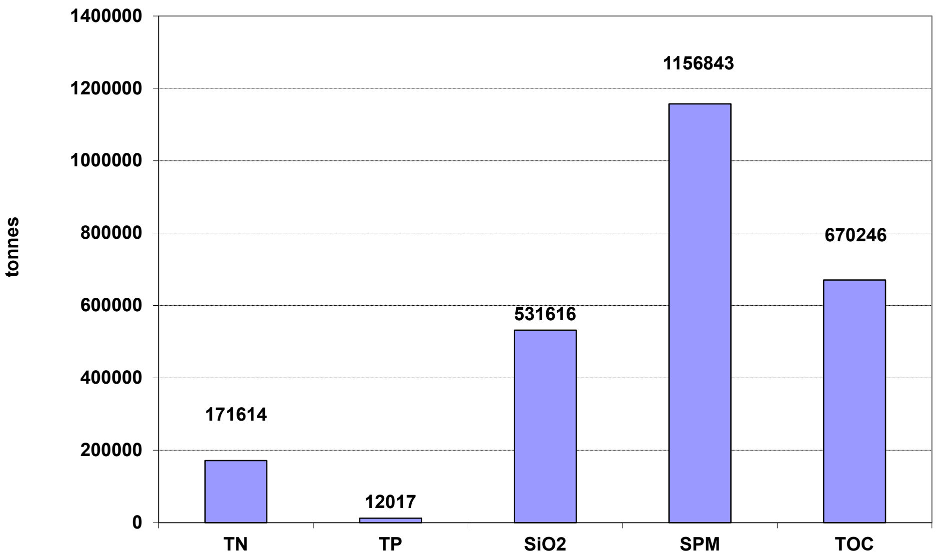
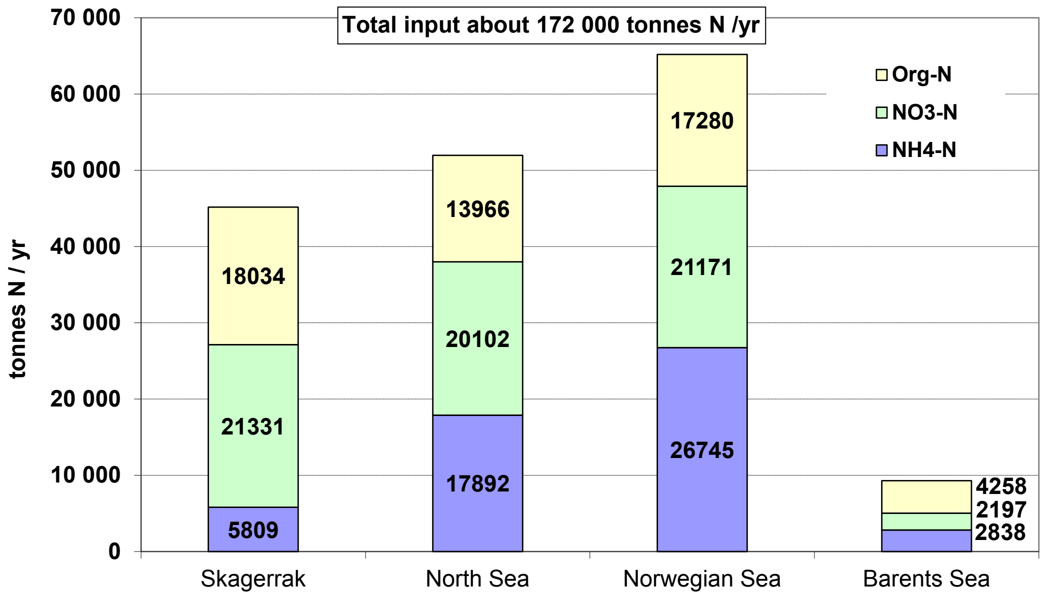


Figure 12. Total inputs (riverine and direct) of total nitrogen (TN), total phosphorus (TP), silicate (SiO_2), suspended particulate matter (SPM) and total organic carbon (TOC) to Norwegian coastal waters in 2011 (lower estimates).

[4] All inputs given here are based on the lower estimates.

An overview of the inputs of the different nitrogen and phosphorus fractions per coastal area is given in Figure 13. Overall, nutrient inputs were highest to the Norwegian Sea and lowest to the Barents Sea. A large part of the ammonium and orthophosphate inputs to the North and Norwegian Seas derive from fish farming, whereas riverine inputs are the main source of nutrients in the Skagerrak area, followed by sewage treatment plants.



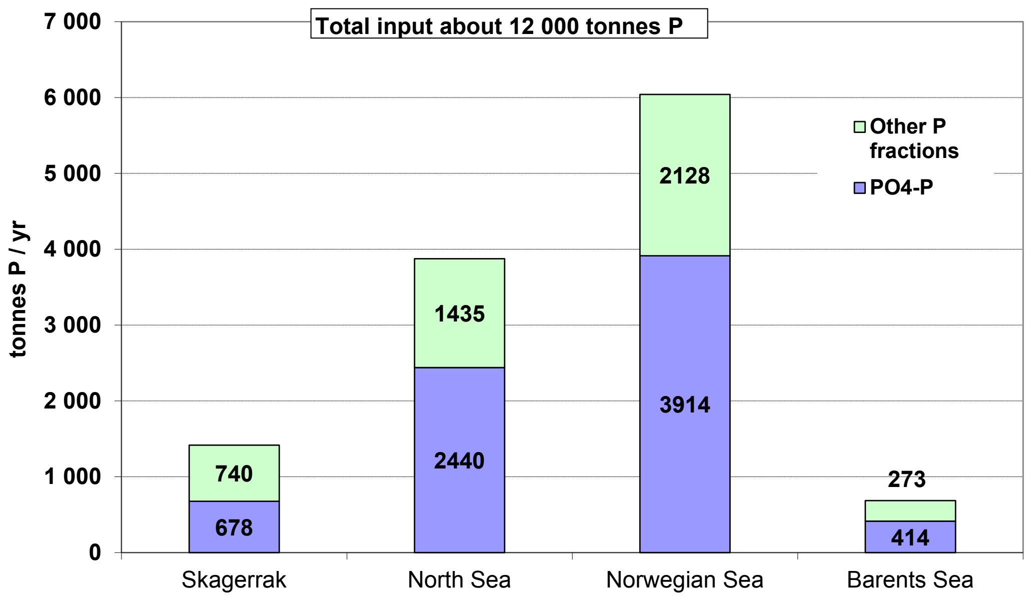


Figure 13. Inputs of total nitrogen (upper panel) and total phosphorus (lower panel) divided into different fractions for the four Norwegian maritime areas (lower estimates).

Suspended particulate matter came mainly from rivers, with a total of about 1 157 000 tonnes; the relatively high value was due to high water discharge in 2011. Of the direct discharges, industrial effluents contribute most, with about 14 000 tonnes. The proportion of sources of particulate matter and nutrients is illustrated in Figure 14. Total phosphorus, orthophosphate, total nitrogen and ammonium derive to a large extent from direct discharges (mainly fish farming). The riverine sources are most important for the loads of silicate and particulate matter. Particulate matter is also discharged from fish farming, but it is not reported and therefore not shown in the chart. The 46 monitored rivers account for about 80% of the riverine nutrient inputs.

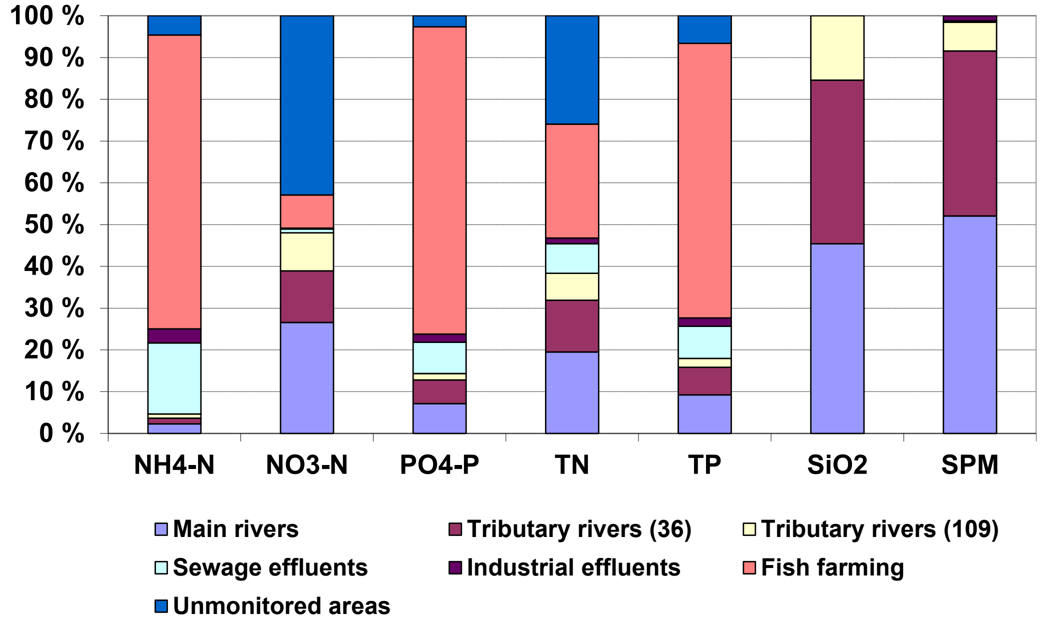


Figure 14. Main sources for nutrients, silicate and suspended particulate matter (SPM). For SPM or silica there are no estimates of inputs from fish farming or unmonitored areas.

The relative share of inputs from fish farms to the total inputs of nutrients is shown in Figure 15 for the four coastal areas. Due to few fish farms in the Skagerrak area, this area has significantly lower inputs from this source than the other three coastal areas. For Norway as a whole, the nutrient loadings from fish farming contributed to about 70 % of the total phosphorus inputs and about 30 % of the total nitrogen inputs.

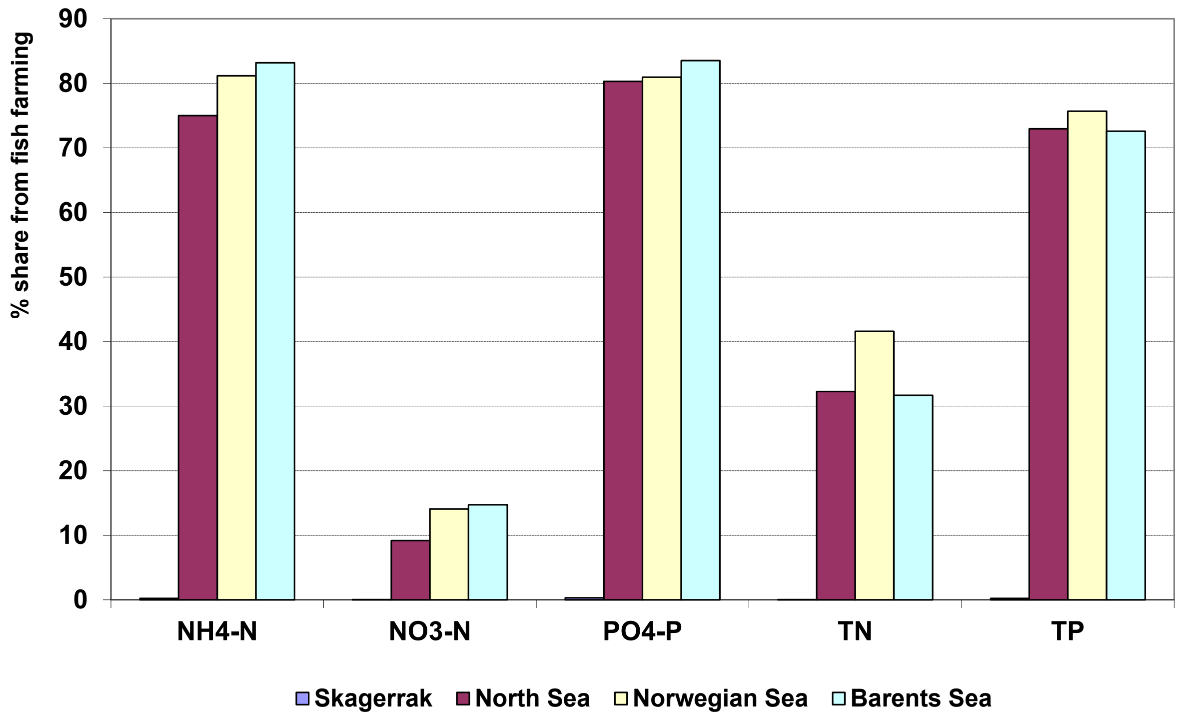


Figure 15. The relative share of nutrient inputs from fish-farming to the total inputs in 2011 for the four coastal areas. For Skagerrak the share was very small for all nutrients.

3.4 Total metal inputs in 2011

In 2011, the inputs of metals to the Norwegian coastal areas were estimated to 242 kg of mercury, 2.8 tonnes of cadmium, 31 tonnes of arsenic, 49 tonnes of lead, 86 tonnes of chromium, 151 tonnes of nickel, 831 tonnes of zinc and 1106 tonnes of copper (lower estimates; Figure 16).

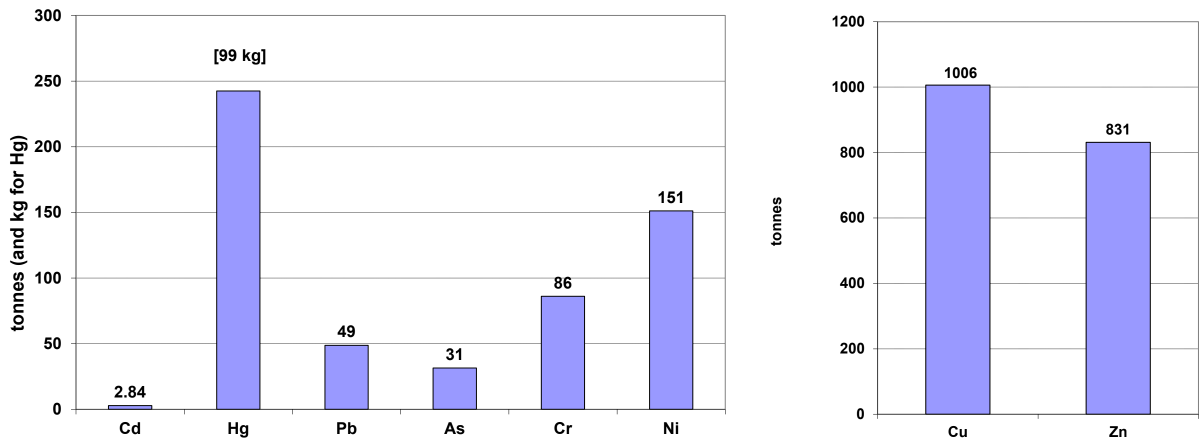


Figure 16. Total inputs of metals in 2011 (lower estimates). Left hand: Cadmium (Cd), mercury (Hg), lead (Pb), arsenic (As), chromium (Cr) and nickel (Ni). Note that mercury (Hg) is given in kg. Right hand: Copper (Cu) and Zinc (Zn).

For all metals except copper the riverine loads account for about 80-90% of the total inputs to Norwegian coastal waters (Figure 17). The high proportion of copper in the direct discharges is explained by fish farming. The fish cages are protected from algae growth with copper-containing chemicals. The metal inputs per sub-region and other details are given in the Addendum (Table 3).

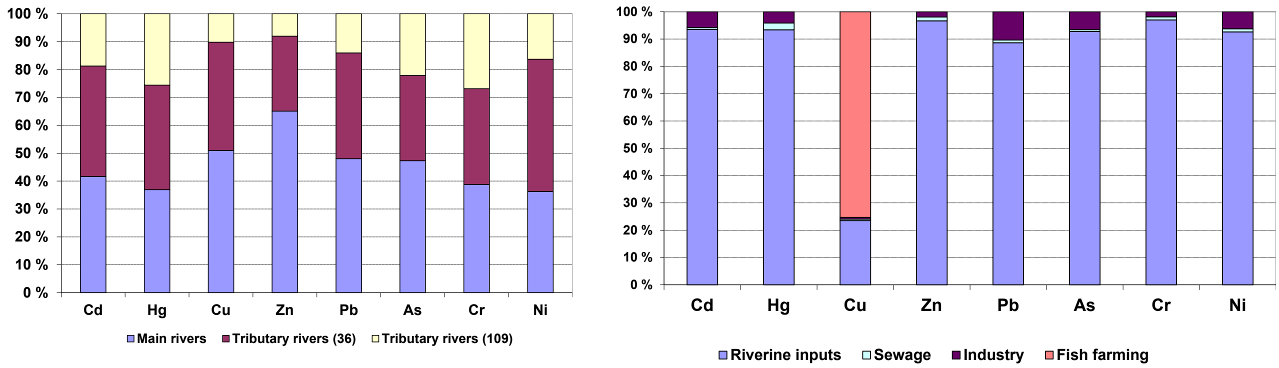


Figure 17. Relative share of riverine and direct discharges to the total inputs of metals to Norwegian coastal waters in 2011 (lower estimates).

3.5 Total lindane and PCB7 inputs in 2011

Lindane and PCB7 were only measured in the main rivers and not the tributary rivers. As in most previous years, all analytical analyses of river water in 2011 were below the LOD (level of detection) for both of these parameters. This means that the lower estimate was 0, and the upper estimate reflected the level of detection and this year's water discharges (Figure 18). Discharges of PCB7 have also been reported from sewage treatment plants, and amounted to 45 kg.

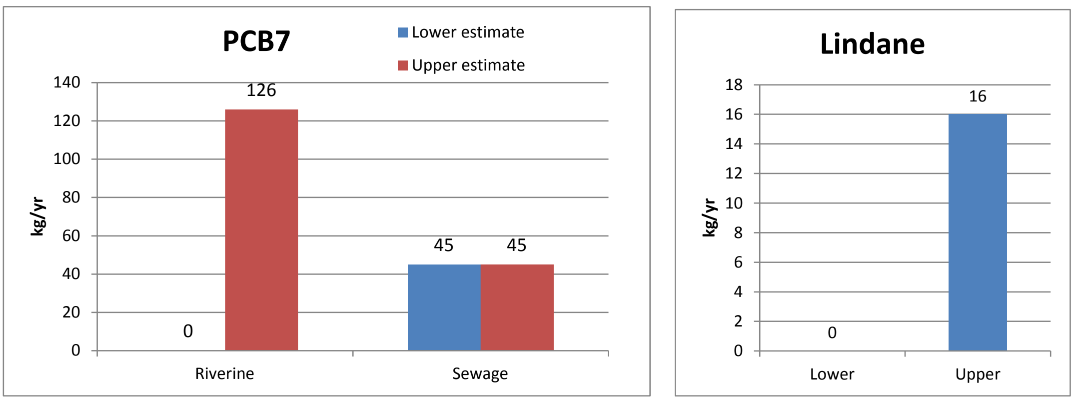


Figure 18. Total inputs of PCB7 (distributed between riverine and sewage treatment plants) and lindane in 2011 (lower and upper estimates).

4. Discussion

Riverine inputs in 2011 were, in general, significantly higher than in 2010. This is explained by higher water discharges. There were relatively small changes in direct discharges from industry and sewage treatment plants from 2010, but discharges of nutrients and copper from fish farming continued to increase. In the main rivers there were downward long-term (1990-2011) trends for several constituents, with a few exceptions.

4.1 Comparison of riverine inputs in 2010 and 2011

The comparison of riverine inputs was based on the data for the 10 main rivers; the 36 tributary rivers monitored four times a year; and the 109 previously monitored rivers. Inputs and estimated water discharges for unmonitored areas (92 rivers and areas below sampling points) were not included. Changes in the 109 tributary rivers not monitored since 2003 mainly reflect between-year variations in annual water discharge, as the concentrations have not been measured since 2003.

As expected, the overall larger water discharge in 2011 as compared to 2010 for all maritime areas was reflected in larger nutrient and sediment loads (Table 7). However, in the Norwegian Sea, the increase was less than expected based on water discharges only, especially for total phosphorus (TP) and suspended particulate matter (SPM). This was not due to conditions in 2011 but in 2010, when there was a relatively high load of TP and SPM in two tributary rivers, River Målselv and River Barduelv, in this region. May 2010 samples from these two rivers were taken during a severe spring flood and had therefore high concentrations of SPM and TP, which resulted in 50-60% higher TP and SPM loads in the entire region as compared to 2009. This phenomenon, of course, illustrates the challenges of sampling infrequently, especially in terms of substances whose load variations correlate well with fluctuations in water discharge.

Table 7. Total riverine loads of total nitrogen (TN), total phosphorus (TP) and suspended particulate matter (SPM) in 2010 and 2011. Changes greater than 5% are marked in orange (increase) and green (decrease).

Maritime area	Nitrogen (tonnes)		Phosphorus (tonnes)		SPM (1000 tonnes)	
	2010	2011	2010	2011	2010	2011
Skagerrak	26307	36 316	603	1 160	259	600
North Sea	7773	13 371	182	349	70	98
Norwegian Sea	8553	12 487	556	539	381	400
Barents Sea	2863	3 636	83	113	21	41
Total Norway	45 496	65 809	1 424	2 160	731	1 139

Table 8 shows metal inputs for 2010 and 2011 as a total for Norway. Clearly, the increase in water flow also caused an increase in metal inputs to the sea. Figure 19 illustrates the increase as percentage difference between 2010 and 2011 in the total riverine inputs. In 2010, substantially lower mercury levels in rivers were observed, with a decrease in loads of 161 kg, or 67 % (lower estimates) compared to 2009. In 2011, however, the levels increased again, probably due to the high water discharges.

Table 8. Changes in metal inputs from the different types of rivers from 2010 to 2011. Changes greater than 5% are marked in orange (increase) and green (decrease).

Change 2010-2011	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg
Source:	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	kg
Main Rivers	5	11	0	44	271	19	15	72
Tributary Rivers(36)	1	4	0	9	55	-9	13	58
Tributary Rivers(109)	2	2	0	7	21	7	6	18
Total Riverine Inputs	8	17	1	59	347	17	34	147
% change	%	%	%	%	%	%	%	%
Total riverine Norway	37	67	49	34	76	14	68	185

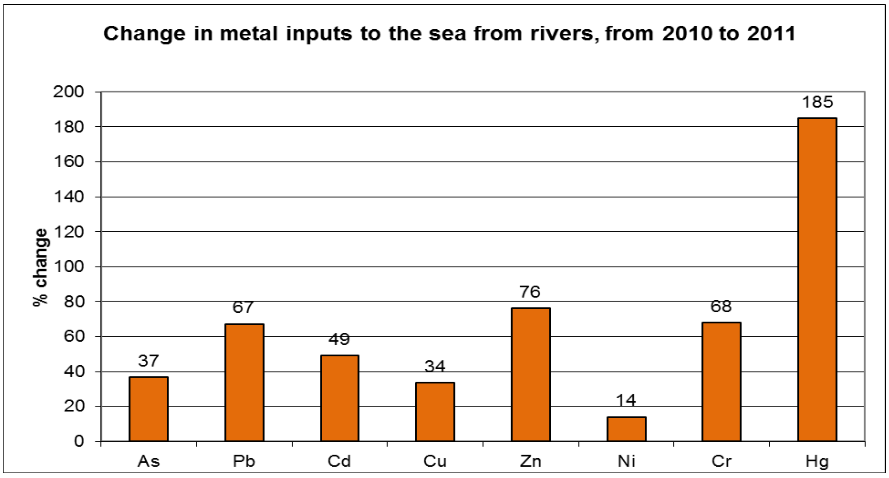


Figure 19. Percentage change in riverine inputs of metals from 2010 to 2011, for all four maritime regions (Norway total).

Loads of PCB7 and lindane were difficult to assess, as concentrations of these two substances were below LOD in all samples in 2011.

4.2 Comparison of direct discharges in 2010 and 2011

There were no major changes in phosphorus and nitrogen discharges relative to 2010 (Table 9). Nutrient discharges from fish farming increased slightly, whereas discharges from industry and sewage decreased slightly.

In terms of direct discharges of metals from sewage and industry, there were relatively low changes since 2010, although even small changes result in high percentage differences (Table 10). Whereas zinc increased by 4 tonnes from 2009 to 2010, it decreased by about 5 tonnes from 2010 to 2011. Mercury discharges from industry increased by 4 kg (24%), and a similar increase occurred from 2009 to 2010. However, when compared to the loads in riverine inputs (242 kg), the discharges from sewage treatment plants and industry are very small. Arsenic discharges from industry tend to vary considerably from year to year; this can be related to a reporting problem (decimal error in the reports from the industrial units).

Table 9. Nutrient discharges from three sectors to the Norwegian coast in 2010 and 2011. Totals for all four maritime areas (STP: Sewage treatment plants). Changes above 5% have been marked with orange (increase) and green (decrease).

Sector	2010 (tonnes)	2011 (tonnes	Change	% change
Total nitrogen:				
Fish farming	43781	46 848	3067	6.55
Industry	2588	2 378	-210	-8.83
STP	12179	12 094	-85	-0.70
Total phosphorus:				
Fish farming	7795	7 899	104	1.32
Industry	258	241	-17	-7.05
STP	937	923	-14	-1.52

Table 10. Changes in direct discharges of metals (lower estimates) to the Norwegian coastal areas from 2010 to 2011. Changes above 5% have been marked with orange (increase) and green (decrease).

Change 2010-2011	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg
Source	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	kg
STP	0.01	-0.04	0.00	0.22	-1.38	-0.09	0.23	-0.18
Industry	1.60	2.21	0.02	-2.50	-3.83	0.13	0.51	-3.69
Sum	1.61	2.17	0.02	-2.28	-5.21	0.05	0.74	-3.87
	%	%	%	%	%	%	%	%
% change	-71	-39	-10	-16	19	0	-29	24

Copper from fish farming was re-calculated this year (cf. Figure 10). Since the results came rather late before reporting, the calculation of copper discharges from fish farms downstream of sampling points have not yet been done for 2010 or earlier years. Hence, no comparison with last year has been made, although as indicated by Figure 10, the total discharges have remained relatively stable since 2006.

4.3 Long-term trends in loads and concentrations in main rivers 1990-2011

In this section an analysis of long-term trends (1990-2011) and anomalies in the inter-annual variability of the riverine loads and concentrations of pollutants in nine of the main rivers is given. The methodology is described in Section 2.8. Additional charts with calculated annual pollutant loads are presented in Appendix V and concentrations in Appendix VI.

4.3.1 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.)

4.3.2 Overview of trend results for water discharge, nutrients and particulate matter

An overview of the statistical trend tests for nutrients and suspended particles loads and concentrations is given in Table 11. The results presented in the table below are further commented in the sections below for each pollutant separately.

Table 11. 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

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

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

4.3.3 Trends in water discharge

Variations in runoff explain most of the inter-annual variability in the riverine loads of nutrients and particles, as already shown in previous reporting of the Norwegian RID-programme (e.g. Skarbøvik *et al*., 2010; 2011a). Time series of actual[5] annual water discharges are presented in Appendix V.

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 11).

Other interesting observations in the water discharge series include:

- In the five Skagerrak rivers the water discharge was particularly high in the year 2000, due to heavy and long-lasting rainfall during autumn that year.
- For the two rivers in northern Norway, Vefsna and Altaelva, the highest annual water discharge was registered in 2005.
- The year 1996 was characterised by low water discharge in all Skagerrak rivers.
- There is a tendency of increased water discharge in River Drammenselva.
- In 2011, the highest observed annual water discharge throughout the monitoring period was noted in Rivers Orreelva and Vefsna and the second highest annual water discharge was observed in Rivers Glomma and Drammenselva

4.3.4 Trends in nutrient loads and concentrations

Nitrogen

Statistically significant trends in TN loads were detected in four out of nine rivers (Table 11; upper). Three of them were downward while the fourth one 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 11; lower).

A clear downward trend (1990-2011) in total nitrogen load and concentrations (as well as for the ammonium and nitrate loads; Table 11) was detected in River Vefsna (Figure 20). As reported in the last years (Skarbøvik *et al.,* 2010; 2011a) this river shows a rather abrupt change in loads of some substances before and after 1999, including nitrogen. In this river also loads of lead and copper, and to some extent ammonium, dropped after 1999. The river has relatively high concentration levels of these substances, which might indicate that the substances derive from either industrial discharges or sewage treatment effluents. This theory is further supported by the fact that high concentrations before 1999 were mainly observed at low water discharges, when dilution is at a minimum. However, in spite of efforts to reveal the reasons for this decrease, including contacts with local expertise, no clear explanations have been found. The sampling site in Vefsna is located *upstream* of any major industries as well as the major settlement (Mosjøen).

A downward long-term trend (1990-2011) in total nitrogen loads was also detected in Rivers Skienselva and Altaelva when variations in water-discharge were taken into account, although it was difficult to visually identify such trends in Figure 21 and Figure 22. For the concentrations series, a statistically significant downward trend was detected in River

[5] 'Actual' water discharge indicates the total water discharge as measured continuously, as opposed to the water discharge measured only at sampling dates.

Skienselva, while in River Altaelva there was a tendency of a downward trend (Table 11; lower). For Altaelva, a substantial interannual variability combined with a notable serial correlation between adjacent years was noted, which is somewhat peculiar. These loads-trends in Skienselva and Altaelva may be caused by a number of different changes or measures in the river basin, but no specific explanation has yet been found. In River Otra a visible downward trend for nitrate loads and concentrations was statistically detected (Figure 23). However this was not the case with total-N. The reason for this is not known.

A statistically significant upward trend was detected for both total nitrogen loads and concentrations in river Numedalslågen (Table 11; Figure 24) which seems to be related to an almost statistically significant upward trend in nitrate-N concentrations ($p<0.07$). In addition, data for total organic carbon (TOC) (not part of the official RID-reporting) indicate an increased trend (not shown), to some extent supporting an increased transport of organic compounds in this river.

A statistically significant downward trend in ammonium load was detected in Rivers Glomma, Orreelva, Orkla, Vefsna and Altaelva (Table 11; upper). Statistically-significant downward trends were also detected for ammonium concentrations in all these rivers except in Orreelva (Table 11; lower). Changes in ammonium loads are shown in charts in Appendix V. Ammonium loads in most rivers only account for 1-5 % of the total nitrogen loads. Ammonium is normally quickly converted to nitrate in river water (via nitrification processes) and is thus a less informative parameter for long-term trend assessments.

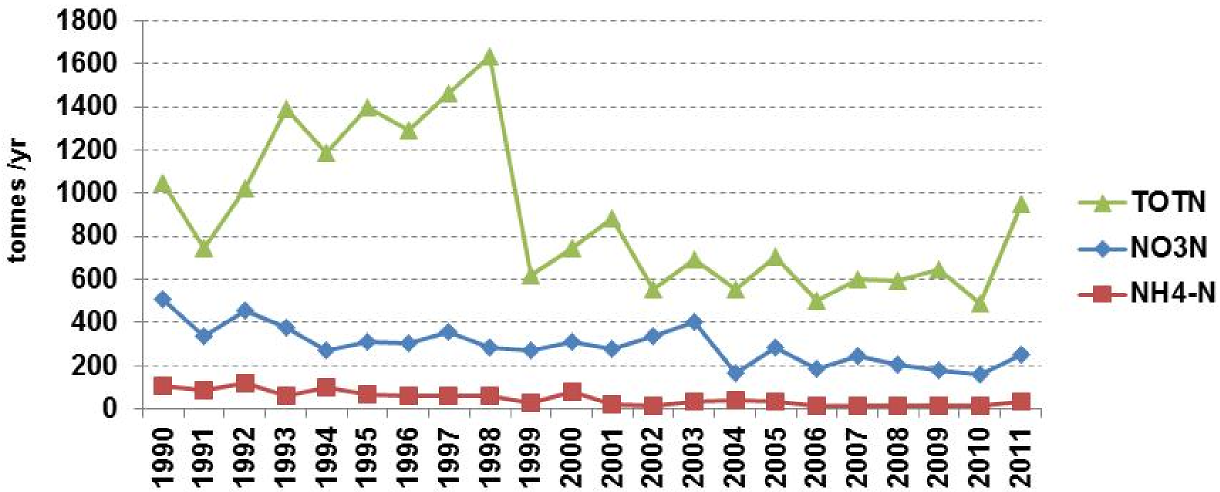


Figure 20. Annual riverine loads in River Vefsna of total nitrogen, nitrate nitrogen and ammonium in 1990-2011. Loads shown are the upper estimates.

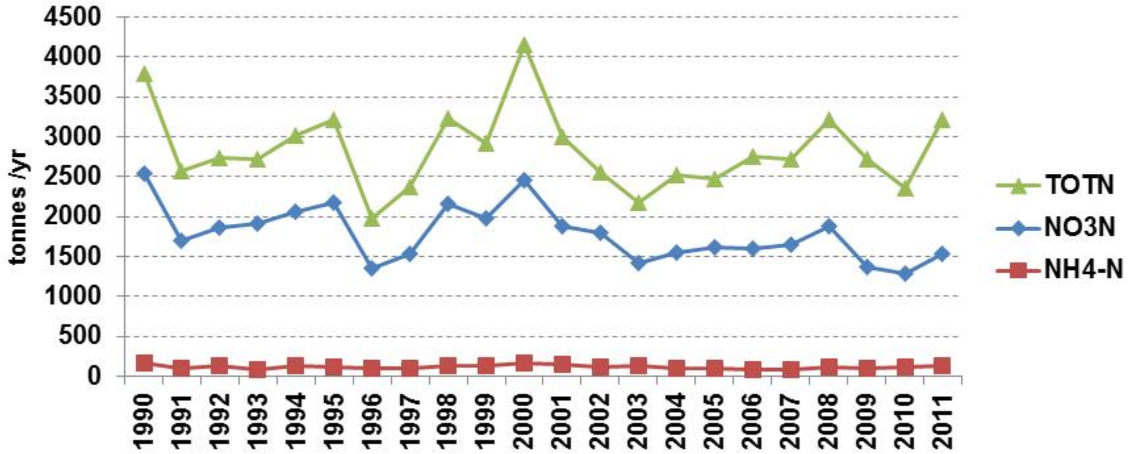


Figure 21. Annual riverine loads in River Skienselva of total nitrogen, nitrate nitrogen and ammonium in 1990-2011. Loads shown are the upper estimates.

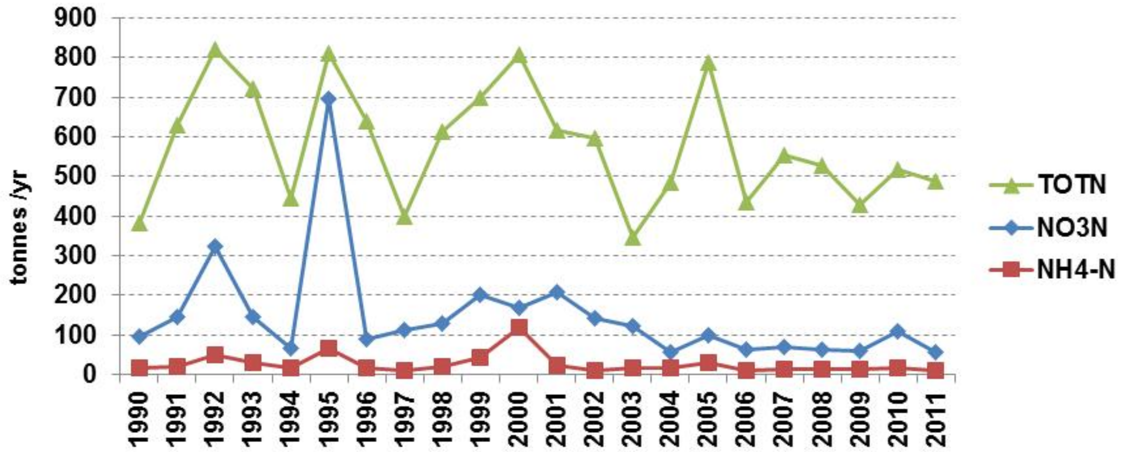


Figure 22. Annual riverine loads in River Altaelva of total nitrogen, nitrate nitrogen and ammonium in 1990-2011.

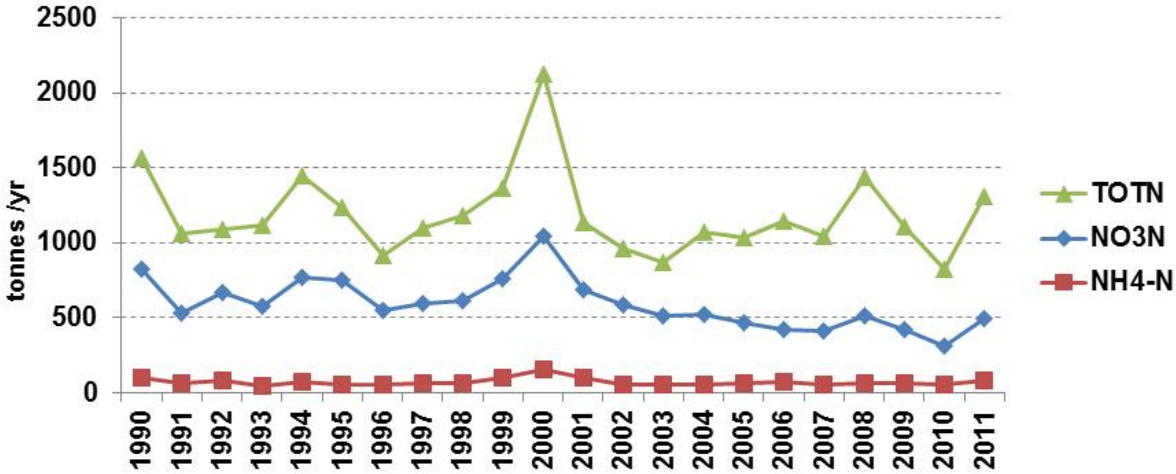


Figure 23. Annual riverine loads in River Otra of total nitrogen, nitrate nitrogen and ammonium in 1990-2011.

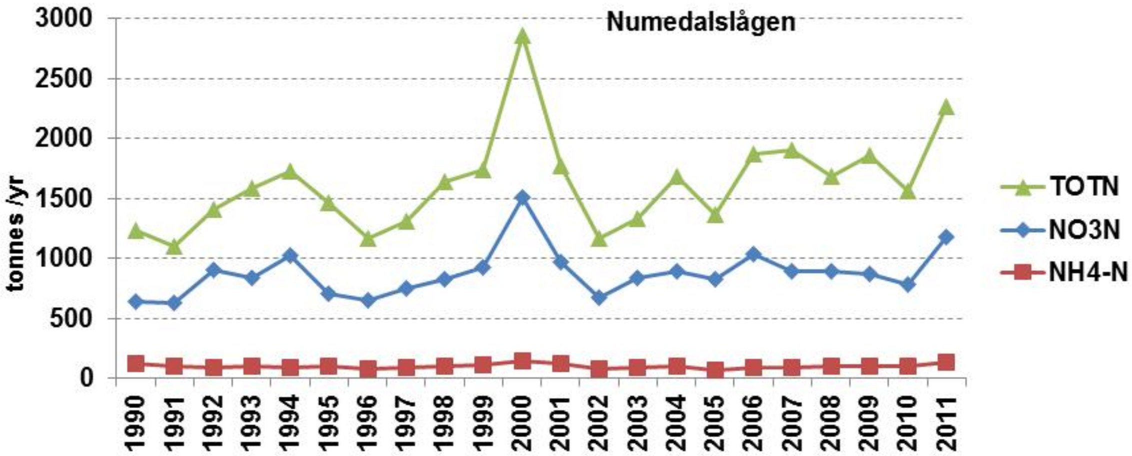


Figure 24. Annual riverine loads in River Numedalslågen of total nitrogen, nitrate nitrogen and ammonium in 1990-2011.

Phosphorus

Statistically significant downward trends in total phosphorus loads were detected in two out of nine rivers (Table 11; upper). For concentrations, four rivers showed statistically significant trends (three downward and one upward trend; Table 11; lower). For the orthophosphate loads and concentrations, statistically significant downward trends were detected in three (upper estimates) and one river (lower estimate).

The total phosphorus loads generally show large inter-annual variability, varying by a factor of three or more over the 21-year study period in a majority of the nine rivers (e.g., Rivers Numedalslågen, Skienselva, Otra, Vefsna and Altaelva; Appendix V). Given this, and especially the high inter-annual variability, it is difficult to detect long-term trends. The only exception is in the two northern-most rivers, Rivers Vefsna and Altaelva, where the phosphorus loads have statistically declined (Figure 25). Apparently, the high phosphorus loads in Vefsna in 1995 was linked to high particle (SPM) loads the same year (Figure 25; upper panel). Similarly, in River Altaelva, the peak years in phosphorus loads are explained by corresponding peaks in the particle transport (Figure 25; lower panel).

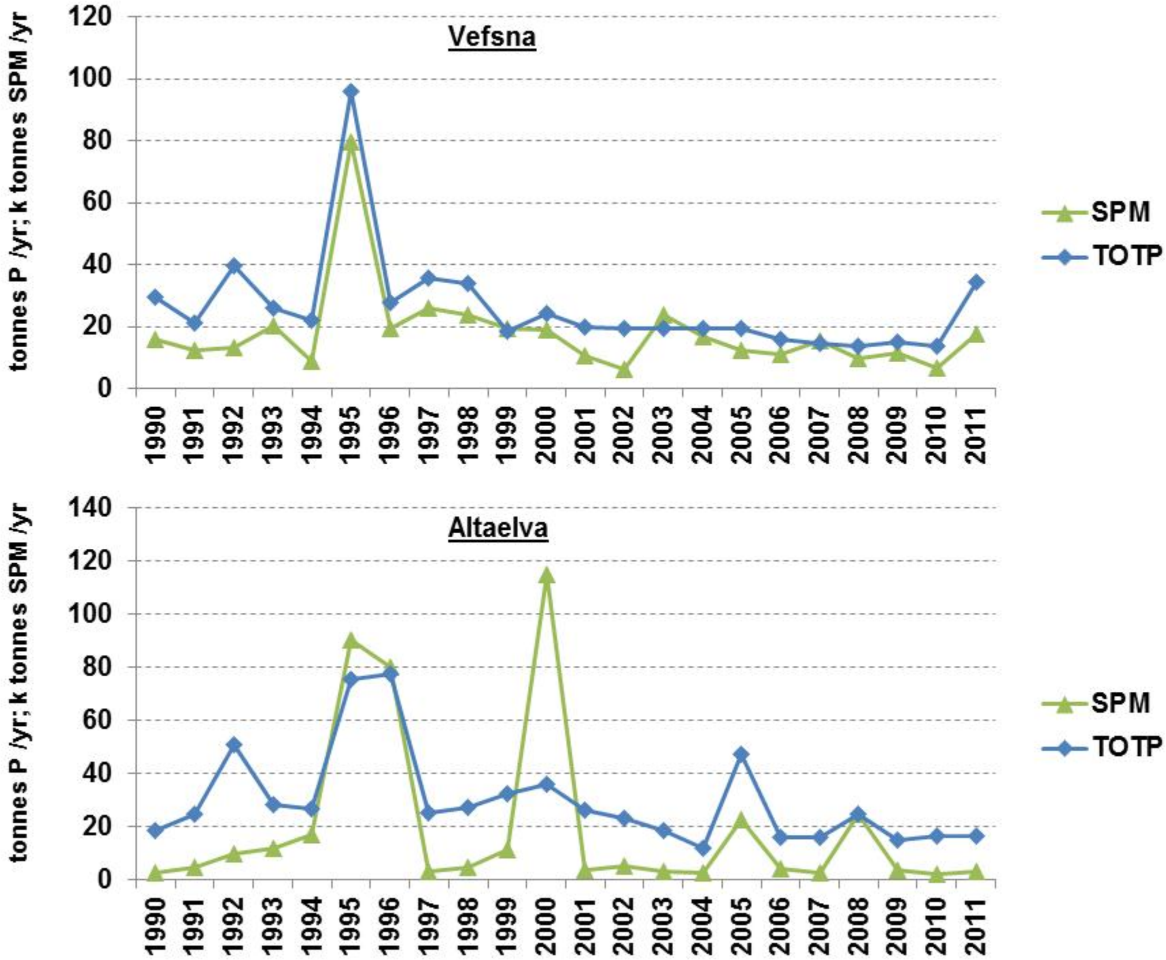


Figure 25. Riverine loads of total phosphorus (tot-P) and suspended particulate matter (SPM) in River Vefsna (upper panel) and Altaelva (lower panel) 1990-2011. It should be noted that total phosphorus loads in 1999-2003 were calculated and not monitored (cf. Stålnacke et al., 2009).

For the other seven rivers there were some tendencies of declining trends of total phosphorus loads in Rivers Glomma and Otra, but due to the high inter-annual variability, no statistically significant trends were detected (Table 11). For the concentration series, a statistically significant downward trend was detected in River Otra. Apparently, the concentrations declined substantially from 1990 to around 1998 and have afterwards stabilised around 3-5 µg/l (Figure 26).

For both orthophosphate loads and concentrations a statistically downward trend was detected in Rivers Vefsna, Altaelva and Otra if the lower estimate method was used (Table 11). When using the upper estimate method, only the Altaelva showed a statistical significant trend for both loads and concentrations ($p<0.05$); and a near-significant trend was detected for loads in Vefsna ($p>0.06$). It should be noted that orthophosphate concentrations in most samples were very low (1-2 µg/l) or at LOD, with the LOD having changed during the course of the monitoring period. This implies that interpretation of orthophosphate trends should be made with great caution.

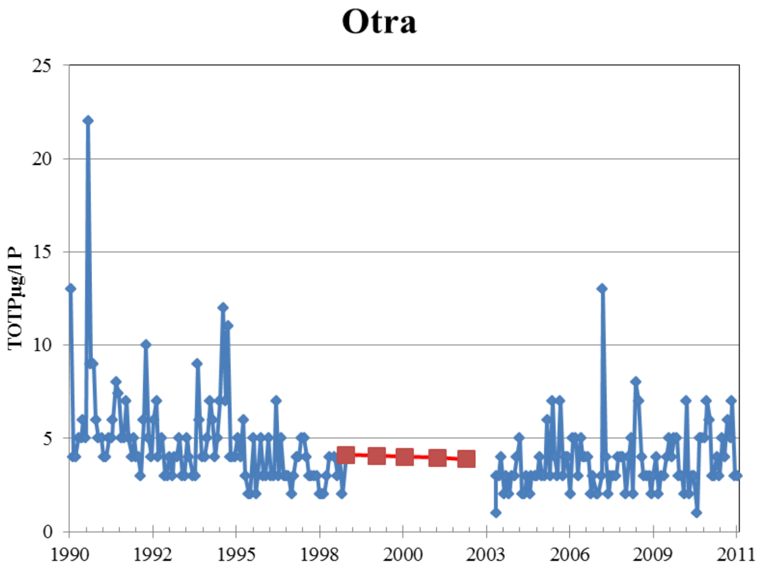


Figure 26. Monthly concentrations of total phosphorus in Otra 1990-2011. The red dots and lines indicate estimated values.

Particulate matter

Statistically significant downward trends in particulate matter were detected in two out of nine rivers; Otra and Vefsna for both loads and concentrations (Table 11; Figure 27). For Vefsna, it was quite obvious that the SPM-levels have become lower during the 2000s compared to the 1990s (Figure 28).

As for total phosphorus, there has been major inter-annual variability in loads of suspended particulate matter (SPM). Nevertheless, a common feature in the time series was the high particle loads in 2000 for all five Skagerrak rivers (less in River Glomma). This is explained by the high water discharges that year.

A more general discussion concerning the sampling frequency in RID and particulate material can be found in Borgvang *et al.* (2006).

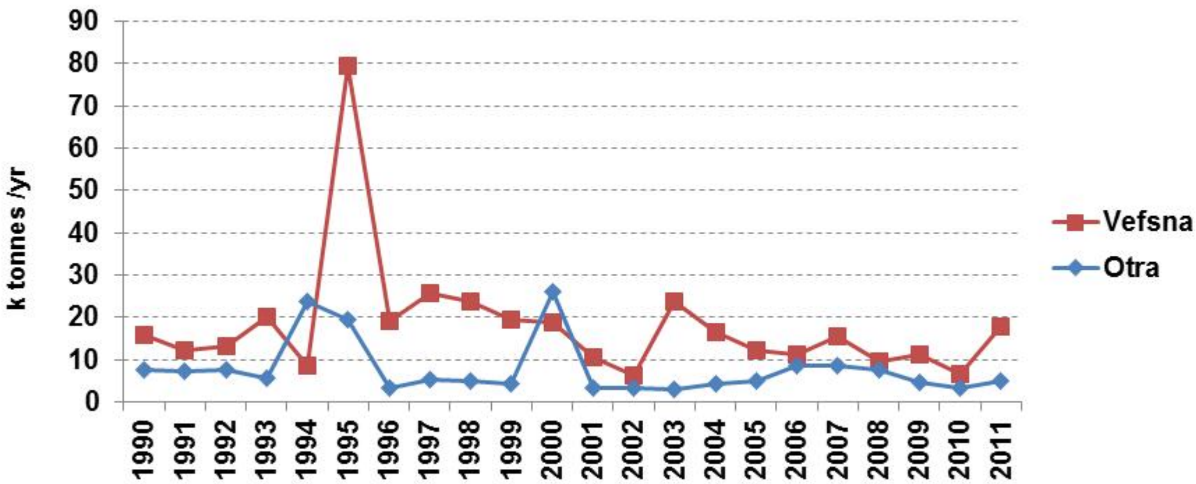


Figure 27. Riverine loads of suspended particulate matter (SPM) in Otra and Vefsna 1990-2011.

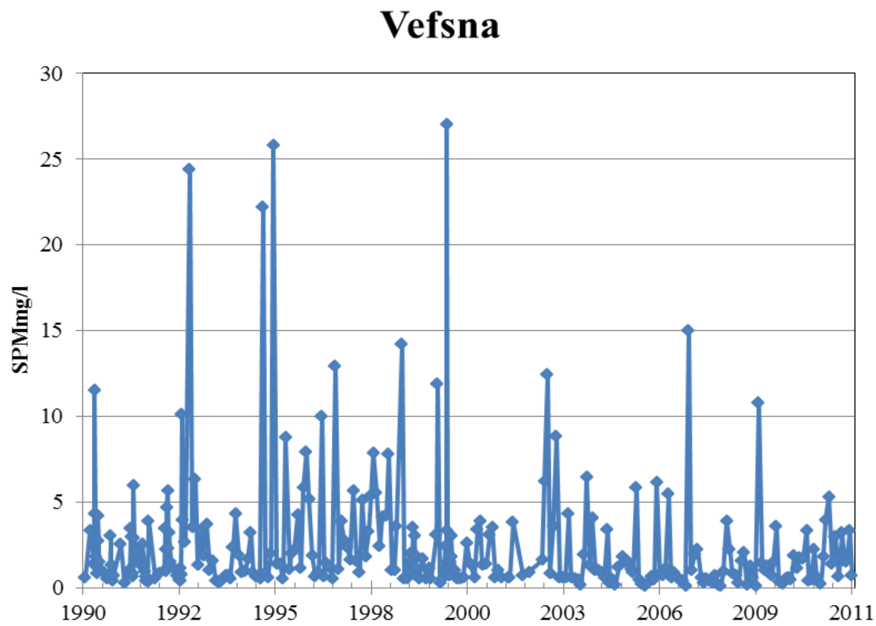


Figure 28. Monthly concentrations of suspended particulate matter (SPM) in Vefsna 1990-2011.

4.3.5 Trends in metal loads and concentrations

In this section the annual riverine loads of six metals in the nine main rivers during the period 1990-2011 are assessed. All charts are given in Appendix V for loads and Appendix VI for 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 12 (upper estimates) and Table 13 (lower estimates). The results in the tables are further commented in the sections below for each metal.

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 shown in this section 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 12. 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

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)

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

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)

Table 13. 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

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)

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

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)

Copper (Cu)

Copper was, together with lead and zinc, the only metal with few values below LOD and few changes in LOD over the monitoring period 1990-2011. In five out of the nine rivers a statistically significant decline in the copper riverine loads was detected (for both upper and lower estimates) (Table 12 and 13). For four of these rivers, a statistically significant downward trend in the concentrations was also detected while two others was close to significant (p<0.06). As noted above for nutrients, River Vefsna shows a sharp decline in some substances after 1999, and copper is one of these. The annual loads of copper during the years 1990-1998 amounted to around 12-17 tonnes, while in the following period (1999-2011) the loads dropped to 2-5 tonnes (Figure 29; upper panel). A statistically significant decline in copper loads in Rivers Numedalslågen, Altaelva, Orkla and Skienselva was also detected (Table 10 and 11). In River Altaelva, the loads have declined from 4-7 tonnes in the early to mid 1990s to 1-3 tonnes in the 2000s; except for the year 2002 which had a load of almost 4 tonnes (Figure 29; middle panel). The high load in River Skienselva in 1990 (Figure 29; lower panel) is explained by two samples with high concentrations (17 µg/l and 20 µg/l), whereas more normal values in this river are less than 1 µg/l.

A relatively steep increase in loads since 2004 can be noted in River Otra (Appendix V). The reason for this is not known.

Single years of anomalies also occur, such as for Cu-concentrations in 1993 in River Numedalslågen, and 1990 in Rivers Skienselva and Otra (Appendix VI). The high copper load in River Numedalslågen in 1993 is explained by generally high concentrations during the entire year, with e.g. 8 observations out of 13 with concentrations above 5 µg/l. In comparison, concentrations above 5 µg/l have only occurred at one sampling occasion (in 2007) during the entire time period 2000-2010.

The high load in River Otra in 1990 is explained by one single sample with high concentration (6 µg/l) in combination with several observations around or above 1 µg/l. The copper concentrations show a parabolic pattern over the time period with declining concentrations from 1990 to the mid 1990s and increasing concentrations since 2002 and onwards (Figure 30). The reason for this pattern is not known.

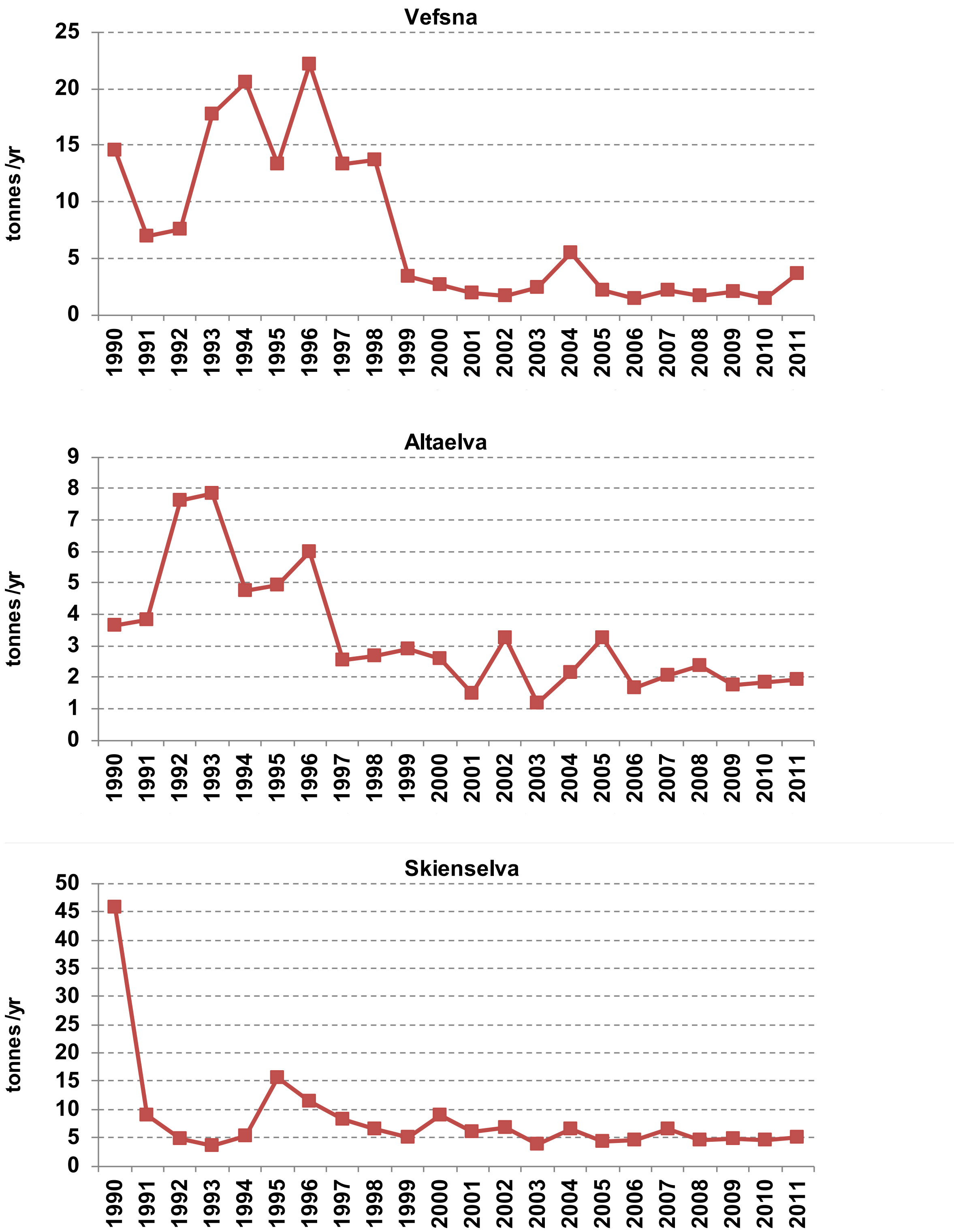


Figure 29. Annual riverine loads of copper in River Vefsna, Altaelva and River Skienselva, 1990-2011.

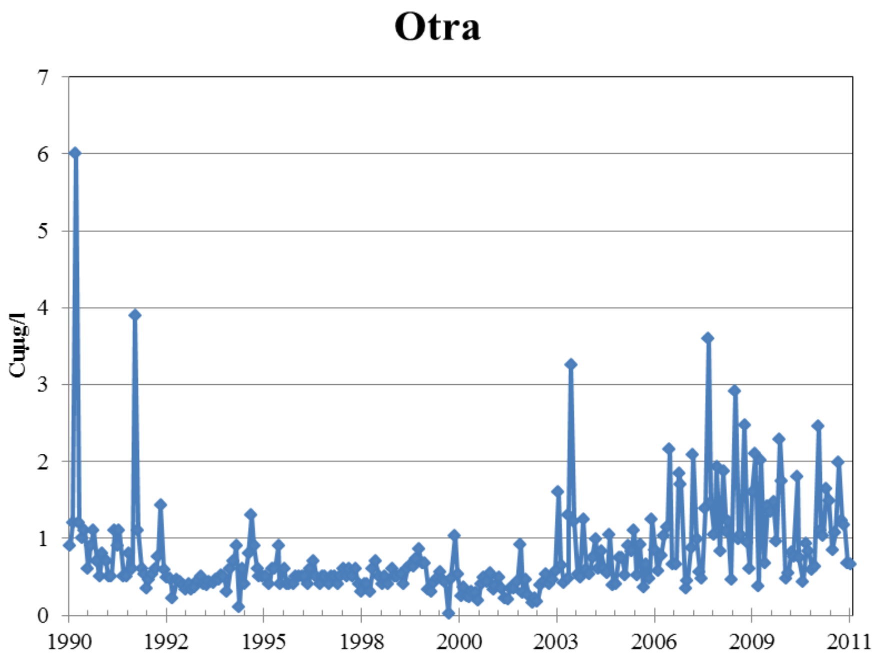


Figure 30. Monthly concentrations of copper in Otra 1990-2011.

Lead (Pb)

The inter-annual variability and trends in inputs of lead are mainly due to changes in LOD. Table 14 shows that the LOD for lead has changed by a factor of 100 during the monitoring period (1990-2011). This means that the interpretation of trends in lead loads should be done with great caution. Nonetheless, the statistical analysis of trends showed downward trends for both upper and lower load estimates in four rivers: Glomma, Numedalslågen, Vefsna and Orkla (Table 12 and 13). In addition, a statistically significant downward trend was detected in Altaelva for the upper load estimates (Table 12), whereas no significant trend was detected based on lower load estimates in the same river (Table 13). The most prominent load trends were found in Rivers Glomma and Vefsna (Figure 31).

For the concentrations series, eight out of nine rivers for the upper estimates showed statistically significant downward trends and the ninth was close to significant ($p<0.06$; Table 12; lower). Only two of the rivers showed statistically significant downward trends when the lower estimates were considered (Table 13).

Table 14. Changes in detection limits (LOD) for lead (µg/l).

Year	1990	1991	1992 -1998	1999	2000	2001	2002-2003	2004-2011
LOD	0.5	0.1	0.02	0.01 (0.1)[1]	0.01	0.01-0.02 (0.1)[1]	0.02-0.05 (0.2)[1]	0.005

1) The values in parenthesis are probably due to errors, as the detection limits (LOD) may have been given in wrong units.

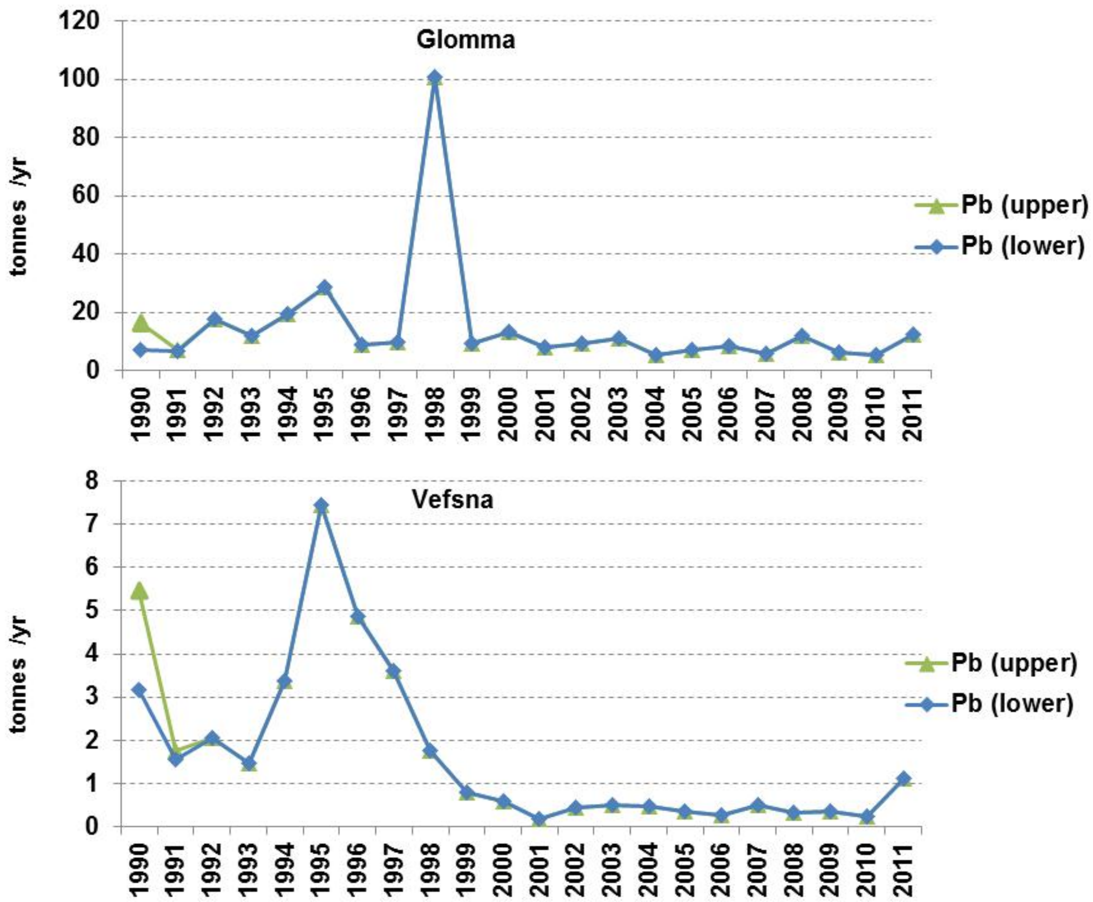
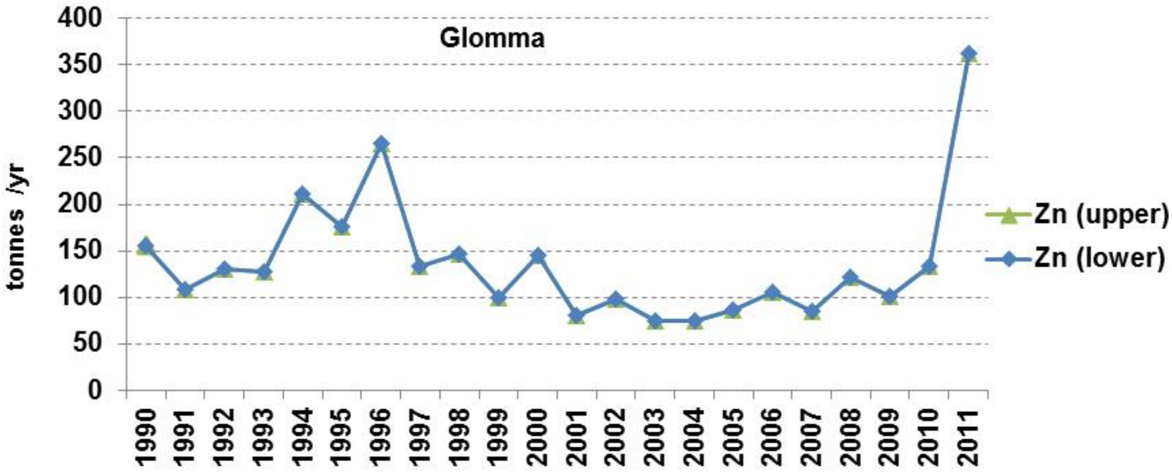


Figure 31. Annual riverine loads of lead in River Glomma and River Vefsna, 1990-2011.

Zinc (Zn)

The zinc loads show relatively low inter-annual variability as compared to many of the other metals. A downward trend in both loads and concentrations was statistically detected in five of the nine investigated rivers for both the lower and upper estimate method: Orkla, Vefsna, Numedalslågen, Skienselva and Otra (Table 12 and 13). In addition, River Altaelva showed a statistical downward trend in the concentration series. High loads in single years were almost solely explained by high single concentration values (e.g. 1993 in River Numedalslågen, 1990 in River Skienselva, 2005 in River Orreelva, and 2008 in River Altaelva). An elevated load in 2011 in river Glomma can be noted in the upper panel of Figure 32. As seen from the raw-data series (the lower panel of Figure 32), there is a general increase in the concentrations in 2011. Combined with elevated water discharge in 2011 (see section 3.2) this led to substantial loads in 2011.



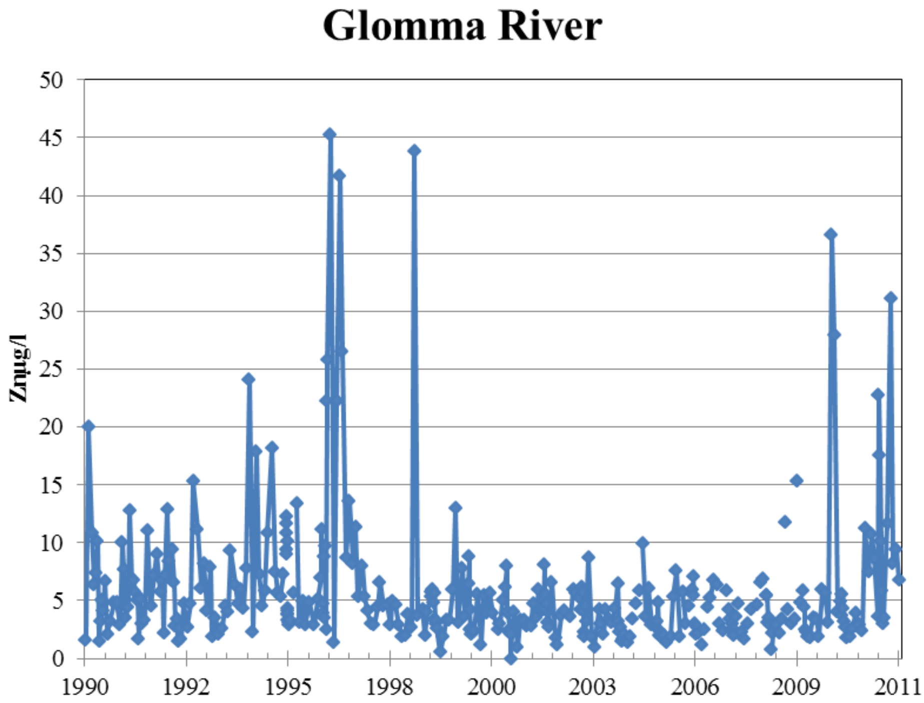


Figure 32. Annual riverine loads (upper panel) and monthly concentrations of zinc in River Glomma, 1990-2011.

Cadmium (Cd)

For the upper estimates, all nine rivers showed a statistically significant downward trend for both the loads and concentrations (Table 12), while for the lower estimates six and three trends were detected for the loads and concentrations, respectively (Table 13). The different results were due to the fact that more than 25% of the observations of cadmium in the nine main rivers were below LOD. In addition, the LODs have changed substantially during the course of the monitoring period; e.g., from 100 ng/l in 1990 to 10 ng/l in 1991 and down to 5 ng/l in 2004-2011. For this reason, a trend assessment of the annual loads and concentrations is highly uncertain and should be interpreted with great caution. The lower and upper load estimates given in Appendix V should therefore solely be used as an indication of the magnitude of the loads.

Mercury (Hg)
As mentioned in the beginning of this section, there is a high analytical uncertainty related to this parameter, and there have also been changes in analytical methods during the period 1999-2003. Moreover, 50% of the observations in the nine rivers were below LOD. The LODs have not changed much during the course of the monitoring period. In most rivers, the concentrations were just above LOD, thus no meaningful trend assessment of the annual loads was possible. Lower and upper load estimates should only be used as an indication of the magnitude of the loads. It should also be noted that the loads in 1999-2003 are based on estimated concentrations.

4.3.6 Trends in loads of PCB7 and lindane
PCB7 is here defined as the sum of seven compounds (CB28, CB52, CB101, CB118, C138, CB153, and CB180). For both lindane and PCB7s, the general pattern has been low concentrations during the entire monitoring period. Most of the concentrations were below the LOD. This obviously poses limitations to assess long-term trends with sufficient accuracy. Furthermore PCB7 was not monitored in the period 1999-2003

No long term trends for these two components were analysed, because most or all of the samples were below LOD.

4.3.7 Overview of trends in riverine loads and concentrations
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.

5. Conclusions

Climate and water discharges
The year 2011 was both warmer and wetter than normal. Precipitation was 30 % above normal for the entire country, and this resulted in correspondingly high water discharges. For Norway as a total the flow was 28 % higher than 2010. Rivers Orreelva and Vefsna had the highest observed annual water discharge for the entire monitoring period (1990-2011). Similarly, the second highest annual water discharge was observed in Rivers Glomma and Drammenselva.

Nutrients and suspended particulate matter
The total nutrient inputs to coastal Norwegian waters in 2011 were estimated to about 12 000 tonnes of phosphorus, 172 000 tonnes of nitrogen, 532 000 tonnes of total silicate, 670 000 tonnes of total organic carbon, and 1 157 000 tonnes of suspended particulate matter.

Nutrient inputs from rivers were larger than 2010, due to the high water discharges. Since the increase in water discharge was less in the Barents region then the rest of the country, the riverine loads did not increase so much there. For the direct discharges, there were only small changes in nutrients. There was a small decrease in nutrient discharges from industry and an even smaller decrease from sewage treatment plants; whereas there was a small increase in nutrients from fish farming.

Long-term trend analyses on loads for the period 1990-2011 revealed that:
- In Rivers Skienselva, Vefsna and Altaelva, there were downward trends in nitrogen loads (total-N and nitrate-N);
- In River Numedalslågen, there was an upward trend in total nitrogen loads;
- In Rivers Glomma, Vefsna, Orrelva and Altaelva, there were downward trends in ammonium loads;
- In Rivers Vefsna and Altaelva, there were downward trends in total phosphorus loads;
- In Rivers Otra and Vefsna, there were downward trends in orthophosphate loads (lower estimates).

Metals
In 2011, the inputs of metals to the Norwegian coastal areas were estimated to 242 kg of mercury, 2.84 tonnes of cadmium, 31 tonnes of arsenic, 49 tonnes of lead, 86 tonnes of chromium, 151 tonnes of nickel, 831 tonnes of zinc and 1106 tonnes of copper (lower estimates).

For all metals except copper the riverine loads account for about 80-90% of the total inputs to Norwegian coastal waters. The high proportion of copper in the direct discharges derives from fish farming. In 2010 a substantial reduction in mercury levels in rivers was observed, with a decrease in loads of 161 kg, or 67 % compared to 2009. In 2011, however, the mercury loads increased by 185%. Such changes from year-to-year are partly explained by differences in discharges and partly by the reporting practices.

Long-term analyses of trends revealed downward trends for copper and zinc:
- For copper there were downward trends in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva.

- For zinc, downward trends were detected 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 the other metals there are many uncertainties related to the trend analyses.

Pesticides
As in previous years concentrations of PCB7 and lindane were low in Norwegian waters. All samples were below the detection limit of the analytical methods.

Distribution between sources
There were no significant changes since 2010 in the distribution of sources for neither nutrients nor metals. Fish farming is the most important of all nutrient sources, except for the Skagerrak region where riverine inputs are the main nutrient source, followed by sewage treatment plants. For all but one of the metals, the riverine loads account for about 80-90% of the total inputs. The exception is copper, due to high discharges from fish farming.

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Appendices

Appendix I
The RID principles and objectives

At the Tenth Meeting of the Paris Commission (Lisbon, June 1988) the principles for the comprehensive study on riverine inputs were adopted. It was then decided to commence the study with measurements carried out in 1990, and to continue the work in the following years (PARCOM, 10/3/2). The purpose is to provide the Commission with an assessment of the waterborne inputs to Convention waters. Besides riverine inputs, the information sought also relates to direct discharges. The objectives of the Comprehensive Study are:

1. To assess, as accurately as possible, all river borne and direct inputs of selected pollutants to Convention waters on an annual basis. Inputs from lakes, polders and storm overflows are to be included where information is available.
2. To contribute to the implementation of the Joint Assessment Monitoring Programme (JAMP) by providing data on inputs to Convention waters on a sub-regional and a regional level.
3. To report these data annually to the OSPAR Commission and:
    a. to review these data periodically with a view to determining temporal trends;
    b. to review, on the basis of the data for 1990 to 1995, whether the Principles of the Comprehensive Study on Riverine Inputs require revision.
4. Each Contracting Party bordering the maritime area and, excluding the EU, should:
    a. aim to monitor on a regular basis at least 90% of the inputs of each selected pollutant;
    b. provide, for a selection of their main rivers, information on the annual mean/median concentrations of pollutants resulting from the monitoring according to paragraph 1.4a; and
    c. as far as is practicable, estimate inputs from diffuse sources, direct sources and minor rivers complementing the percentage monitored (cf. paragraph 1.4a) to 100%.

PARCOM Recommendation 88/2 stipulates that Contracting Parties should take effective national steps in order to reduce nutrient inputs into areas where these inputs are likely, directly or indirectly, to cause pollution, and to achieve a substantial reduction (of the order of 50 %) in anthropogenic inputs of phosphorus and nitrogen to these areas between 1985 and 1995. At the Third International Conference on the Protection of the North Sea States in 1990, Ministers agreed that discharges of selected persistent organic pollutants to the whole North Sea area are to be reduced by 50-70% depending on the pollutant in question.

Appendix II
Water sampling personnel

An overview of the personnel for water sampling in 2011 is given below:

Personnel for water sampling in the 10 main rivers:	*Personnel for water sampling in the 36 rivers with quarterly sampling:*
Nils Haakensen (Glomma)	Olav Smestad
Vibeke Svenne (Drammen)	Leif Johnny Bogetveit/Øystein Nøtsund
Vebjørn Opdahl (Vefsna)	Hallgeir Hansen
Anders Bjordal (Alta)	Nils Haakensen
Joar Skauge (Orkla)	Vebjørn Opdahl
Geir Ove Heiden (Vosso)	Erik Kårvatn/Inger Astrid Moen Kårvatn
Eskild Henning Larsen/Peder Vidnes (Skien)	Harald Viken
Sverre Holm (Numedalen)	Egil Moen
Einar Helland (Orre)	Øystein Iselvmo
Ellen Grethe Ruud Åtland (Otra)	Einar Pettersen
	Ellen Grethe Ruud Åtland
	Einar Helland
	Asbjørn Bjerkan
	Torbjørn Langeland/Rune Roaldkvam
	Odd Birger Nilsen
	Jan Stokkeland
	Maria Knagenhjelm/Inger Moe
	Leif Magnus Dale
	Svein Gitle Tangen
	Bjarne Stangvik

Appendix III
Catchment information

Catchment information for rivers monitored monthly - Main Rivers

The main rivers are listed in Table A-III-1.

The rivers Glomma, Drammenselva, Numedalslågen, Skienselva, and Otra drain into the Skagerrak area, the part of the North Sea which is considered to be most susceptible to pollution. These five rivers also represent the major load bearing rivers in Norway. Of these, River Glomma is the largest river in Norway, with a catchment area of about 41 200 km^2, or about 13 % of the total land area in Norway. Drammenselva has the third largest catchment area of Norwegian rivers with its 17 034 km^2.

Orreelva and Vosso drain into the coastal area of the North Sea (Coastal area II). Orreelva is a relatively small river with a catchment area of only 105 km^2, and an average flow of about 4 m^3/s, but it is included in the RID Programme since it drains one of the most intensive agricultural areas in Norway. More than 30% of its drainage area is covered by agricultural land, and discharges from manure stores and silos together with runoff from heavily manured fields cause eutrophication and problems with toxic algal blooms.

River Vosso has been in the RID Programme since its start in 1990. Until 2004 it was sampled once a year, and in the period 2004-2007 four times a year. From 2008 it was exchanged with River Suldalslågen (see below) as a main river with monthly samplings. River Vosso was chosen due to the low levels of pressures in the catchment. It has a low population density of 1.1 persons/km^2, and only 3 % of the catchment area is covered by agricultural land. The rest of the catchment is mainly mountains and forested areas.

River Suldalslågen was sampled as a main river up until 2007, but from 2008 this river has been sampled only four times a year. The reason for this is that the river is heavily modified by hydropower developments, and water from large parts of the catchment has been diverted to an adjacent catchment. The decision to change the sampling here was taken based on a weighing of advantages of long time series and disadvantages of continuing to sample a river which is very uncharacteristic. Since it was one of the main rivers from 1990-2007, its catchment characteristics are nevertheless given here: It has a drainage area of 1457 km^2 and a population density of only 2.4 persons/km^2. There are no industrial units reporting discharges of nitrogen or phosphorus from the catchment. The pressures are, thus, mainly linked to the aforementioned hydropower.

Table A-III-1. The 10 main rivers, their coastal area, catchment size and long term average flow.

Discharge area	Name of river	Catchment area (km^2)	Long term average flow (1000 m^3/day) *
I. Skagerrak	Glomma	41918	61347
	Drammenselva	17034	26752
	Numedalslågen	5577	10173
	Skienselva	10772	23540
	Otra	3738	12863
II. North Sea	Orreelva	105	430
	Vosso (from 2008)	1492	2738
III. Norwegian Sea	Orkla	3053	3873
	Vefsna	4122	14255
IV. Barents Sea	Alta	7373	7573

** For the 30-year normal 1961-1990; at the water quality sampling points.*

The Orkla and Vefsna rivers drain into the Norwegian Sea (Coastal area III). Agricultural land occupies 4 and 8 % of their catchment areas, respectively. Farming in this part of the country is less intensive as compared to the Orre area. More important are abandoned mines in the upper part of the Orkla watercourse. Several other rivers in this area may also receive pollution from abandoned mines (heavy metals). These two rivers have, however, no reported industrial activity discharging nitrogen or phosphorus.

The last of the main rivers, the River Alta, is, with its population density of only 0.3 persons per km^2 and no industrial plants reporting discharges, selected as the second of the two unpolluted river systems, although this is, as River Suldalslågen, affected by hydropower development. The river drains into the Barents Sea.

The ten watercourses represent river systems typical for different parts of the country. As such they are very useful when estimating loads of comparable rivers with less data than the main rivers. All rivers except Orreelva are to varying degrees modified for hydropower production.

Catchment information for rivers monitored quarterly – Tributary Rivers

A list of the tributary rivers is given in Table A-III-2.

The average size of the catchment area of the tributary rivers[6] is 2380 km^2, but the size varies from Vikedalselva with its 118 km^2, to the second largest drainage basin in Norway, Pasvikelva with a drainage basin of 18404 km^2.

Land use varies considerably, as shown in Figure A-III-1. As an example, the Figgjo and Tista Rivers have the highest coverage of agricultural land (31[7] and 12%, respectively), whereas some of the rivers have no or insignificant agricultural activities in their drainage basins (e.g. Ulla, Røssåga, Målselv, Tana and Pasvik). Some catchments, such as Lyseelv,

[6] River Vosso is still included in this figure.
[7] Statistics for Figgjo also include values from Orre, as these rivers are adjacent.

Årdalselv and Ulla in the west; and Pasvik in the north, are more or less entirely dominated by mountains, moors, and mountain plateaus.

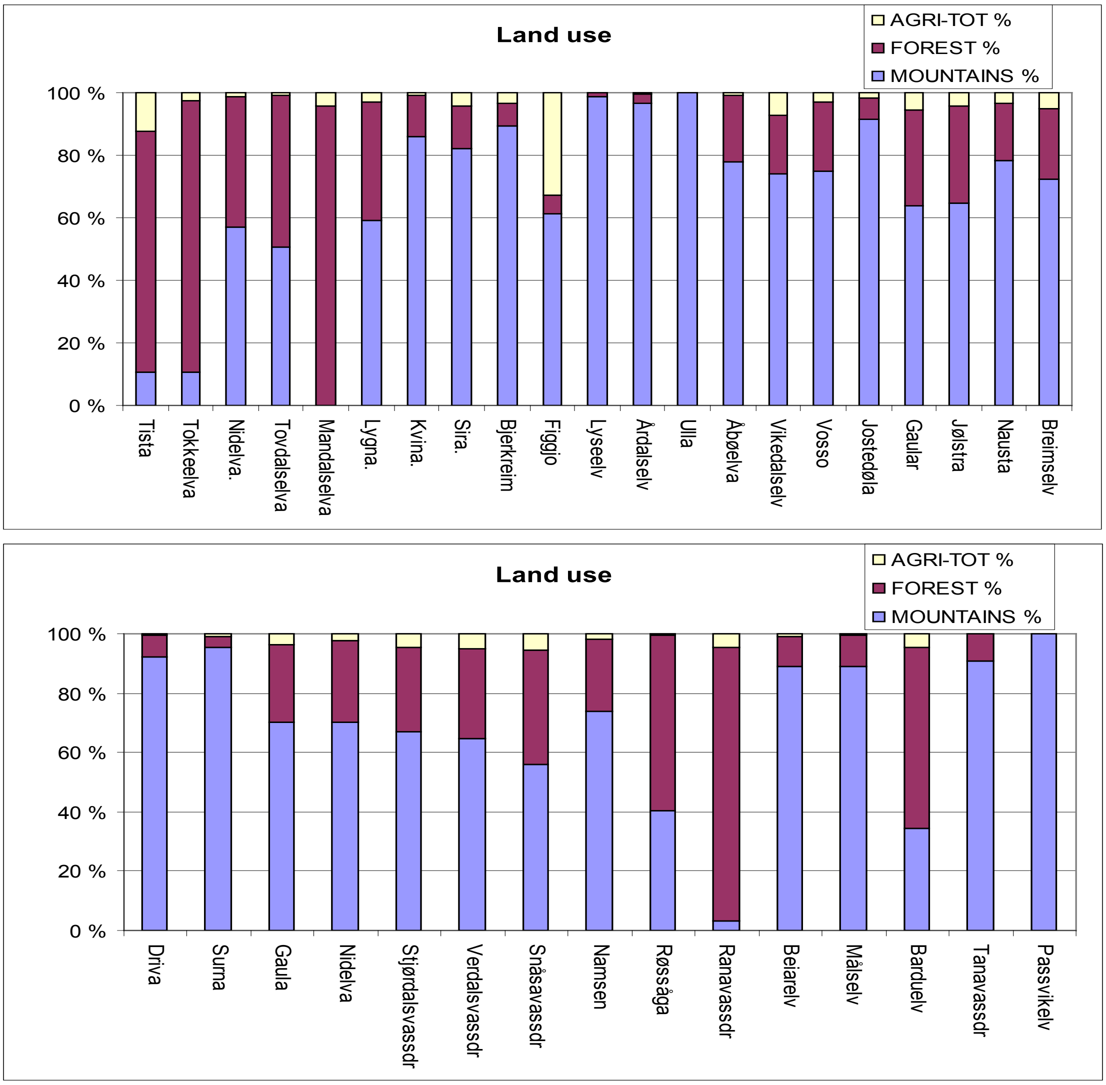

Figure A-III-1. Land use distribution in the catchment areas of the 36 rivers monitored quarterly. "Agri-tot" means total agricultural land. "Mountains" include moors and mountain plateaus not covered by forest.

There is also considerable variation in population density, from rivers in the west and north with less than one inhabitant per km^2, to rivers with larger towns and villages with up to 100 or more inhabitants per km^2. Population density decreases in general from south to north in Norway. The average population density of the 36 river catchments amounts to about 14 inhabitants per km^2, whereas the average density in the main river catchments is about 20 inhabitants per km^2.

Table A-III-2. River basin characteristics for the 36 rivers monitored quarterly. Discharge Q is based on the 1961-1990 mean (from NVE).

Official Norwegian river code	**River**	**Basin area (km^2)**	**Area upstream samplings site (km^2)**	**Normal Q (10^6 m^3/yr)**
001	Tista	1588	1582	721
017	Tokkeelva	1238	1200	1042
019	Nidelva	4025	4020	3783
020	Tovdalselva	1856	1854	1984
022	Mandalselva	1809	1800	2624
024	Lygna	664	660	1005
025	Kvina	1445	1140	2625
026	Sira	1916	1872	3589
027	Bjerkreimselva	705	704	1727
028	Figgjo	229	218	361
031	Lyseelv	182	182	425
033	Årdalselv	519	516	1332
035	Ulla	393	393	1034
036	Suldalslågen	1457	1457	6690
037	Saudaelv	353	353	946
038	Vikedalselv	118	117	298
062	Vosso	1492	1465	2738
076	Jostedøla	865	864	1855
083	Gaular	627	625	1568
084	Jølstra	714	709	1673
084	Nausta	277	273	714
087	Breimselv	636	634	1364
109	Driva	2487	2435	2188
112	Surna	1200	1200	1816
122	Gaula	3659	3650	3046
123	Nidelva	3110	3100	3482
124	Stjørdalsvassdraget	2117	2117	2570
127	Verdalsvassdraget	1472	1472	1857
128	Snåsavassdraget	1095	1088	1376
139	Namsen	1124	1118	1376
155	Røssåga	2092	2087	2995
156	Ranavassdraget	3847	3846	5447
161	Beiaren	1064	875	1513
196	Målselv	3239	3200	2932
196	Barduelv	2906	2906	2594
234	Tanavassdraget	16389	15713	5944
244	Pasvikelv	18404	18400	5398

Appendix IV
Methodology, detailed information and changes over time

Method for the selection of rivers for monitoring

A total of 247 rivers discharge into the coastal waters of Norway. In order to comply with the PARCOM requirements to measure 90 % of the load from Norwegian rivers to coastal areas, it would have been necessary to monitor a large number of rivers. In order to reduce this challenge to a manageable and economically viable task, it was early on decided that 8 of the major load-bearing rivers should be monitored in accordance with the objectives of the comprehensive study. These are the rivers Glomma, Drammenselva, Numedalslågen, Skienselva, Otra, Orreelva, Orkla and Vefsna. In addition, two relatively “unpolluted” rivers were included for comparison purposes; these now are River Vosso and River Alta, and are monitored at the same frequency. In these 10 rivers a number of studies have been carried out since 1990 (www.klif.no). However, River Vosso only became a ‘main river’ in 2008/2009, when it replaced River Suldalslågen (see below for justification of this change).

In addition to these 10 main rivers, for 14 years (1990-2003) the RID Programme estimated the load of 126 to 145 so-called ‘tributary’ rivers, all of which discharge directly to the sea. These estimates were generally based on only one sample per year. Since the transport of dissolved and particle associated material in rivers can vary considerably over time, an important and necessary change in the programme was introduced in 2004: The number of “tributary rivers” was reduced to 36, and the sampling frequency was increased to 4 samples per year. The total drainage area for the original selection of 145 tributary rivers was 134 000 km^2, whereas the selected 36 rivers cover 86 000 km^2. This constitutes 64% of the former tributary area, illustrating that the 36 tributaries were selected for their relatively large drainage areas. The total drainage area of the monitored rivers is, then, about 180 000 km^2, which constitutes about 50% of the total land area draining into the convention seas.

The selection also focused on finding rivers with representative water discharge data. Reliable data exist for 35 of the 36 selected rivers, although for four of the rivers water discharge is only monitored in tributaries and not in the main watercourse. Lyselva is the only river without a water discharge monitoring station.

Since it has been of special importance to estimate the major loads to Skagerrak, a proportionally higher number of rivers have been chosen for this part of the country.

The load from the remaining rivers has been calculated through TEOTIL modelling. Table A-IV-1 gives an overview of the major “types” of Norwegian rivers draining into coastal areas, as defined within the RID Programme.

Table A-IV-1. Norwegian rivers draining into coastal areas and the methods used to estimate loads from these rivers

Type of river	Number
Total number of rivers draining into Norwegian coastal areas	247
Main rivers, monitored monthly or more often since 2004	10
Tributary rivers, monitored quarterly since 2004	36
Tributary rivers, monitored once a year in 1990-2003; modelled from 2004 onwards	109
Rivers that have never been monitored by the RID Programme (loads are modelled)	92

Sampling methodology and sampling sites

The sites are located in regions of unidirectional flow (no back eddies). In order to ensure as uniform water quality as possible, monitoring is carried out at sites where the water is well mixed, e.g. at or immediately downstream a weir, in waterfalls, rapids or in channels in connection with hydroelectric power stations. Sampling sites are located as close to the freshwater limit as possible, without being influenced by seawater.

Several of the most significant discharges from industry and municipal wastewater systems are located downstream the sampling sites. These emissions are not included in the riverine inputs, but are included in the direct discharge estimates.

Table A-IV-2 gives the coordinates of the sampling stations. For quality assurance reasons, the sampling sites have been documented by use of photographs. This, together with the coordinates, will ensure continuity in the event that sampling personnel changes.

Table A-IV-2. Coordinates of the 46 sampling points.

Regine No	RID-ID	Station name	Latitude	Longitude	RID-Region
002.A51	2	Glomma at Sarpsfoss	59.27800	11.13400	Skagerrak
012.A3	15	Drammenselva	59.75399	10.00903	
015.A1	18	Numedalslågen	59.08627	10.06962	
016.A221	20	Skienselva	59.19900	9.61100	
021.A11	26	Otra	58.18742	7.95411	
028.4A	37	Orreelva	58.73143	5.52936	North Sea
062.B0	64	Vosso (Bolstadelvi)	60.64800	6.00000	
121.A41	100	Orkla	63.20100	9.77300	Norwegian Sea
151.A4	115	Vefsna	65.74900	13.23900	
212.A0	140	Altaelva	69.90100	23.28700	Barents Sea
Regine No	RID-ID	Station name	Latitude	Longitude	RID-Region
001.A6	1	Tista	59,12783	11.44436	Skagerrak
017.A1	21	Tokkeelva	58.87600	9.35400	
019.A230	24	Nidelv (Rykene)	58.40100	8.64200	
020.A12	25	Tovdalselva	58.21559	8.11668	
022.A5	28	Mandalselva	58.14300	7.54604	
024.B120	30	Lyngdalselva	58.16300	7.08798	North Sea
025.AA	31	Kvina	58.32020	6.97023	
026.C	32	Sira	58.41367	6.65669	
027.A1	35	Bjerkreimselva	58.47894	5.99530	
028.A3	38	Figgjoelva	58.79168	5.59780	
031.AA0	44	Lyseelva	59.05696	6.65835	
032.4B1	45	Årdalselva	59.08100	6.12500	
035.A21	47	Ulladalsåna (Ulla)	59.33000	6.45000	
036.A21	48	Suldalslågen	59.48200	6.26000	
035.721	49	Saudaelva	59.38900	6.21800	
038.A0	51	Vikedalselva	59.49958	5.91030	
076.A0	75	Jostedøla	61.41333	7.28025	
083.A0	78	Gaular	61.37000	5.68800	
084.A2	79	Jølstra	61.45170	5.85766	
084.7A0	80	Nausta	61.51681	5.72318	
087.A221	84	Gloppenelva (Breimselva)	61.76500	6.21300	
109.A0	95	Driva	62.66900	8.57100	Norwegian Sea
112.A0	98	Surna	62.97550	8.74262	
122.A24	103	Gaula	63.28600	10.27000	
123.A2	104	Nidelva(Tr.heim)	63.43300	10.40700	
124.A21	106	Stjørdalselva	63.44900	10.99300	
127.A0	108	Verdalselva	63.79200	11.47800	
128.A1	110	Snåsavassdraget	64.01900	11.50700	
139.A50	112	Namsen	64.44100	11.81900	
155.A0	119	Røssåga	66.10900	13.80700	
156.A0	122	Ranaelva	66.32300	14.17700	
161.B4	124	Beiarelva	66.99100	14.75000	
196.B2	132	Målselv	69.03600	18.66600	
196.AA3	133	Barduelva	69.04300	18.59500	
234.B41	150	Tanaelva	70.23000	28.17400	Barents Sea
246.A5	153	Pasvikelva	69.50100	30.11600	

Analytical methods and detection limits

Table A-IV-3. Analytical methods and limits of detection for parameters included in the sampling programme in 2011.

Parameter	Detection limit	Analytical Methods (NS: Norwegian Standard)
pH		NS 4720
Conductivity (mS/m)	0.05	NS-ISO 7888
Suspended particulate matter (SPM.) (mg/L)	0.1	NS 4733 modified
Total Organic Carbon (TOC) (mg C/L)	0.1	NS-ISO 8245
Total phosphorus (µg P/L)	1.0	NS 4725 – Peroxidisulphate oxidation method
Orthophosphate (PO4-P) (µg P/L)	1.0	NS 4724 – Automated molybdate method
Total nitrogen (µg N/L)	10	NS 4743 – Peroxidisulphate oxidation method
Nitrate (NO_3-N) (µgN/L)	1	NS-EN ISO 10304-1
Ammonium (NH_4-N) (µg N/L)	2	NS-EN ISO 14911
Silicate (SiO_2) (Si/ICP; mg Si /L)	0.02	ISO 11885 + NIVA's accredited method E9-5
Lead (Pb) (µg Pb/L)	0.005	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Cadmium (Cd) (µg Cd/L)	0.005	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Copper (Cu) (µg Cu/L)	0.01	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Zinc (Zn) (µg Zn/L)	0.05	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Arsenic (As) (µg As/L)	0.05	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Chromium (Cr) (µg Cr/L)	0.1	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Nickel (Ni) (µg Ni/L)	0.05	NS-EN ISO 17294-1 and NS EN ISO 17294-2
Mercury (Hg) (ng Hg/L)	1.0	NS-EN 1483 and NIVA's accredited method E4-3
Lindane (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,4,4'-trichlorobiphenyl (CB28) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',5,5'-tetrachlorobiphenyl (CB52) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',4,5,5'-pentachlorobiphenyl (CB101) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,3',4,4',5-pentachlorobiphenyl (CB118) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',3,4,4',5'-hexachlorobiphenyl (CB138) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',4,4',5,5'-hexachlorobiphenyl (CB153) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)

Water discharge and hydrological modelling

For the 10 main rivers, daily water discharge measurements were, as in former years, used for the calculation of loads. Since the discharge monitoring stations are not located at the same site as the water sampling is conducted, the water discharge at the water quality sampling sites were calculated by up- or downscaling, proportional to the drainage areas.

For the 36 rivers monitored quarterly, as well as the remaining 109 rivers from the former RID studies, water discharge was simulated with a spatially distributed version of the HBV-model (Beldring *et al.*, 2003). The use of this model was introduced in 2004. Earlier, the water discharge in the 145 rivers was calculated based on the 30-year average, and adjusted with precipitation data for the actual year. The results from the spatially-distributed HBV are transferred to TEOTIL for use in the load estimates. Smaller response units ('regine-units') were introduced in TEOTIL in order to improve load estimates for smaller basins (tributaries). This update of the TEOTIL model in 2006 resulted in an increased estimate of the water discharge in the unmonitored areas. It is believed that the present estimate is more correct than in former years, which implies that a recalculation of former years may be called for.

The gridded HBV-model model performs water balance calculations for square grid-cell landscape elements characterised by their altitude and land use. Each grid cell may be divided into two land-use zones with different vegetation cover, a lake area and a glacier area. The model is run with daily time steps, using precipitation and air temperature data as inputs. It has components for accumulation, sub-grid scale distribution and ablation of snow, interception storage, sub-grid scale distribution of soil moisture storage, evapotranspiration, groundwater storage and runoff response, lake evaporation and glacier mass balance. Potential evapotranspiration is a function of air temperature; however, the effects of seasonally varying vegetation characteristics are considered. The algorithms of the model were described by Bergström (1995) and Sælthun (1996). The model is spatially distributed in that every model element has unique characteristics which determine its parameters, input data are distributed, water balance computations are performed separately for each model element, and finally, only those parts of the model structure which are necessary are used for each element. When watershed boundaries are defined, runoff from the individual model grid cells is sent to the respective basin outlets.

The parameter values assigned to the computational elements of the precipitation-runoff model should reflect the fact that hydrological processes are sensitive to spatial variations in topography, soil properties and vegetation. As the Norwegian landscape is dominated by shallow surface deposits overlying rather impermeable bedrock, the capacity for subsurface storage of water is small (Beldring, 2002). Areas with low capacity for soil water storage will be depleted faster and reduced evapotranspiration caused by moisture stress shows up earlier than in areas with high capacity for soil water storage (Zhu and Mackay, 2001). Vegetation characteristics such as stand height and leaf area index influence the water balance at different time scales through their control on evapotranspiration, snow accumulation and snow melt (Matheussen *et al.*, 2000). The following land-use classes were used for describing the properties of the 1-km^2 landscape elements of the model: (i) areas above the tree line with extremely sparse vegetation, mostly lichens, mosses and grasses; (ii) areas above the tree line with grass, heather, shrubs or dwarf trees; (iii) areas below the tree line with sub-alpine forests; (iv) lowland areas with coniferous or deciduous forests; and (v) non-forested areas below the tree line. The model was run with specific parameters for each land use class controlling snow processes, interception storage, evapotranspiration and subsurface moisture storage and runoff generation. Lake evaporation and glacier mass balance were controlled by parameters with global values.

A regionally applicable set of parameters was determined by calibrating the model with the restriction that the same parameter values are used for all computational elements of the model that fall into the same class for land surface properties. This calibration procedure rests on the hypothesis that model elements with identical landscape characteristics have similar hydrological behaviour, and should consequently be assigned the same parameter values. The grid cells should represent the significant and systematic variations in the properties of the land surface, and representative (typical) parameter values must be applied for different classes of soil and vegetation types, lakes and glaciers (Gottschalk *et al.*, 2001). The model was calibrated using available information about climate and hydrological processes from all gauged basins in Norway with reliable observations, and parameter values were transferred to other basins based on the classification of landscape characteristics. Several automatic calibration procedures, which use an optimisation algorithm to find those values of model parameters that minimise or maximise, as appropriate, an objective function or statistic of the residuals between model simulated outputs and observed watershed output, have been developed. The nonlinear parameter estimation method PEST (Doherty *et al*., 1998) was used. PEST adjusts the parameters of a model between specified lower and upper bounds until the sum of squares of residuals between selected model outputs and a complementary set of observed data are reduced to a minimum. A multi-criteria calibration strategy was applied, where the residuals between model simulated and observed monthly runoff from several basins located in areas with different runoff regimes and landscape characteristics were considered simultaneously.

Precipitation and temperature values for the model grid cells were determined by inverse distance interpolation of observations from the closest precipitation stations and temperature stations. Differences in precipitation and temperature caused by elevation were corrected by precipitation-altitude gradients and temperature lapse rates determined by the Norwegian Meteorological Institute. There is considerable uncertainty with regard to the variations of precipitation with altitude in the mountainous terrain of Norway, and this is probably the major source of uncertainty in the stream flow simulations. The precipitation-altitude gradients were reduced above the altitude of the coastal mountain ranges in western and northern Norway, as drying out of ascending air occurs in high mountain areas due to orographically induced precipitation (Daly *et al.,* 1994). These mountain ranges release most of the precipitation associated with the eastward-migrating extra tropical storm tracks that dominate the weather in Norway. Figure A-IV-1 shows the spatial distribution of mean annual runoff (mm/year) for Norway for the period 1961-1990. The Norwegian Water Resources and Energy Directorate (NVE) performs this modelling.

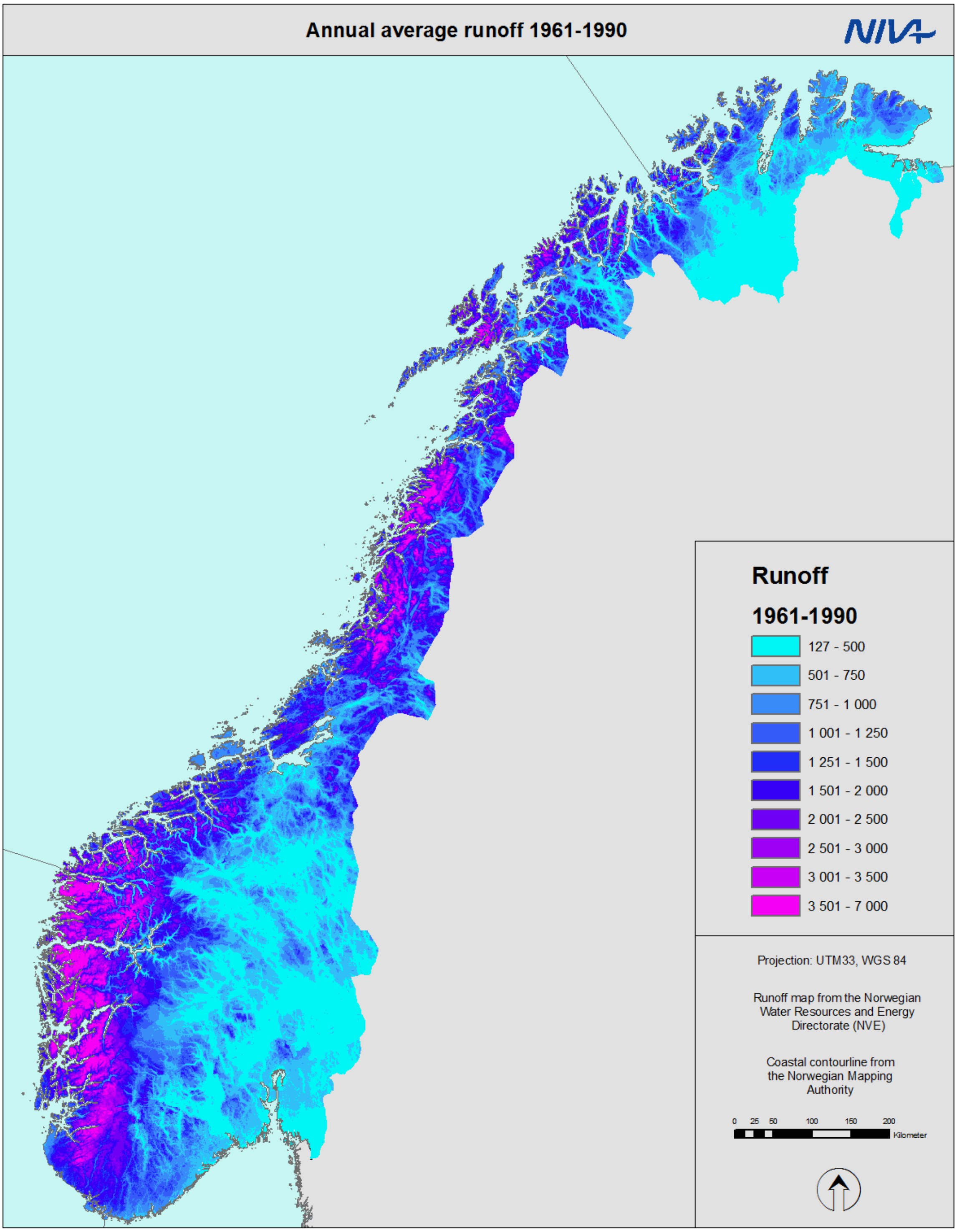

Figure A-IV-1. Average annual runoff (mm/year) for Norway for the period 1961-1990.

Direct discharges to the sea

The direct discharges comprise point source discharges in unmonitored areas. The estimates are based on national statistical information, including:

- Sewage; Municipal wastewater and scattered dwellings (Statistics Norway- SSB / KOSTRA);Industry (The Climate and Pollution Agency - Klif/Forurensning)
- Aquaculture; Nutrients (The Directorate of Fisheries / ALTINN (altinn.no)) and copper (sales statistics of antifouling products made available by Klif)

Sewage effluents

Statistics Norway (SSB) is responsible for the annual registration of data from wastewater treatment plants in the country. Approximately 50% of the Norwegian population is connected to advanced treatment plants with high efficiency of phosphorus or both phosphorus and nitrogen treatment. The rest of the population is connected to treatment plants with simpler primary treatment (42%) or no treatment (8%) (SSB, 2002). Most of the treatment plants with only primary treatment serve smaller settlements, while the majority of advanced treatment plants (plants with chemical and/or biological treatment) are found near the larger cities, and therefore treat most of the produced wastewater. Of the total hydraulic capacity of 5.74 million p.e. (person equivalent), chemical plants account for 37%, chemical/biological treatment for 27%, primary treatment for 24%, direct discharges for 8%, biological treatment for 2% and others for 2% (2002 data). In the region draining to the North Sea, most of the wastewater (from 83% of the population in the area) is treated in chemical or combined biological-chemical treatment plants, whereas the most common treatment methods along the coast from Hordaland county and northwards are primary treatment or no treatment. The fifty percent reduction target for anthropogenic phosphorus has been met for the Skagerrak coast as a result of increased removal of phosphorus in treatment plants.

Statistics Norway (SSB) and the Climate and Pollution Agency (Klif) jointly conduct annual registration of data on nutrients from all wastewater treatment plants in the country with a capacity of more than 50 person equivalents (p.e.). The data are reported each year by the municipalities. The electronic reporting system KOSTRA is used for reporting of effluent data from the municipalities directly to SSB. For the plants with no reporting requirements (<50 p.e.), the discharge was estimated by multiplying the number of people with standard Norwegian per capita load figures and then adjusting the estimate according to the removal efficiency of the treatment plants. "Principles of the Comprehensive Study of Riverine Inputs and Direct Discharges" (PARCOM, 1988) recommends the derived per capita loads listed in Table A-IV-4 to be used. The Norwegian per capita loads are based on studies of Norwegian sewerage districts (Farestveit *et al.*, 1995). Discharges from the population not connected to public treatment plants are assumed to be the same per capita as those for treatment plants without reporting requirements.

Municipal wastewater also includes industrial effluents. The fraction of the total person equivalents (p.e.) is partitioned between sewage and industrial wastewater according to the number of persons and the size of industrial effluents connected to each treatment plant.

Total nutrient loads from sewage in unmonitored areas are estimated using the transport model TEOTIL, based on the input data described above. The model takes account of retention of nutrients in lakes. The Norwegian Institute for Water Research (NIVA) performs this modelling.

Table A-IV-4. Per capita loads used for estimation of untreated sewage discharges.

Parameter	OSPAR	Norway
BOD (kg O/person/day)	0.063	0.046
COD (kg O/person/day)		0.094
TOC (kg TOC /person/day)		0.023
S.P.M. (kg S.P.M./person/day)	0.063	0.042
Tot-N (kg N/person/day)	0.009	0.012
Tot-P (kg P/person/day)	0.0027	0.0016

The metal and organic pollutant loads from wastewater treatment plants reflect the sum of the *reported* load from wastewater treatment plants in unmonitored areas and along the coast. Reporting of these substances is required only for the largest treatment plants (>20.000 p.e. for metals and >50.000 p.e. for selected organic pollutants). No assumptions on loads from other plants than those reporting have been considered.

Industrial effluents

Estimates of discharges from industry are based on data reported to Klif's data base "Forurensning" and the share of municipal wastewater considered to derive from industry (see above). Sampling frequency for industrial effluents varies from weekly composite samples to random grab samples. Sampling is performed at least twice a year. Nutrient loads from industry in unmonitored areas are estimated using the TEOTIL model, based on the reported data. Metal and organic pollutant loads, where reported, are summed.

Fish farming effluents

Fish farmers report monthly data for fish fodder, biomass, slaughtered fish and slaughter offal down to net cage level. These are reported by The Directorate of Fisheries. Raw data are available at altinn.no.

Statistics Norway has sales statistics for farmed trout and salmon. These show an increase in fish farming activities since 1995, which have led to increases in discharges from fish farming despite improvements in treatment yield and production procedures.

The waste from aquaculture facilities is predominantly from feed (De Pauw and Joyce, 1991: Pillay, 1992; Handy and Poxton, 1993), and includes uneaten feed (feed waste), undigested feed residues and faecal/excretion products (Cripps, 1993). The main pollutants from aquaculture are organic matter, nitrogen and phosphorus (Cho and Bureau, 1997).

NIVA estimates nitrogen and phosphorus discharges from fish farming according to HARP Guidelines (Guideline 2/method 1, see Borgvang and Selvik, 2000). The estimates are based on mass balance equations, i.e. feed used (based on P or N content in feed), and fish production (based on P or N content in produced fish). The estimates do not distinguish between particulate and dissolved fractions of the nitrogen and phosphorus discharge/loss. This simple approach will therefore overestimate the nitrogen and phosphorus discharges/losses, as it does not take into account the burial of particulate nitrogen and especially phosphorus in the sediments.

The produced volume has increased compared to previous years and the corresponding discharges of nitrogen and phosphorus have probably increased correspondingly. Several factors may influence sold volume, biomass produced and discharges of nitrogen and phosphorus; a few are listed here:

- Farmers may adapt slaughtering according to the market situation and sold volume and biomass produced may not correspond.
- Underreporting on the use of feed is possible; this was more likely when feed quotas were in operation (before 2005)
- Diseases may lead to delayed sale or reduced production

For more information about details in data reporting and availability see Selvik *et al.* (2007) and Skarbøvik *et al.* (2011). The total nutrient loads from fish farming are estimated using the TEOTIL model, based on the input data described above.

Changes in the Norwegian RID programme over the years

Since the Norwegian RID Programme started in 1990, several changes have been introduced. For this reason, in 2009 the entire Norwegian database was upgraded in order to better reflect the same methodology (Stålnacke *et al.*, 2009). However, not all methodological changes could be adjusted (such as the changes in LOD values over time). Below is an overview of the main changes in the RID methodology.

Changes in the selection and monitoring frequency of the 'main rivers'

The monitoring of so-called 'main rivers' comprises monitoring of 10 rivers with mainly monthly sampling. In 2008, River Suldalslågen was removed from this selection of 'main rivers', and instead River Vosso was introduced as a new main river. The main reason was that River Suldalslågen is heavily modified by hydropower developments, and the load in this river does therefore not represent an unmodified watershed in this region. River Vosso, on the other hand, fitted well into the category of 'relatively unpolluted river' with a population density of 1.1 persons/km^2, and only 3 % of the catchment area used for agriculture. The river is situated in the same maritime region as River Suldalslågen.

In 2008, data from another sampling programme were included in the database for River Glomma, and the number of samples in this river is therefore increased in some years, but not in 2011. This parallel dataset contains only data for some nutrients and TOC.

Changes in the selection and monitoring frequency of the 'tributary rivers'

The term 'tributary' is only used to signify that these rivers are sampled less frequently than the main rivers, as they all drain directly into the sea.
In the period 1990-2003, 145 'tributary' rivers were sampled once a year only. In 2004, the number of 'tributary rivers' was reduced to 36 rivers which were sampled four times a year. The remaining 109 rivers, formerly monitored once a year since 1990, were no longer sampled.

Changes in load calculation methods

Several changes have been made in the calculation of loads; these are thoroughly described in Stålnacke *et al.* (2009). The present database is now based on a common method that is now the standard method in the Norwegian RID Programme.

The former method multiplied a flow-weighted annual concentration with the total annual discharge (i.e., total annual water volume) in accordance with the OSPAR JAMP Guidelines. For various reasons, the sampling is not always conducted at regular time intervals and in some cases also monthly data are missing. Thus, it was decided that it would be better to weight each sample not only by water discharge but also to the time period the sample represented. These time periods were defined by the midpoints between the samples. Note that the formula is used only within one year, i.e., the time period for a sample is never extended into another year. The modified load calculation formula is shown below.

$$Load = Q_r \frac{\sum_1^n Q_i \bullet C_i \bullet t_i}{\sum_1^n Q_i \bullet t_i}$$

where Q_i represents the water discharge at the day of sampling (day i);
C_i the concentration at day i;
t_i the time period from the midpoint between day i-1 and day i to the midpoint between day i and day i+1, i.e., half the number of days between the previous and next sampling;
Q_r is the annual water volume.

Changes in laboratories, methods and detection limits

During 1990-1998 the chemical analyses for the RID Programme were conducted at the NIVA-lab. In the period 1999-2003 the analyses were carried out by Analycen (now: EuroFins). In 2004 NIVA-lab resumed analysing the samples.

Changes in detection limits and laboratory analysis methods have been reported in each annual report and are not included here. However, changes in detection limits have been duly taken into account in the trend analyses.

Changes in methods concerning direct discharges

In 2008 a new method to calculate the direct discharges was introduced, and used on all years since 1990, as described in Stålnacke *et al.* (2009). Basically, the new method calculates the discharges from a plant whenever data are lacking and there is no information that the plant has been shut down. This calculation is based on a trend line that is made from data on the former years' discharges. The missing value in the last year will be set equal to the value of the trend line in the former year (or the year with the most recent data).

Several industrial point sources that had huge discharges of sediments were excluded from the reporting in 2008. The reason was that these did not represent particle pollution to the coastal areas since the sediments were disposed of in very restricted dumping tips. This significantly reduced sediment inputs to the Norwegian maritime areas as compared to former years.

The loads from fish farming were first included in the grand total values in 2000, i.e. originally these loads were not included in the input figures for the period 1990-1999. However, in the recalculation project in 2007 a time series for nitrogen, phosphorus and copper from aquaculture, was established, covering the entire period from 1990 to 2007 (see Stålnacke *et al.*, 2009). Then, in 2011 another adjustment was made: Over the years the nutrient content in fish fodder has been reduced. In 2011 a table showing changes in nutrient content over the period 2000-2010 was established, in cooperation with Klif (see Skarbøvik *et al.*, 2011). As a result, nutrient loads were adjusted from the year 2000 onwards. The current report is the first annual report from the RID programme where the new nutrient content data have been applied in the load calculations.

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Appendix V
Long-term trends in riverine loads. Complimentary charts to Chapter 4.3.

The charts cover the following substances in consecutive order:

- Water discharge (Q)
- Total-N
- Nitrate-N (NO_3-N)
- Ammonium-N (NH_4-N)
- Total-P
- Orthophosphate (PO_4-P)
- Suspended particulate matter (SPM)
- Copper (Cu)
- Lead (Pb)
- Zinc (Zn)
- Cadmium (Cd)
- Mercury (Hg)
- Arsenic (As)
- PCB7
- Lindane (g-HCH)

The charts in this Appendix are complimentary to Chapter 4.3.

Extra- or interpolated values are indicated with different colours.
The substances where such extra- or interpolation has been performed include total-P, ammonium-N (NH_4-N), mercury (Hg), arsenic (As) and PCB7.

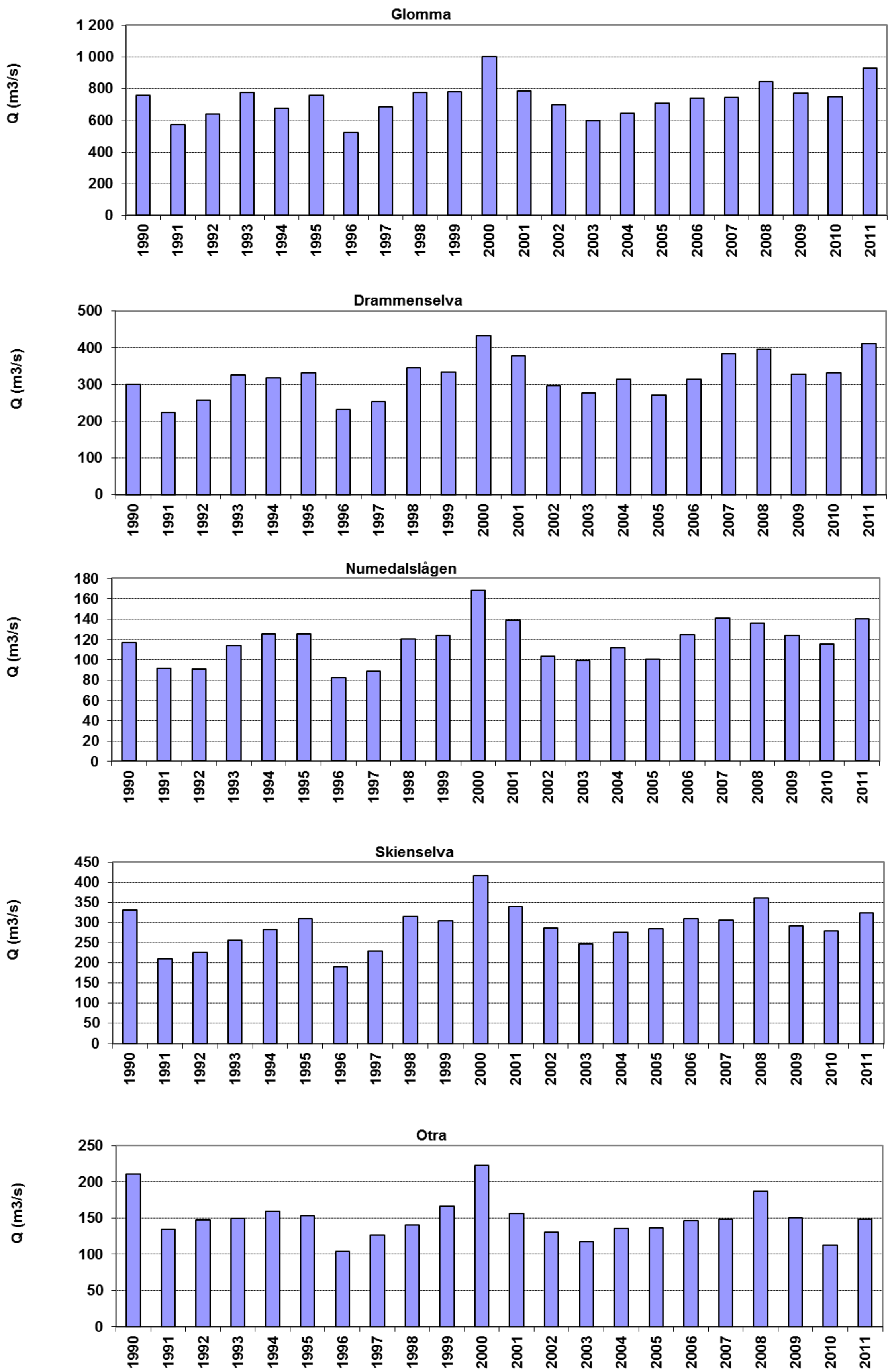

Figure A-V-1a. Annual water discharge in the five main Norwegian rivers draining to Skagerrak, 1990-2011.

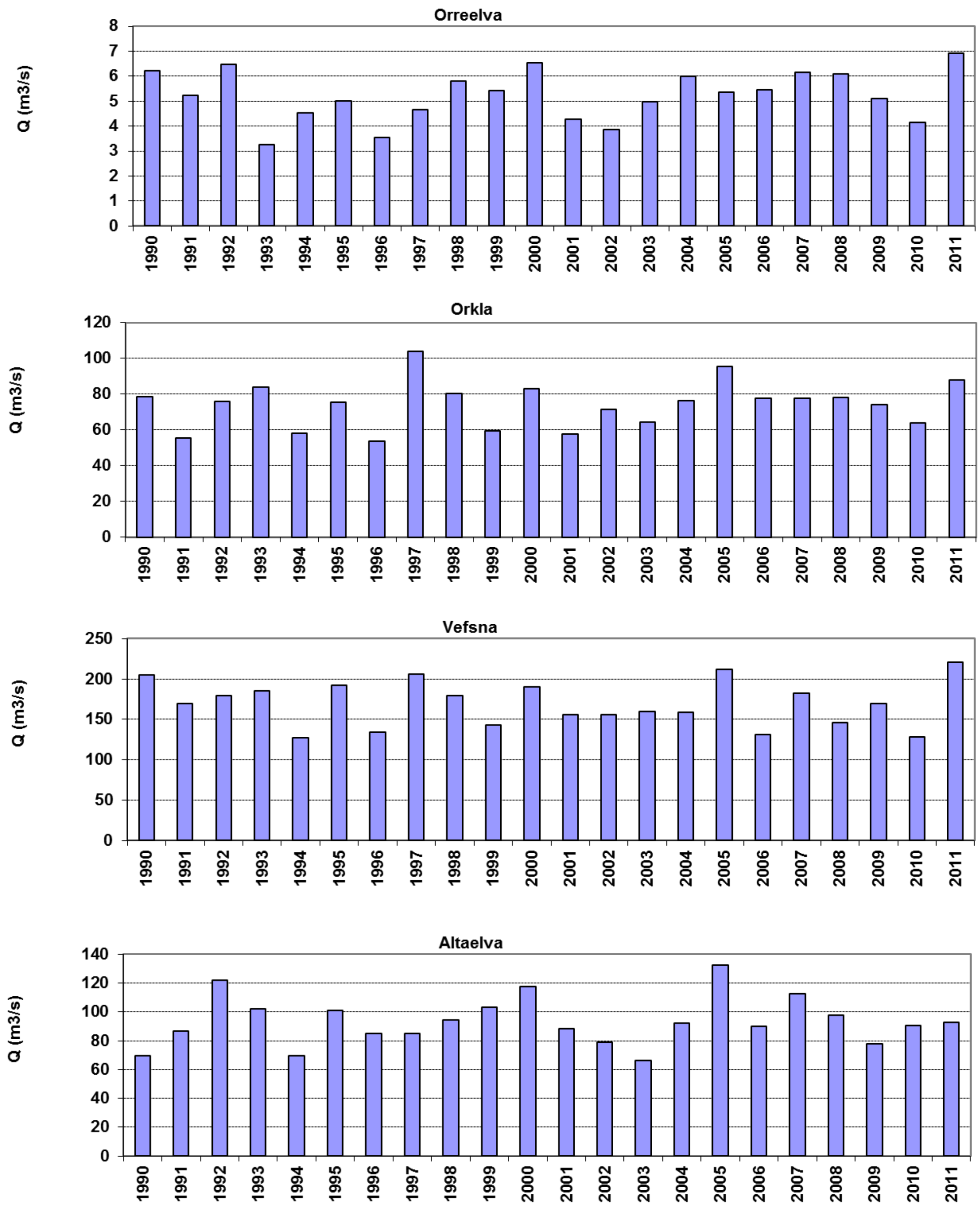

Figure A-V-1b. Annual water discharge in four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

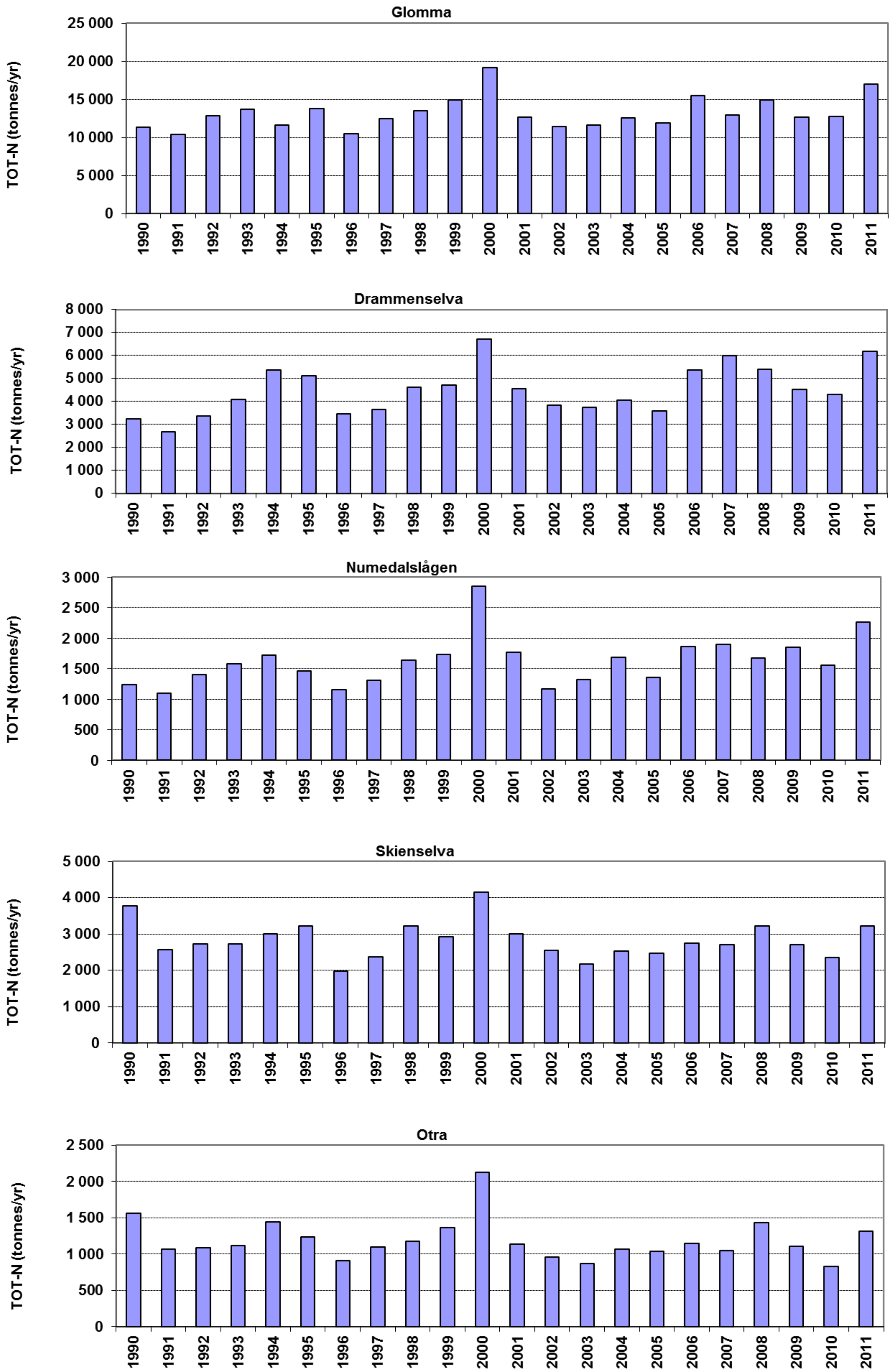

Figure A-V-2a. Annual riverine loads of total nitrogen from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

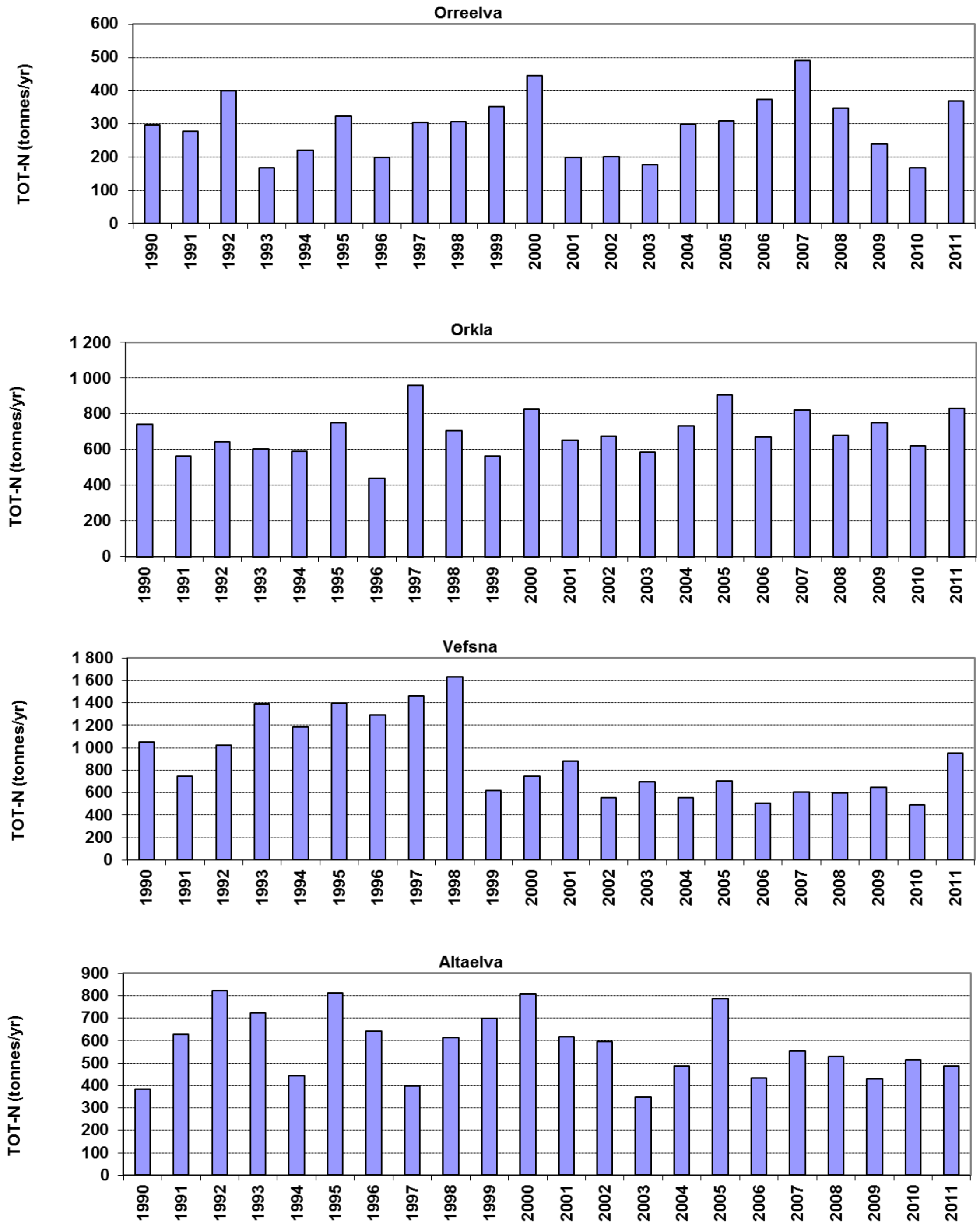

Figure A-V-2b. Annual riverine loads of total nitrogen from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

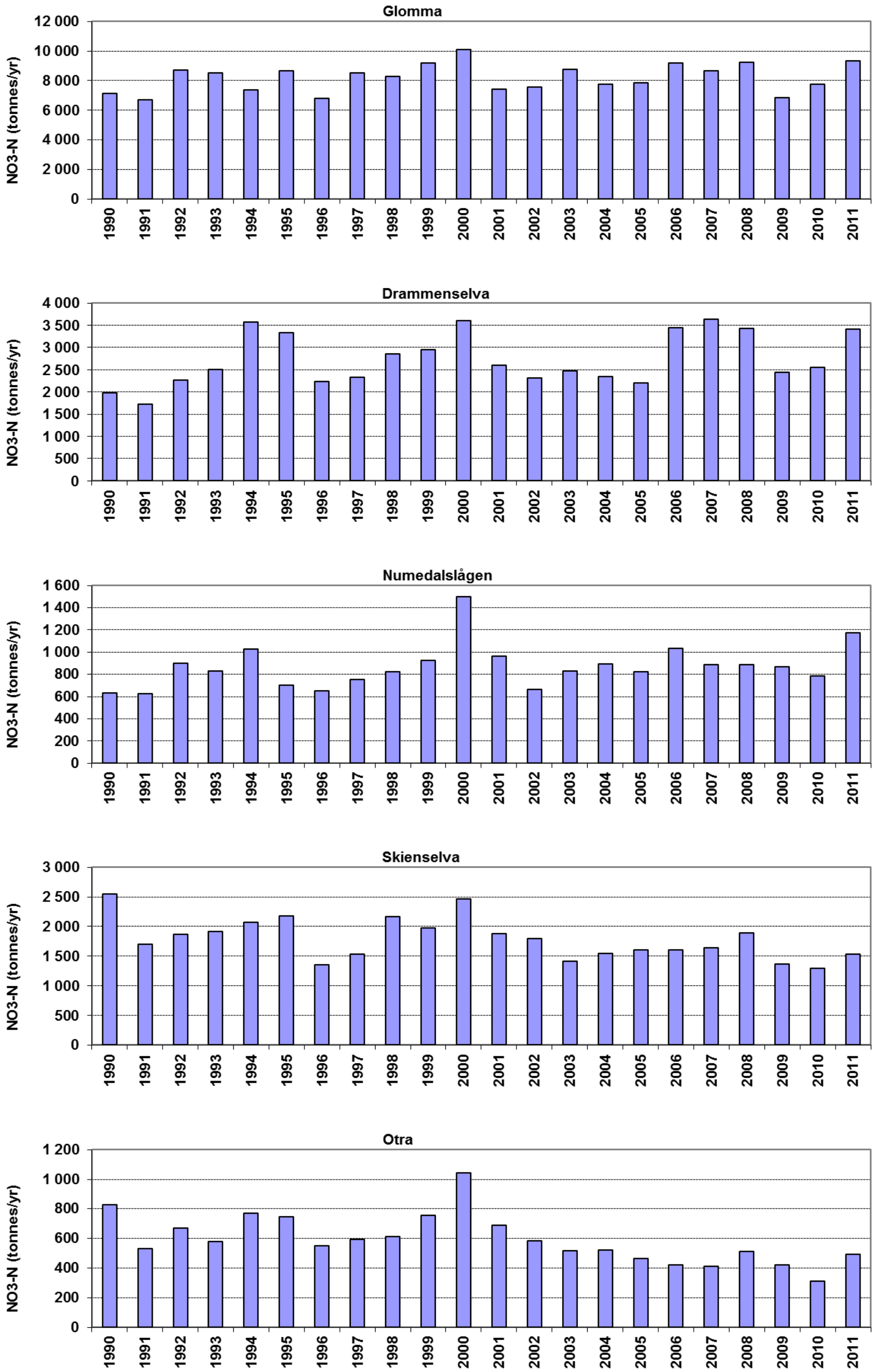

Figure A-V-3a. Annual riverine loads of nitrate nitrogen from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

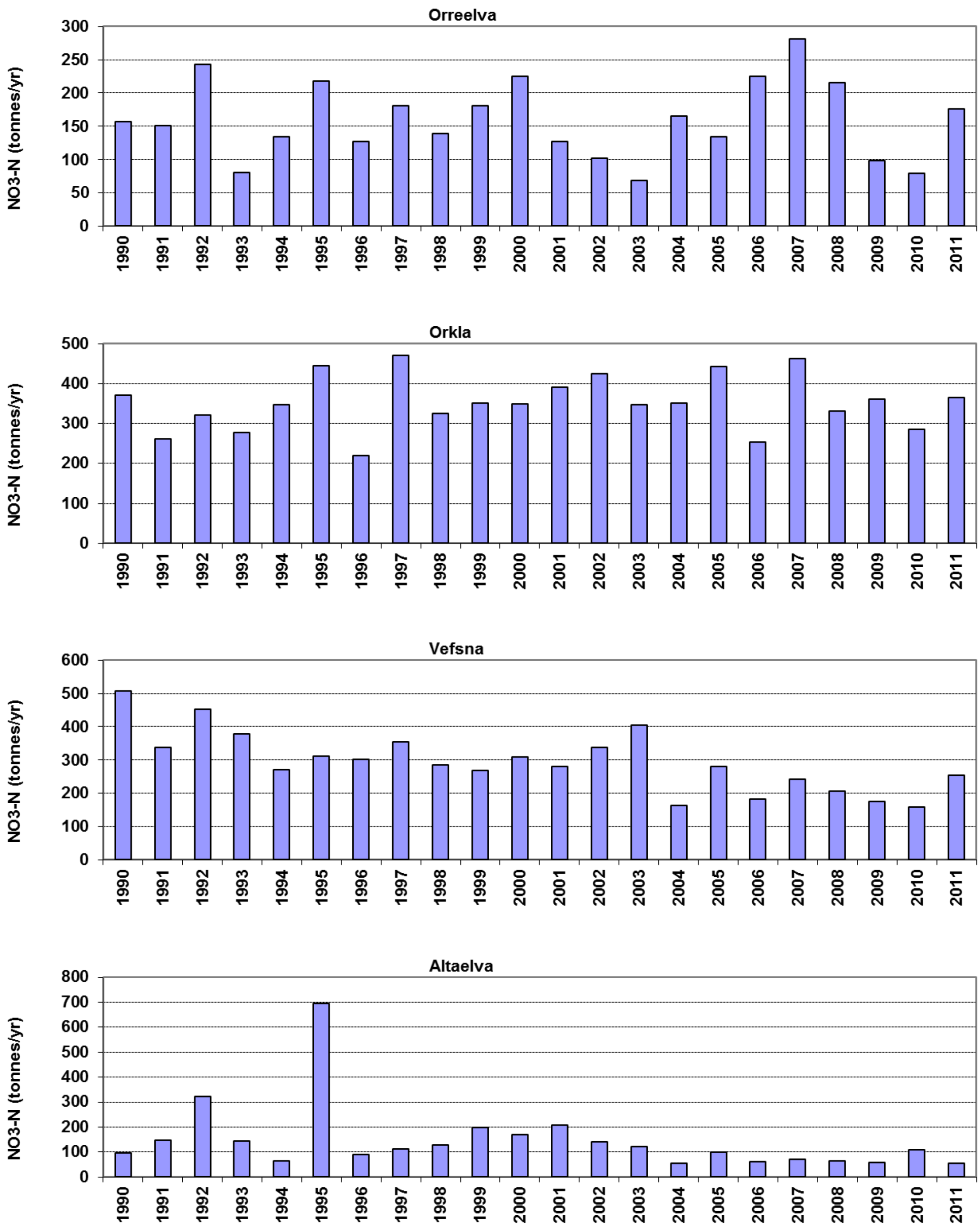

Figure A-V-3b. Annual riverine loads of nitrate nitrogen from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

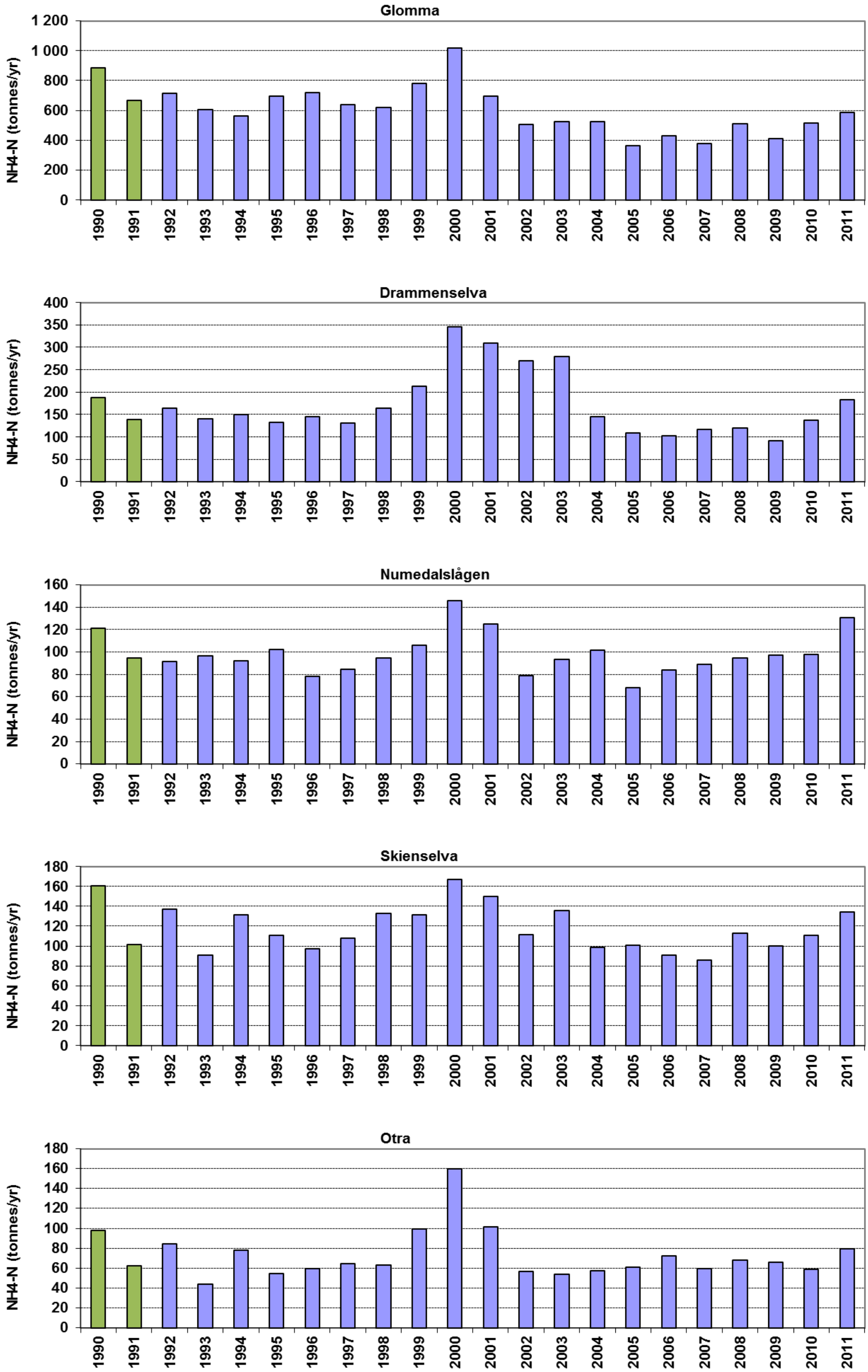

Figure A-V-4a. Annual riverine loads of ammonium nitrogen from the five main Norwegian rivers draining to Skagerrak, 1990-2011. Years with interpolated values are given in green.

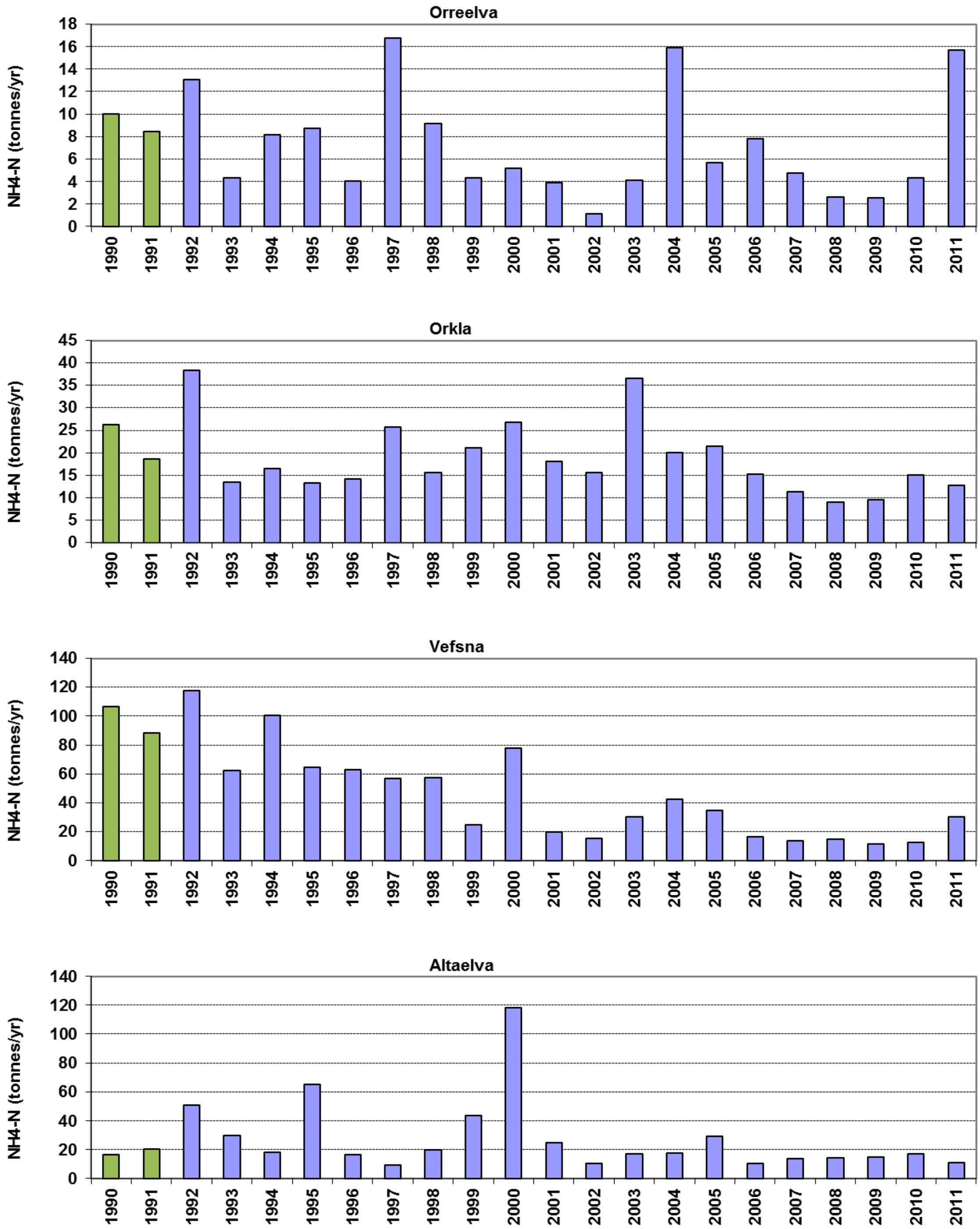

Figure A-V-4b. Annual riverine loads of ammonium nitrogen from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011. Years with interpolated values are given in green.

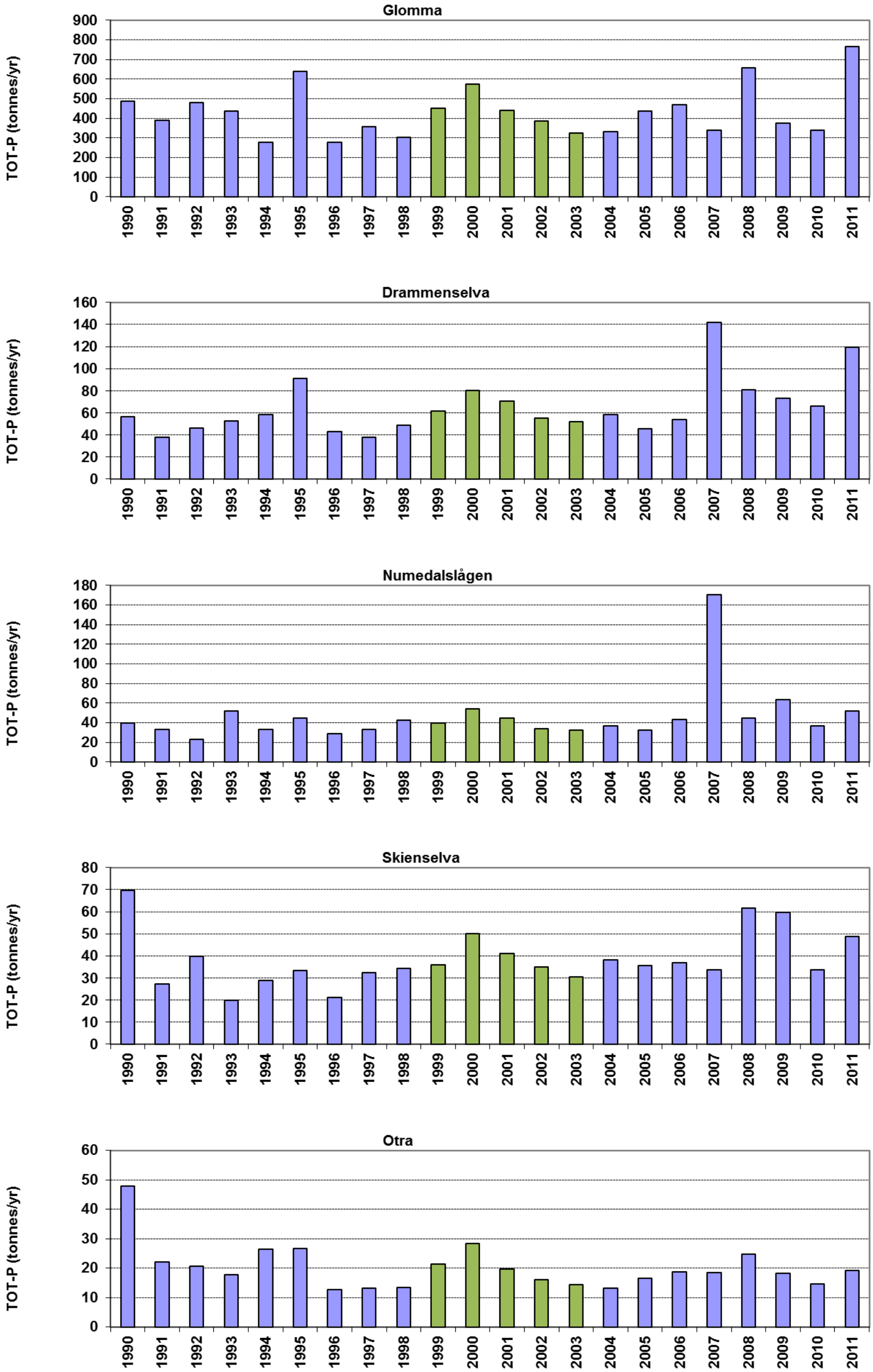

Figure A-V-5a. Annual riverine loads of <u>*total phosphorus*</u> *from the five main Norwegian rivers draining to Skagerrak, 1990-2011. Years with interpolated values are given in green.*

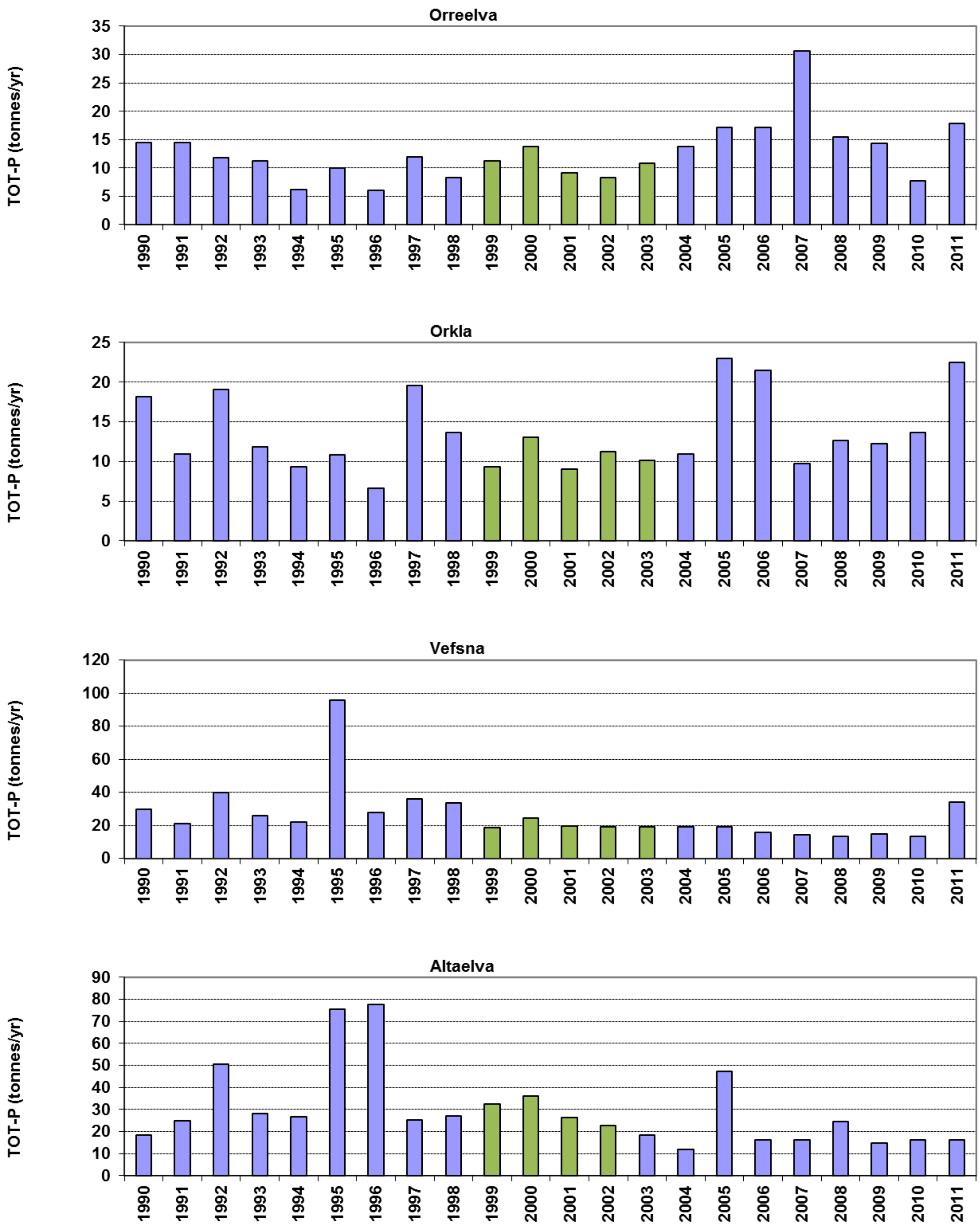

Figure A-V- 5b. Annual riverine loads of <u>total phosphorus</u> from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011. Years with interpolated values are given in green.

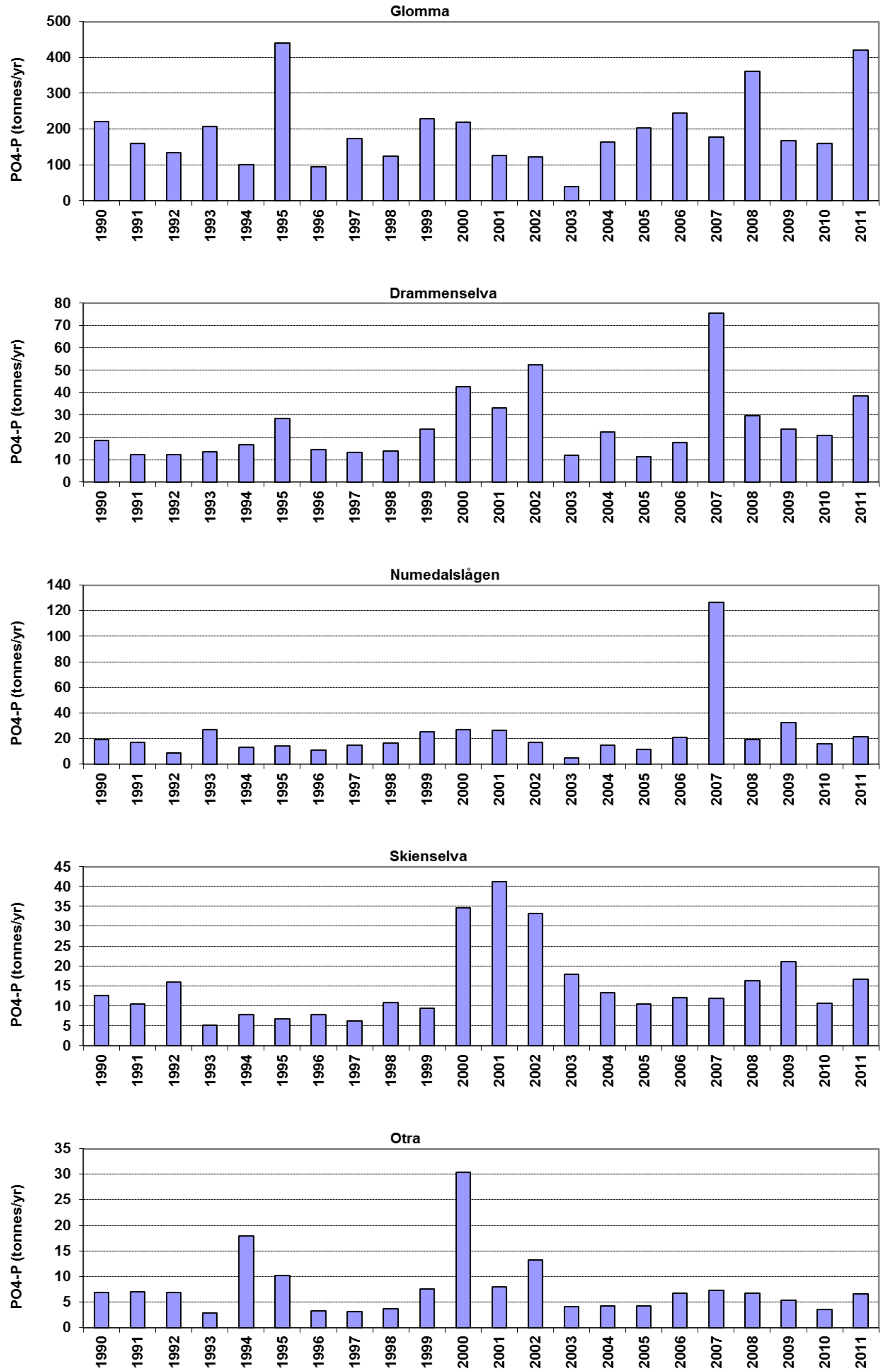

Figure A-V-6a. Annual riverine loads of orthophosphate from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

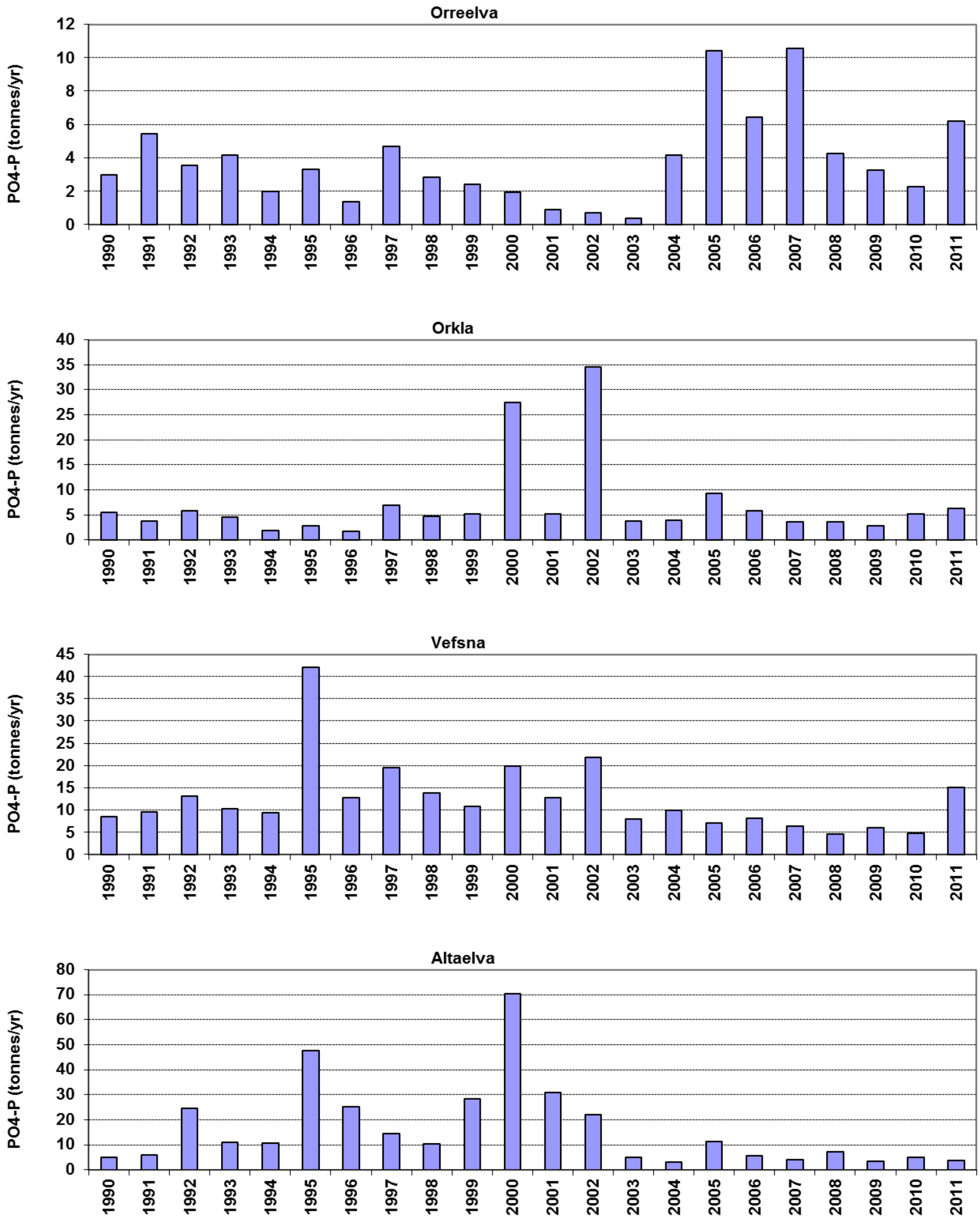

Figure A-V-6b. Annual riverine loads of <u>*orthophosphate*</u> *from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.*

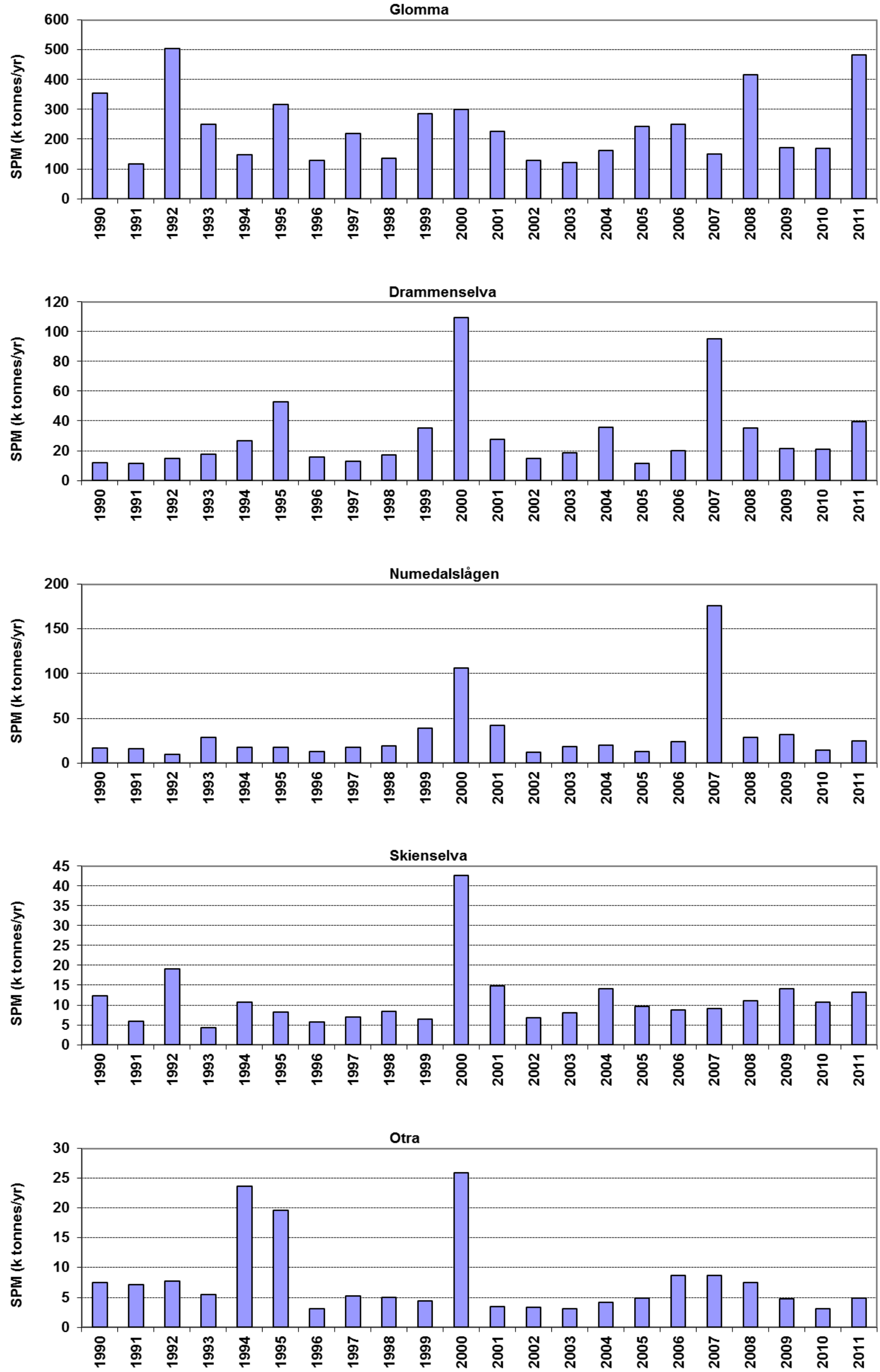

Figure A-V-7a. Annual riverine loads of <u>*suspended particulate matter*</u> *from the five main Norwegian rivers draining to Skagerrak, 1990-2011.*

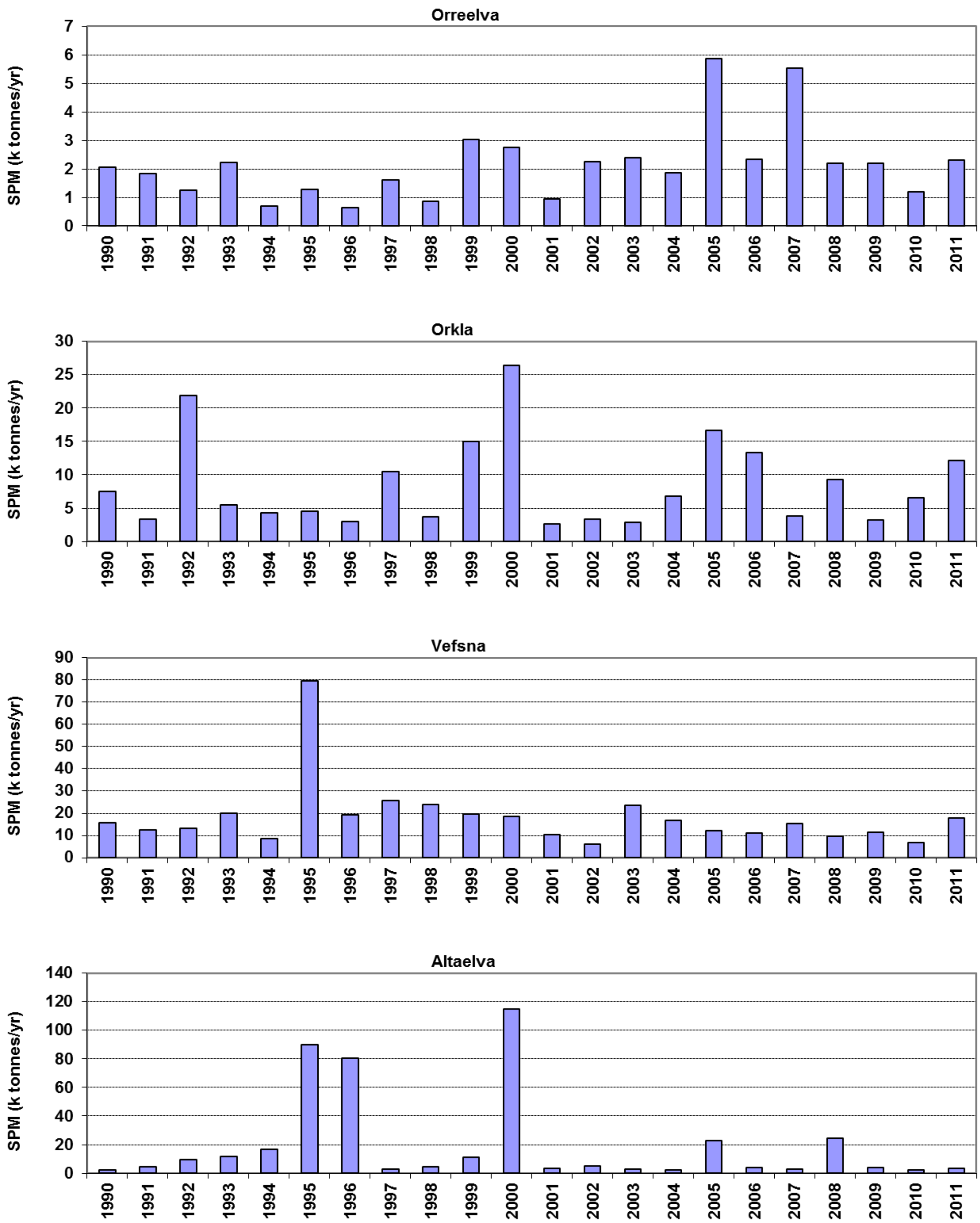

Figure A-V-7b. Annual riverine loads of <u>*suspended particulate matter*</u> *from four main rivers draining to the North Sea, the Norwegian Sea and the Barents* Sea*, Norway, 1990-2011.*

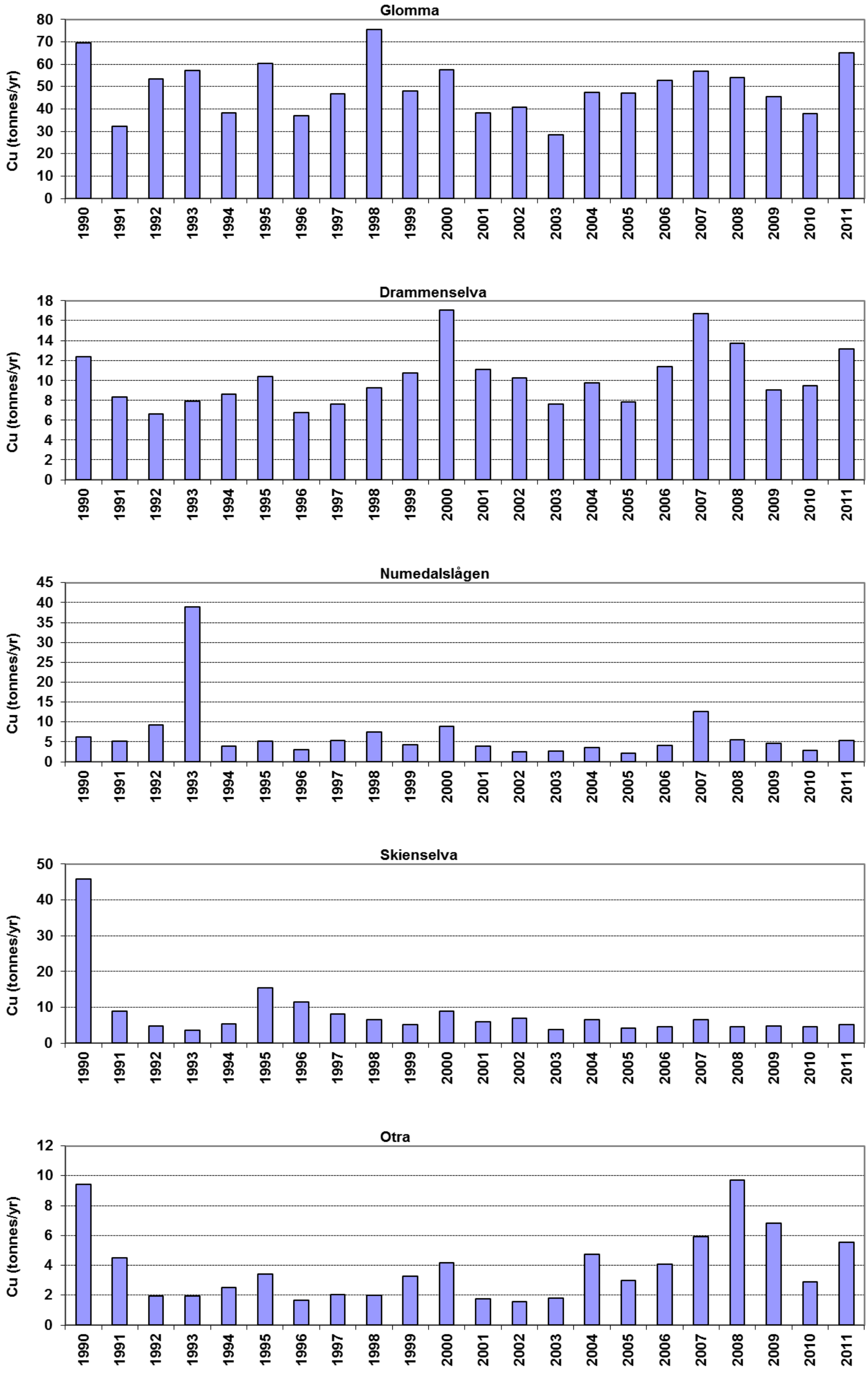

Figure A-V-8a.Annual riverine loads of copper from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

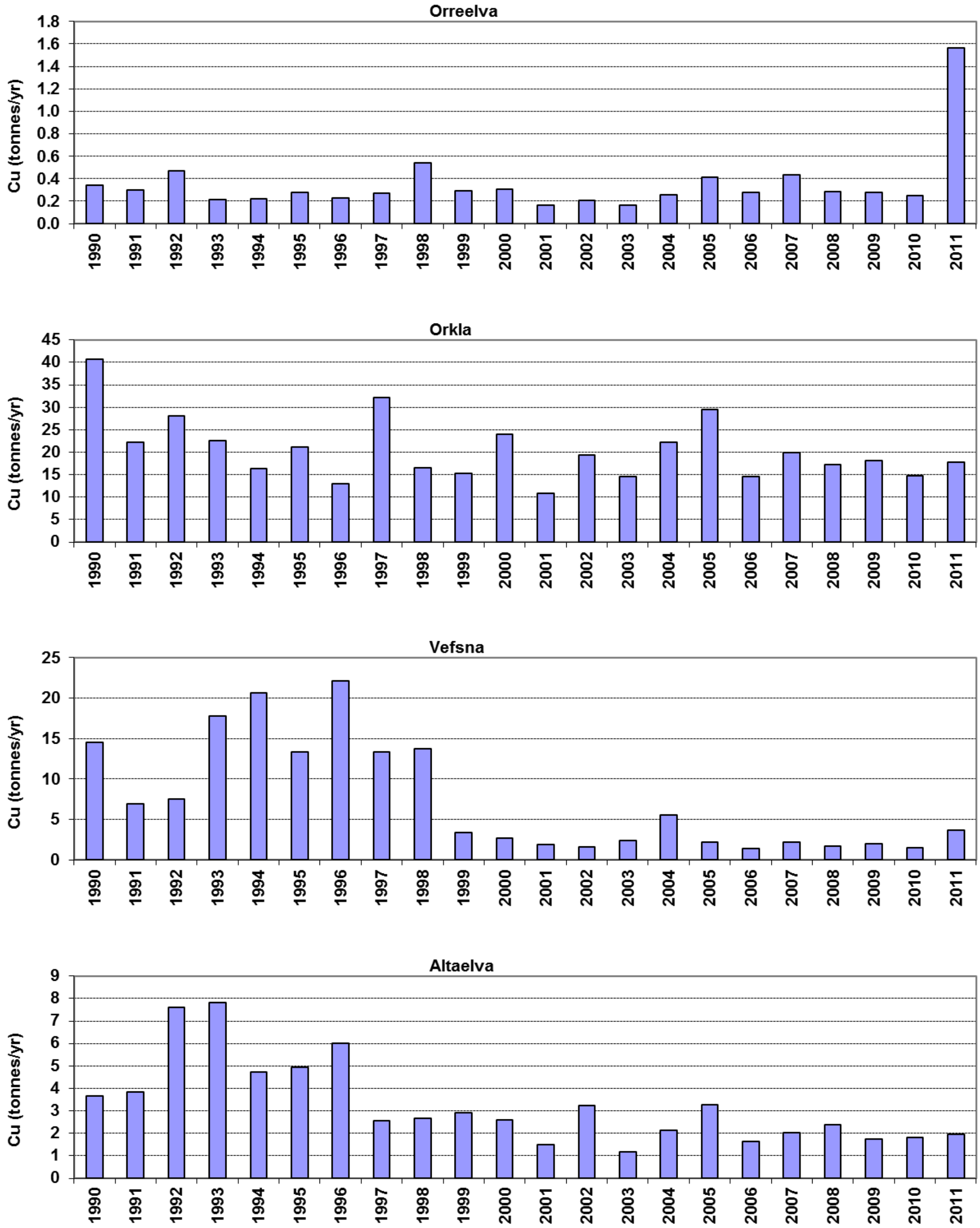

Figure A-V-8b. Annual riverine loads of copper from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

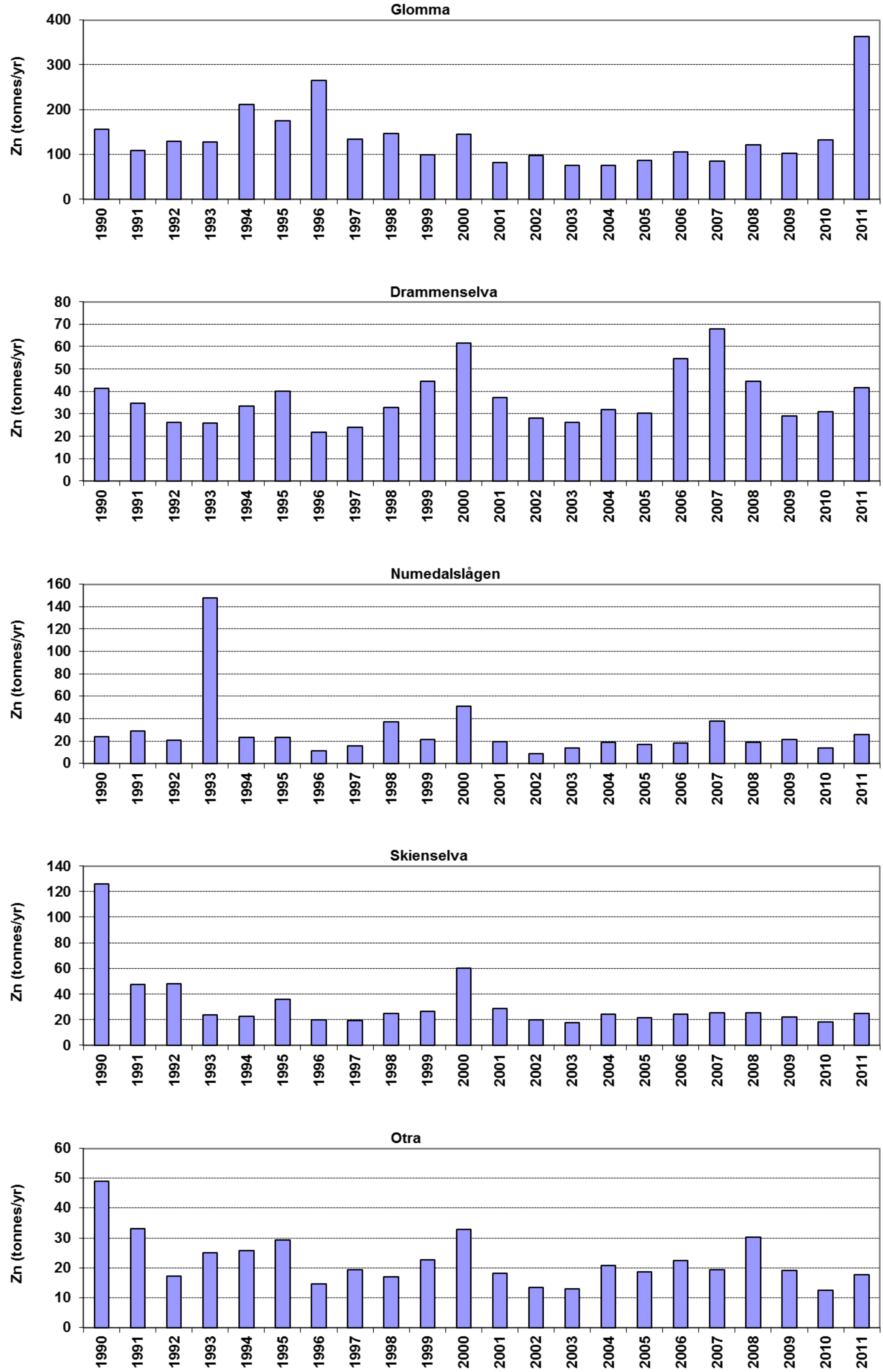

Figure A-V-9a. Annual riverine loads of zinc from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

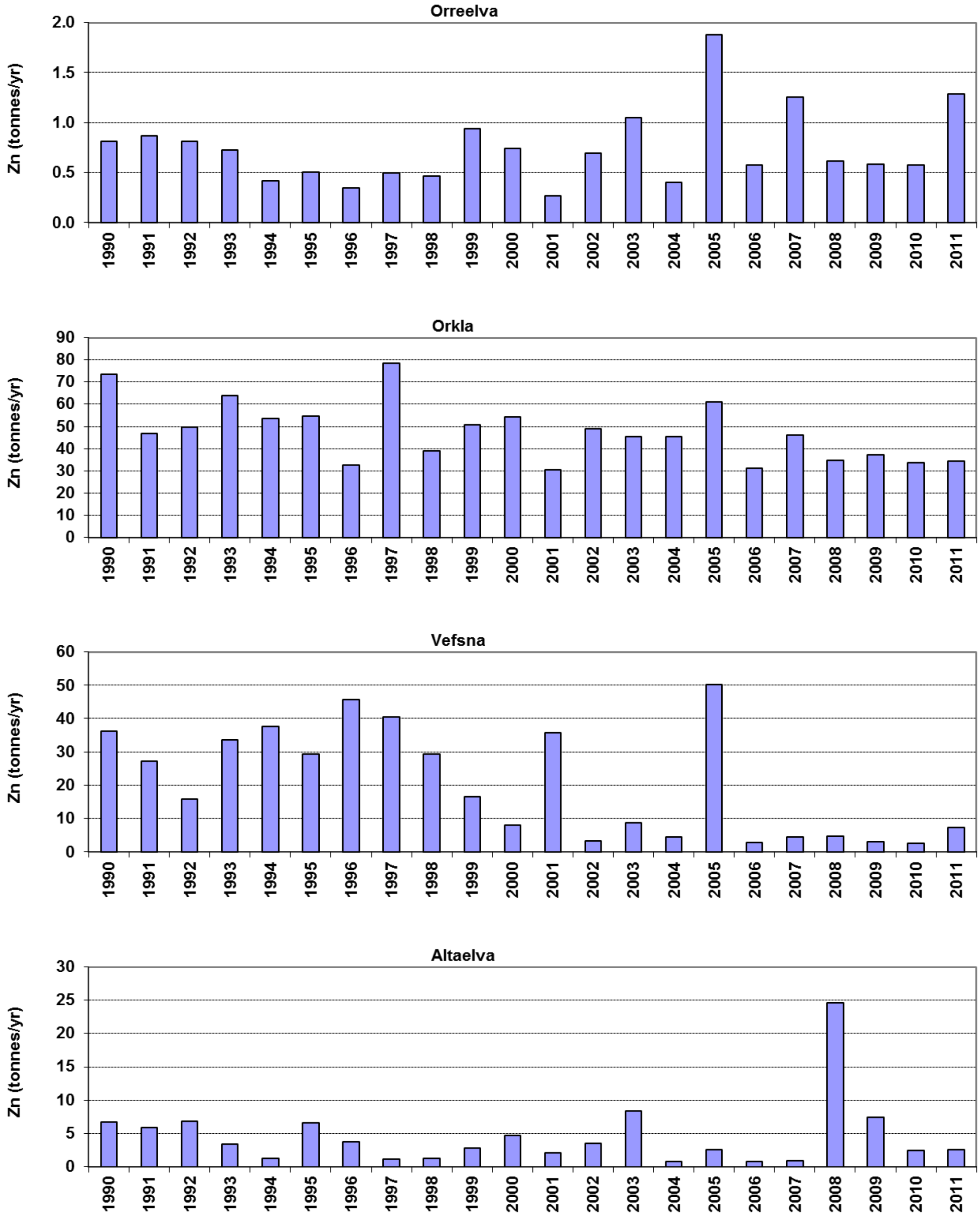

Figure A-V-9b. Annual riverine loads of zinc from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

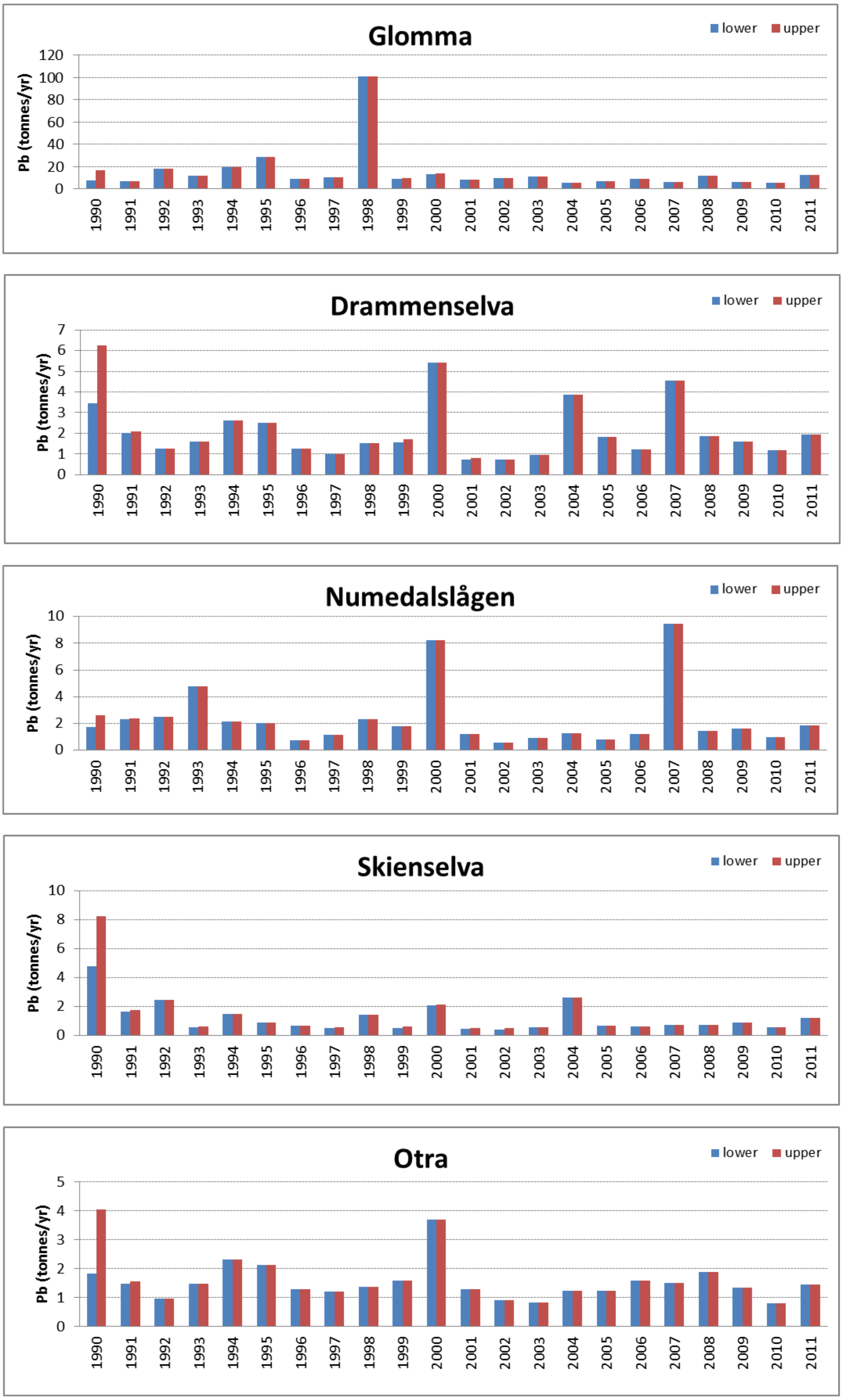

Figure A-V-10a. Annual riverine loads (upper and lower estimates) of lead from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

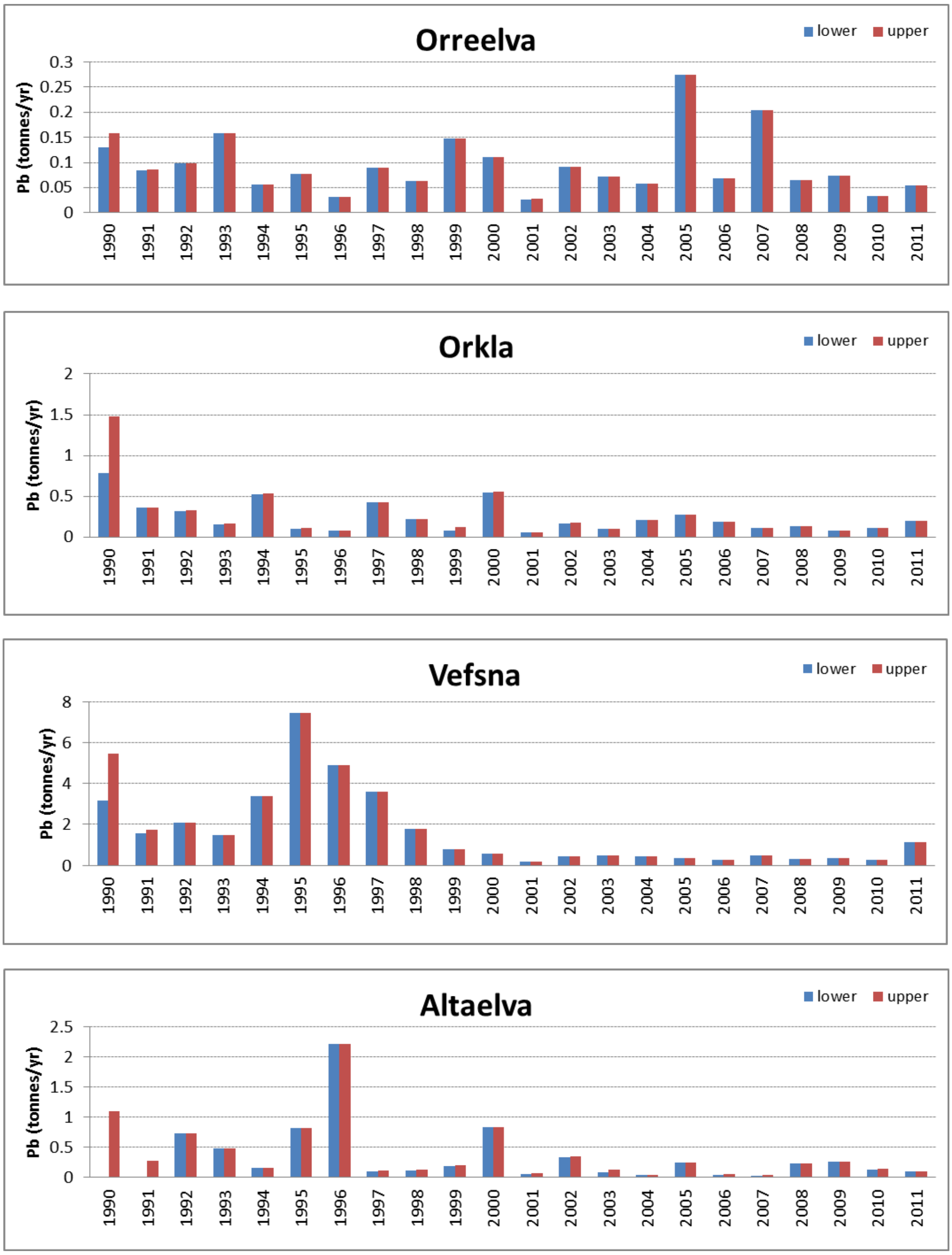

Figure A-V-10b. Annual riverine loads (upper and lower estimates) of lead from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

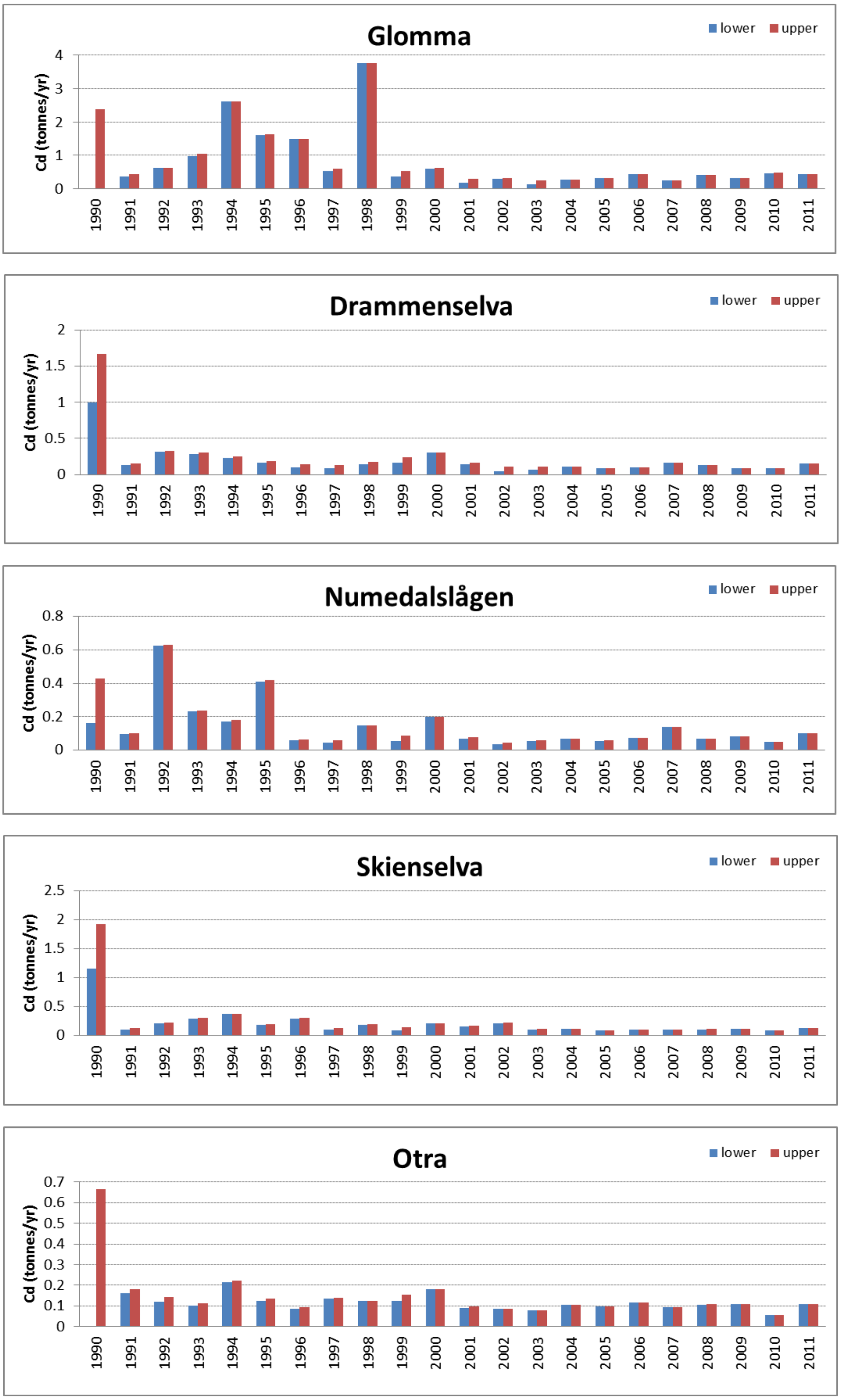

Figure A-V-11a. Annual riverine loads (upper and lower estimates) of cadmium from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

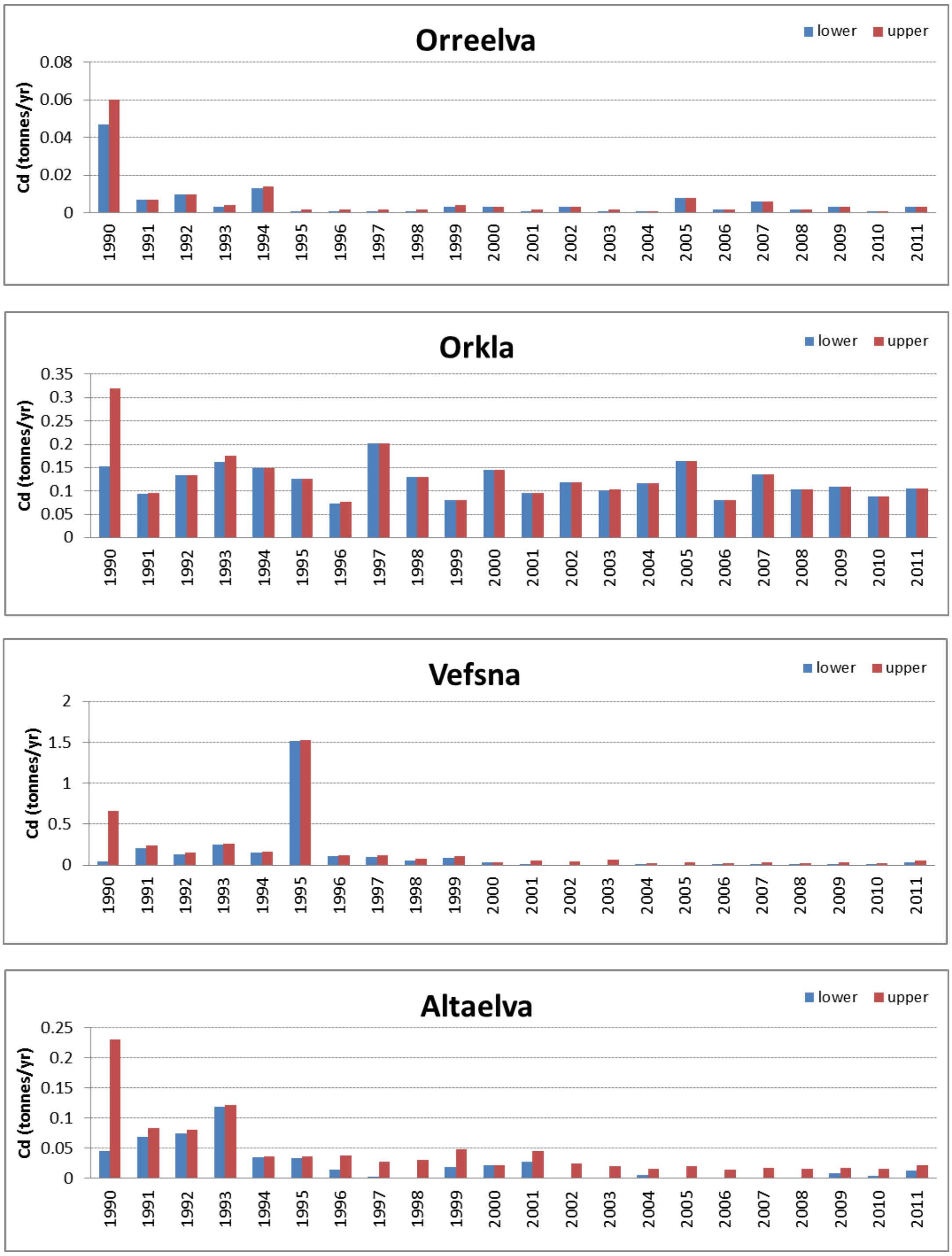

Figure A-V-11b. Annual riverine loads (upper and lower estimates) of cadmium from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

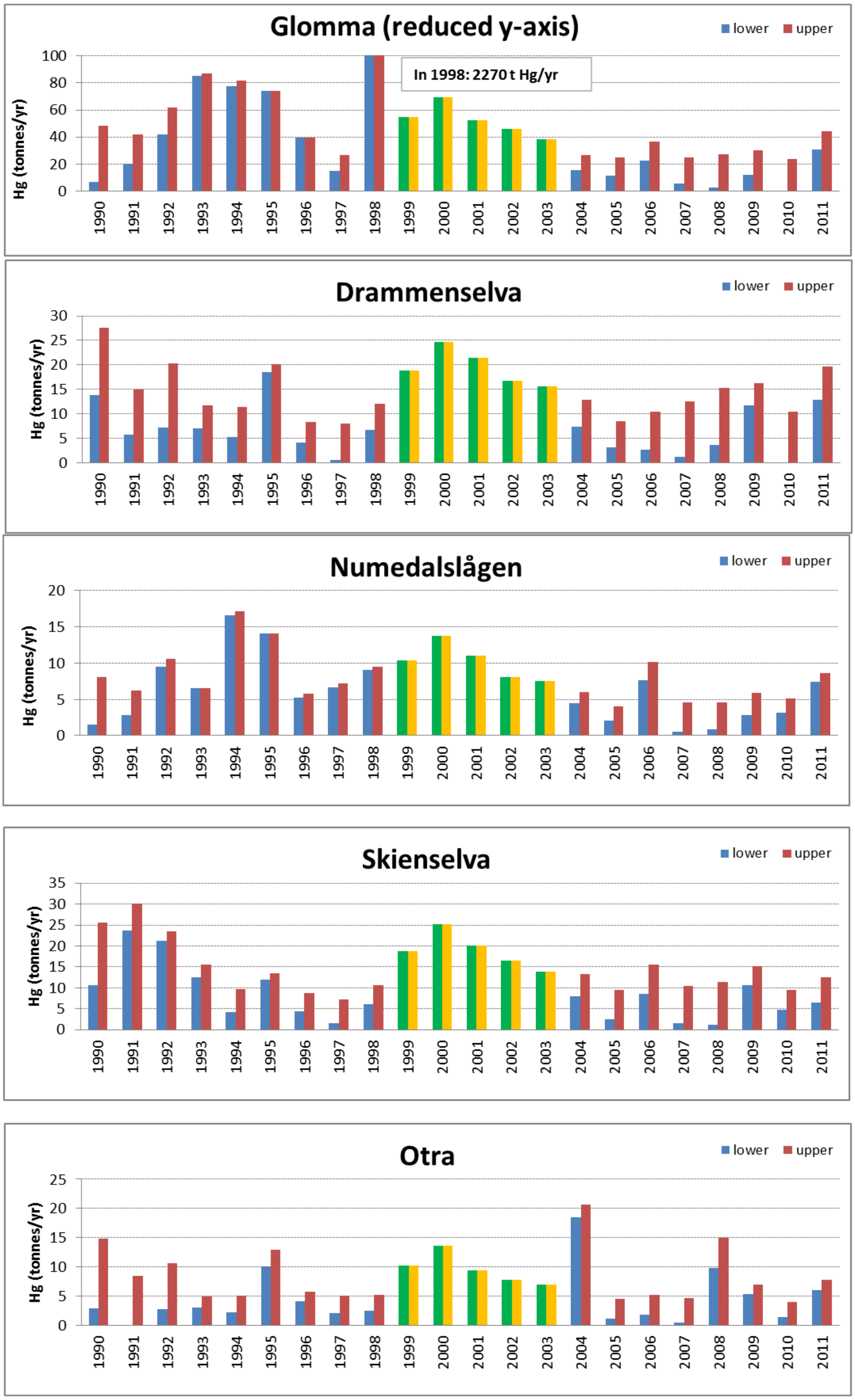

Figure A-V-12a. Annual riverine loads (upper and lower estimates) of mercury from the five main Norwegian rivers draining to Skagerrak, 1990-2011. Years with interpolated upper and lower estimates are given in green (lower) and yellow (upper).

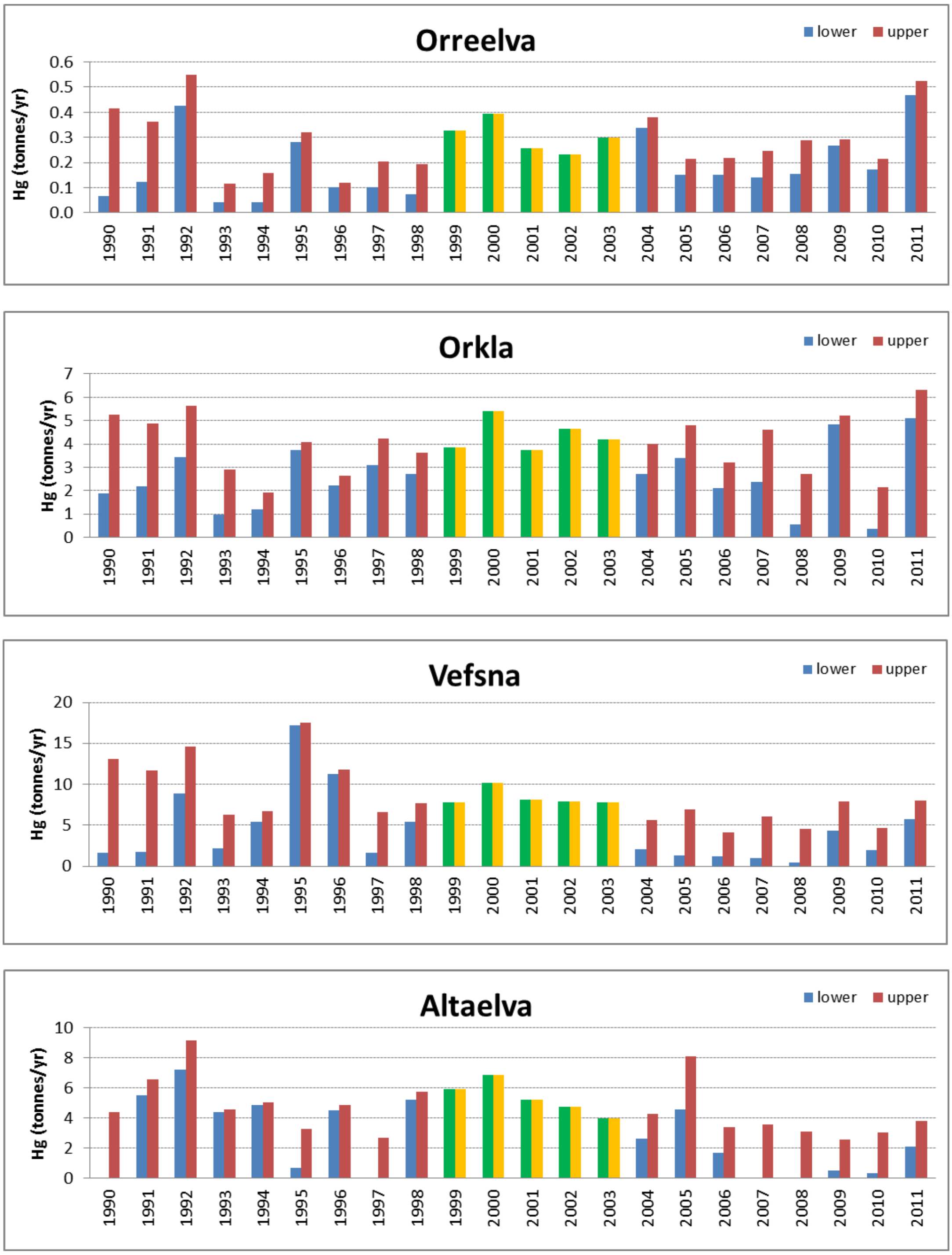

Figure A-V-12b. Annual riverine loads (upper and lower estimates) of mercury from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011. Years with interpolated upper and lower estimates are given in green (lower) and yellow (upper).

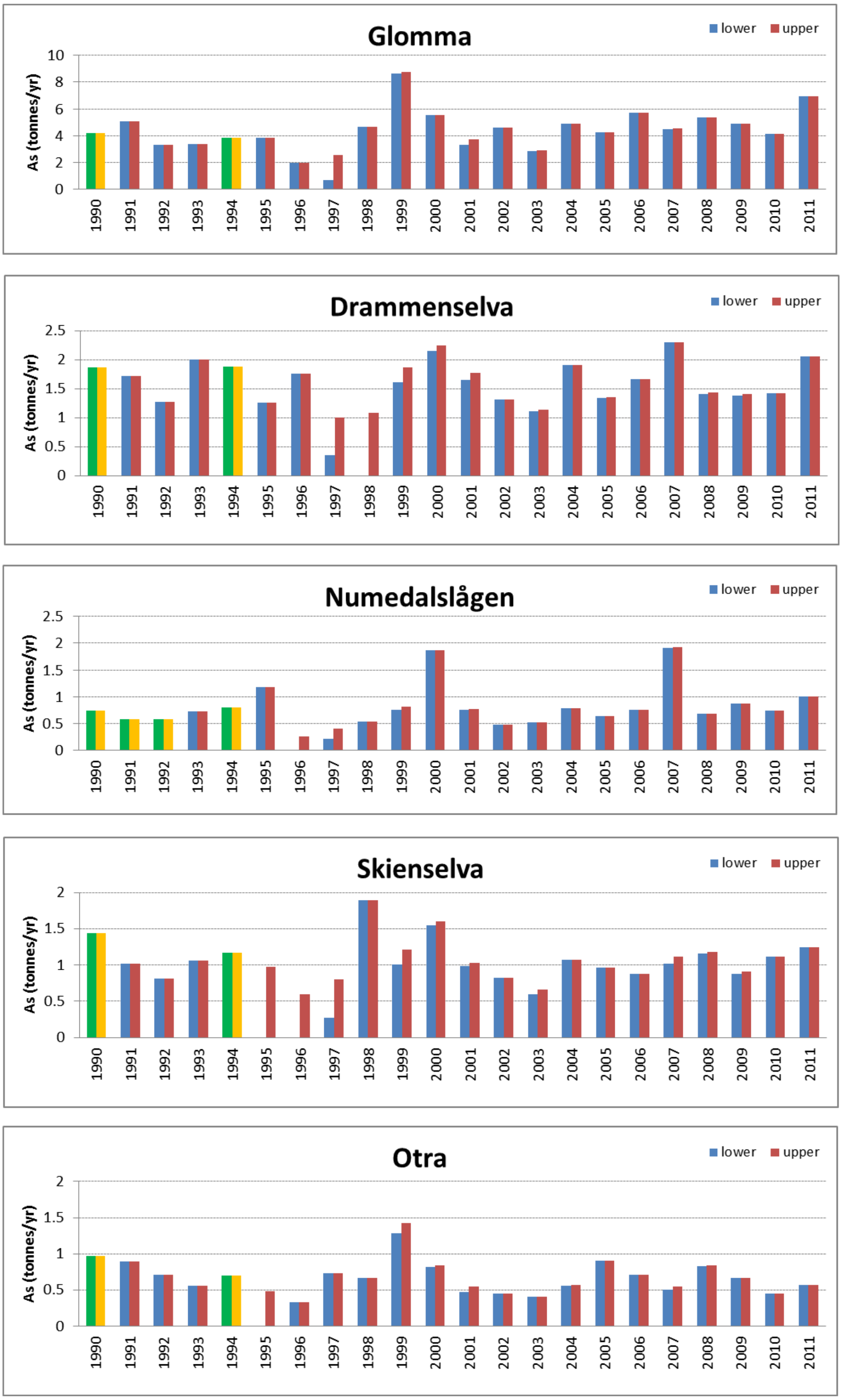

Figure A-V-13a. Annual riverine loads (upper and lower estimates) of arsenic from the five main Norwegian rivers draining to Skagerrak, 1990-2011. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

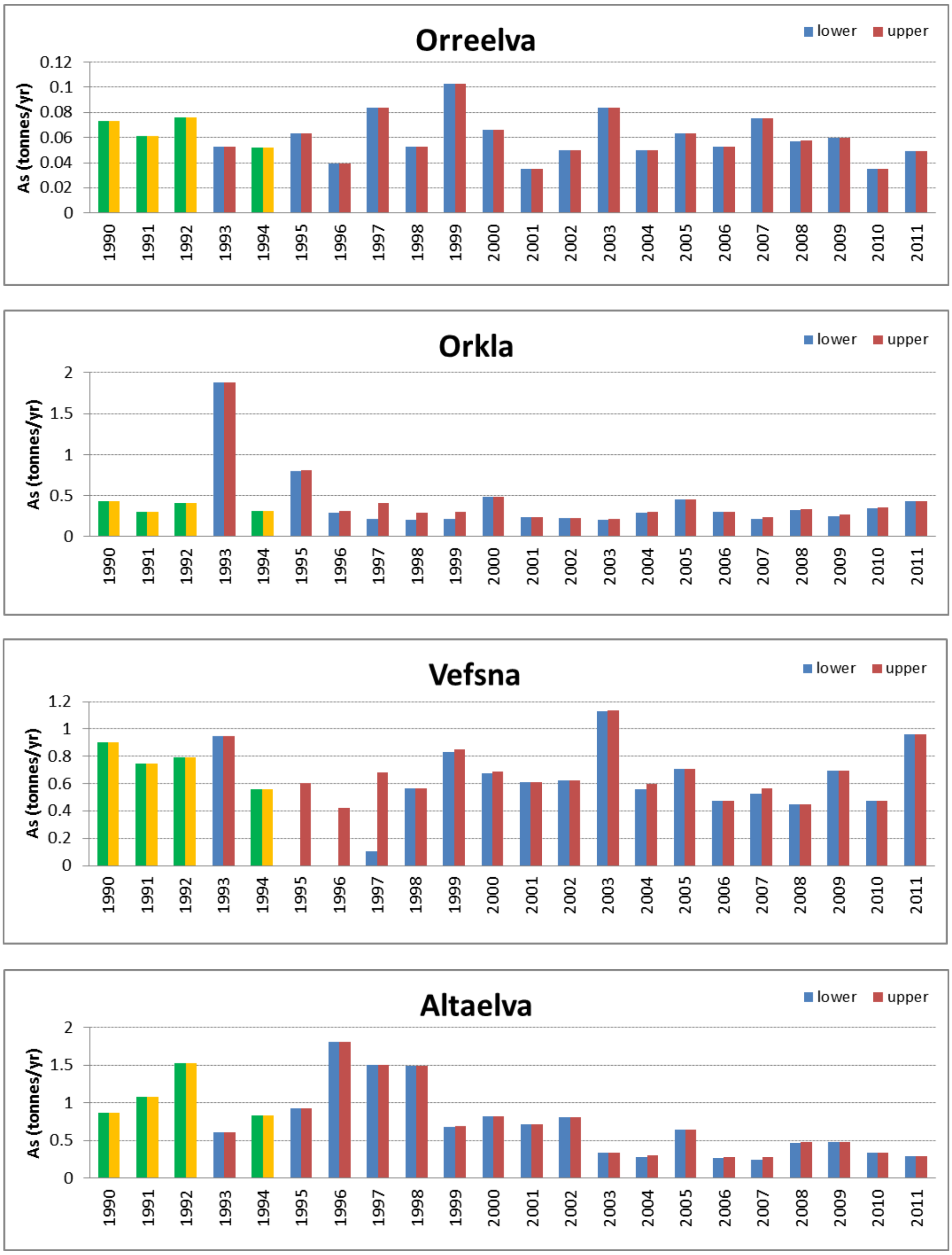

Figure A-V-13b. Annual riverine loads (upper and lower estimates) of arsenic from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

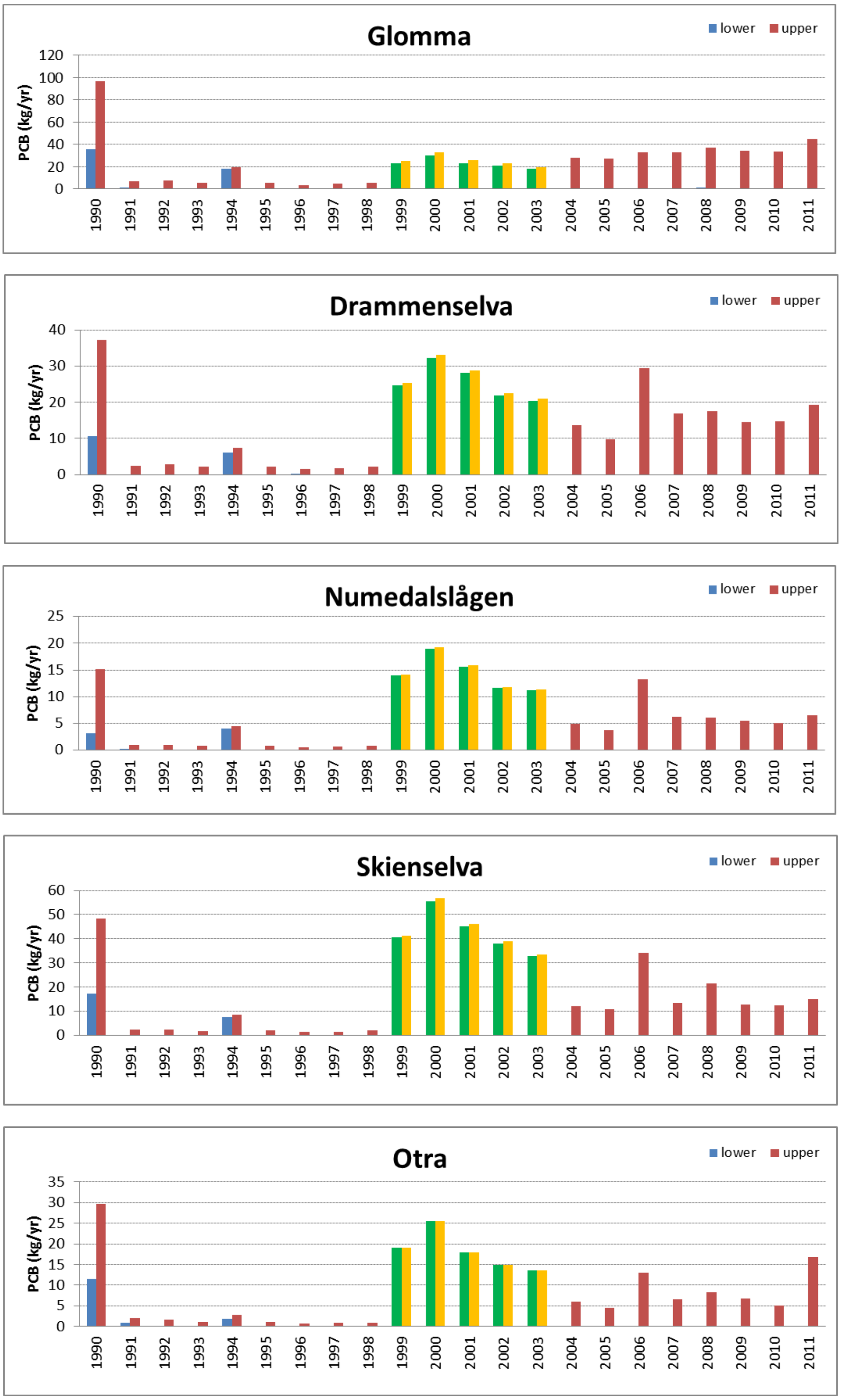

Figure A-V-14a. Annual riverine loads (upper and lower estimates) of PCB7 from the five main Norwegian rivers draining to Skagerrak, 1990-2011. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

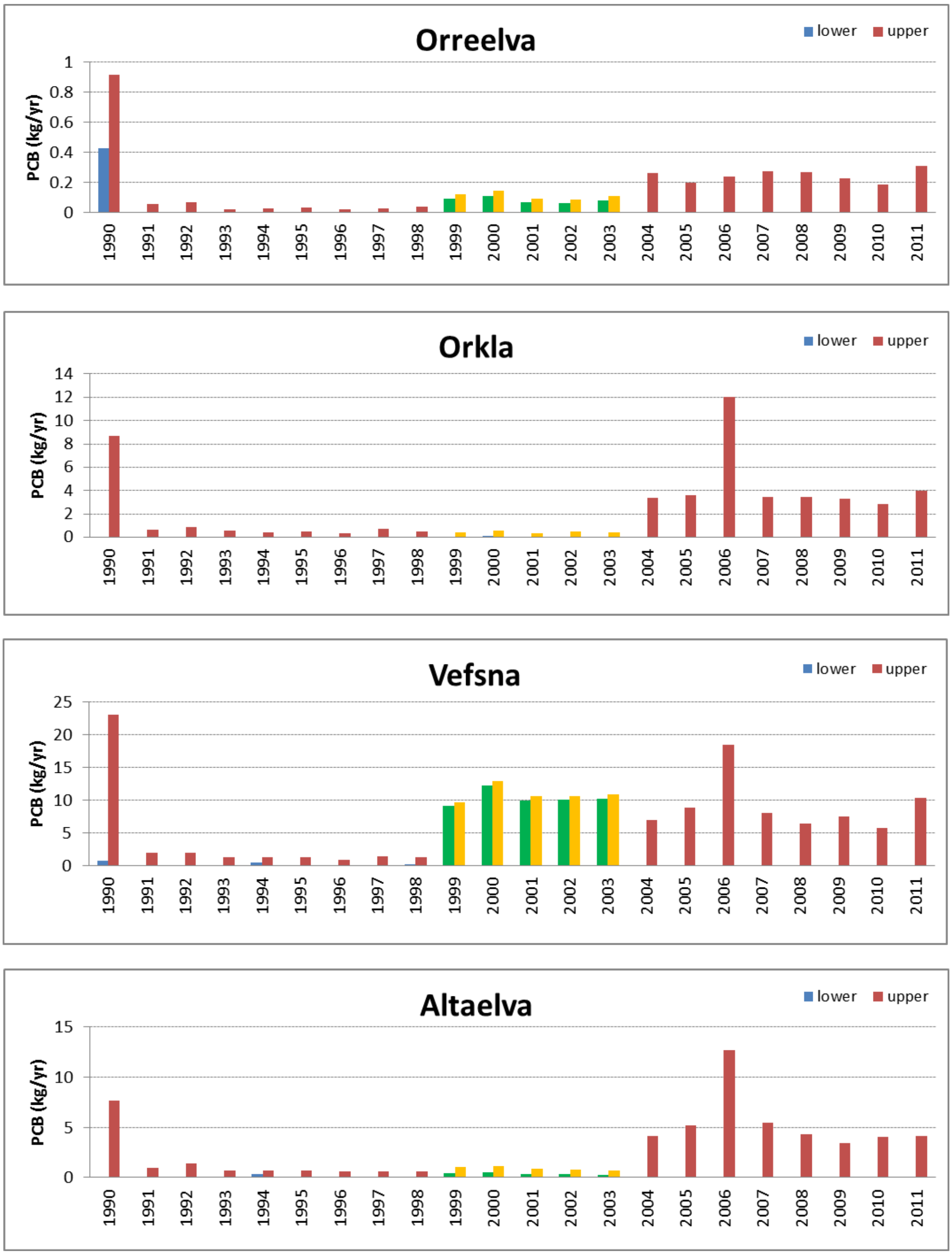

Figure A-V-14b. Annual riverine loads (upper and lower estimates) of PCB7 from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

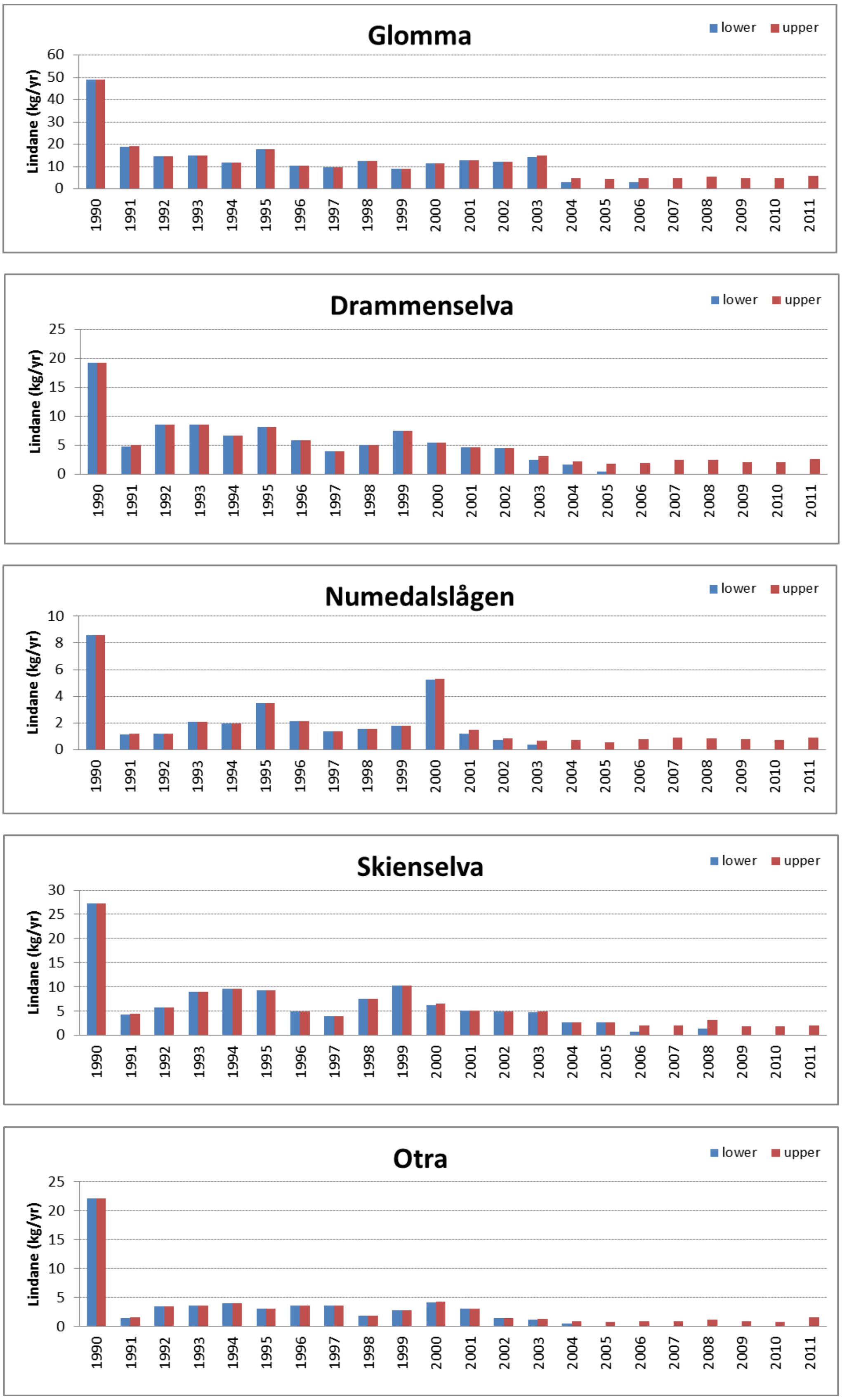

Figure A-V-15a. Annual riverine loads (upper and lower estimates) of <u>Lindane</u> from the five main Norwegian rivers draining to Skagerrak, 1990-2011.

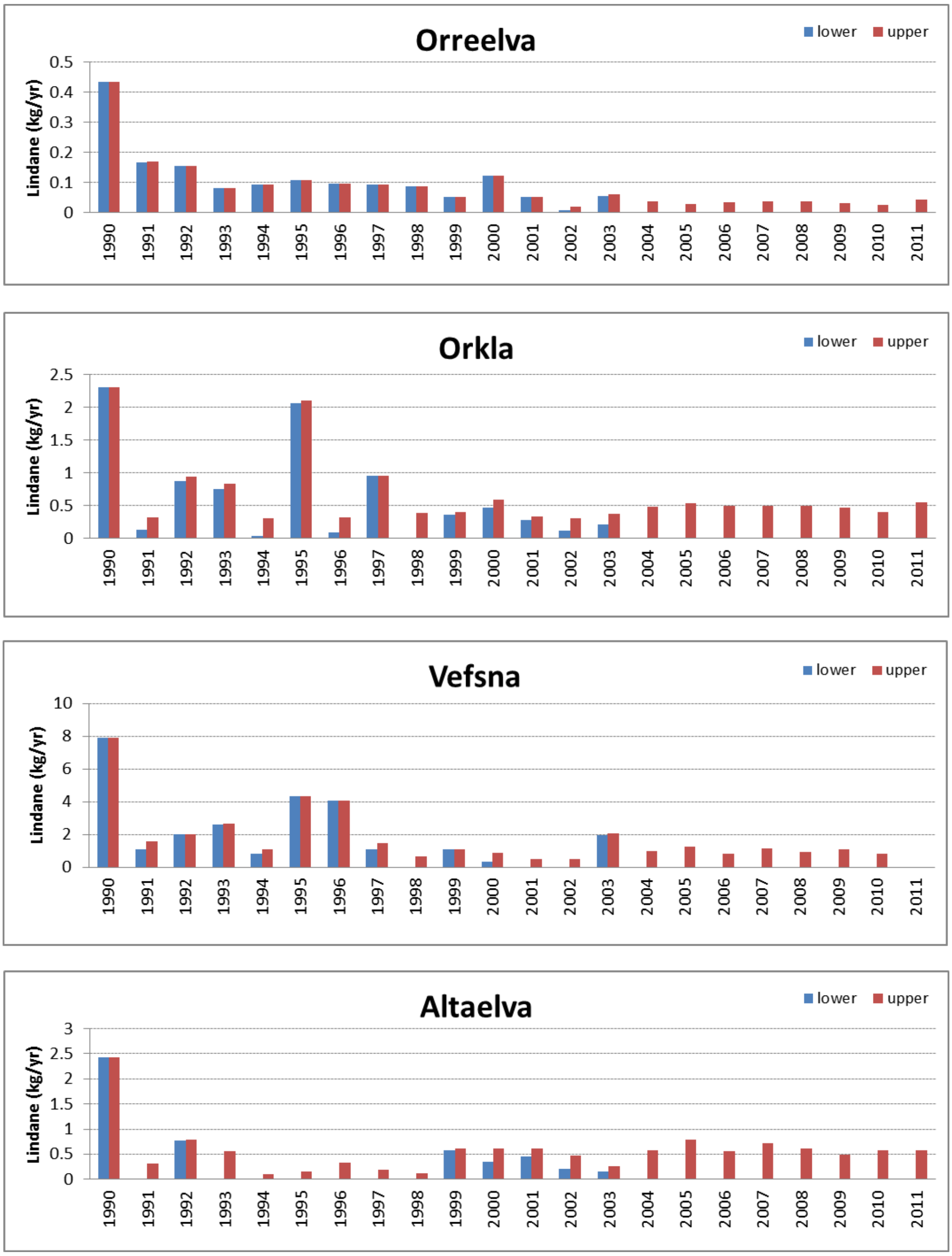

Figure A-V-15b. Annual riverine loads (upper and lower estimates) of <u>Lindane</u> from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.

Appendix VI

Trend Analyses – Pollutant Concentrations. Complementary charts to Chapter 4.3.

The charts cover the following substances in consecutive order:

- Water discharge (Q)
- Total-N
- Nitrate-N (NO_3-N)
- Ammonium-N (NH_4-N)
- Total-P
- Phosphate-P (PO_4-P)
- Suspended particulate matter (SPM)
- Cadmium (Cd)
- Copper (Cu)
- Nickel (Ni)
- Lead (Pb)
- Zinc (Zn)

The charts in this Appendix are complementary to Chapter 4.3. The charts show the concentrations in the water samples, and not the volume-weighted monthly concentrations.

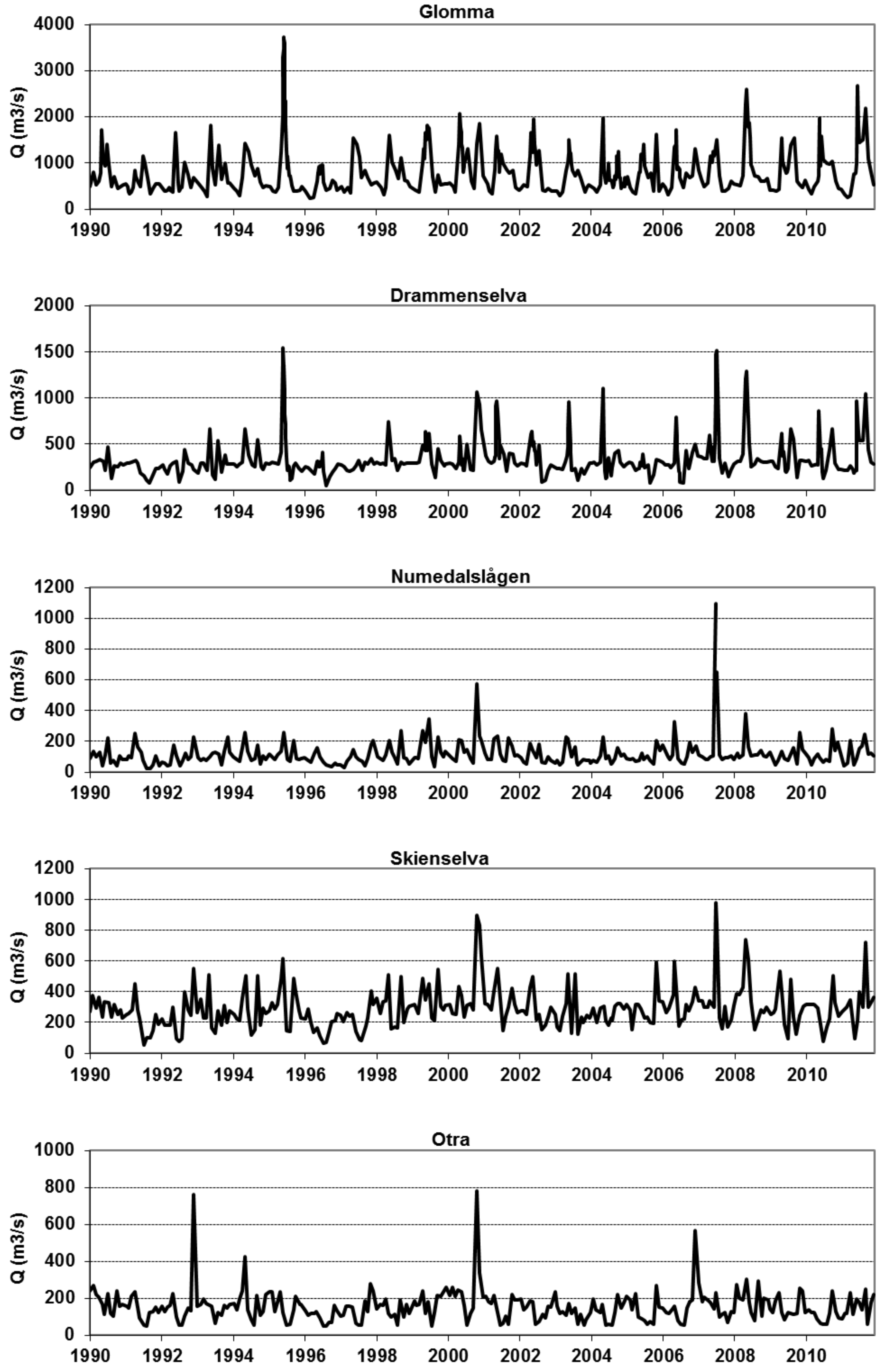

Figure A-VI-1a. Monthly <u>water discharge</u> (based only on data at the day of water quality sampling) for the five main rivers draining to Skagerrak, Norway, 1990-2011.

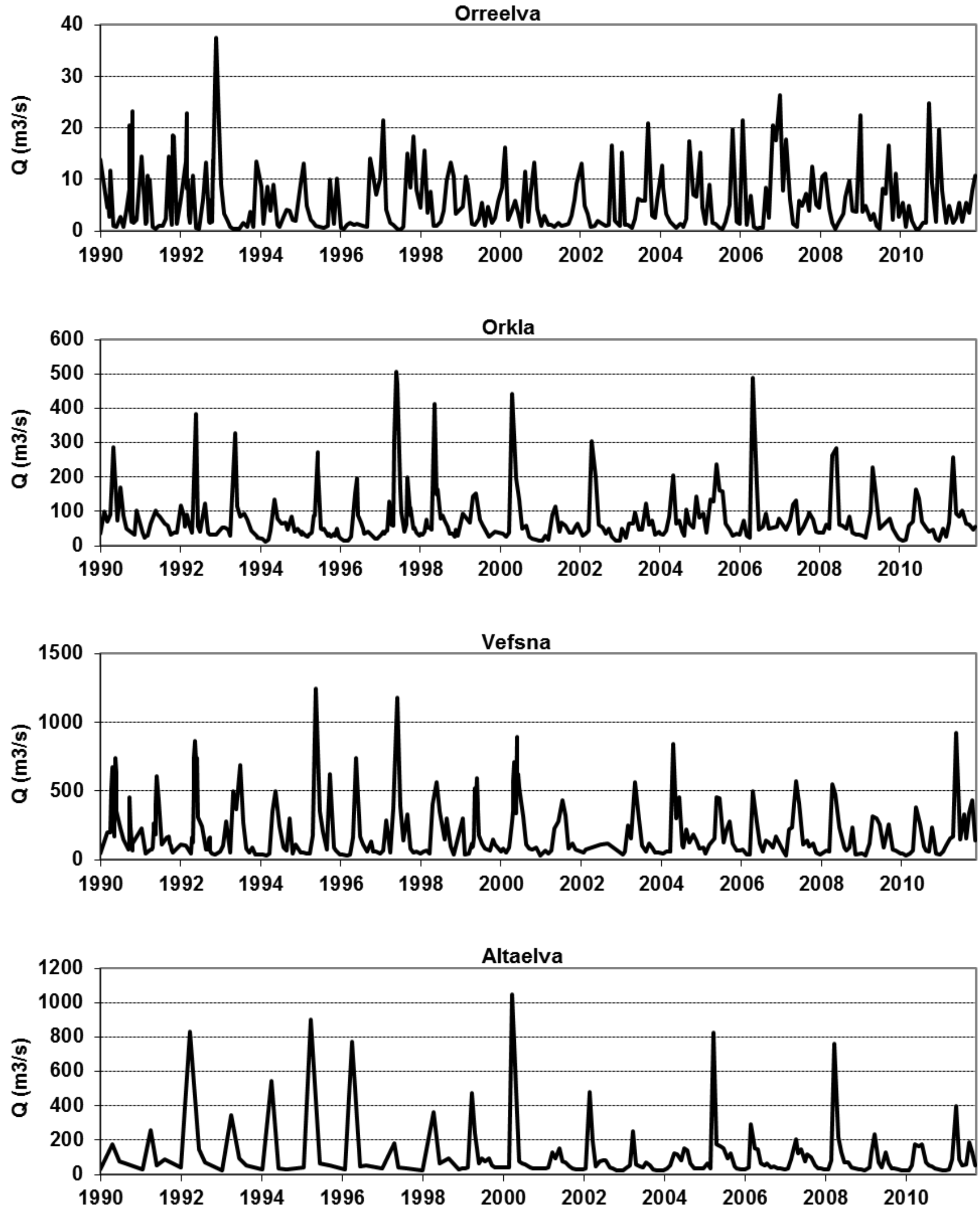

Figure A-VI-1b. Monthly <u>*water discharge*</u> *(based only on data at the day of water quality sampling) for the four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2011.*

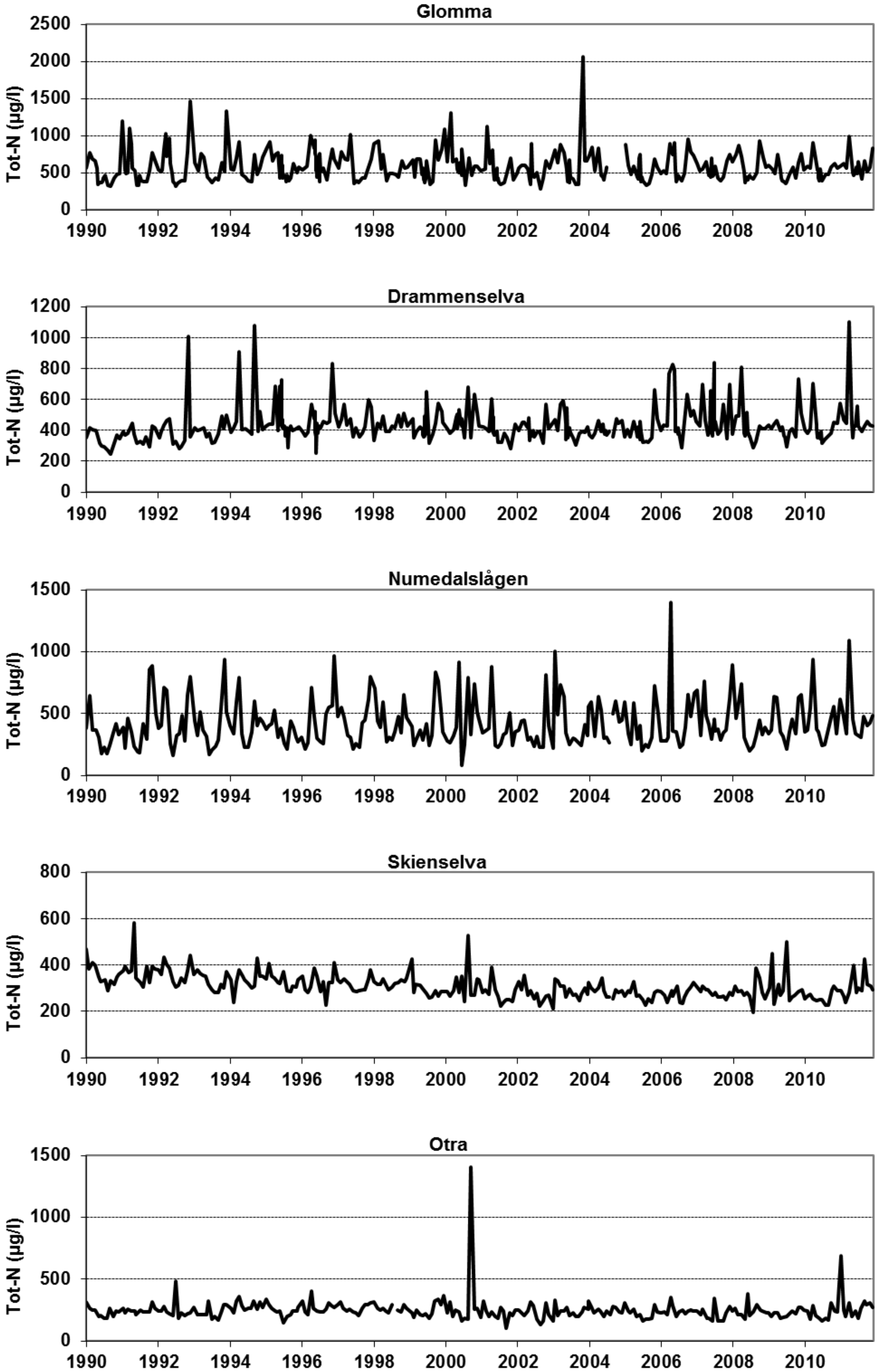

Figure A-VI-2a. Monthly concentrations of total nitrogen in the five main Norwegian Skagerrak rivers, 1990-2011.

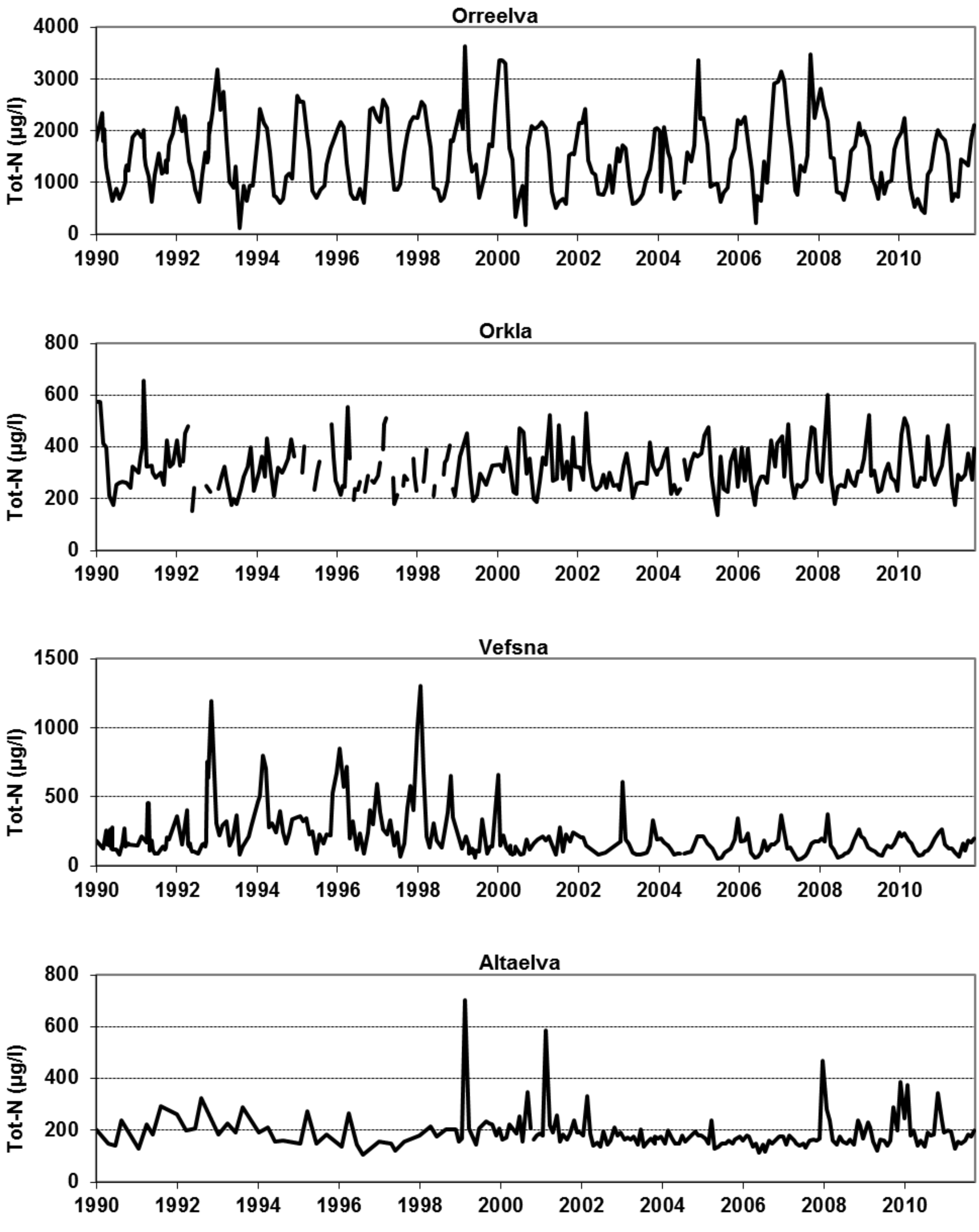

Figure A-VI-2b. Monthly concentrations of total nitrogen in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

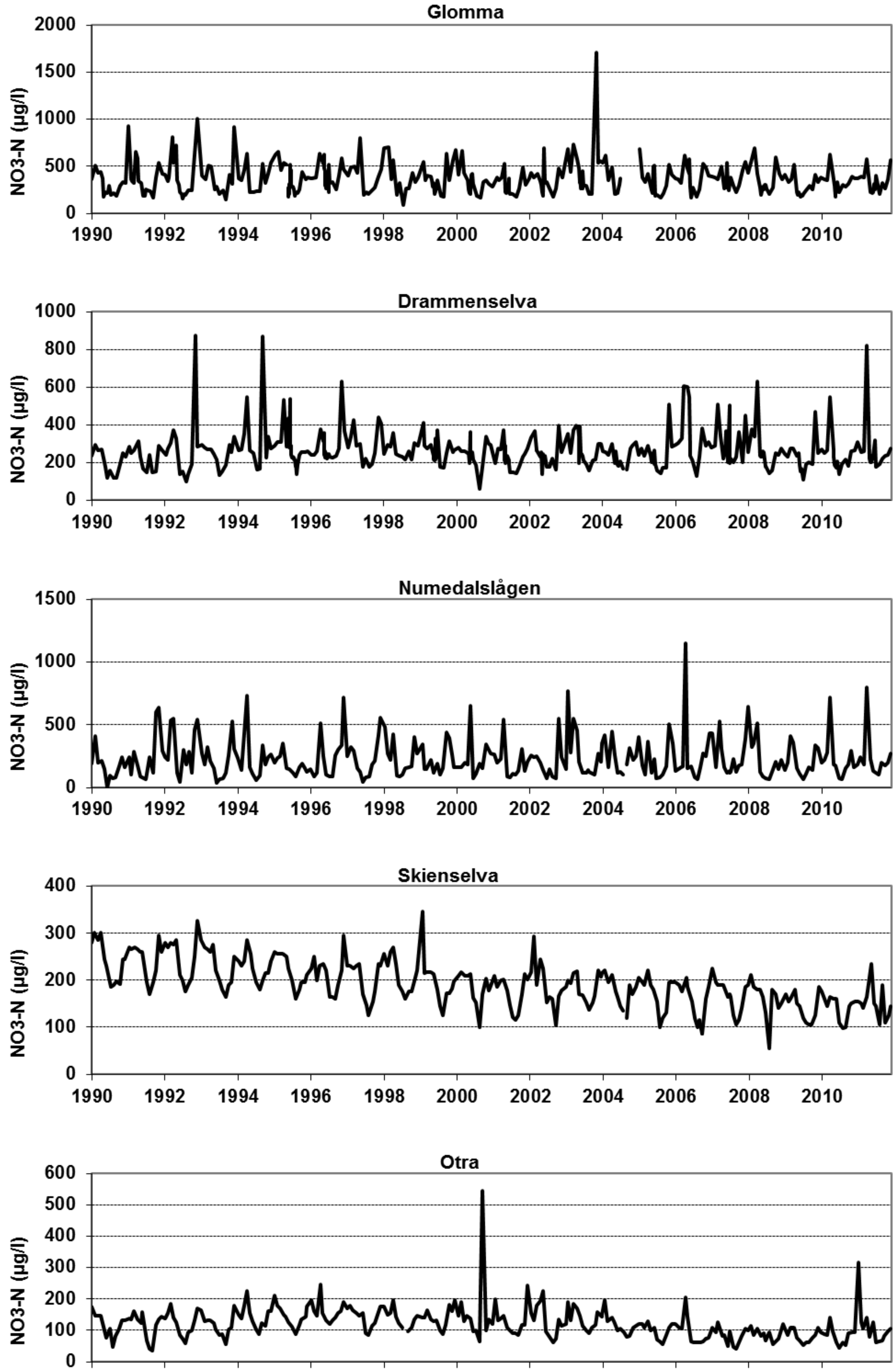

Figure A-VI-3a. Monthly concentrations of <u>*nitrate nitrogen*</u> *in the five main Norwegian Skagerrak rivers, 1990-2011.*

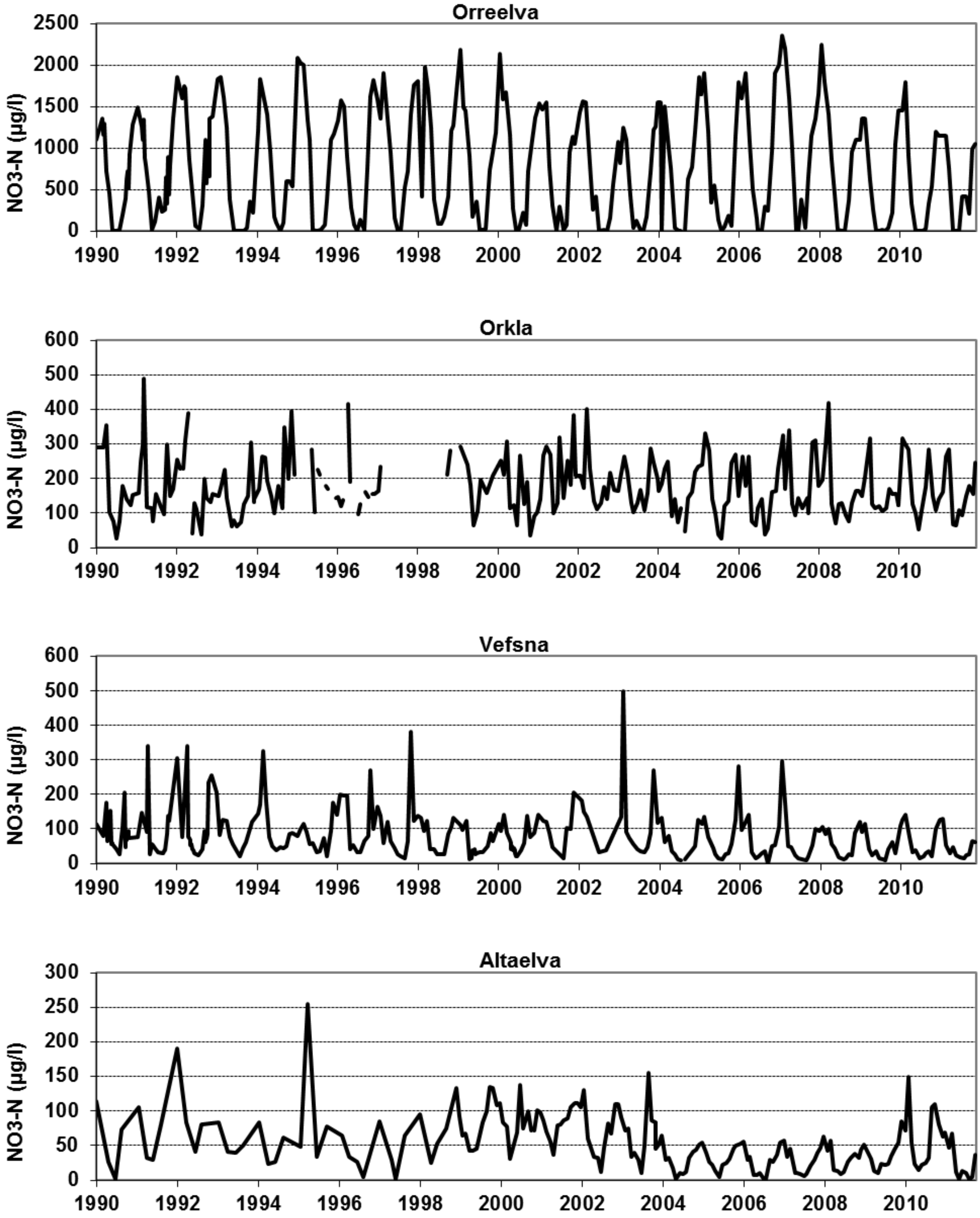

Figure A-VI-3b. Monthly concentrations of <u>nitrate nitrogen</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

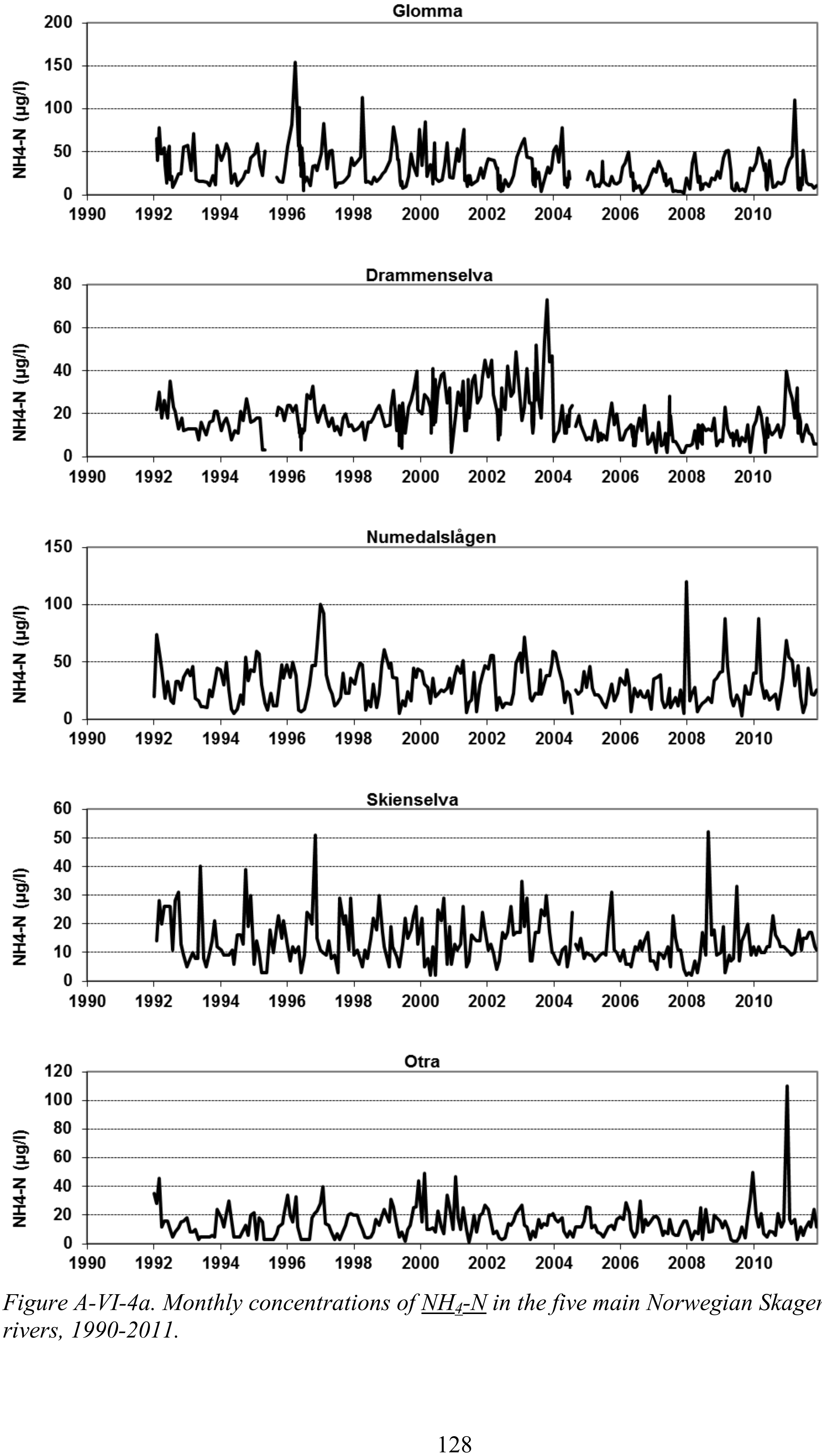

Figure A-VI-4a. Monthly concentrations of <u>NH_4-N</u> *in the five main Norwegian Skagerrak rivers, 1990-2011.*

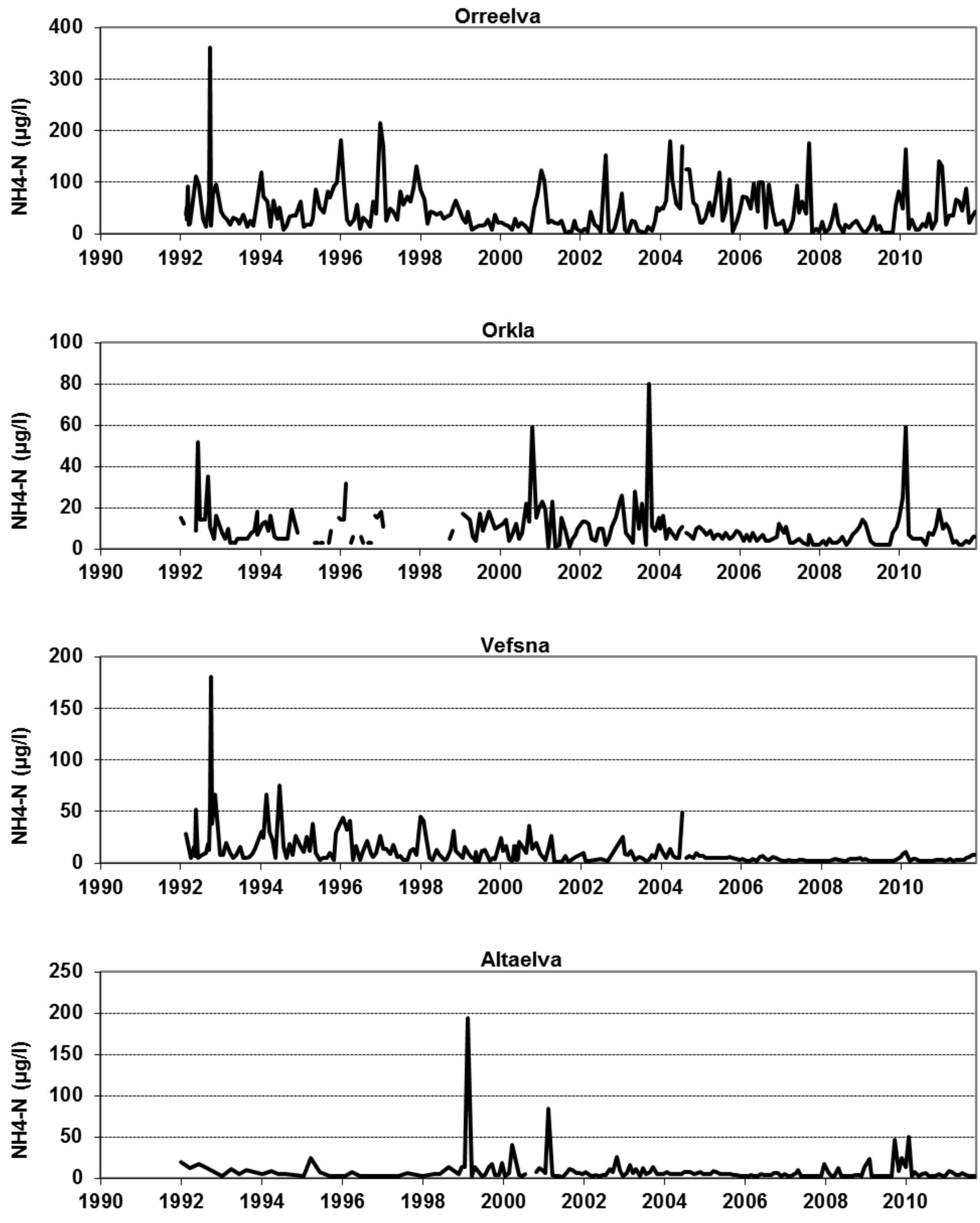

Figure A-VI-4b. Monthly concentrations of NH_4-N in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

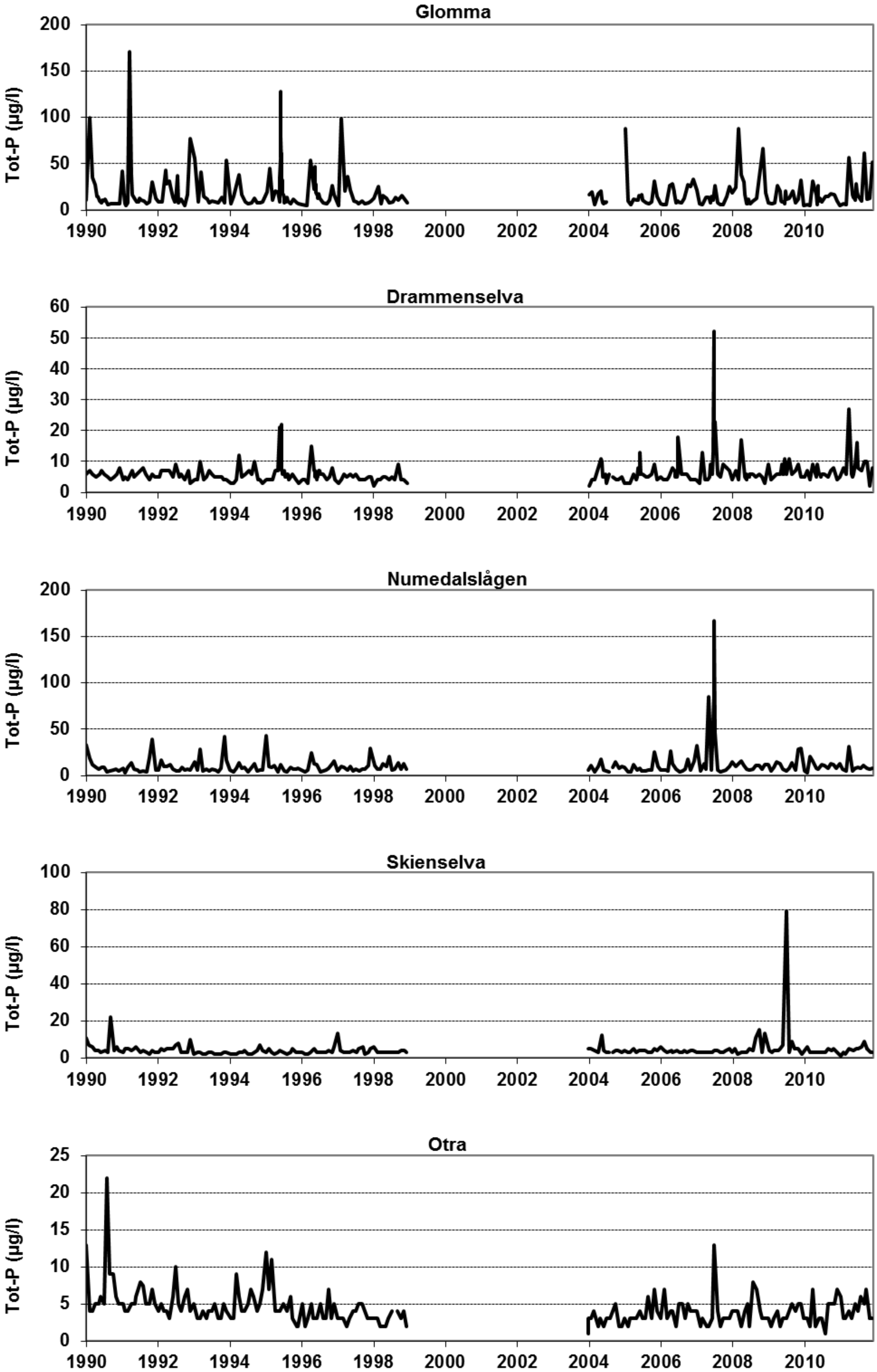

Figure A-VI-5a. Monthly concentrations of <u>total phosphorus</u> in the five main Norwegian Skagerrak rivers, 1990-2011.

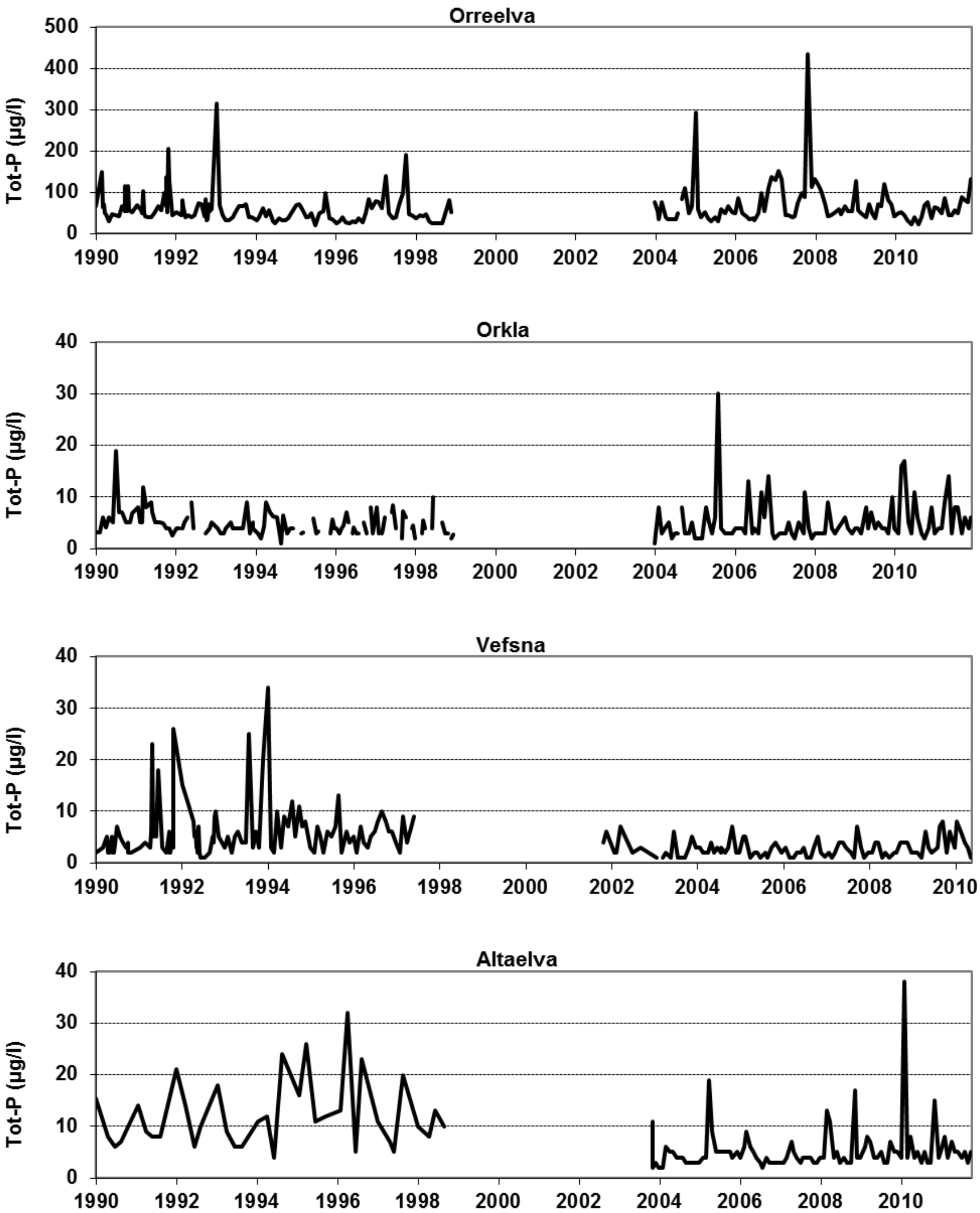

Figure A-VI-5b. Monthly concentrations of <u>*total phosphorus*</u> *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.*

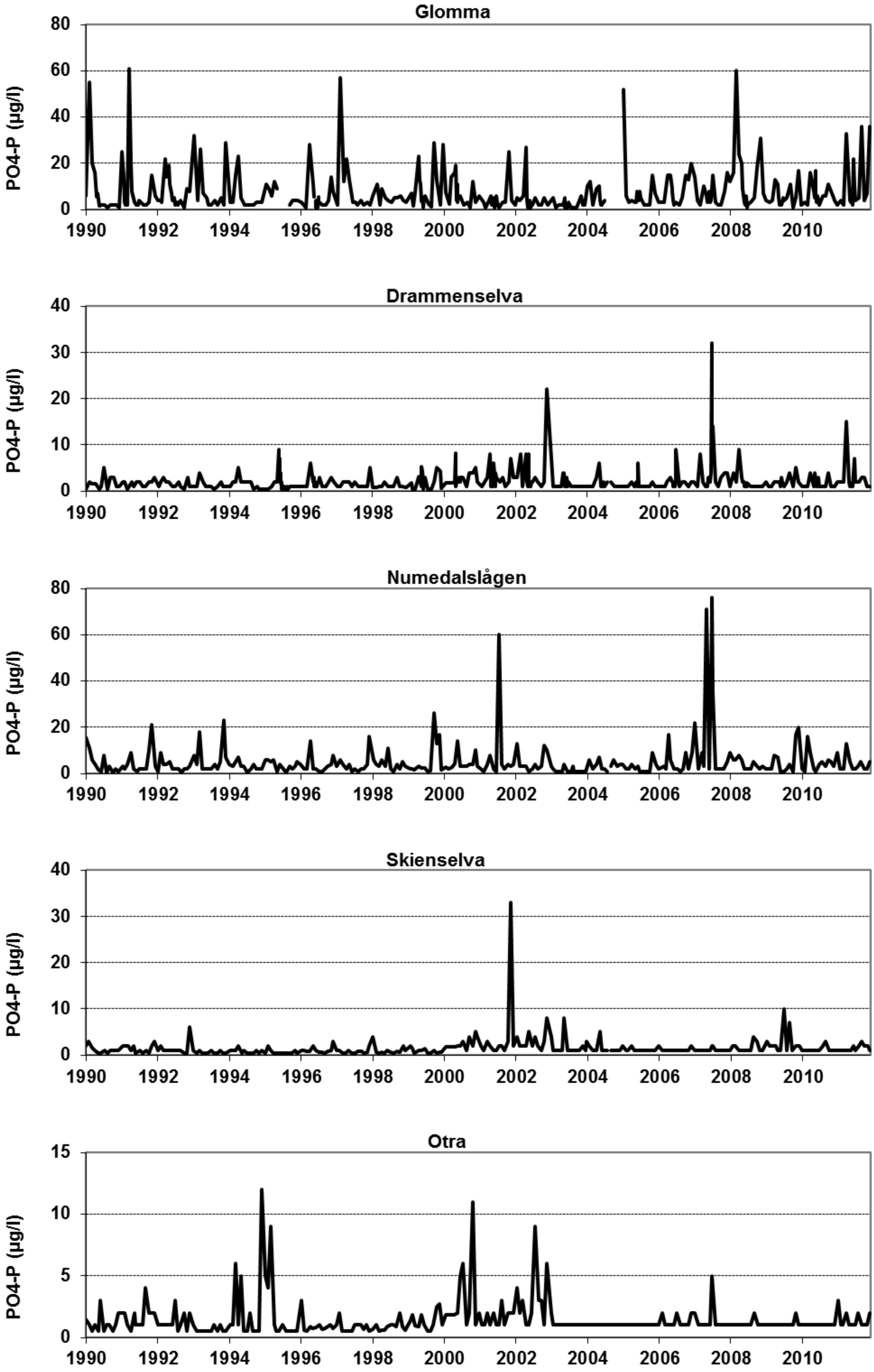

Figure A-VI-6a. Monthly concentrations of PO_4-P *in the five main Norwegian Skagerrak rivers, 1990-2011.*

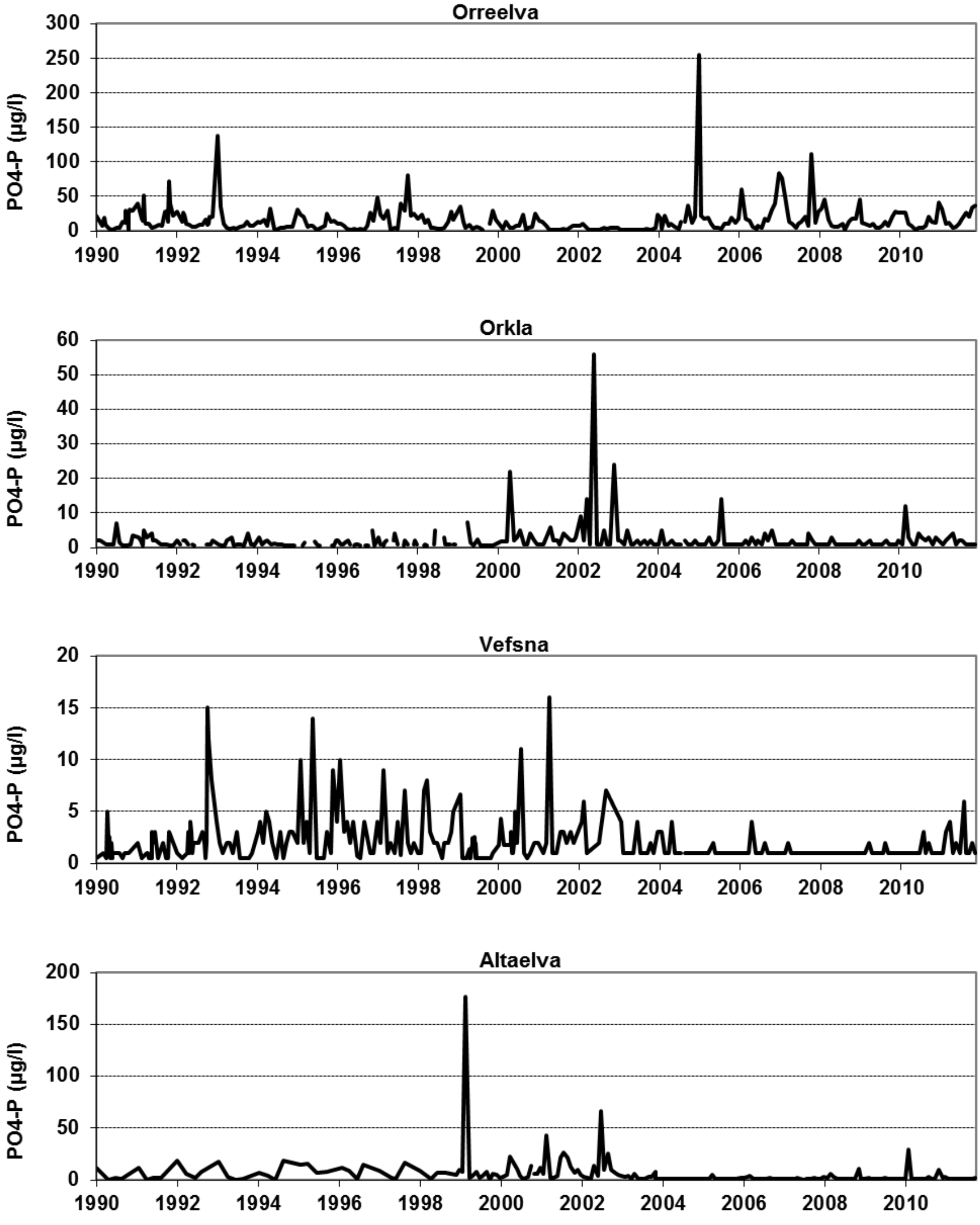

Figure A-VI-6b. Monthly concentrations of $\underline{PO_4\text{-}P}$ *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.*

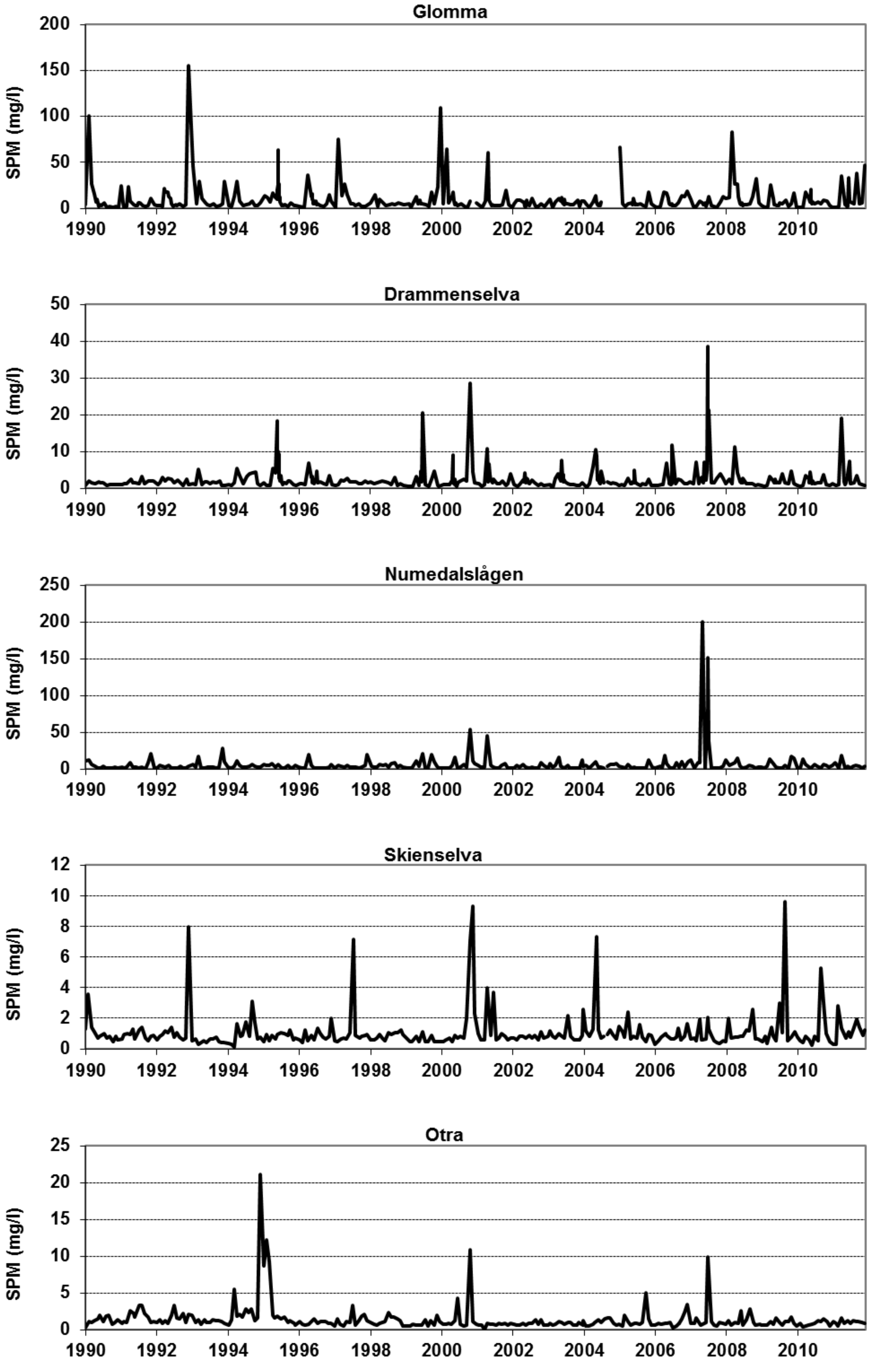

Figure A-VI-7a. Monthly concentrations of suspended particulate matter in the five main Norwegian Skagerrak rivers, 1990-2011.

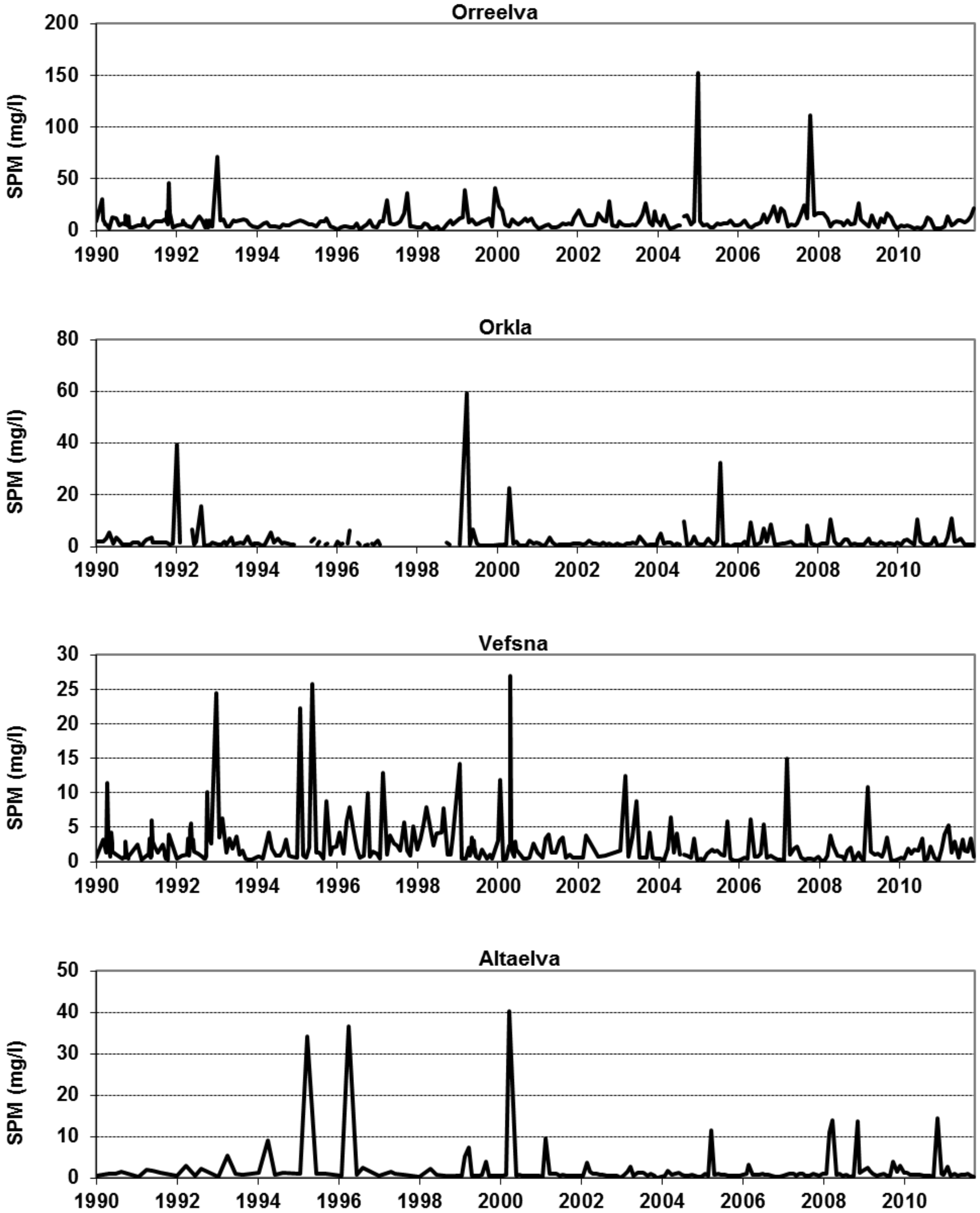

Figure A-VI-7b. Monthly concentrations of suspended particulate matter in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

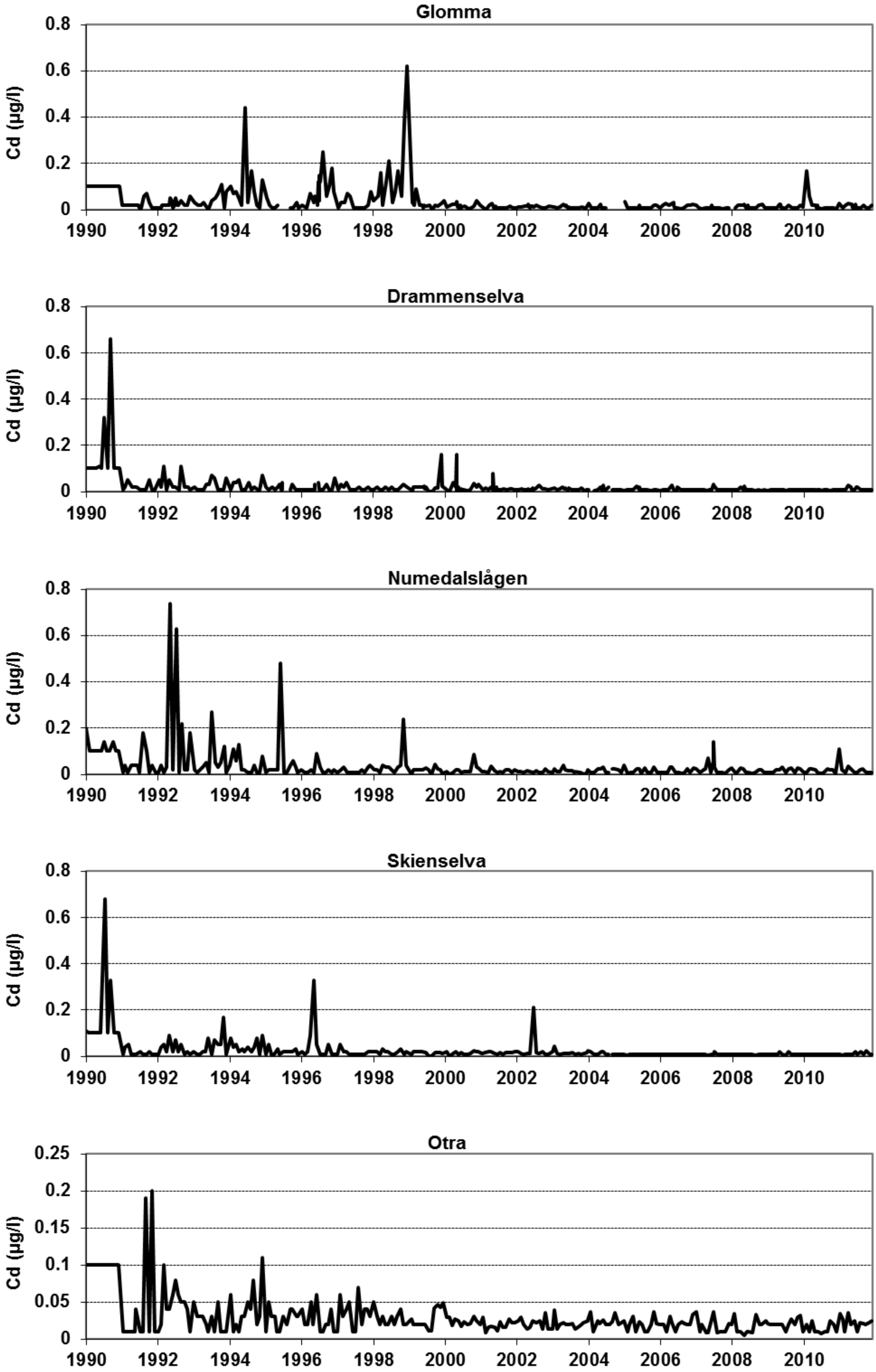

Figure A-VI-8a. Monthly concentrations of cadmium in the five main Norwegian Skagerrak rivers, 1990-2011.

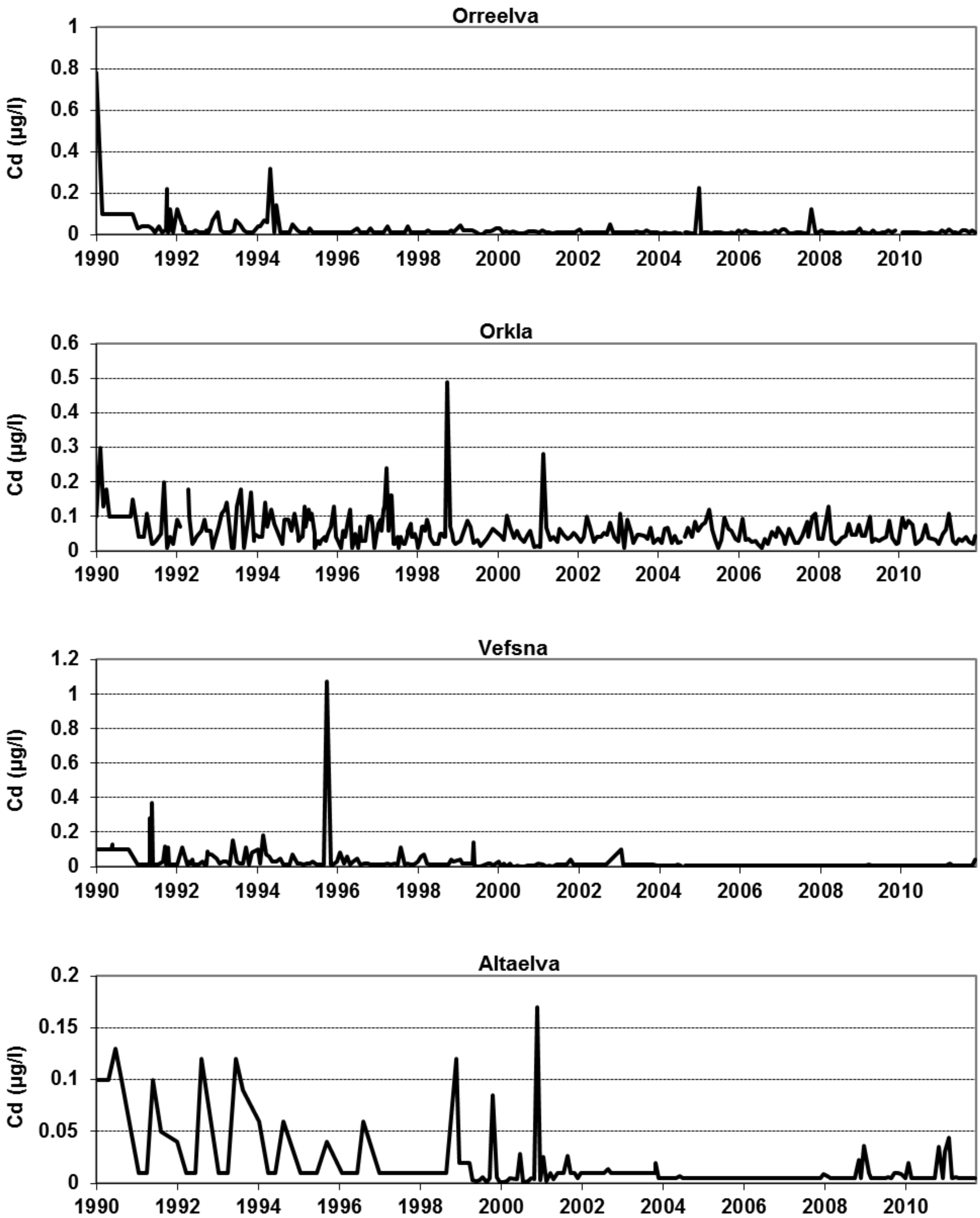

Figure A-VI-8b. Monthly concentrations of <u>cadmium</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

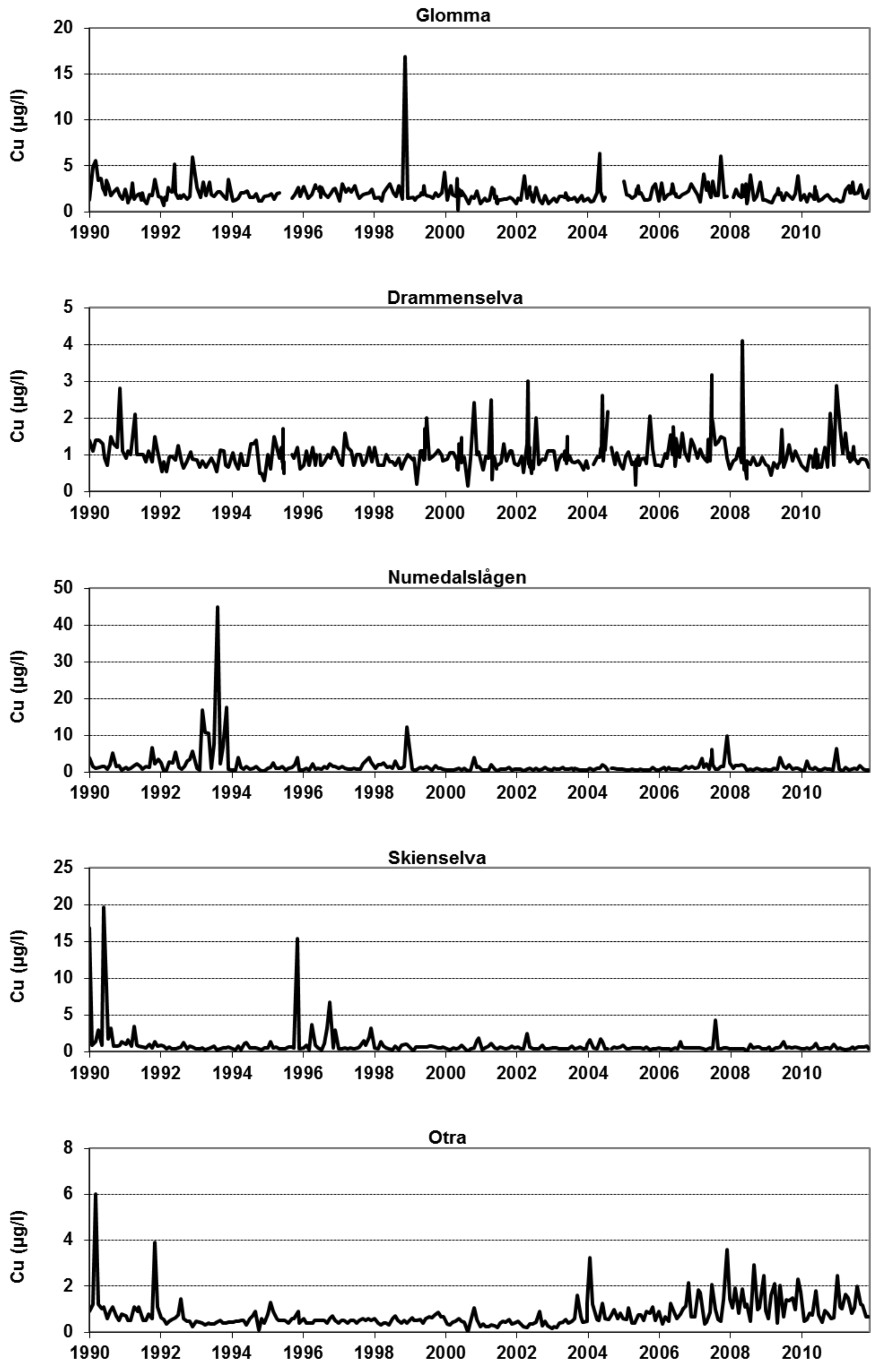

Figure A-VI-9a. Monthly concentrations of <u>copper</u> in the five main Norwegian Skagerrak rivers, 1990-2011.

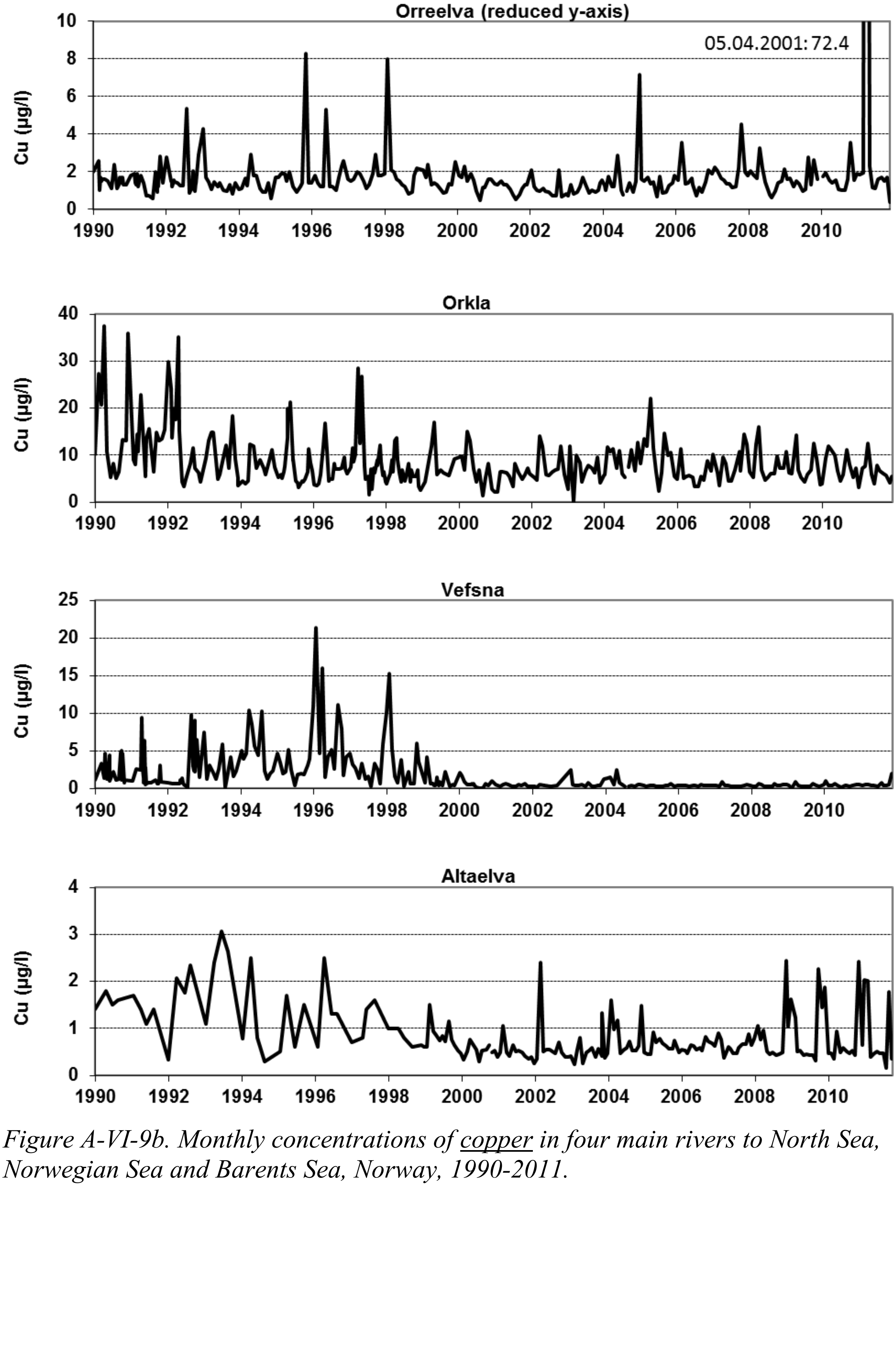

Figure A-VI-9b. Monthly concentrations of <u>copper</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

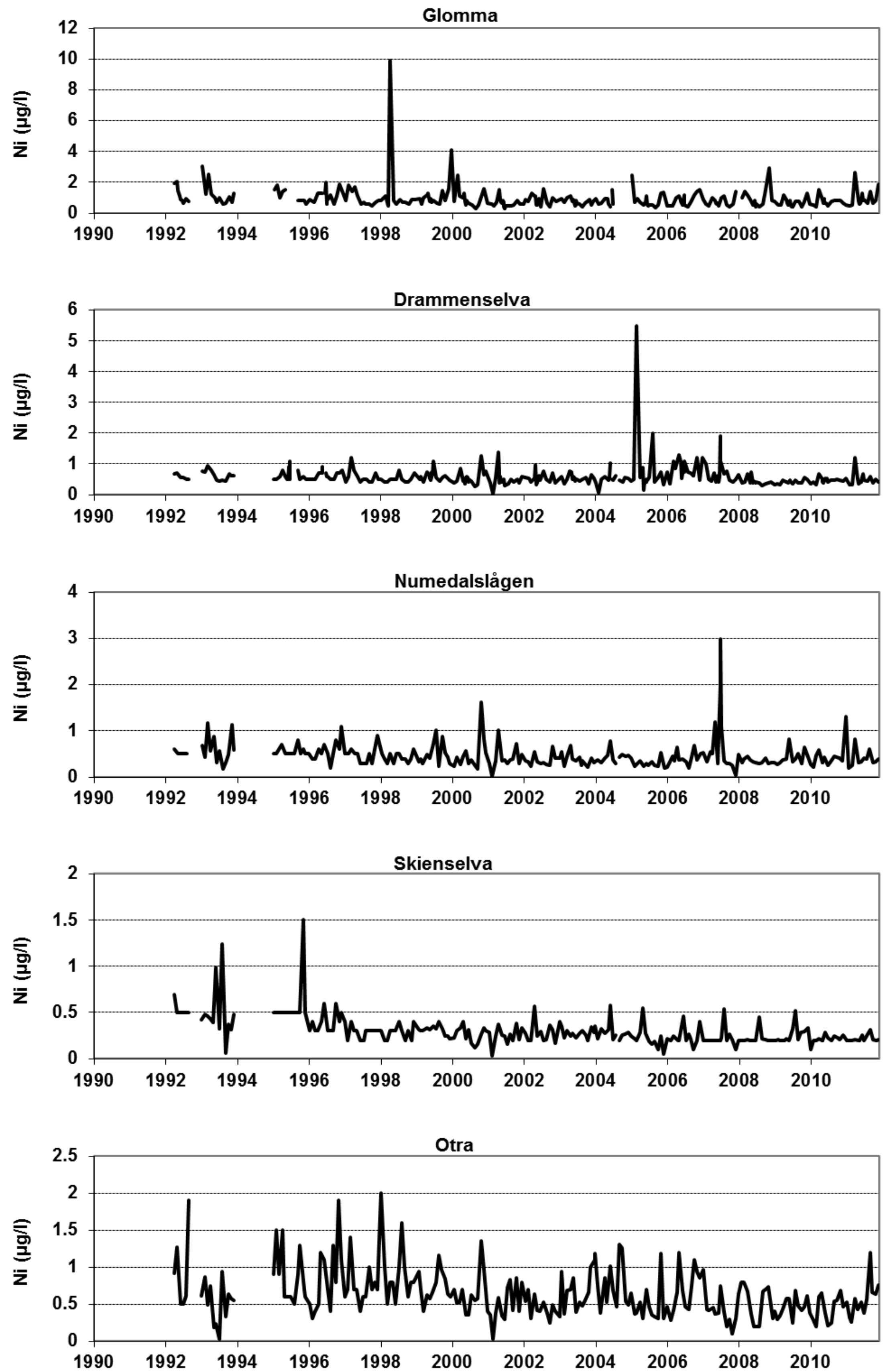

Figure A-VI-10a. Monthly concentrations of nickel in the five main Norwegian Skagerrak rivers, 1990-2011.

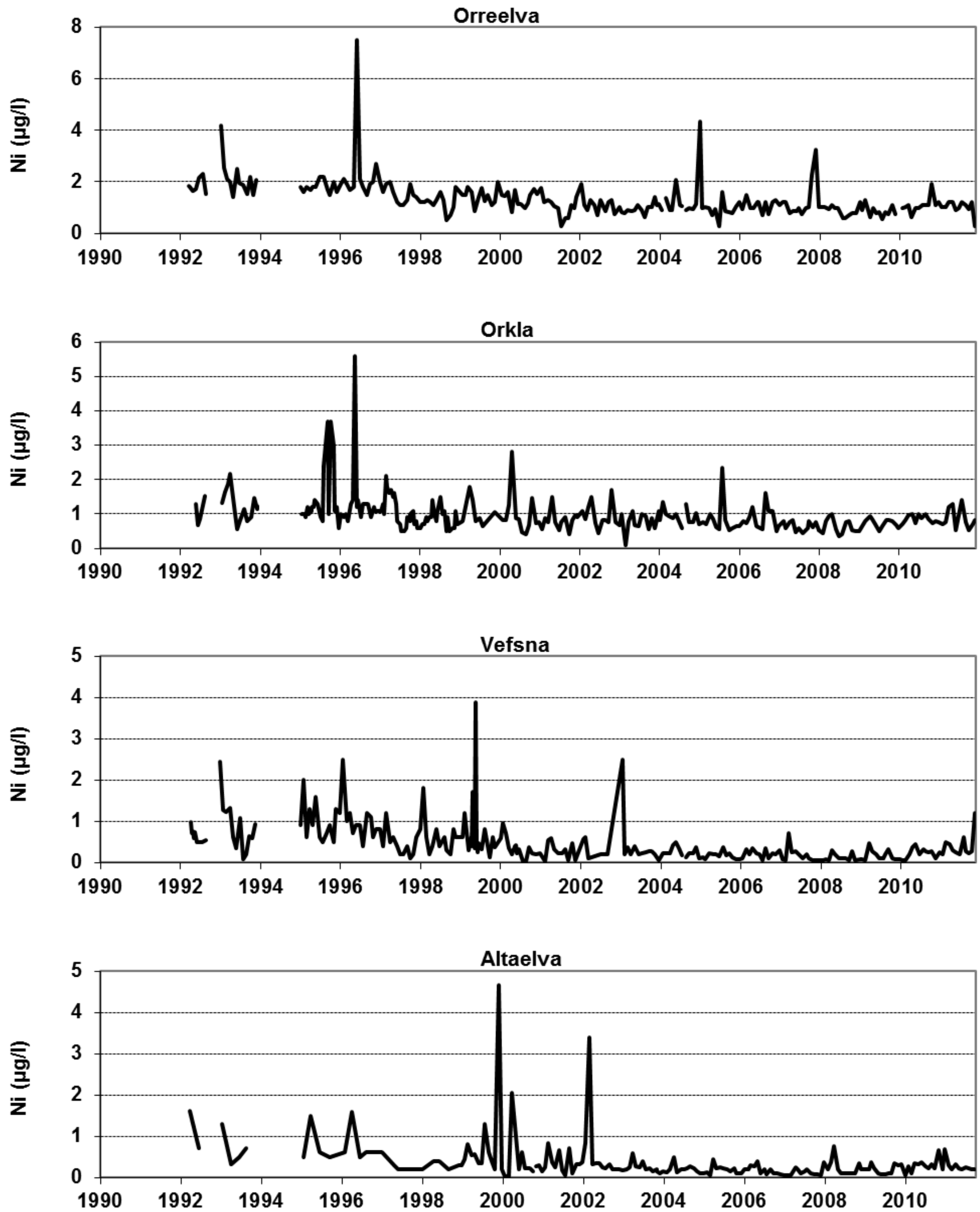

Figure A-VI-10b. Monthly concentrations of nickel in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

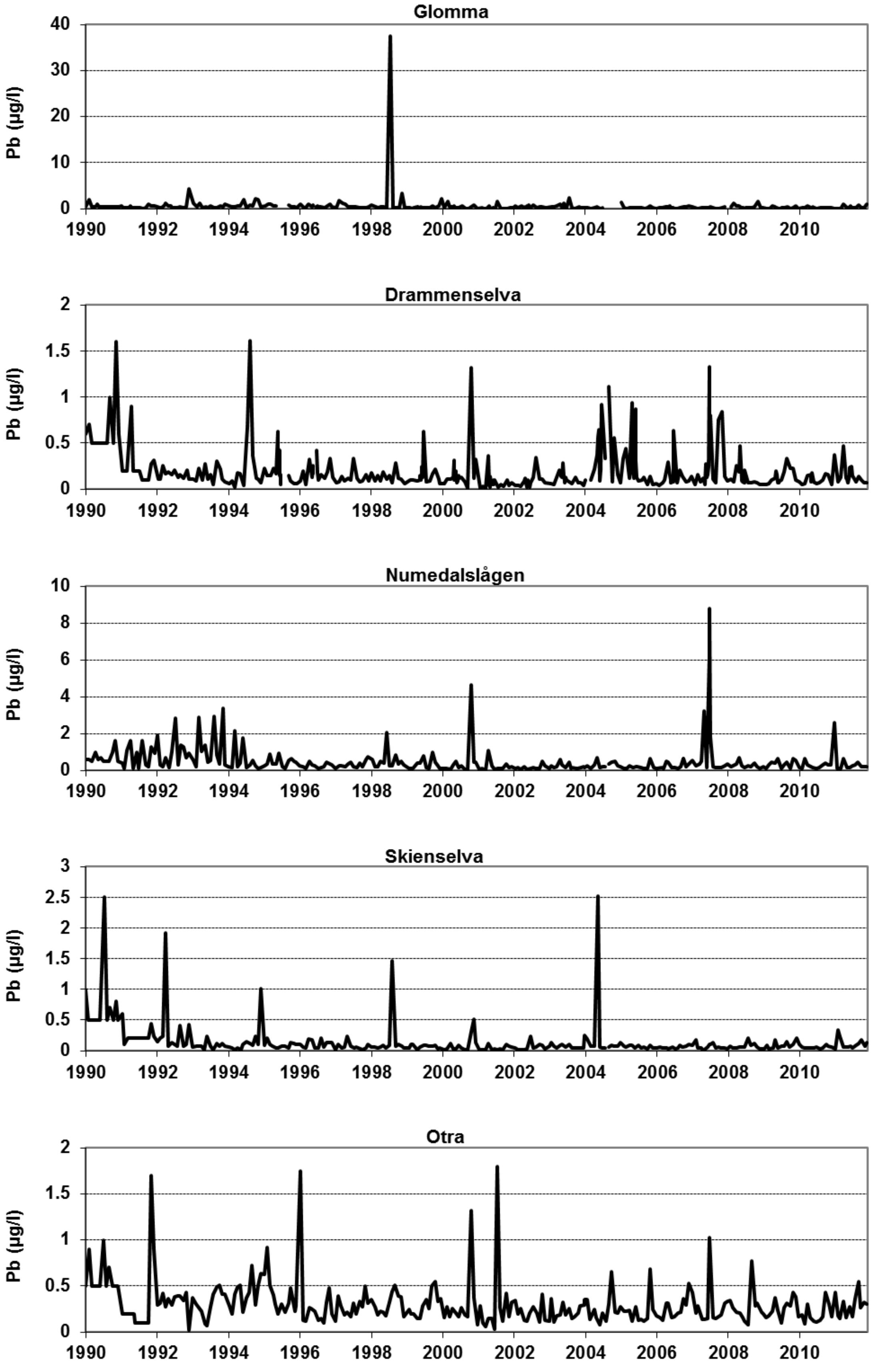

Figure A-VI-11a. Monthly concentrations of lead in the five main Norwegian Skagerrak rivers, 1990-2011.

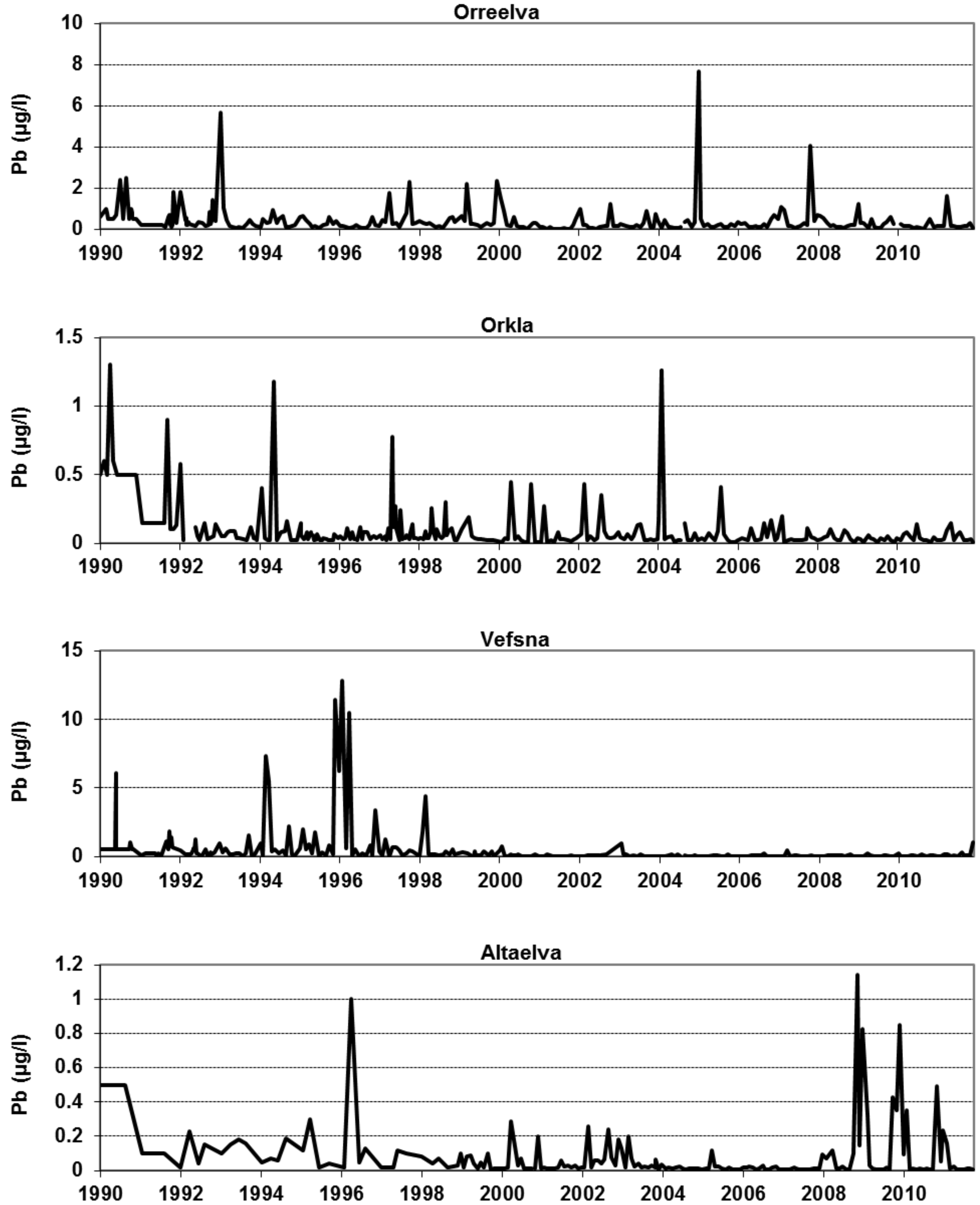

Figure A-VI-11b. Monthly concentrations of lead in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

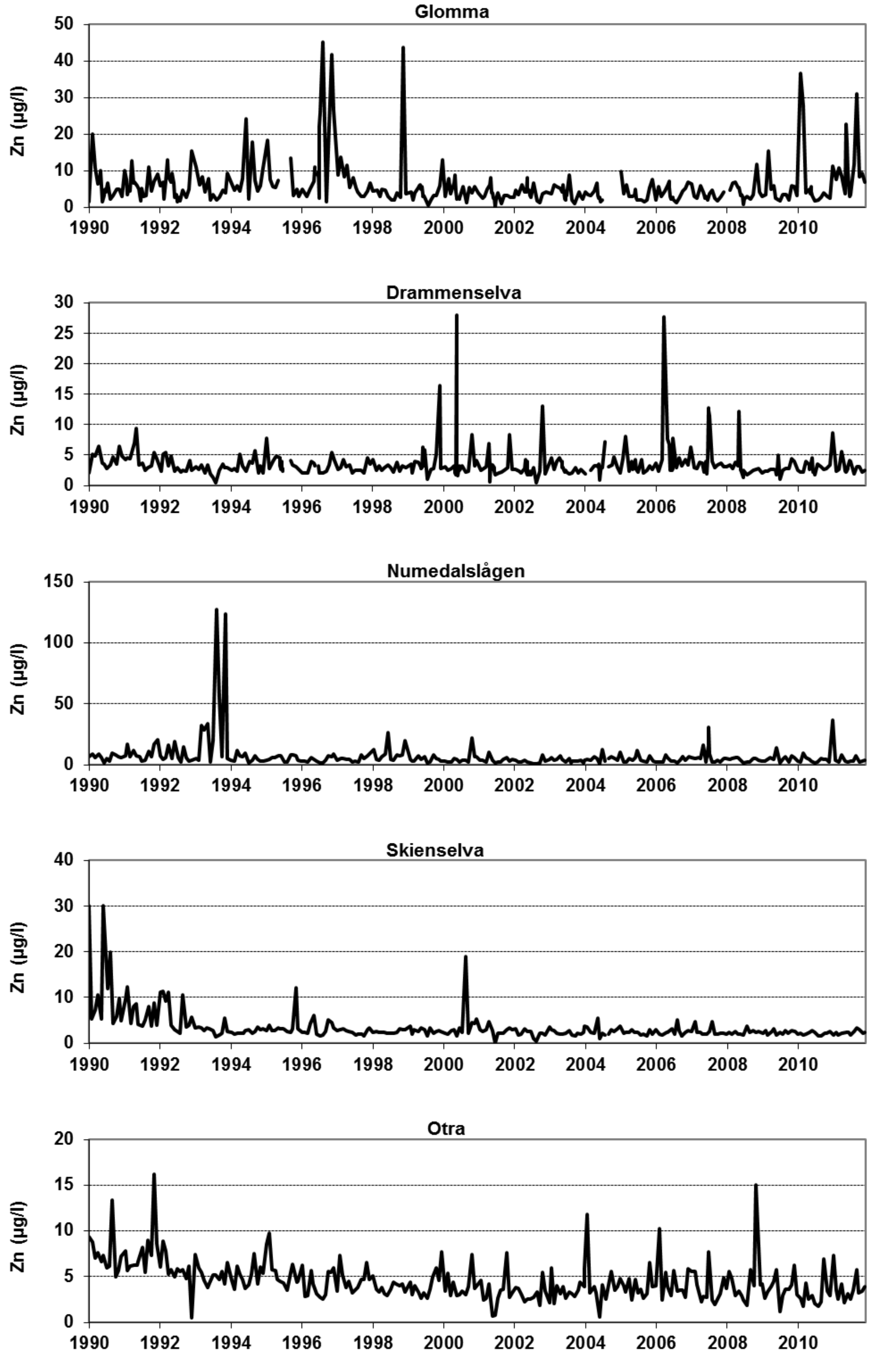

Figure A-VI-12a. Monthly concentrations of zinc in the five main Norwegian Skagerrak rivers, 1990-2011.

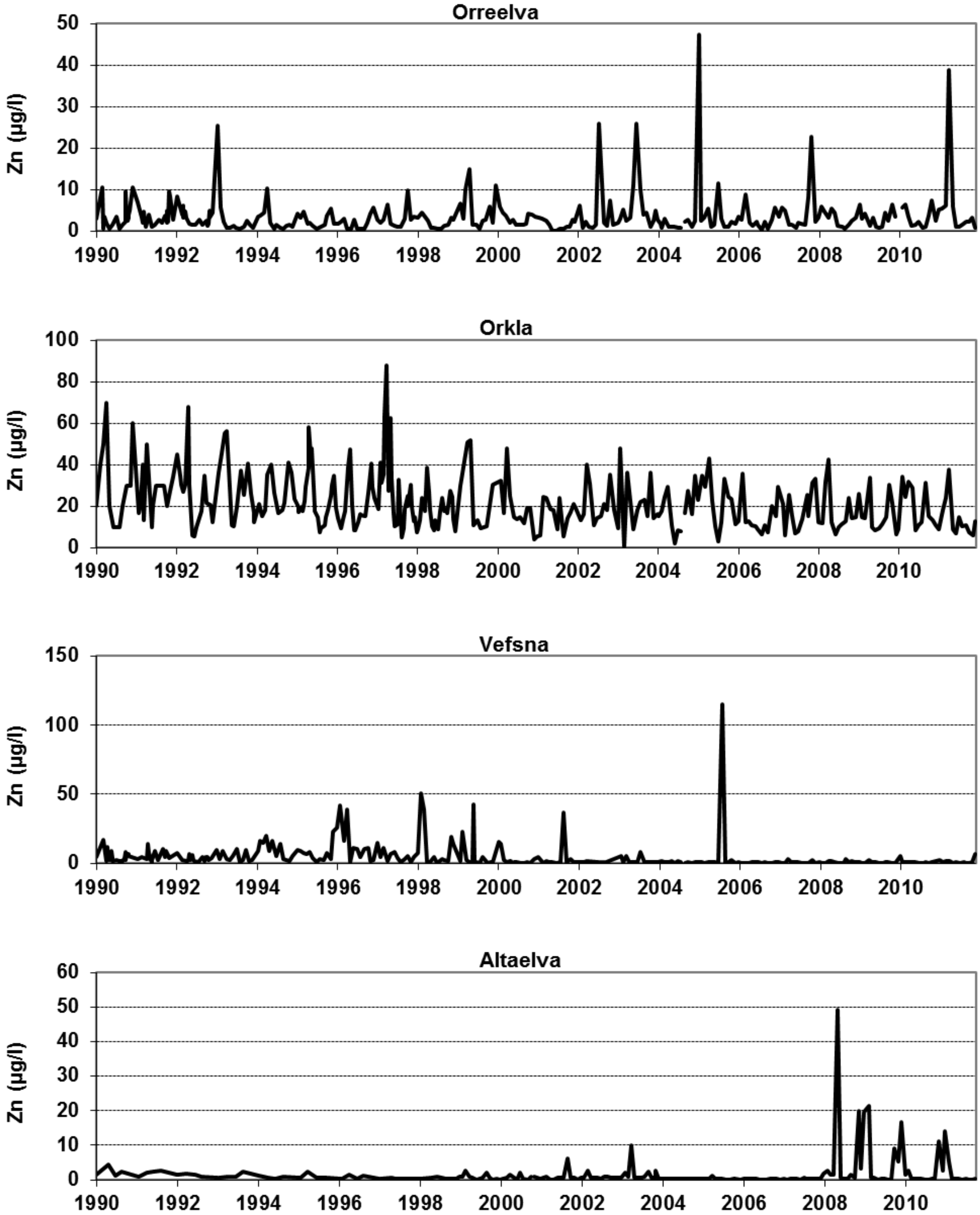

Figure A-VI-12b. Monthly concentrations of <u>zinc</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2011.

Appendix VII

Direct discharges of TP, TN and Cu since 1990

Values since 1990 are shown since new calculations were done for fish farming in 2011. Note that values for for NO_3, NH_4 and PO_4 are not included since for fish farming, these are not measured but calculated based on a set of pre-defined factors.

Table A-VII-1. Direct discharges of total phosphorus 1990 – 2011.

Year	Sewage	Industry	Fish farming	Total direct discharges
	Tonnes TP	Tonnes TP	Tonnes TP	Tonnes TP
1990	867	230	1404	2502
1991	867	245	1315	2427
1992	867	199	1229	2296
1993	991	401	1548	2940
1994	948	386	2072	3406
1995	1289	385	2662	4336
1996	1381	398	3097	4876
1997	1296	238	3168	4701
1998	1189	218	3968	5374
1999	1088	197	3965	5250
2000	982	209	4139	5331
2001	957	205	3825	4987
2002	903	228	4085	5215
2003	882	231	4964	6076
2004	859	261	4905	6025
2005	863	213	5396	6472
2006	891	231	6883	8004
2007	919	248	7169	8336
2008	912	338	7107	8358
2009	921	256	8057	9234
2010	937	258	8018	9213
2011	923	241	7899	9063

Table A-VII-2. Direct discharges of total nitrogen 1990 – 2011.

Year	Sewage	Industry	Fish farming	Total direct discharges
	Tonnes TN	Tonnes TN	Tonnes TN	Tonnes TN
1990	11595	3546	6965	22106
1991	11595	3455	6551	21601
1992	11595	4263	6135	21993
1993	12925	4289	7639	24853
1994	11659	2966	10151	24776
1995	16069	2901	12977	31947
1996	17979	2909	15037	35926
1997	15198	3676	15329	34202
1998	14318	2673	19185	36176
1999	13242	2493	19042	34777
2000	12237	2615	20958	35811
2001	11401	2581	19443	33425
2002	10858	2820	20838	34516
2003	10625	2618	25162	38404
2004	10814	2811	24901	38527
2005	11039	2361	27547	40946
2006	11537	2438	32565	46541
2007	11584	2580	36995	51159
2008	11534	2610	38556	52700
2009	12168	2312	43943	58423
2010	12179	2588	44011	58779
2011	12094	2378	46848	61320

Table A-VII-3. Direct discharges of copper 1990 – 2011.

Year	Sewage	Industry	Fish farming	Total direct discharges
	Tonnes Cu	Tonnes Cu	Tonnes Cu	Tonnes Cu
1990	5.0	54	127	187
1991	5.0	22	120	147
1992	5.0	10	112	127
1993	5.0	10	140	155
1994	6.8	11	185	203
1995	6.8	12	236	254
1996	6.8	11	273	291
1997	6.8	9	311	327
1998	6.8	10	348	365
1999	6.8	8	346	361
2000	6.8	7	389	403
2001	6.8	7	361	375
2002	6.9	6	459	473
2003	7.3	9	475	491
2004	6.9	10	484	500
2005	10.6	53	526	589
2006	6.7	9	626	641
2007	7.9	9	714	731
2008	6.5	9	724	740
2009	4.3	9	836	849
2010	5.1	9	696	710
2011	5.3	7	779	791

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Title – English and Norwegian

Riverine inputs and direct discharges to Norwegian coastal waters – 2011
Elvetilførsler og direkte tilførsler til norske kystområder – 2011

Summary

Riverine inputs and direct discharges to Norwegian coastal waters in 2011 have been estimated in accordance with the requirements of the OSPAR Commission. Due to high water discharges in 2011, the riverine inputs of both nutrients and metals were greater than in 2010. However, analyses of data since 1990 from nine main rivers in the program reveal downward trends both for nutrients and metals, with an exception of upwards trends for nitrogen in one river. Fish farming continues to be a major source of nutrients and copper to coastal waters. Inputs of PCBs and the pesticide lindane were, as in former years, insignificant.

4 subject words	4 emneord
Riverine inputs. Direct discharges. Norwegian coastal waters. Monitoring	Elvetilførsler. Direkte tilførsler. Norske kystområder. Overvåking

Addendum

Data from the 2011 RID Programme

Table 1.
Raw data and summary statistics for the 10 main and 36 tributary rivers in Norway in 2011

Glomma ved Sarpsfossen
Glomma ved Sarpsfossen

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
03.01.2011	428	7.07	5.02	0.85	3.00	2	5	370	30	585	3.57	0.09	0.10	0.03	1.37	11.20	0.54	0.30	<1.00		
07.02.2011	313	7.10	5.32	1.30	2.80	4	7	395	41	625	3.68	0.10	0.06	0.01	1.06	7.52	0.49	<0.10	<1.00	<0.20	<1.40
07.03.2011	261	7.02	5.22	1.69	2.80	2	6	385	45	565	3.83	0.10	0.06	0.02	1.21	10.70	0.51	0.20	<1.00		
04.04.2011	287	6.90	6.14	34.90	4.80	33	57	580	110	990	6.76	0.39	0.91	0.03	2.32	8.63	2.64	2.20	<1.00		
09.05.2011	756	7.15	3.88	4.30	5.00	4	17	230	8	505	3.38	0.10	0.17	0.02	2.80	3.65	0.74	0.20	2.00		
18.05.2011	757	7.22	4.28	3.50	3.80	3	14	225	6	465	2.89	0.10	0.14	0.01	2.02	22.70	0.58	0.20	<1.00		
28.05.2011	782	7.16	4.20	2.15	3.50	4	13	220	20	495	3.06	0.20	0.13	0.01	2.09	17.60	0.62	0.20	<1.00		
06.06.2011	990	7.31	4.34	2.40	3.60	2	11	225	6	490	3.04	0.20	0.34	0.01	2.31	10.10	0.84	0.32	<1.00		
16.06.2011	2684	6.91	3.89	33.50	5.50	22	28	310	14	580	4.11	0.24	0.67	0.03	3.25	5.83	1.30	0.58	<1.00		
26.06.2011	1823	7.09	3.88	8.64	4.52	10	20	255	12	495	3.25	0.20	0.24	0.01	2.45	3.04	0.83	0.32	<1.00		
04.07.2011	1454	6.44	4.30	7.36	4.16	4	16	404	52	650	3.29	0.23	0.24	0.01	1.97	3.53	0.87	0.42	1.00		
08.08.2011	1508	7.14	3.93	5.16	3.80	5	10	205	15	415	2.82	0.20	0.28	0.01	2.07	11.70	0.65	0.32	<1.00	<0.20	<1.60
12.09.2011	2190	6.94	4.27	38.30	7.40	36	62	320	12	665	5.24	0.39	0.87	0.02	2.92	31.10	1.40	2.00	2.50		
03.10.2011	1094	7.16	4.00	4.58	5.20	4	12	265	12	515	3.64	0.20	0.17	0.01	1.54	8.23	0.65	0.20	1.00		
07.11.2011	809	7.21	4.76	5.51	4.90	7	13	360	8	580	4.28	0.20	0.21	0.01	1.46	9.41	0.84	0.38	2.00	<0.20	<1.40
05.12.2011	527	6.92	5.45	46.80	5.80	36	52	570	11	830	7.10	0.32	0.95	0.02	2.38	6.76	1.90	1.20	3.00		
Lower avg.	1041	7.05	4.56	12.56	4.41	11	21	332	25	591	4.00	0.20	0.35	0.02	2.08	10.73	0.96	0.57	0.72	0.00	0
Upper avg..	1041	7.05	4.56	12.56	4.41	11	21	332	25	591	4.00	0.20	0.35	0.02	2.08	10.73	0.96	0.57	1.34	0.20	1.47
Minimum	261	6.44	3.88	0.85	2.80	2	5	205	6	415	2.82	0.09	0.06	0.01	1.06	3.04	0.49	0.10	1.00	0.20	1.40
Maximum	2684	7.31	6.14	46.80	7.40	36	62	580	110	990	7.10	0.39	0.95	0.03	3.25	31.10	2.64	2.20	3.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	3	3
St.dev	714	0.20	0.69	15.76	1.24	13	19	117	27	145	1.30	0.10	0.32	0.01	0.63	7.44	0.59	0.65	0.65	0.00	0.12

Drammenselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
04.01.2011	230	7.00	4.89	1.16	3.70	2	5	310	40	575	3.38	0.10	0.37	0.01	2.87	8.65	0.53	0.32	<1.00		
08.02.2011	212	6.98	3.80	0.76	2.70	2	8	255	31	470	2.74	0.10	0.08	0.01	1.70	2.32	0.32	<0.10	<1.00	<0.20	<1.40
08.03.2011	212	6.83	3.92	0.91	3.00	2	6	260	27	445	2.78	0.10	0.13	0.01	1.03	2.64	0.33	0.10	1.50		
05.04.2011	266	7.05	5.39	19.00	4.10	15	27	820	18	1100	5.39	0.22	0.47	0.03	1.59	5.59	1.20	0.80	<1.00		
03.05.2011	221	7.10	3.44	1.66	3.40	2	6	220	32	440	2.57	0.20	0.12	0.02	0.91	3.39	0.50	0.20	<1.00		
12.05.2011	186			1.07	2.90	<1	5	200	11	350	2.33	0.20	0.11	0.01	1.05	2.37	0.36	0.10	<1.00		
26.05.2011	208	7.02	3.52	1.56	2.90	<1	6	200	20	420	2.44	0.10	0.07	0.01	0.80	2.24	0.39	<0.10	<1.00		
07.06.2011	217	7.14	3.88	3.24	3.40	2	9	245	16	430	2.63	0.10	0.16	0.01	0.87	2.79	0.41	<0.10	2.00		
14.06.2011	962	7.10	3.50	3.92	4.00	1	9	240	11	435	2.78	0.10	0.24	0.01	0.85	3.07	0.48	0.20	<1.00		
25.06.2011	623	7.00	4.44	7.25	5.01	7	16	320	7	555	3.59	0.21	0.25	0.02	1.22	4.17	0.68	0.33	3.00		
05.07.2011	539	7.04	3.30	1.13	4.42	2	8	175	9	425	2.91	0.20	0.15	0.02	0.91	3.99	0.47	0.20	<1.00		
09.08.2011	539	7.12	3.40	1.41	4.30	2	7	190	15	395	2.74	0.10	0.08	0.01	0.75	1.90	0.43	0.20	<1.00	<0.20	<1.60
06.09.2011	1042	7.23	3.67	3.53	5.20	3	10	220	11	430	3.23	0.22	0.14	0.01	0.89	3.05	0.60	0.42	2.50		
04.10.2011	440	7.16	3.78	1.34	4.20	3	10	235	10	460	3.04	0.20	0.10	0.01	0.87	3.04	0.39	<0.10	1.50	<0.20	<1.40
08.11.2011	301	7.16	3.69	0.94	4.20	1	2	240	6	435	3.17	0.10	0.07	0.01	0.84	2.22	0.50	0.32	<1.00		
06.12.2011	285	6.90	3.79	0.86	3.10	1	8	275	6	430	3.08	0.10	0.07	0.01	0.67	2.54	0.40	0.20	1.50		
Lower avg.	405	7.06	3.89	3.11	3.78	3	9	275	17	487	3.05	0.15	0.16	0.01	1.11	3.37	0.50	0.21	0.75	0.00	0.00
Upper avg..	405	7.06	3.89	3.11	3.78	3	9	275	17	487	3.05	0.15	0.16	0.01	1.11	3.37	0.50	0.24	1.38	0.20	1.47
Minimum	186	6.83	3.30	0.76	2.70	1	2	175	6	350	2.33	0.10	0.07	0.01	0.67	1.90	0.32	0.10	1.00	0.20	1.40
Maximum	1042	7.23	5.39	19.00	5.20	15	27	820	40	1100	5.39	0.22	0.47	0.03	2.87	8.65	1.20	0.80	3.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	16	15	15	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	3	3
St.dev	272	0.11	0.58	4.57	0.77	4	6	151	10	172	0.71	0.06	0.12	0.01	0.55	1.68	0.21	0.18	0.62	0.00	0.12

Numedalslågen

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
06.01.2011	105	6.91	2.95	5.45	3.10	9	13	185	69	615	3.08	0.69	2.61	0.11	6.39	36.70	1.30	1.10			
03.02.2011	40	6.78	4.73	8.27	3.90	2	7	240	54	515	3.55	0.10	0.08	0.02	0.67	3.48	0.20	<0.10	<1.00	<0.20	<1.40
07.03.2011	62	6.84	3.20	1.02	2.00	2	5	180	51	340	3.00	0.09	0.09	0.01	0.38	1.90	0.25	<0.10	<1.00		
06.04.2011	203	6.73	4.89	17.90	5.40	13	31	800	29	1090	5.80	0.24	0.62	0.04	1.21	7.78	0.83	0.68	2.50		
09.05.2011	45	7.05	3.71	0.97	3.10	5	5	225	47	455	3.02	0.20	0.14	0.02	0.44	2.76	0.31	0.10	1.00	<0.20	<1.40
07.06.2011	88	7.03	2.87	3.45	4.50	2	8	130	20	335	2.85	0.20	0.16	0.01	0.67	2.36	0.34	<0.10	<1.00		
05.07.2011	155	7.02	2.56	1.84	5.93	2	9	115	6	320	3.12	0.20	0.24	0.01	0.91	3.26	0.42	<0.10	5.00		
03.08.2011	168	6.81	2.53	3.23	5.10	3	8	105	13	305	3.19	0.20	0.28	0.02	0.86	2.88	0.40	0.20	<1.00	<0.20	<1.60
05.09.2011	247	6.84	2.92	5.18	6.20	5	11	195	45	480	4.09	0.29	0.46	0.02	1.84	7.08	0.60	0.35	1.50		
05.10.2011	120	6.89	2.87	3.37	4.20	2	8	175	22	405	3.57	0.20	0.19	0.01	0.63	2.56	0.32	0.10	2.00	<0.20	<1.40
03.11.2011	125	6.82	2.95	1.90	4.50	2	7	195	21	425	3.77	0.10	0.19	0.01	0.48	3.10	0.34	0.10	1.00		
06.12.2011	109	6.94	3.60	3.54	4.00	5	8	270	26	485	4.34	0.20	0.22	0.01	0.57	3.78	0.39	0.20	2.50		
Lower avg.	122	6.89	3.32	4.68	4.33	4	10	235	34	481	3.61	0.23	0.44	0.02	1.25	6.47	0.47	0.24	1.41	0.00	0.00
Upper avg..	122	6.89	3.32	4.68	4.33	4	10	235	34	481	3.61	0.23	0.44	0.02	1.25	6.47	0.47	0.27	1.77	0.20	1.45
Minimum	40	6.73	2.53	0.97	2.00	2	5	105	6	305	2.85	0.09	0.08	0.01	0.38	1.90	0.20	0.10	1.00	0.20	1.40
Maximum	247	7.05	4.89	17.90	6.20	13	31	800	69	1090	5.80	0.69	2.61	0.11	6.39	36.70	1.30	1.10	5.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	4	4
St.dev	63	0.10	0.78	4.65	1.23	3	7	185	19	213	0.83	0.16	0.70	0.03	1.67	9.69	0.31	0.31	1.23	0.00	0.10

Skienselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.01.2011	272	6.63	1.94	0.27	2.50	1	<1	155	11	290	2.27	0.10	0.03	0.01	0.38	1.80	0.20	<0.10	<1.00		
09.02.2011	287	6.71	1.82	0.32	2.40	1	3	150	10	265	2.16	0.10	0.33	<0.01	0.47	2.32	0.20	<0.10	<1.00	<0.20	<1.40
03.03.2011	297	6.69	1.82	2.83	2.20	<1	2	140	9	240	2.16	0.10	0.24	0.01	0.35	1.70	0.20	<0.10	<1.00		
05.04.2011	345	6.75	2.14	1.34	2.40	1	5	165	10	280	2.27	0.10	0.06	0.01	0.28	2.10	0.21	0.20	<1.00		
19.05.2011	92	6.68	2.08	0.70	2.70	<1	4	235	18	400	2.18	0.07	0.05	0.01	0.42	2.41	0.20	<0.10	1.50		
15.06.2011	212	6.84	2.00	1.11	2.40	2	5	150	11	280	2.12	0.07	0.08	0.02	0.58	2.37	0.25	<0.10	1.00		
05.07.2011	397	7.00	2.03	0.79	2.68	1	5	145	15	300	2.09	0.08	0.04	0.01	0.39	1.70	0.20	<0.10	1.50		
11.08.2011	297	6.82	1.99	1.42	4.00	2	6	105	15	290	2.14	0.10	0.09	0.02	0.62	2.52	0.26	<0.10	<1.00	<0.20	<1.60
08.09.2011	720	6.98	2.90	1.94	4.30	3	9	190	17	425	2.65	0.20	0.12	0.01	0.66	3.41	0.31	1.40	2.00		
06.10.2011	297	6.65	1.97	1.42	4.40	2	5	110	17	315	2.48	0.10	0.17	0.02	0.59	2.95	0.21	0.10	1.00	<0.20	<1.40
08.11.2011	341	7.06	2.99	0.86	3.80	2	3	125	12	310	2.29	0.20	0.07	0.01	0.74	2.19	0.20	0.20	<1.00		
05.12.2011	365	6.75	2.03	1.21	3.00	<1	3	145	11	295	2.35	0.10	0.14	0.01	0.42	2.33	0.21	0.20	<1.00		
Lower avg.	327	6.80	2.14	1.18	3.06	1	4	151	13	308	2.26	0.11	0.12	0.01	0.49	2.32	0.22	0.18	0.58	0.00	0.00
Upper avg..	327	6.80	2.14	1.18	3.06	2	4	151	13	308	2.26	0.11	0.12	0.01	0.49	2.32	0.22	0.23	1.17	0.20	1.47
Minimum	92	6.63	1.82	0.27	2.20	1	1	105	9	240	2.09	0.07	0.03	0.01	0.28	1.70	0.20	0.10	1.00	0.20	1.40
Maximum	720	7.06	2.99	2.83	4.40	3	9	235	18	425	2.65	0.20	0.33	0.02	0.74	3.41	0.31	1.40	2.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	3	3
St.dev	147	0.15	0.39	0.71	0.82	1	2	35	3	53	0.17	0.04	0.09	0.01	0.14	0.50	0.04	0.37	0.33	0.00	0.12

Otra

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
11.01.2011	89	6.23	2.69	1.08	2.50	3	6	315	110	685	1.57	0.07	0.43	0.03	2.46	7.32	0.52	0.10	2.00		
08.02.2011	117	6.32	2.18	0.85	2.30	<1	3	125	17	250	1.96	0.10	0.18	0.03	1.10	3.52	0.32	<0.10	<1.00	<0.20	<1.40
03.03.2011	118	6.17	1.97	0.48	1.70	<1	3	105	14	200	1.64	0.08	0.15	0.01	1.03	2.56	0.26	<0.10	<1.00		
06.04.2011	231	6.03	1.96	1.57	3.20	2	4	140	17	305	1.93	0.10	0.34	0.04	1.64	4.22	0.57	0.10	<1.00		
04.05.2011	114	6.27	1.34	0.87	2.10	<1	3	79	3	195	1.05	0.10	0.16	0.02	1.49	2.15	0.43	<0.10	<1.00		
07.06.2011	198	6.14	1.57	1.23	3.10	<1	5	125	12	245	1.48	0.10	0.28	0.02	0.84	3.16	0.52	<0.10	<1.00		
05.07.2011	174	6.37	1.35	0.81	2.47	<1	4	63	6	185	1.11	0.10	0.17	0.01	1.07	2.56	0.38	<0.10	5.50		
09.08.2011	136	6.03	1.60	1.25	4.40	2	6	66	11	265	1.54	0.20	0.36	0.02	1.99	3.56	0.56	0.20	1.00	<0.50	
12.09.2011	248	5.80	1.67	1.15	6.30	1	5	68	15	325	1.99	0.22	0.55	0.02	1.23	5.79	1.20	0.10	2.00		
03.10.2011	60	6.10	1.54	1.14	4.00	1	7	82	12	295	1.73	0.20	0.26	0.02	1.18	3.25	0.66	0.10	2.00	<0.20	<1.40
07.11.2011	175	5.97	1.54	1.01	4.10	1	3	97	24	305	2.03	0.10	0.32	0.02	0.68	3.40	0.64	0.10	1.00		
07.12.2011	219	5.62	1.63	0.84	3.50	2	3	105	12	275	2.09	0.10	0.31	0.03	0.67	3.90	0.76	0.20	1.50		
Lower avg.	157	6.09	1.75	1.02	3.31	1	4	114	21	294	1.68	0.12	0.29	0.02	1.28	3.78	0.57	0.08	1.25	0.00	0.00
Upper avg..	157	6.09	1.75	1.02	3.31	1	4	114	21	294	1.68	0.12	0.29	0.02	1.28	3.78	0.57	0.12	1.67	0.30	1.40
Minimum	60	5.62	1.34	0.48	1.70	1	3	63	3	185	1.05	0.07	0.15	0.01	0.67	2.15	0.26	0.10	1.00	0.20	1.40
Maximum	248	6.37	2.69	1.57	6.30	3	7	315	110	685	2.09	0.22	0.55	0.04	2.46	7.32	1.20	0.20	5.50	0.50	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	3	2
St.dev	60	0.22	0.39	0.28	1.27	1	1	68	29	131	0.35	0.05	0.12	0.01	0.54	1.46	0.25	0.04	1.29	0.17	0.00

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Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.01.2011	20	7.40	19.77	2.16	5.70	41	64	1150	140	2020	4.41	0.22	0.14	0.01	1.89	5.07	1.20	0.46	<1.00		
01.02.2011	8	7.43	18.10	1.78	5.50	33	62	1150	130	1900	3.98	0.31	0.13	0.02	1.85	5.46	1.00	<0.10	1.50	<0.20	<1.40
07.03.2011	2	7.37	17.40	3.55	5.10	10	50	1150	18	1820	3.19	0.20	0.17	0.01	1.96	6.23	1.00	0.38	<1.00		
05.04.2011	5	7.46	17.60	13.90	5.70	12	85	760	36	1540	0.53	0.29	1.62	0.03	72.40	38.70	1.20	0.37	1.00		
16.05.2011	1	7.76	19.70	5.39	5.40	4	43	5	36	655	0.26	0.23	0.13	0.01	2.29	5.95	1.20	0.10	<1.00	<0.20	<1.40
06.06.2011	3	7.66	19.00	6.47	6.60	6	44	3	66	785	0.47	0.26	0.16	0.01	1.14	1.00	0.92	<0.10	<1.00		
04.07.2011	6	8.53	20.50	10.20	6.08	10	56	2	62	730	0.60	0.29	0.08	0.01	1.12	1.10	0.97	0.20	1.50		
02.08.2011	2	7.40	17.20	10.30	6.80	18	48	415	45	1440	3.14	0.21	0.08	0.02	1.60	1.60	1.20	<0.10	<1.00	<0.20	<1.60
05.09.2011	6	7.49	18.10	8.04	6.80	26	88	420	88	1390	5.22	0.30	0.14	0.02	1.69	2.22	1.10	0.20	1.00		
04.10.2011	3	7.73	17.70	9.92	6.30	21	80	205	22	1320	5.39	0.23	0.17	0.01	1.52	2.14	0.93	<0.10	2.00	<0.20	<1.40
01.11.2011	8	7.59	17.00	13.90	6.80	34	77	985	34	1840	5.22	0.27	0.30	0.02	1.69	3.20	1.20	0.10	3.50		
05.12.2011	11	6.98	18.90	22.00	6.60	37	131	1050	44	2100	1.76	0.09	0.03	0.01	0.41	0.83	0.26	0.10	5.50		
Lower avg.	6	7.57	18.41	8.97	6.11	21	69	608	60	1462	2.85	0.24	0.26	0.01	7.46	6.13	1.01	0.16	1.33	0.00	0.00
Upper avg..	6	7.57	18.41	8.97	6.11	21	69	608	60	1462	2.85	0.24	0.26	0.01	7.46	6.13	1.01	0.19	1.75	0.20	1.45
Minimum	1	6.98	17.00	1.78	5.10	4	43	2	18	655	0.26	0.09	0.03	0.01	0.41	0.83	0.26	0.10	1.00	0.20	1.40
Maximum	20	8.53	20.50	22.00	6.80	41	131	1150	140	2100	5.39	0.31	1.62	0.03	72.40	38.70	1.20	0.46	5.50	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	5	0.37	1.14	5.80	0.62	13	25	484	40	510	2.04	0.06	0.43	0.01	20.46	10.46	0.26	0.13	1.39	0.00	0.10

Vosso(Bolstadelvi)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.01.2011	5	6.40	1.55	0.15	0.84	<1	<1	115	5	200	0.73	0.08	0.03	0.01	0.25	0.92	0.28	<0.10	<1.00		
31.01.2011	9	6.33	1.47	0.78	1.20	1	4	145	<2	250	1.16	0.10	0.08	0.01	1.36	1.70	0.31	1.80	<1.00	<0.20	<1.40
15.03.2011	11	6.42	1.59	0.27	1.00	1	3	155	10	260	0.94	0.05	0.05	0.01	0.39	1.30	0.31	0.10	<1.00		
05.04.2011	151	6.39	2.13	1.68	1.50	4	6	225	10	350	1.28	0.10	0.09	0.01	0.31	1.50	0.42	0.20	<1.00		
02.05.2011 14:00:00		6.33	2.08	0.78	1.50	2	5	215	14	320	1.30	0.05	0.08	0.02	0.43	1.60	0.37	<0.10	<1.00		
06.06.2011	297	6.53	1.38	0.73	1.10	<1	2	110	7	200	1.01	<0.05	0.06	0.01	0.48	1.20	0.28	<0.10	1.00		
05.07.2011	190	6.36	0.98	0.62	0.96	<1	4	75	7	175	0.68	0.20	0.06	0.01	0.44	1.70	0.26	<0.10	1.00		
01.08.2011	50	6.50	0.97	0.81	1.20	1	1	70	7	190	0.75	0.08	0.19	0.01	0.48	1.20	0.33	<0.10	9.00	<0.20	<1.60
05.09.2011	98	6.57	1.08	0.48	1.40	<1	4	69	7	175	0.81	0.07	0.06	0.01	0.35	0.69	0.26	0.26	5.00		
04.10.2011	145	6.37	1.35	0.61	2.20	1	5	100	9	240	1.26	0.09	0.08	<0.01	0.44	1.10	0.20	<0.10	1.50	<0.20	<1.40
07.11.2011	152	6.52	1.30	0.47	1.40	1	3	125	8	240	1.11	0.07	0.05	<0.01	0.26	1.00	0.29	<0.10	<1.00		
05.12.2011	102	6.49	1.50	1.05	1.20	3	8	150	9	240	1.22	0.09	0.32	0.01	0.33	1.70	0.33	0.10	2.50		
Lower avg.	110	6.43	1.45	0.70	1.29	1	4	130	8	237	1.02	0.08	0.10	0.01	0.46	1.30	0.30	0.21	1.67	0.00	0.00
Upper avg..	110	6.43	1.45	0.70	1.29	2	4	130	8	237	1.02	0.09	0.10	0.01	0.46	1.30	0.30	0.26	2.17	0.20	1.47
Minimum	5	6.33	0.97	0.15	0.84	1	1	69	2	175	0.69	0.05	0.03	0.01	0.25	0.69	0.20	0.10	1.00	0.20	1.40
Maximum	297	6.57	2.13	1.68	2.20	4	8	225	14	350	1.31	0.20	0.32	0.02	1.36	1.70	0.42	1.80	9.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	3	3
St.dev	90	0.08	0.37	0.39	0.36	1	2	52	3	55	0.23	0.04	0.08	0.00	0.29	0.34	0.06	0.49	2.45	0.00	0.12

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Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.01.2011	16	7.43	5.47	0.46	1.90	2	3	140	19	290	2.59	0.09	0.02	0.02	3.18	8.70	0.76	0.30	4.00		
07.02.2011	51	7.52	6.29	0.81	2.20	1	4	160	10	330	2.91	0.06	0.02	0.05	7.24	18.10	0.70	<0.10	10.00	<0.20	<1.40
07.03.2011	27	7.37	9.10	0.98	2.20	2	4	265	12	415	3.66	0.09	0.03	0.06	7.60	23.80	0.77	0.20	<1.00		
04.04.2011	67	7.33	8.45	3.45	4.10	3	9	285	10	485	3.47	0.20	0.09	0.11	12.50	37.40	1.20	0.68	<1.00		
09.05.2011	257	7.21	3.41	10.80	3.70	4	14	69	3	255	2.25	0.20	0.15	0.03	5.90	9.00	1.30	0.92	<1.00	<0.20	<1.40
09.06.2011	94	7.11	3.85	1.89	2.10	<1	3	66	4	175	1.71	0.10	0.03	0.02	3.91	6.66	0.52	0.20	1.50		
05.07.2011	84	7.40	4.55	2.24	5.93	2	8	110	<2	295	2.61	0.20	0.06	0.04	7.92	14.70	0.97	0.30	1.50		
04.08.2011	104	7.30	5.05	3.27	4.00	2	8	94	<2	275	3.14	0.25	0.08	0.03	6.65	10.20	1.40	0.87	2.00	<0.20	<1.60
06.09.2011	65	7.56	5.80	0.76	2.80	<1	3	150	4	295	2.72	0.10	0.02	0.04	6.11	11.00	0.75	0.37	3.50		
10.10.2011	61	7.47	6.04	0.79	5.00	<1	6	180	3	375	3.17	0.10	0.02	0.03	5.62	7.48	0.54	0.20	5.50	<0.20	<1.40
10.11.2011	47	7.27	5.59	0.69	2.60	<1	4	155	6	275	3.02	0.06	0.03	0.02	4.08	6.07	0.70	0.36	<1.00		
06.12.2011	57	7.09	6.85	0.72	2.50	1	6	245	6	395	3.49	0.09	0.01	0.04	5.41	12.60	0.83	0.20	2.00		
Lower avg.	78	7.34	5.87	2.24	3.25	1	6	160	6	322	2.89	0.13	0.05	0.04	6.34	13.81	0.87	0.38	2.50	0.00	0.00
Upper avg..	78	7.34	5.87	2.24	3.25	2	6	160	7	322	2.89	0.13	0.05	0.04	6.34	13.81	0.87	0.39	2.83	0.20	1.45
Minimum	16	7.09	3.41	0.46	1.90	1	3	66	2	175	1.71	0.06	0.01	0.02	3.18	6.07	0.52	0.10	1.00	0.20	1.40
Maximum	257	7.56	9.10	10.80	5.93	4	14	285	19	485	3.66	0.25	0.15	0.11	12.50	37.40	1.40	0.92	10.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	62	0.15	1.68	2.89	1.29	1	3	73	5	83	0.56	0.07	0.04	0.03	2.44	9.04	0.29	0.28	2.67	0.00	0.10

Vefsna

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
06.01.2011	37	7.68	9.65	0.19	1.20	<1	2	125	3	245	2.09	0.10	0.02	<0.01	0.51	2.15	0.25	0.20	<1.00		
08.02.2011	62	7.52	8.48	1.79	2.20	<1	3	130	3	265	1.94	0.10	0.03	<0.01	0.38	0.66	0.20	<0.10	<1.00	<0.20	<1.70
04.03.2011	102	7.35	7.20	3.94	2.60	3	7	54	2	155	1.80	0.20	0.13	<0.01	0.52	1.50	0.49	0.30	<1.00		
07.04.2011	153	7.36	7.25	5.30	2.30	4	8	30	4	125	1.64	0.20	0.15	0.02	0.53	1.30	0.43	0.37	<1.00		
06.05.2011	166	7.48	6.17	1.40	1.90	<1	2	48	<2	128	1.39	0.10	0.04	<0.01	0.38	0.35	0.30	0.10	1.50	<0.20	<1.40
07.06.2011	925	7.00	3.08	2.94	1.20	2	6	23	3	96	1.03	0.10	0.08	<0.01	0.37	0.52	0.24	<0.10	1.00		
14.07.2011	148	7.24	2.82	0.63	0.64	<1	3	19	3	67	0.66	0.10	0.04	<0.01	0.22	0.30	0.20	0.10	<1.00		
18.08.2011	332	6.98	3.56	3.20	3.10	6	8	16	3	160	1.63	0.22	0.31	0.01	0.71	1.10	0.62	0.20	<1.00	<0.20	<1.60
06.09.2011	155	7.53	4.76	1.57	1.10	1	6	25	5	111	1.24	0.10	0.05	0.01	0.34	0.36	0.27	0.32	3.00		
04.10.2011	345	7.46	4.75	1.47	2.40	<1	4	28	6	185	1.54	0.10	0.05	<0.01	0.39	0.33	0.21	0.10	1.50	<0.20	<1.40
03.11.2011	435	7.22	4.30	3.31	1.90	2	3	64	8	170	1.45	0.10	0.09	<0.01	0.46	0.52	0.28	0.20	1.00		
01.12.2011	141	6.76	7.44	0.70	1.90	<1	<1	62	8	195	4.47	0.37	1.04	0.04	1.95	6.82	1.20	0.44	<1.00		
Lower avg.	250	7.30	5.79	2.20	1.87	2	4	52	4	159	1.74	0.15	0.17	0.01	0.56	1.33	0.39	0.19	0.67	0.00	0.00
Upper avg..	250	7.30	5.79	2.20	1.87	2	4	52	4	159	1.74	0.15	0.17	0.01	0.56	1.33	0.39	0.21	1.25	0.20	1.52
Minimum	37	6.76	2.82	0.19	0.64	1	1	16	2	67	0.66	0.10	0.02	0.01	0.22	0.30	0.20	0.10	1.00	0.20	1.40
Maximum	925	7.68	9.65	5.30	3.10	6	8	130	8	265	4.47	0.37	1.04	0.04	1.95	6.82	1.20	0.44	3.00	0.20	1.70
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	244	0.27	2.23	1.54	0.72	2	2	39	2	58	0.94	0.08	0.29	0.01	0.45	1.83	0.29	0.12	0.58	0.00	0.15

Altaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.01.2011	27	7.30	8.11	14.30	3.50	10	15	80	5	345	5.88	0.20	0.49	0.04	2.43	11.20	0.66	0.76	<1.00		
10.02.2011	24	7.40	7.44	0.98	2.80	2	4	63	2	240	5.46	0.08	0.06	<0.01	0.64	2.53	0.20	0.20	<1.00	<0.20	<1.40
09.03.2011	24	7.13	7.85	0.66	2.80	3	5	69	2	190	5.75	0.10	0.24	0.03	2.03	14.00	0.69	0.47	<1.00		
06.04.2011	32	7.49	7.71	2.59	2.80	1	8	47	9	200	5.05	0.10	0.16	0.04	2.02	5.38	0.29	0.34	<1.00		
10.05.2011	90	7.54	8.42	0.61	2.90	<1	4	68	7	195	5.90	0.10	0.01	<0.01	0.39	0.27	0.20	0.30	1.50	<0.20	<1.40
10.06.2011	396	7.04	3.05	0.97	2.20	1	7	12	4	129	2.11	0.06	0.03	0.01	0.47	0.32	0.32	0.10	<1.00		
08.07.2011	90	7.38	4.80	0.55	3.00	1	5	<1	4	155	3.00	0.10	0.01	<0.01	0.50	0.20	0.21	0.30	<1.00		
11.08.2011	53	7.53	5.42	0.75	2.90	<1	5	14	6	148	3.12	0.09	<0.01	<0.01	0.47	0.10	0.20	<0.10	1.00	<0.20	<1.60
12.09.2011	61	7.42	5.83	0.87	2.80	1	4	11	4	160	3.21	0.10	<0.01	<0.01	0.47	0.41	0.24	0.10	3.00		
11.10.2011	189	7.42	5.72	0.89	3.00	1	5	<1	2	185	3.87	0.10	0.01	<0.01	0.16	0.10	0.21	<0.10	1.50	<0.20	<1.40
10.11.2011	128	7.20	5.49	0.51	3.20	1	3	4	<2	175	4.64	0.20	0.01	<0.01	1.78	0.08	0.20	0.20	<1.00		
08.12.2011	53	6.89	5.75	0.34	3.50	2	5	36	<2	200	5.22	0.10	0.01	<0.01	0.35	0.20	0.20	0.30	2.50		
Lower avg.	97	7.31	6.30	2.00	2.95	2	6	34	4	194	4.43	0.11	0.08	0.01	0.98	2.90	0.30	0.26	0.79	0.00	0.00
Upper avg..	97	7.31	6.30	2.00	2.95	2	6	34	4	194	4.43	0.11	0.09	0.01	0.98	2.90	0.30	0.27	1.38	0.20	1.45
Minimum	24	6.89	3.05	0.34	2.20	1	3	1	2	129	2.11	0.06	0.01	0.01	0.16	0.08	0.20	0.10	1.00	0.20	1.40
Maximum	396	7.54	8.42	14.30	3.50	10	15	80	9	345	5.91	0.20	0.49	0.04	2.43	14.00	0.69	0.76	3.00	0.20	1.60
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	106	0.21	1.61	3.92	0.35	3	3	30	2	56	1.32	0.04	0.15	0.01	0.82	4.83	0.18	0.19	0.68	0.00	0.10

Tista utløp Femsjøen

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.02.2011	9	6.68	5.69	1.09	9.30	6	15	535	3	885	4.28	0.31	0.20	0.02	1.28	3.33	0.75	<0.10	<1.00		
09.05.2011	20	6.97	5.12	4.32	8.50	5	17	460	6	855	3.51	0.30	0.25	0.02	3.40	3.50	0.75	0.38	1.50		
08.08.2011	22	6.96	5.23	1.57	8.70	3	11	505	16	860	2.89	0.28	0.18	0.02	1.24	18.60	0.65	0.31	<1.00		
03.10.2011	36	6.73	5.00	1.73	10.10	4	11	485	13	840	3.19	0.29	0.21	0.02	1.19	15.10	0.58	0.30	<1.00		
Lower avg.	22	6.84	5.26	2.18	9.15	5	14	496	10	860	3.47	0.30	0.21	0.02	1.78	10.13	0.68	0.25	0.38		
Upper avg..	22	6.84	5.26	2.18	9.15	5	14	496	10	860	3.47	0.30	0.21	0.02	1.78	10.13	0.68	0.27	1.12		
Minimum	9	6.68	5.00	1.09	8.50	3	11	460	3	840	2.89	0.28	0.18	0.02	1.19	3.33	0.58	0.10	1.00		
Maximum	36	6.97	5.69	4.32	10.10	6	17	535	16	885	4.28	0.31	0.25	0.02	3.40	18.60	0.75	0.38	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	11	0.15	0.30	1.45	0.72	1	3	32	6	19	0.60	0.01	0.03	0.00	1.08	7.89	0.08	0.12	0.25		

Tokkeelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
02.02.2011	6	6.02	2.03	0.89	7.30	2	8	155	10	395	3.06	0.22	0.25	0.03	0.64	6.36	0.43	<0.10	<1.00		
04.05.2011	19	6.30	2.09	1.36	6.10	1	6	155	3	365	2.95	0.20	0.25	0.05	0.53	5.76	0.44	0.10	<1.00		
08.08.2011	40	6.57	2.01	0.58	6.00	<1	5	110	13	360	2.70	0.23	0.27	0.03	0.62	5.06	0.45	0.20	<1.00		
19.10.2011	24	6.01	1.70	1.24	8.20	2	7	81	3	355	3.02	0.22	0.34	0.03	0.41	6.03	0.42	0.10	2.00		
Lower avg.	22	6.22	1.96	1.02	6.90	1	7	125	7	369	2.93	0.22	0.28	0.04	0.55	5.80	0.44	0.10	0.50		
Upper avg..	22	6.22	1.96	1.02	6.90	2	7	125	7	369	2.93	0.22	0.28	0.04	0.55	5.80	0.44	0.12	1.25		
Minimum	6	6.01	1.70	0.58	6.00	1	5	81	3	355	2.70	0.20	0.25	0.03	0.41	5.06	0.42	0.10	1.00		
Maximum	40	6.57	2.09	1.36	8.20	2	8	155	13	395	3.06	0.23	0.34	0.05	0.64	6.36	0.45	0.20	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	14	0.27	0.18	0.35	1.05	1	1	36	5	18	0.16	0.01	0.05	0.01	0.11	0.55	0.01	0.05	0.50		

Nidelva(Rykene)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
31.01.2011	32	6.39	2.35	0.40	3.00	1	4	190	19	375	2.57	0.23	0.16	0.03	0.74	4.06	0.20	<0.10	<1.00		
04.05.2011	114	6.61	2.08	1.20	3.70	<1	4	125	11	305	1.99	0.21	0.26	0.05	0.54	3.85	0.24	0.10	<1.00		
08.08.2011	193	6.74	2.09	1.77	4.70	2	7	135	10	355	2.12	0.20	0.31	0.02	0.82	3.97	0.27	0.10	1.50		
24.10.2011	79	6.72	2.20	1.36	4.10	2	6	150	9	350	2.48	0.20	0.28	0.03	1.18	5.77	0.30	0.20	2.50		
Lower avg.	104	6.62	2.18	1.18	3.88	1	5	150	12	346	2.29	0.21	0.25	0.03	0.82	4.41	0.25	0.10	1.00		
Upper avg..	104	6.62	2.18	1.18	3.88	2	5	150	12	346	2.29	0.21	0.25	0.03	0.82	4.41	0.25	0.12	1.50		
Minimum	32	6.39	2.08	0.40	3.00	1	4	125	9	305	1.99	0.20	0.16	0.02	0.54	3.85	0.20	0.10	1.00		
Maximum	193	6.74	2.35	1.77	4.70	2	7	190	19	375	2.57	0.23	0.31	0.05	1.18	5.77	0.30	0.20	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	68	0.16	0.13	0.57	0.71	1	2	29	5	30	0.28	0.01	0.06	0.01	0.27	0.91	0.04	0.05	0.71		

Tovdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
08.02.2011	51	6.46	2.67	6.85	5.30	7	14	185	53	485	2.95	0.25	0.54	0.04	0.76	7.06	0.45	0.20	<1.00		
04.05.2011	49	6.75	2.06	1.51	4.00	<1	4	120	9	310	1.99	0.21	0.35	0.04	0.48	3.82	0.30	<0.10	<1.00		
09.08.2011	102	6.19	1.79	1.91	7.80	<1	9	46	22	340	1.82	0.28	0.65	0.04	3.60	5.28	0.40	0.20	1.00		
09.10.2011	48	6.43	2.01	1.74	7.50	1	6	75	17	325	2.20	0.23	0.56	0.03	0.42	4.39	0.33	0.31	2.50		
Lower avg.	63	6.46	2.13	3.00	6.15	2	8	107	25	365	2.24	0.24	0.53	0.04	1.31	5.14	0.37	0.18	0.88		
Upper avg..	63	6.46	2.13	3.00	6.15	3	8	107	25	365	2.24	0.24	0.53	0.04	1.31	5.14	0.37	0.20	1.38		
Minimum	48	6.19	1.79	1.51	4.00	1	4	46	9	310	1.82	0.21	0.35	0.03	0.42	3.82	0.30	0.10	1.00		
Maximum	102	6.75	2.67	6.85	7.80	7	14	185	53	485	2.95	0.28	0.65	0.04	3.60	7.06	0.45	0.31	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	26	0.23	0.38	2.57	1.82	3	4	61	19	81	0.50	0.03	0.13	0.00	1.53	1.42	0.07	0.09	0.75		

Mandalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
09.02.2011	70	6.05	2.69	1.42	5.10	2	7	210	32	455	2.52	0.20	0.58	0.05	2.14	6.15	0.26	0.30	<1.00		
11.05.2011	135	6.78	2.06	0.88	3.40	<1	6	150	18	305	1.35	0.20	0.38	0.02	1.10	2.87	0.20	<0.10	9.00		
08.08.2011	97	6.31	1.75	3.90	5.90	3	12	98	21	410	1.39	0.29	0.63	0.04	5.51	5.21	0.37	0.20	<1.00		
09.10.2011	75	6.22	1.83	4.39	6.30	4	11	120	6	350	1.58	0.21	0.71	0.03	0.45	3.96	0.10	0.20	2.00		
Lower avg.	94	6.34	2.08	2.65	5.18	2	9	145	19	380	1.71	0.22	0.58	0.03	2.30	4.55	0.23	0.18	2.75		
Upper avg..	94	6.34	2.08	2.65	5.18	3	9	145	19	380	1.71	0.22	0.58	0.03	2.30	4.55	0.23	0.20	3.25		
Minimum	70	6.05	1.75	0.88	3.40	1	6	98	6	305	1.35	0.20	0.38	0.02	0.45	2.87	0.10	0.10	1.00		
Maximum	135	6.78	2.69	4.39	6.30	4	12	210	32	455	2.52	0.29	0.71	0.05	5.51	6.15	0.37	0.30	9.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	30	0.31	0.43	1.76	1.28	1	3	49	11	66	0.55	0.04	0.14	0.01	2.25	1.43	0.11	0.08	3.86		

Lyngdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
09.02.2011	45	6.10	3.01	1.29	3.80	1	5	230	19	490	2.31	0.20	0.42	0.05	0.94	6.44	0.20	<0.10	<1.00		
11.05.2011	33	6.67	2.54	2.69	3.40	1	6	165	3	325	1.16	0.20	0.92	0.03	0.70	4.83	0.10	<0.10	<1.00		
08.08.2011	31	6.48	2.11	2.51	7.20	2	8	115	4	410	1.56	0.26	0.74	0.04	1.79	4.56	0.20	0.10	<1.00		
09.10.2011	31	6.29	2.37	3.97	6.00	3	21	115	8	425	1.86	0.21	0.67	0.03	0.34	4.39	0.07	0.20	1.50		
Lower avg.	35	6.38	2.51	2.62	5.10	2	10	156	9	413	1.72	0.22	0.69	0.04	0.94	5.06	0.14	0.08	0.38		
Upper avg..	35	6.38	2.51	2.62	5.10	2	10	156	9	413	1.72	0.22	0.69	0.04	0.94	5.06	0.14	0.12	1.12		
Minimum	31	6.10	2.11	1.29	3.40	1	5	115	3	325	1.16	0.20	0.42	0.03	0.34	4.39	0.07	0.10	1.00		
Maximum	45	6.67	3.01	3.97	7.20	3	21	230	19	490	2.31	0.26	0.92	0.05	1.79	6.44	0.20	0.20	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	7	0.25	0.38	1.10	1.81	1	7	55	7	68	0.49	0.03	0.21	0.01	0.62	0.94	0.07	0.05	0.25		

Kvina

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
09.02.2011	64	5.94	3.09	1.32	4.80	3	8	210	26	460	2.37	0.20	0.51	0.04	1.60	5.86	0.20	0.10	<1.00		
11.05.2011	124	6.64	2.21	1.28	3.30	<1	8	84	13	280	0.28	0.20	0.35	0.02	2.54	2.61	0.20	<0.10	1.00		
08.08.2011	59	5.91	2.07	3.24	8.40	3	12	125	10	475	1.39	0.28	1.08	0.04	0.78	4.67	0.20	0.10	4.50		
09.10.2011	67	6.07	2.34	1.16	7.00	2	8	105	2	360	2.02	0.30	0.92	0.03	1.40	4.83	0.20	0.30	1.50		
Lower avg.	79	6.14	2.43	1.75	5.88	2	9	131	13	394	1.52	0.24	0.72	0.03	1.58	4.49	0.20	0.12	1.75		
Upper avg..	79	6.14	2.43	1.75	5.88	2	9	131	13	394	1.52	0.24	0.72	0.03	1.58	4.49	0.20	0.15	2.00		
Minimum	59	5.91	2.07	1.16	3.30	1	8	84	2	280	0.28	0.20	0.35	0.02	0.78	2.61	0.20	0.10	1.00		
Maximum	124	6.64	3.09	3.24	8.40	3	12	210	26	475	2.38	0.30	1.08	0.04	2.54	5.86	0.20	0.30	4.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	31	0.34	0.46	1.00	2.27	1	2	55	10	91	0.92	0.05	0.34	0.01	0.73	1.36	0.00	0.10	1.68		

Sira

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
09.02.2011	146	5.65	1.21	0.63	1.70	<1	3	110	24	240	0.94	0.10	0.28	0.02	0.60	2.22	0.10	<0.10	<1.00		
11.05.2011	229	5.78	1.26	0.66	1.80	<1	6	115	29	295	1.01	0.10	0.25	0.01	1.52	2.51	0.10	<0.10	<1.00		
08.08.2011	104	5.68	1.41	0.85	3.00	<1	4	105	20	280	0.94	0.10	0.51	0.02	1.92	2.81	0.10	0.10	2.00		
09.10.2011	163	5.64	1.35	0.79	3.80	1	5	93	21	255	1.09	0.10	0.43	0.01	0.27	1.90	<0.05	0.10	2.00		
Lower avg.	161	5.69	1.31	0.73	2.58	0	5	106	24	268	0.99	0.10	0.37	0.02	1.08	2.36	0.08	0.05	1.00		
Upper avg..	161	5.69	1.31	0.73	2.58	1	5	106	24	268	0.99	0.10	0.37	0.02	1.08	2.36	0.09	0.10	1.50		
Minimum	104	5.64	1.21	0.63	1.70	1	3	93	20	240	0.94	0.10	0.25	0.01	0.27	1.90	0.05	0.10	1.00		
Maximum	229	5.78	1.41	0.85	3.80	1	6	115	29	295	1.09	0.10	0.51	0.02	1.92	2.81	0.10	0.10	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	52	0.06	0.09	0.11	1.01	0	1	9	4	25	0.07	0.00	0.12	0.01	0.77	0.39	0.03	0.00	0.58		

Bjerkreimselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
08.02.2011	65	6.32	3.82	0.99	1.70	6	12	400	42	595	1.58	0.08	0.19	0.01	0.30	3.15	0.20	<0.10	1.50		
04.05.2011	51	6.56	2.95	0.63	1.40	2	12	295	4	415	1.37	0.10	0.17	0.03	0.28	2.86	0.21	<0.10	<1.00		
15.08.2011	29	6.46	2.94	0.69	1.80	2	4	330	<2	495	1.22	0.10	0.16	0.02	0.28	1.70	0.10	<0.10	<1.00		
11.10.2011	74	6.42	3.06	0.46	1.90	2	4	340	6	455	1.55	0.20	0.21	0.02	0.27	2.43	0.06	<0.10	1.00		
Lower avg.	55	6.44	3.19	0.69	1.70	3	8	341	13	490	1.43	0.12	0.18	0.02	0.28	2.54	0.14	0.00	0.62		
Upper avg..	55	6.44	3.19	0.69	1.70	3	8	341	14	490	1.43	0.12	0.18	0.02	0.28	2.54	0.14	0.10	1.12		
Minimum	29	6.32	2.94	0.46	1.40	2	4	295	2	415	1.22	0.08	0.16	0.01	0.27	1.70	0.06	0.10	1.00		
Maximum	74	6.56	3.82	0.99	1.90	6	12	400	42	595	1.58	0.20	0.21	0.03	0.30	3.15	0.21	0.10	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	19	0.10	0.42	0.22	0.22	2	5	44	19	77	0.17	0.05	0.02	0.01	0.01	0.63	0.07	0.00	0.25		

Figgjoelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
01.02.2011	6	7.12	12.20	19.30	3.80	41	109	1100	100	1630	4.39	0.25	1.05	0.03	1.68	8.80	0.65	<0.10	2.50		
16.05.2011	5	7.42	12.70	4.19	3.20	5	21	1050	14	1410	2.20	0.20	0.53	0.02	3.77	10.10	1.00	0.30	1.00		
02.08.2011	5	7.20	10.60	1.71	3.40	6	17	960	12	1350	2.11	0.10	0.16	0.01	0.84	2.47	0.46	0.20	1.00		
10.10.2011	9	6.93	8.81	2.21	5.20	26	45	840	34	1385	2.95	0.10	0.34	0.01	1.36	5.17	0.45	0.30	2.50		
Lower avg.	6	7.17	11.08	6.85	3.90	20	48	988	40	1444	2.91	0.16	0.52	0.02	1.91	6.64	0.64	0.20	1.75		
Upper avg..	6	7.17	11.08	6.85	3.90	20	48	988	40	1444	2.91	0.16	0.52	0.02	1.91	6.64	0.64	0.23	1.75		
Minimum	5	6.93	8.81	1.71	3.20	5	17	840	12	1350	2.11	0.10	0.16	0.01	0.84	2.47	0.45	0.10	1.00		
Maximum	9	7.42	12.70	19.30	5.20	41	109	1100	100	1630	4.39	0.25	1.05	0.03	3.77	10.10	1.00	0.30	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	2	0.20	1.76	8.37	0.90	17	43	114	41	127	1.05	0.08	0.39	0.01	1.29	3.47	0.26	0.10	0.87		

Lyseelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
06.02.2011	15	6.29	3.56	<0.10	0.72	<1	2	155	<2	210	2.04	<0.05	0.07	0.01	0.27	3.75	0.10	<0.10	<1.00		
08.05.2011	15	6.38	1.38	0.27	0.75	<1	2	73	<2	113	0.83	<0.05	0.14	0.01	0.32	2.99	0.09	<0.10	<1.00		
07.08.2011	6	6.49	1.19	0.37	2.30	<1	4	80	5	200	1.13	0.07	0.28	0.04	0.49	5.10	0.08	0.10	4.00		
16.10.2011	17	6.43	1.76	<0.10	0.85	<1	2	89	<2	149	1.81	<0.05	0.09	0.01	0.20	1.40	<0.05	0.20	1.00		
Lower avg.	13	6.40	1.97	0.16	1.15	0	3	99	1	168	1.45	0.02	0.14	0.02	0.32	3.31	0.07	0.08	1.25		
Upper avg..	13	6.40	1.97	0.21	1.15	1	3	99	3	168	1.45	0.06	0.14	0.02	0.32	3.31	0.08	0.12	1.75		
Minimum	6	6.29	1.19	0.10	0.72	1	2	73	2	113	0.83	0.05	0.07	0.01	0.20	1.40	0.05	0.10	1.00		
Maximum	17	6.49	3.56	0.37	2.30	1	4	155	5	210	2.04	0.07	0.28	0.04	0.49	5.10	0.10	0.20	4.00		
More than 70%LOD	yes	yes	yes	no	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	5	0.09	1.09	0.13	0.77	0	1	38	2	45	0.56	0.01	0.09	0.01	0.13	1.54	0.02	0.05	1.50		

Årdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
15.02.2011	18	6.41	3.35	0.25	1.20	1	3	325	<2	415	2.42	0.08	0.06	<0.01	0.24	2.00	0.10	0.49	<1.00		
10.05.2011	58	6.54	1.68	0.56	1.00	<1	3	92	3	170	0.75	0.07	0.12	0.01	0.30	1.50	0.10	0.10	<1.00		
16.08.2011	13	6.48	2.04	0.43	1.60	<1	2	140	3	270	1.28	0.06	0.13	0.01	0.44	1.90	0.10	<0.10	1.00		
11.10.2011	86	5.94	2.48	0.64	3.20	<1	2	96	<2	215	2.07	0.20	0.21	0.01	0.24	1.70	0.06	<0.10	1.50		
Lower avg.	44	6.34	2.39	0.47	1.75	0	3	163	2	268	1.63	0.10	0.13	0.01	0.31	1.78	0.09	0.15	0.62		
Upper avg..	44	6.34	2.39	0.47	1.75	1	3	163	3	268	1.63	0.10	0.13	0.01	0.31	1.78	0.09	0.20	1.12		
Minimum	13	5.94	1.68	0.25	1.00	1	2	92	2	170	0.75	0.06	0.06	0.01	0.24	1.50	0.06	0.10	1.00		
Maximum	86	6.54	3.35	0.64	3.20	1	3	325	3	415	2.42	0.20	0.21	0.01	0.44	2.00	0.10	0.49	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	35	0.27	0.72	0.17	1.00	0	1	110	1	106	0.75	0.07	0.06	0.00	0.10	0.22	0.02	0.20	0.25		

Ulladalsåna (Ulla)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
15.02.2011	19	6.33	3.39	<0.10	0.66	<1	1	130	<2	170	2.33	<0.05	0.02	<0.01	0.10	1.10	0.06	0.34	<1.00		
10.05.2011	39	6.53	1.40	0.19	1.10	<1	1	37	2	87	1.01	0.07	0.07	0.01	0.21	0.94	0.10	<0.10	<1.00		
16.08.2011	15	6.81	2.09	<0.10	1.20	<1	1	135	2	230	2.10	0.07	0.05	0.01	0.21	0.99	0.10	<0.10	<1.00		
11.10.2011	65	6.26	1.76	0.20	2.40	<1	1	23	<2	104	1.35	0.08	0.14	<0.01	0.16	1.20	<0.05	0.20	4.00		
Lower avg.	35	6.48	2.16	0.10	1.34	0	1	81	1	148	1.70	0.06	0.07	0.00	0.17	1.06	0.06	0.14	1.00		
Upper avg..	35	6.48	2.16	0.15	1.34	1	1	81	2	148	1.70	0.07	0.07	0.01	0.17	1.06	0.08	0.18	1.75		
Minimum	15	6.26	1.40	0.10	0.66	1	1	23	2	87	1.01	0.05	0.02	0.01	0.10	0.94	0.05	0.10	1.00		
Maximum	65	6.81	3.39	0.20	2.40	1	1	135	2	230	2.33	0.08	0.14	0.01	0.21	1.20	0.10	0.34	4.00		
More than 70%LOD	yes	yes	yes	no	yes	no	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	23	0.25	0.87	0.06	0.75	0	0	59	0	65	0.62	0.01	0.05	0.00	0.05	0.12	0.03	0.11	1.50		

Suldalslågen

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
31.01.2011		6.48	2.08	1.22	0.91	2	3	215	8	315	1.20	0.10	0.08	0.01	0.38	5.03	0.20	<0.10	<1.00		
09.05.2011		6.65	1.59	0.53	0.84	<1	2	120	3	180	0.79	0.06	0.04	0.01	0.22	1.20	0.10	<0.10	<1.00		
02.08.2011		6.61	1.25	0.68	0.68	<1	3	110	3	190	0.71	<0.05	0.06	0.01	0.25	1.20	0.10	<0.10	<1.00		
10.10.2011		6.47	1.62	0.50	1.70	<1	2	145	<2	220	1.13	0.05	0.08	0.01	0.31	1.60	0.08	0.20	2.00		
Lower avg.	0	6.55	1.64	0.73	1.03	1	3	148	4	226	0.96	0.05	0.07	0.01	0.29	2.26	0.12	0.05	0.50		
Upper avg..	0	6.55	1.64	0.73	1.03	1	3	148	4	226	0.96	0.06	0.07	0.01	0.29	2.26	0.12	0.12	1.25		
Minimum	0	6.47	1.25	0.50	0.68	1	2	110	2	180	0.71	0.05	0.04	0.01	0.22	1.20	0.08	0.10	1.00		
Maximum	0	6.65	2.08	1.22	1.70	2	3	215	8	315	1.20	0.10	0.08	0.01	0.38	5.03	0.20	0.20	2.00		
More than 70%LOD	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	0	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	0	0.09	0.34	0.33	0.46	1	1	47	3	62	0.25	0.02	0.02	0.00	0.07	1.86	0.05	0.05	0.50		

Saudaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
31.01.2011	12	6.29	2.13	0.10	0.79	3	5	340	<2	475	1.91	0.10	0.36	0.02	5.30	6.76	0.47	0.50	<1.00		
09.05.2011	51	6.18	1.60	0.46	0.59	<1	2	78	2	134	0.62	0.06	0.09	0.02	0.41	1.80	0.20	<0.10	1.00		
08.08.2011	36	6.40	0.84	0.41	1.10	<1	3	39	4	134	0.53	0.07	0.09	0.01	0.33	0.66	0.09	<0.10	1.50		
10.10.2011	57	6.18	1.42	0.75	0.98	<1	2	66	2	122	0.83	<0.05	0.08	0.01	0.30	1.60	<0.05	0.10	<1.00		
Lower avg.	39	6.26	1.50	0.43	0.86	1	3	131	2	216	0.98	0.06	0.15	0.01	1.58	2.70	0.19	0.15	0.62		
Upper avg..	39	6.26	1.50	0.43	0.86	2	3	131	3	216	0.98	0.07	0.15	0.01	1.58	2.70	0.20	0.20	1.12		
Minimum	12	6.18	0.84	0.10	0.59	1	2	39	2	122	0.54	0.05	0.08	0.01	0.30	0.66	0.05	0.10	1.00		
Maximum	57	6.40	2.13	0.75	1.10	3	5	340	4	475	1.91	0.10	0.36	0.02	5.30	6.76	0.47	0.50	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	20	0.11	0.53	0.27	0.22	1	1	140	1	173	0.64	0.02	0.13	0.01	2.48	2.75	0.19	0.20	0.25		

Vikedalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
28.02.2011	13	6.52	3.53	1.60	1.10	2	5	245	12	355	1.13	0.20	0.14	0.04	0.38	3.54	0.56	<0.10	1.00		
09.05.2011	6	6.50	2.11	3.61	1.00	2	5	130	11	245	0.83	0.20	0.21	0.02	0.56	2.11	0.29	0.10	<1.00		
16.08.2011	5	6.69	2.36	0.70	1.90	2	6	240	4	385	0.83	0.39	0.09	0.01	0.51	1.30	0.35	<0.10	1.00		
17.10.2011	9	6.74	2.63	0.39	1.30	1	3	265	4	370	1.07	0.29	0.13	0.01	0.58	1.60	0.33	<0.10	10.00		
Lower avg.	8	6.61	2.66	1.58	1.32	2	5	220	8	339	0.97	0.27	0.14	0.02	0.51	2.14	0.38	0.02	3.00		
Upper avg..	8	6.61	2.66	1.58	1.32	2	5	220	8	339	0.97	0.27	0.14	0.02	0.51	2.14	0.38	0.10	3.25		
Minimum	5	6.50	2.11	0.39	1.00	1	3	130	4	245	0.83	0.20	0.09	0.01	0.38	1.30	0.29	0.10	1.00		
Maximum	13	6.74	3.53	3.61	1.90	2	6	265	12	385	1.13	0.39	0.21	0.04	0.58	3.54	0.56	0.10	10.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	3	0.12	0.62	1.45	0.40	1	1	61	4	64	0.16	0.09	0.05	0.01	0.09	0.99	0.12	0.00	4.50		

Jostedøla

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
09.02.2011	16	6.68	12.40	0.58	0.99	3	4	375	12	535	5.71	<0.05	0.06	<0.01	0.89	2.12	0.10	0.30	<1.00		
12.05.2011	76	6.59	1.44	10.00	0.97	16	19	93	3	146	1.92	<0.05	0.17	0.01	0.77	2.20	0.42	0.45	<1.00		
09.08.2011	184	6.48	0.76	22.40	0.37	25	49	33	5	84	2.48	<0.05	0.30	<0.01	1.02	3.78	0.82	1.20	1.00		
10.10.2011	116	6.76	1.82	7.57	2.00	10	13	125	3	260	2.89	<0.05	0.24	0.01	0.75	1.70	0.29	0.43	1.50		
Lower avg.	98	6.63	4.10	10.14	1.08	14	21	157	6	256	3.25	0.00	0.19	0.00	0.85	2.45	0.41	0.60	0.62		
Upper avg..	98	6.63	4.10	10.14	1.08	14	21	157	6	256	3.25	0.05	0.19	0.01	0.85	2.45	0.41	0.60	1.12		
Minimum	16	6.48	0.76	0.58	0.37	3	4	33	3	84	1.92	0.05	0.06	0.01	0.75	1.70	0.10	0.30	1.00		
Maximum	184	6.76	12.40	22.40	2.00	25	49	375	12	535	5.71	0.05	0.30	0.01	1.02	3.78	0.82	1.20	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	71	0.12	5.55	9.10	0.68	9	20	151	4	200	1.69	0.00	0.11	0.00	0.13	0.91	0.31	0.41	0.25		

Gaular

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
11.02.2011	30	6.24	1.41	0.31	1.40	1	4	145	6	230	1.26	<0.05	0.04	<0.01	0.23	1.50	0.08	<0.10	<1.00		
06.05.2011	56	6.31	1.44	0.89	1.40	<1	5	94	4	180	0.98	<0.05	0.05	<0.01	0.20	1.30	0.10	<0.10	<1.00		
16.08.2011	65	6.21	1.06	0.83	1.40	3	8	57	3	170	0.73	<0.05	0.04	0.01	0.25	0.79	0.10	<0.10	<1.00		
07.10.2011	191	6.12	1.31	1.57	2.60	7	10	<1	6	200	1.07	<0.05	0.10	<0.01	0.33	1.10	<0.05	0.20	1.00		
Lower avg.	86	6.22	1.30	0.90	1.70	3	7	74	5	195	1.01	0.00	0.06	0.00	0.25	1.17	0.07	0.05	0.25		
Upper avg..	86	6.22	1.30	0.90	1.70	3	7	74	5	195	1.01	0.05	0.06	0.01	0.25	1.17	0.08	0.12	1.00		
Minimum	30	6.12	1.06	0.31	1.40	1	4	1	3	170	0.73	0.05	0.04	0.01	0.20	0.79	0.05	0.10	1.00		
Maximum	191	6.31	1.44	1.57	2.60	7	10	145	6	230	1.26	0.05	0.10	0.01	0.33	1.50	0.10	0.20	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	72	0.08	0.17	0.52	0.60	3	3	61	2	26	0.22	0.00	0.03	0.00	0.06	0.30	0.02	0.05	0.00		

Jølstra

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
11.02.2011	46	6.37	2.12	0.50	1.30	2	7	190	7	265	1.39	<0.05	0.02	<0.01	0.23	1.60	0.10	<0.10	<1.00		
06.05.2011	64	6.45	1.65	0.62	1.00	1	3	125	<2	200	1.07	<0.05	0.04	<0.01	0.24	1.50	0.08	<0.10	<1.00		
16.08.2011	53	5.75	1.99	0.54	0.95	2	4	110	5	210	0.77	<0.05	0.02	0.01	0.22	0.82	0.08	<0.10	<1.00		
07.10.2011	207	6.13	1.53	2.60	2.00	5	11	66	6	250	1.16	<0.05	0.09	0.01	0.34	1.30	<0.05	0.20	1.00		
Lower avg.	92	6.18	1.82	1.06	1.31	3	6	123	5	231	1.10	0.00	0.04	0.00	0.26	1.30	0.06	0.05	0.25		
Upper avg..	92	6.18	1.82	1.06	1.31	3	6	123	5	231	1.10	0.05	0.04	0.01	0.26	1.30	0.08	0.12	1.00		
Minimum	46	5.75	1.53	0.50	0.95	1	3	66	2	200	0.77	0.05	0.02	0.01	0.22	0.82	0.05	0.10	1.00		
Maximum	207	6.45	2.12	2.60	2.00	5	11	190	7	265	1.39	0.05	0.09	0.01	0.34	1.60	0.10	0.20	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	77	0.31	0.28	1.03	0.48	2	4	51	2	31	0.26	0.00	0.03	0.00	0.06	0.35	0.02	0.05	0.00		

Nausta

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
11.02.2011	18	6.29	2.12	0.41	1.60	3	6	155	5	240	2.02	<0.05	0.03	<0.01	0.21	1.50	0.10	<0.10	<1.00		
06.05.2011	24	6.35	1.26	0.84	1.30	2	4	3	<2	85	0.79	<0.05	0.07	<0.01	0.19	1.50	0.10	<0.10	<1.00		
16.08.2011	20	6.48	1.15	0.80	2.30	3	7	89	<2	250	0.98	<0.05	0.06	0.01	0.26	0.57	0.09	<0.10	2.00		
07.10.2011	80	6.00	1.40	1.72	2.10	7	10	<1	3	147	1.01	<0.05	0.11	0.01	0.22	1.10	<0.05	0.10	1.00		
Lower avg.	35	6.28	1.48	0.94	1.83	4	7	62	2	181	1.20	0.00	0.07	0.00	0.22	1.17	0.07	0.02	0.75		
Upper avg..	35	6.28	1.48	0.94	1.83	4	7	62	3	181	1.20	0.05	0.07	0.01	0.22	1.17	0.08	0.10	1.25		
Minimum	18	6.00	1.15	0.41	1.30	2	4	1	2	85	0.79	0.05	0.03	0.01	0.19	0.57	0.05	0.10	1.00		
Maximum	80	6.48	2.12	1.72	2.30	7	10	155	5	250	2.02	0.05	0.11	0.01	0.26	1.50	0.10	0.10	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	no	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	30	0.20	0.44	0.55	0.46	2	3	74	1	79	0.55	0.00	0.04	0.00	0.03	0.44	0.02	0.00	0.50		

Gloppenelva(Breimselva)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
27.02.2011	31	6.62	2.26	6.54	1.60	12	15	210	4	315	1.92	<0.05	0.09	<0.01	0.52	2.31	0.32	0.20	<1.00		
30.05.2011	71	6.51	1.79	0.75	1.00	<1	5	220	10	320	1.16	0.05	0.01	<0.01	0.28	0.71	0.10	<0.10	<1.00		
09.08.2011	78	6.62	1.34	1.88	0.76	2	5	130	6	225	0.98	<0.05	0.04	<0.01	0.33	0.74	0.20	<0.10	2.00		
29.10.2011	48	6.52	1.44	0.88	1.20	2	4	67	<2	255	1.20	<0.05	0.03	0.01	0.31	0.65	0.10	0.10	1.50		
Lower avg.	57	6.57	1.71	2.51	1.14	4	7	157	5	279	1.31	0.01	0.04	0.00	0.36	1.10	0.18	0.08	0.88		
Upper avg..	57	6.57	1.71	2.51	1.14	4	7	157	6	279	1.31	0.05	0.04	0.00	0.36	1.10	0.18	0.12	1.38		
Minimum	31	6.51	1.34	0.75	0.76	1	4	67	2	225	0.98	0.05	0.01	0.01	0.28	0.65	0.10	0.10	1.00		
Maximum	78	6.62	2.26	6.54	1.60	12	15	220	10	320	1.92	0.05	0.09	0.01	0.52	2.31	0.32	0.20	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	22	0.06	0.42	2.73	0.36	5	5	72	3	46	0.41	0.00	0.03	0.00	0.11	0.81	0.11	0.05	0.48		

Driva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
28.02.2011	41	7.05	3.18	0.27	0.97	<1	3	155	<2	255	2.63	<0.05	<0.01	<0.01	0.40	0.20	0.10	<0.10	<1.00		
03.05.2011 11:00:00		7.11	3.77	1.82	2.50	2	6	160	3	310	2.76	0.07	0.04	0.02	1.61	1.40	0.33	0.20	<1.00		
05.08.2011	84	7.19	2.79	2.26	1.50	2	6	68	4	175	2.59	0.06	0.06	<0.01	1.09	1.20	0.37	0.38	<1.00		
10.10.2011	77	7.24	3.48	0.64	1.50	<1	3	165	2	255	3.23	<0.05	<0.01	<0.01	0.54	0.05	<0.05	0.30	2.00		
Lower avg.	67	7.15	3.30	1.25	1.62	1	5	137	2	249	2.80	0.03	0.02	0.00	0.91	0.71	0.20	0.22	0.50		
Upper avg..	67	7.15	3.30	1.25	1.62	2	5	137	3	249	2.80	0.06	0.03	0.01	0.91	0.71	0.21	0.24	1.25		
Minimum	41	7.05	2.79	0.27	0.97	1	3	68	2	175	2.59	0.05	0.01	0.01	0.40	0.05	0.05	0.10	1.00		
Maximum	84	7.24	3.77	2.26	2.50	2	6	165	4	310	3.23	0.07	0.06	0.02	1.61	1.40	0.37	0.38	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no	no	yes	yes	yes	yes	no		
n	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	23	0.08	0.42	0.95	0.64	1	2	46	1	56	0.29	0.01	0.03	0.01	0.55	0.69	0.16	0.12	0.50		

Surna

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
22.03.2011	125	6.78	3.77	79.40	4.40	63	82	365	13	620	5.13	0.20	0.56	0.05	3.31	4.66	2.25	2.60	<1.00		
06.06.2011	60	6.77	2.01	1.00	1.90	<1	5	37	6	118	1.26	<0.05	0.03	<0.01	0.36	0.47	0.20	0.10	<1.00		
22.08.2011	32	6.83	1.91	0.55	2.00	<1	2	56	4	155	1.24	<0.05	0.02	<0.01	0.35	0.26	0.25	<0.10	<1.00		
17.10.2011	50	6.85	2.66	0.62	2.40	2	5	270	3	390	1.83	<0.05	0.03	<0.01	0.67	0.49	0.39	0.20	6.30		
Lower avg.	67	6.81	2.59	20.39	2.68	16	24	182	7	321	2.37	0.05	0.16	0.01	1.17	1.47	0.77	0.73	1.58		
Upper avg..	67	6.81	2.59	20.39	2.68	17	24	182	7	321	2.37	0.09	0.16	0.02	1.17	1.47	0.77	0.75	2.33		
Minimum	32	6.77	1.91	0.55	1.90	1	2	37	3	118	1.24	0.05	0.02	0.01	0.35	0.26	0.20	0.10	1.00		
Maximum	125	6.85	3.77	79.40	4.40	63	82	365	13	620	5.13	0.20	0.56	0.05	3.31	4.66	2.25	2.60	6.30		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	41	0.04	0.86	39.34	1.17	31	39	161	5	233	1.87	0.08	0.27	0.02	1.43	2.13	0.99	1.23	2.65		

Gaula

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2011	39	7.52	19.30	1.15	3.10	2	6	230	29	465	3.62	<0.05	0.04	<0.01	0.83	1.30	1.40	0.31	<1.00		
04.05.2011	178	7.28	8.16	4.70	3.50	4	8	100	5	260	2.80	0.10	0.12	0.02	2.27	2.69	1.60	0.58	<1.00		
11.08.2011	138	7.33	9.16	3.94	7.70	2	8	105	<2	375	3.17	0.25	0.29	0.02	2.82	2.62	2.12	0.71	<1.00		
19.10.2011	93	7.18	11.10	8.20	3.90	6	10	160	32	350	3.94	0.07	0.16	0.01	1.72	4.14	2.22	0.89	2.50		
Lower avg.	112	7.33	11.93	4.50	4.55	4	8	149	17	363	3.38	0.10	0.15	0.01	1.91	2.69	1.84	0.62	0.62		
Upper avg..	112	7.33	11.93	4.50	4.55	4	8	149	17	363	3.38	0.12	0.15	0.01	1.91	2.69	1.84	0.62	1.38		
Minimum	39	7.18	8.16	1.15	3.10	2	6	100	2	260	2.80	0.05	0.04	0.01	0.83	1.30	1.40	0.31	1.00		
Maximum	178	7.52	19.30	8.20	7.70	6	10	230	32	465	3.94	0.25	0.29	0.02	2.82	4.14	2.22	0.89	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	60	0.14	5.06	2.90	2.13	2	2	61	16	84	0.50	0.09	0.10	0.01	0.85	1.16	0.40	0.24	0.75		

Nidelva(Tr.heim)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2011	46	7.13	3.34	0.43	2.60	<1	3	105	5	210	1.68	0.07	0.03	<0.01	0.63	1.30	0.47	0.20	<1.00		
04.05.2011	138	7.07	3.19	1.13	2.60	<1	3	86	6	200	1.84	0.09	0.04	0.02	1.19	0.87	0.69	0.10	<1.00		
11.08.2011	109	7.25	4.06	6.93	5.60	5	13	110	12	355	2.50	0.20	0.19	0.01	2.31	2.43	1.60	0.76	<1.00		
19.10.2011	88	7.05	3.10	1.59	3.10	1	4	57	7	220	1.86	0.07	0.06	<0.01	0.53	1.60	0.88	0.20	2.00		
Lower avg.	95	7.12	3.42	2.52	3.48	2	6	90	8	246	1.97	0.11	0.08	0.01	1.16	1.55	0.91	0.32	0.50		
Upper avg..	95	7.12	3.42	2.52	3.48	2	6	90	8	246	1.97	0.11	0.08	0.01	1.16	1.55	0.91	0.32	1.25		
Minimum	46	7.05	3.10	0.43	2.60	1	3	57	5	200	1.68	0.07	0.03	0.01	0.53	0.87	0.47	0.10	1.00		
Maximum	138	7.25	4.06	6.93	5.60	5	13	110	12	355	2.50	0.20	0.19	0.02	2.31	2.43	1.60	0.76	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	39	0.09	0.44	2.98	1.44	2	5	24	3	73	0.36	0.06	0.08	0.01	0.82	0.66	0.49	0.30	0.50		

Stjørdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2011	48	7.06	5.49	1.50	3.40	1	4	240	11	400	1.05	0.07	0.04	<0.01	0.71	2.73	0.37	0.20	<1.00		
04.05.2011	107	6.98	2.85	2.45	3.20	2	4	62	2	195	1.30	0.08	0.07	0.02	1.98	3.45	0.50	0.20	<1.00		
11.08.2011	67	7.07	3.01	1.78	8.50	2	8	58	6	335	1.65	0.10	0.12	0.02	5.26	5.59	1.10	0.41	<1.00		
19.10.2011	55	7.01	3.56	2.33	3.50	2	4	125	4	265	1.94	0.06	0.06	0.01	3.26	5.17	0.55	0.20	2.50		
Lower avg.	69	7.03	3.73	2.02	4.65	2	5	121	6	299	1.49	0.08	0.07	0.01	2.80	4.23	0.63	0.25	0.62		
Upper avg..	69	7.03	3.73	2.02	4.65	2	5	121	6	299	1.49	0.08	0.07	0.02	2.80	4.23	0.63	0.25	1.38		
Minimum	48	6.98	2.85	1.50	3.20	1	4	58	2	195	1.05	0.06	0.04	0.01	0.71	2.73	0.37	0.20	1.00		
Maximum	107	7.07	5.49	2.45	8.50	2	8	240	11	400	1.94	0.10	0.12	0.02	5.26	5.59	1.10	0.41	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	26	0.04	1.21	0.45	2.57	1	2	85	4	88	0.39	0.02	0.03	0.01	1.94	1.37	0.32	0.11	0.75		

Verdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2011	31	7.36	6.54	2.31	4.10	2	5	215	8	390	2.91	0.10	0.06	<0.01	0.82	0.88	0.69	0.20	<1.00		
04.05.2011	86	7.10	3.35	3.11	3.20	2	4	58	4	180	1.47	0.09	0.10	0.02	1.62	1.60	0.69	0.20	<1.00		
11.08.2011	47	7.19	3.23	3.37	7.50	2	9	36	<2	285	1.54	0.21	0.11	0.01	2.13	1.10	0.78	0.30	<1.00		
19.10.2011	39	7.29	5.56	4.04	3.60	6	10	140	6	360	2.08	0.10	0.10	<0.01	0.51	1.30	0.75	0.20	3.00		
Lower avg.	51	7.24	4.67	3.21	4.60	3	7	112	5	304	2.00	0.12	0.09	0.01	1.27	1.22	0.73	0.22	0.75		
Upper avg..	51	7.24	4.67	3.21	4.60	3	7	112	5	304	2.00	0.12	0.09	0.01	1.27	1.22	0.73	0.22	1.50		
Minimum	31	7.10	3.23	2.31	3.20	2	4	36	2	180	1.47	0.09	0.06	0.01	0.51	0.88	0.69	0.20	1.00		
Maximum	86	7.36	6.54	4.04	7.50	6	10	215	8	390	2.91	0.21	0.11	0.02	2.13	1.60	0.78	0.30	3.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	24	0.11	1.64	0.72	1.97	2	3	82	3	94	0.66	0.06	0.02	0.01	0.74	0.31	0.05	0.05	1.00		

Snåsavassdraget

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2011	31	7.13	5.05	1.11	4.50	2	6	225	5	385	1.89	0.08	0.01	<0.01	0.58	0.60	0.65	0.30	<1.00		
04.05.2011	56	7.17	4.73	2.68	4.00	3	6	200	2	360	1.55	0.10	0.08	0.01	1.58	1.10	0.45	0.20	<1.00		
11.08.2011	18	7.27	4.80	0.85	5.30	1	6	85	9	300	1.20	0.10	0.04	<0.01	1.64	0.72	0.43	0.10	<1.00		
19.10.2011	29	7.14	4.89	1.19	4.50	2	3	135	14	355	1.52	0.07	0.04	<0.01	0.70	0.86	0.42	0.34	2.00		
Lower avg.	33	7.18	4.87	1.46	4.58	2	5	161	8	350	1.54	0.09	0.04	0.00	1.12	0.82	0.49	0.24	0.50		
Upper avg..	33	7.18	4.87	1.46	4.58	2	5	161	8	350	1.54	0.09	0.04	0.01	1.12	0.82	0.49	0.24	1.25		
Minimum	18	7.13	4.73	0.85	4.00	1	3	85	2	300	1.20	0.07	0.01	0.01	0.58	0.60	0.42	0.10	1.00		
Maximum	56	7.27	5.05	2.68	5.30	3	6	225	14	385	1.89	0.10	0.08	0.01	1.64	1.10	0.65	0.34	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	16	0.06	0.14	0.83	0.54	1	2	63	5	36	0.28	0.02	0.03	0.00	0.56	0.22	0.11	0.11	0.50		

Namsen

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.02.2011	34	7.01	4.08	3.41	4.80	13	20	105	155	700	1.87	0.08	0.19	0.01	2.15	7.13	0.70	<0.10	<1.00		
10.05.2011	128	6.77	2.24	11.60	2.90	12	17	24	7	133	1.53	0.10	0.25	<0.01	0.82	2.34	0.95	0.78	<1.00		
08.08.2011	35	7.00	2.55	2.08	3.30	2	8	35	12	215	1.07	0.09	0.08	0.01	0.81	1.40	0.39	0.10	<1.00		
10.10.2011	68	6.98	3.05	10.70	4.80	7	11	59	<2	225	2.29	0.08	0.17	<0.01	1.01	1.50	0.72	0.67	2.00		
Lower avg.	66	6.94	2.98	6.95	3.95	9	14	56	44	318	1.69	0.09	0.17	0.00	1.20	3.09	0.69	0.39	0.50		
Upper avg..	66	6.94	2.98	6.95	3.95	9	14	56	44	318	1.69	0.09	0.17	0.01	1.20	3.09	0.69	0.41	1.25		
Minimum	34	6.77	2.24	2.08	2.90	2	8	24	2	133	1.07	0.08	0.08	0.01	0.81	1.40	0.39	0.10	1.00		
Maximum	128	7.01	4.08	11.60	4.80	13	20	105	155	700	2.29	0.10	0.25	0.01	2.15	7.13	0.95	0.78	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	44	0.11	0.81	4.90	1.00	5	5	36	74	258	0.52	0.01	0.07	0.00	0.64	2.72	0.23	0.36	0.50		

Røssåga

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
08.02.2011	65	7.33	4.20	0.11	0.96	<1	2	61	2	133	0.96	0.10	0.02	<0.01	0.37	2.62	0.44	0.10	<1.00		
11.05.2011	190	7.43	5.26	1.05	1.30	<1	5	38	2	108	0.94	0.10	0.10	0.01	0.48	3.89	0.40	<0.10	<1.00		
18.08.2011	125	7.26	3.62	0.39	0.93	<1	2	26	5	108	0.71	0.10	0.03	<0.01	0.28	0.78	0.43	<0.10	1.00		
07.10.2011	199	7.53	6.02	0.75	2.50	<1	3	28	5	149	1.13	0.20	0.12	0.01	0.51	7.76	0.22	0.10	2.50		
Lower avg.	145	7.39	4.78	0.58	1.42	0	3	38	4	125	0.94	0.12	0.07	0.00	0.41	3.76	0.37	0.05	0.88		
Upper avg..	145	7.39	4.78	0.58	1.42	1	3	38	4	125	0.94	0.12	0.07	0.01	0.41	3.76	0.37	0.10	1.38		
Minimum	65	7.26	3.62	0.11	0.93	1	2	26	2	108	0.71	0.10	0.02	0.01	0.28	0.78	0.22	0.10	1.00		
Maximum	199	7.53	6.02	1.05	2.50	1	5	61	5	149	1.13	0.20	0.12	0.01	0.51	7.76	0.44	0.10	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	62	0.12	1.07	0.41	0.74	0	1	16	2	20	0.18	0.05	0.05	0.00	0.11	2.96	0.10	0.00	0.75		

Ranaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
08.02.2011	53	7.26	4.37	0.51	0.93	<1	2	69	11	150	1.30	0.10	0.02	<0.01	0.36	0.50	0.31	0.20	<1.00		
11.05.2011	255	7.73	8.05	3.99	1.80	<1	6	35	<2	127	1.54	0.08	0.11	<0.01	0.58	1.80	0.37	0.30	1.00		
18.08.2011	245	7.38	3.64	0.73	0.49	<1	2	37	3	190	0.96	0.06	0.03	<0.01	0.33	0.45	0.20	<0.10	<1.00		
07.10.2011	500	7.54	6.51	1.15	2.20	1	3	72	2	175	2.33	0.10	0.04	0.01	0.69	1.10	0.29	0.31	2.00		
Lower avg.	263	7.48	5.64	1.60	1.36	0	3	53	4	161	1.54	0.08	0.05	0.00	0.49	0.96	0.29	0.20	0.75		
Upper avg..	263	7.48	5.64	1.60	1.36	1	3	53	5	161	1.54	0.08	0.05	0.01	0.49	0.96	0.29	0.23	1.25		
Minimum	53	7.26	3.64	0.51	0.49	1	2	35	2	127	0.96	0.06	0.02	0.01	0.33	0.45	0.20	0.10	1.00		
Maximum	500	7.73	8.05	3.99	2.20	1	6	72	11	190	2.33	0.10	0.11	0.01	0.69	1.80	0.37	0.31	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	184	0.20	2.02	1.62	0.78	0	2	20	4	28	0.58	0.02	0.04	0.00	0.17	0.63	0.07	0.10	0.50		

Beiarelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
24.02.2011	9	7.24	15.80	5.78	2.60	2	16	490	405	1530	6.20	0.20	0.16	0.03	3.47	18.30	1.40	0.30	<1.00		
30.05.2011	79	7.11	3.53	2.14	1.70	<1	6	15	4	132	1.45	0.09	0.04	0.01	0.40	1.00	0.52	0.20	1.00		
25.08.2011	41	7.44	3.64	6.25	0.30	3	5	9	10	87	2.12	0.10	0.07	0.01	0.64	1.90	0.68	0.33	2.00		
25.10.2011	36	7.38	4.85	0.60	1.60	<1	<1	24	<2	131	2.44	0.06	0.02	<0.01	0.54	1.10	0.48	0.20	<1.00		
Lower avg.	41	7.29	6.96	3.69	1.55	1	7	135	105	470	3.05	0.11	0.07	0.01	1.26	5.58	0.77	0.26	0.75		
Upper avg..	41	7.29	6.96	3.69	1.55	2	7	135	105	470	3.05	0.11	0.07	0.01	1.26	5.58	0.77	0.26	1.25		
Minimum	9	7.11	3.53	0.60	0.30	1	1	9	2	87	1.45	0.06	0.02	0.01	0.40	1.00	0.48	0.20	1.00		
Maximum	79	7.44	15.80	6.25	2.60	3	16	490	405	1530	6.20	0.20	0.16	0.03	3.47	18.30	1.40	0.33	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	29	0.15	5.93	2.76	0.95	1	6	237	200	707	2.14	0.06	0.06	0.01	1.48	8.49	0.43	0.07	0.50		

Målselv

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.02.2011	21	7.44	9.43	0.34	0.85	1	2	94	8	195	2.93	0.06	0.01	<0.01	0.80	0.30	0.20	0.10	<1.00		
08.05.2011	76	7.83	9.10	153.00	2.70	133	130	75	5	195	9.95	0.48	2.08	0.01	5.62	15.70	5.86	6.93	<1.00		
09.08.2011	59	7.72	7.67	0.85	0.72	<1	2	26	2	96	2.20	<0.05	0.02	<0.01	0.97	0.20	0.20	<0.10	<1.00		
05.10.2011	50	7.62	8.08	0.51	1.00	<1	<1	39	<2	107	2.65	<0.05	<0.01	<0.01	0.32	<0.05	0.06	0.20	<1.00		
Lower avg.	52	7.65	8.57	38.67	1.32	34	34	59	4	148	4.43	0.14	0.53	0.00	1.93	4.05	1.58	1.81	0.00		
Upper avg..	52	7.65	8.57	38.67	1.32	34	34	59	4	148	4.43	0.16	0.53	0.01	1.93	4.06	1.58	1.83	1.00		
Minimum	21	7.44	7.67	0.34	0.72	1	1	26	2	96	2.20	0.05	0.01	0.01	0.32	0.05	0.06	0.10	1.00		
Maximum	76	7.83	9.43	153.00	2.70	133	130	94	8	195	9.95	0.48	2.08	0.01	5.62	15.70	5.86	6.93	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	23	0.17	0.83	76.22	0.93	66	64	31	3	54	3.69	0.21	1.03	0.00	2.48	7.76	2.85	3.40	0.00		

Barduelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.02.2011	19	7.40	5.51	0.90	1.10	2	3	61	3	146	2.13	0.07	0.02	<0.01	0.44	0.40	0.20	0.10	<1.00		
08.05.2011	69	7.69	8.56	33.10	1.70	33	37	105	9	215	4.11	0.10	0.37	0.01	1.43	3.74	1.60	1.70	<1.00		
09.08.2011	53	7.95	9.88	1.43	0.54	<1	4	37	<2	123	1.60	0.06	0.03	0.01	1.04	0.33	0.23	<0.10	<1.00		
05.10.2011	45	7.79	9.28	2.17	0.85	2	2	43	<2	105	2.29	<0.05	0.02	<0.01	0.36	<0.05	<0.05	0.20	<1.00		
Lower avg.	47	7.71	8.31	9.40	1.05	9	12	62	3	147	2.53	0.06	0.11	0.00	0.82	1.12	0.51	0.50	0.00		
Upper avg..	47	7.71	8.31	9.40	1.05	10	12	62	4	147	2.53	0.07	0.11	0.01	0.82	1.13	0.52	0.52	1.00		
Minimum	19	7.40	5.51	0.90	0.54	1	2	37	2	105	1.60	0.05	0.02	0.01	0.36	0.05	0.05	0.10	1.00		
Maximum	69	7.95	9.88	33.10	1.70	33	37	105	9	215	4.11	0.10	0.37	0.01	1.43	3.74	1.60	1.70	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	21	0.23	1.94	15.81	0.49	16	17	31	3	48	1.09	0.02	0.17	0.00	0.51	1.75	0.72	0.79	0.00		

Tanaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
01.02.2011	38	7.06	7.87	0.37	1.60	3	9	105	10	285	10.50	0.05	0.05	0.01	0.81	3.25	0.20	<0.10	<1.00		
04.05.2011	137	7.39	5.23	1.28	4.30	2	9	5	7	185	7.42	0.06	0.04	0.01	0.51	0.64	0.46	0.31	1.50		
08.08.2011	160	7.45	4.60	0.57	3.00	4	5	11	7	170	5.52	0.05	0.02	0.01	0.46	0.59	0.28	0.20	<1.00		
10.10.2011	348	7.26	3.51	6.64	6.20	4	12	8	<2	245	7.10	<0.05	0.03	<0.01	0.56	0.51	0.47	0.57	2.50		
Lower avg.	171	7.29	5.30	2.22	3.78	3	9	32	6	221	7.64	0.04	0.03	0.01	0.59	1.25	0.35	0.27	1.00		
Upper avg..	171	7.29	5.30	2.22	3.78	3	9	32	7	221	7.64	0.05	0.03	0.01	0.59	1.25	0.35	0.30	1.50		
Minimum	38	7.06	3.51	0.37	1.60	2	5	5	2	170	5.52	0.05	0.02	0.01	0.46	0.51	0.20	0.10	1.00		
Maximum	348	7.45	7.87	6.64	6.20	4	12	105	10	285	10.50	0.06	0.05	0.01	0.81	3.25	0.47	0.57	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	129	0.17	1.85	2.98	1.96	1	3	49	3	53	2.09	0.01	0.01	0.00	0.15	1.34	0.13	0.20	0.71		

Pasvikelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
01.02.2011	50	7.02	4.08	0.77	2.80	<1	4	54	25	380	5.56	0.20	0.32	0.02	1.41	4.61	1.30	<0.10	<1.00		
04.05.2011	341	7.09	2.49	1.17	2.10	<1	5	37	23	220	3.74	0.21	0.24	0.05	3.61	4.70	1.90	0.10	<1.00		
08.08.2011	149	7.22	3.64	1.06	3.40	2	7	2	13	195	4.21	0.10	0.02	0.01	1.44	0.78	7.41	<0.10	<1.00		
10.10.2011	231	7.22	4.16	1.91	4.10	2	5	7	5	210	4.96	0.10	0.01	0.01	1.87	0.25	9.17	0.20	2.00		
Lower avg.	193	7.14	3.59	1.23	3.10	1	5	25	17	251	4.62	0.15	0.15	0.02	2.08	2.58	4.94	0.08	0.50		
Upper avg..	193	7.14	3.59	1.23	3.10	2	5	25	17	251	4.62	0.15	0.15	0.02	2.08	2.58	4.94	0.12	1.25		
Minimum	50	7.02	2.49	0.77	2.10	1	4	2	5	195	3.74	0.10	0.01	0.01	1.41	0.25	1.30	0.10	1.00		
Maximum	341	7.22	4.16	1.91	4.10	2	7	54	25	380	5.56	0.21	0.32	0.05	3.61	4.70	9.17	0.20	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	124	0.10	0.77	0.49	0.85	1	1	25	9	86	0.80	0.06	0.16	0.02	1.04	2.40	3.94	0.05	0.50		

Table 2.
Riverine inputs from the 10 main and 36 + 109 tributary rivers in Norway in 2011

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
MAIN RIVERS (10)																				
Glomma at Sarpsfossen	*lower avg.*	80 173	481 937	145 018	420	765	9 319	588	16 979	118 744	6.920	12.508	0.442	65.012	362.480	29.296	21.141	30.978	0	0
	upper avg.	80 173	481 937	145 018	420	765	9 319	588	16 979	118 744	6.920	12.508	0.442	65.012	362.480	29.296	21.225	44.171	5.821	44.409
Drammenselva	*lower avg.*	35 573	39 386	53 923	38	119	3 408	183	6 174	40 512	2.050	1.940	0.159	13.136	41.537	6.680	3.281	12.922	0	0
	upper avg.	35 573	39 386	53 923	38	119	3 408	183	6 174	40 512	2.050	1.940	0.159	13.136	41.537	6.680	3.509	19.698	2.597	19.344
Numedalslågen	*lower avg.*	12 078	24 416	21 291	22	52	1 175	130	2 262	17 103	1.003	1.840	0.099	5.319	26.058	2.242	1.195	7.438	0	0
	upper avg.	12 078	24 416	21 291	22	52	1 175	130	2 262	17 103	1.003	1.840	0.099	5.319	26.058	2.242	1.294	8.614	0.882	6.495
Skienselva	*lower avg.*	28 023	13 253	32 998	14	48	1 539	135	3 218	23 644	1.244	1.211	0.119	5.122	24.636	2.340	3.163	6.563	0	0
	upper avg.	28 023	13 253	32 998	17	49	1 539	135	3 218	23 644	1.244	1.211	0.122	5.122	24.636	2.340	3.606	12.592	2.046	14.999
Otra	*lower avg.*	12 799	4 918	16 401	5	19	494	79	1 311	8 072	0.573	1.437	0.107	5.559	17.695	2.880	0.402	5.993	0	0
	upper avg.	12 799	4 918	16 401	7	19	494	79	1 311	8 072	0.573	1.437	0.107	5.559	17.695	2.880	0.574	7.846	1.525	16.773
Orreelva	*lower avg.*	597	2 318	1 347	6	18	177	16	370	678	0.049	0.054	0.003	1.567	1.284	0.201	0.040	0.467	0	0
	upper avg.	597	2 318	1 347	6	18	177	16	370	678	0.049	0.054	0.003	1.567	1.284	0.201	0.045	0.525	0.044	0.309
Vosso(Bolstadelvi)	*lower avg.*	10 452	2 946	5 081	4	15	446	30	855	3 924	0.301	0.374	0.027	1.538	4.882	1.102	0.261	6.315	0	0
	upper avg.	10 452	2 946	5 081	6	15	446	30	855	3 924	0.349	0.374	0.031	1.538	4.882	1.102	0.523	7.251	0.763	5.532
Orkla	*lower avg.*	7 581	12 101	9 783	5	23	365	12	832	7 515	0.432	0.204	0.106	17.705	34.490	2.764	1.486	5.100	0	0
	upper avg.	7 581	12 101	9 783	6	23	365	13	832	7 515	0.432	0.204	0.106	17.705	34.490	2.764	1.501	6.302	0.553	3.979
Vefsna	*lower avg.*	19 096	17 773	12 337	13	34	253	30	951	10 553	0.959	1.121	0.033	3.655	7.201	2.518	0.970	5.780	0	0
	upper avg.	19 096	17 773	12 337	15	34	253	30	951	10 553	0.959	1.121	0.059	3.655	7.201	2.518	1.220	8.067	1.394	10.296
Altaelva	*lower avg.*	8 021	3 198	8 073	3	16	55	10	487	10 579	0.288	0.095	0.013	1.938	2.608	0.775	0.474	2.075	0	0
	upper avg.	8 021	3 198	8 073	4	16	56	11	487	10 579	0.288	0.097	0.022	1.938	2.608	0.775	0.535	3.834	0.586	4.166
TRIBUTARY RIVERS (36)																				
Tista utløp Femsjøen	*lower avg.*	2 278	1 827	7 826	3	11	406	9	708	2 741	0.243	0.175	0.019	1.399	10.157	0.537	0.243	0.268		
	upper avg.	2 278	1 827	7 826	3	11	406	9	708	2 741	0.243	0.175	0.019	1.399	10.157	0.537	0.250	0.921		
Tokkeelva	*lower avg.*	2 525	899	6 267	1	6	104	7	333	2 649	0.203	0.264	0.033	0.493	5.158	0.403	0.124	0.587		
	upper avg.	2 525	899	6 267	1	6	104	7	333	2 649	0.203	0.264	0.033	0.493	5.158	0.403	0.130	1.215		
Nidelva(Rykene)	*lower avg.*	11 054	5 774	16 854	6	23	561	43	1 377	8 837	0.826	1.120	0.130	3.294	17.510	1.064	0.467	4.857		
	upper avg.	11 054	5 774	16 854	7	23	561	43	1 377	8 837	0.826	1.120	0.130	3.294	17.510	1.064	0.493	6.248		
Tovdalselva	*lower avg.*	5 522	5 468	13 077	3	17	190	48	720	4 353	0.500	1.104	0.073	3.332	10.278	0.750	0.376	1.973		
	upper avg.	5 522	5 468	13 077	4	17	190	48	720	4 353	0.500	1.104	0.073	3.332	10.278	0.750	0.417	2.759		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Mandalselva	*lower avg.*	7 350	6 729	13 321	5	23	380	48	980	4 350	0.595	1.484	0.085	5.548	11.327	0.596	0.391	9.992		
	upper avg.	7 350	6 729	13 321	6	23	380	48	980	4 350	0.595	1.484	0.085	5.548	11.327	0.596	0.487	11.040		
Lyngdalselva	*lower avg.*	2 881	2 725	5 197	2	11	170	10	440	1 866	0.225	0.701	0.041	0.917	5.408	0.147	0.078	0.438		
	upper avg.	2 881	2 725	5 197	2	11	170	10	440	1 866	0.225	0.701	0.041	0.917	5.408	0.147	0.134	1.198		
Kvina	*lower avg.*	6 116	3 476	11 964	3	19	267	27	816	2 932	0.534	1.442	0.062	3.987	9.235	0.446	0.256	3.310		
	upper avg.	6 116	3 476	11 964	4	19	267	27	816	2 932	0.534	1.442	0.062	3.987	9.235	0.446	0.343	3.733		
Sira	*lower avg.*	12 457	3 272	11 662	1	22	481	110	1 223	4 595	0.455	1.580	0.061	4.495	10.447	0.312	0.203	4.052		
	upper avg.	12 457	3 272	11 662	5	22	481	110	1 223	4 595	0.455	1.580	0.061	4.495	10.447	0.383	0.455	6.572		
Bjerkreimselva	*lower avg.*	4 625	1 117	2 904	5	13	580	24	821	2 493	0.227	0.317	0.034	0.476	4.441	0.229	0.000	1.317		
	upper avg.	4 625	1 117	2 904	5	13	580	24	821	2 493	0.227	0.317	0.034	0.476	4.441	0.229	0.169	1.904		
Figgjoelva	*lower avg.*	621	1 393	959	5	11	216	9	325	675	0.035	0.114	0.004	0.420	1.490	0.138	0.050	0.447		
	upper avg.	621	1 393	959	5	11	216	9	325	675	0.035	0.114	0.004	0.420	1.490	0.138	0.055	0.447		
Lyseelva	*lower avg.*	1 385	54	469	0	1	51	0	81	780	0.003	0.059	0.006	0.140	1.398	0.029	0.044	0.388		
	upper avg.	1 385	86	469	1	1	51	1	81	780	0.026	0.059	0.006	0.140	1.398	0.038	0.070	0.650		
Årdalselva	*lower avg.*	3 744	776	3 075	0	3	161	1	304	2 252	0.193	0.224	0.011	0.369	2.292	0.107	0.103	1.195		
	upper avg.	3 744	776	3 075	1	3	161	3	304	2 252	0.193	0.224	0.012	0.369	2.292	0.107	0.185	1.739		
Ulladalsåna (Ulla)	*lower avg.*	3 005	171	1 907	0	1	54	1	130	1 582	0.073	0.110	0.003	0.186	1.208	0.046	0.162	2.312		
	upper avg.	3 005	194	1 907	1	1	54	2	130	1 582	0.080	0.110	0.007	0.186	1.208	0.075	0.200	2.831		
Suldalslågen	*lower avg.*	3 874	781	1 224	0	3	117	3	213	1 104	0.055	0.147	0.019	0.937	2.579	0.157	0.107	0.843		
	upper avg.	3 874	781	1 224	2	3	117	3	213	1 104	0.085	0.147	0.019	0.937	2.579	0.187	0.178	1.545		
Saudaelva	*lower avg.*	1 020	542	466	1	2	86	3	128	380	0.094	0.053	0.008	0.183	0.890	0.154	0.006	1.335		
	upper avg.	1 020	542	466	1	2	86	3	128	380	0.094	0.053	0.008	0.183	0.890	0.154	0.037	1.400		
Vikedalselva	*lower avg.*	6 662	33 132	2 721	41	68	224	10	435	6 437	0.000	0.598	0.011	2.098	6.403	1.257	1.782	2.323		
	upper avg.	6 662	33 132	2 721	41	68	224	10	435	6 437	0.122	0.598	0.017	2.098	6.403	1.257	1.782	2.886		
Jostedøla	*lower avg.*	6 599	3 043	5 181	12	20	81	13	469	2 458	0.000	0.189	0.002	0.701	2.685	0.087	0.301	1.507		
	upper avg.	6 599	3 043	5 181	12	20	82	13	469	2 458	0.120	0.189	0.012	0.701	2.685	0.162	0.392	2.408		
Gaular	*lower avg.*	7 217	4 843	4 351	10	22	245	13	630	2 959	0.000	0.173	0.015	0.785	3.451	0.084	0.330	1.649		
	upper avg.	7 217	4 843	4 351	10	22	245	14	630	2 959	0.132	0.173	0.018	0.785	3.451	0.167	0.428	2.634		
Jølstra	*lower avg.*	2 779	1 361	1 970	5	8	27	2	160	1 089	0.000	0.090	0.004	0.222	1.164	0.037	0.064	0.858		
	upper avg.	2 779	1 361	1 970	5	8	27	3	160	1 089	0.051	0.090	0.005	0.222	1.164	0.069	0.101	1.126		
Nausta	*lower avg.*	5 292	3 958	2 077	6	12	296	10	530	2 391	0.028	0.071	0.002	0.658	1.856	0.319	0.111	1.878		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	5 292	3 958	2 077	6	12	296	11	530	2 391	0.097	0.071	0.010	0.658	1.856	0.319	0.224	2.749		
Gloppenelva(Breimselva)	*lower avg.*	7 442	3 070	3 798	2	11	352	6	617	7 859	0.056	0.056	0.000	1.910	1.296	0.400	0.734	2.508		
	upper avg.	7 442	3 070	3 798	4	11	352	7	617	7 859	0.145	0.065	0.014	1.910	1.296	0.463	0.786	3.970		
Driva	*lower avg.*	4 464	72 590	5 534	58	78	433	15	738	5 746	0.181	0.523	0.047	3.360	4.547	2.252	2.450	1.976		
	upper avg.	4 464	72 590	5 534	58	78	433	15	738	5 746	0.218	0.523	0.051	3.360	4.547	2.252	2.463	3.292		
Surna	*lower avg.*	9 381	17 344	16 278	13	29	432	41	1 131	11 113	0.436	0.586	0.056	7.464	9.988	6.448	2.300	2.092		
	upper avg.	9 381	17 344	16 278	13	29	432	43	1 131	11 113	0.449	0.586	0.057	7.464	9.988	6.448	2.300	4.679		
Gaula	*lower avg.*	8 429	8 312	10 838	5	18	266	24	760	6 160	0.342	0.252	0.030	3.827	4.687	2.944	0.957	1.670		
	upper avg.	8 429	8 312	10 838	6	18	266	24	760	6 160	0.342	0.252	0.036	3.827	4.687	2.944	0.957	3.911		
Nidelva(Tr.heim)	*lower avg.*	6 052	4 691	9 892	4	11	230	11	607	3 296	0.173	0.163	0.035	6.212	9.320	1.380	0.545	1.309		
	upper avg.	6 052	4 691	9 892	4	11	230	11	607	3 296	0.173	0.163	0.037	6.212	9.320	1.380	0.545	2.994		
Stjørdalselva	*lower avg.*	4 301	5 131	6 806	5	10	147	7	428	2 863	0.187	0.151	0.017	2.143	2.082	1.135	0.348	1.075		
	upper avg.	4 301	5 131	6 806	5	10	147	7	428	2 863	0.187	0.151	0.019	2.143	2.082	1.135	0.348	2.287		
Verdalselva	*lower avg.*	2 855	1 820	4 578	2	5	181	7	371	1 635	0.092	0.052	0.004	1.204	0.926	0.501	0.254	0.537		
	upper avg.	2 855	1 820	4 578	2	5	181	7	371	1 635	0.092	0.052	0.007	1.204	0.926	0.501	0.254	1.311		
Snåsavassdraget	*lower avg.*	4 294	14 686	5 879	15	23	71	34	367	2 755	0.142	0.310	0.003	1.610	3.942	1.238	0.916	0.979		
	upper avg.	4 294	14 686	5 879	15	23	71	35	367	2 755	0.142	0.310	0.009	1.610	3.942	1.238	0.934	2.057		
Namsen	*lower avg.*	11 402	3 011	7 008	0	14	143	15	528	4 081	0.583	0.366	0.030	1.854	19.915	1.402	0.208	4.875		
	upper avg.	11 402	3 011	7 008	4	14	143	15	528	4 081	0.583	0.366	0.036	1.854	19.915	1.402	0.416	6.663		
Røssåga	*lower avg.*	22 378	14 080	14 252	4	29	464	17	1 349	15 154	0.720	0.453	0.031	4.785	9.188	2.400	2.022	10.770		
	upper avg.	22 378	14 080	14 252	8	29	464	21	1 349	15 154	0.720	0.453	0.050	4.785	9.188	2.400	2.168	12.581		
Ranaelva	*lower avg.*	3 728	3 887	1 964	1	7	63	41	288	2 896	0.125	0.070	0.009	0.922	3.144	0.816	0.317	1.232		
	upper avg.	3 728	3 887	1 964	2	7	63	41	288	2 896	0.125	0.070	0.011	0.922	3.144	0.816	0.317	1.643		
Beiarelva	*lower avg.*	7 725	160 073	4 363	138	137	153	9	409	14 839	0.515	2.177	0.010	6.959	16.524	6.325	7.400	0.000		
	upper avg.	7 725	160 073	4 363	140	138	153	10	409	14 839	0.590	2.181	0.019	6.959	16.567	6.325	7.465	2.820		
Målselv	*lower avg.*	7 015	34 000	2 854	33	40	169	9	393	7 128	0.147	0.386	0.011	2.356	3.821	1.695	1.785	0.000		
	upper avg.	7 015	34 000	2 854	34	40	169	12	393	7 128	0.186	0.386	0.016	2.356	3.860	1.734	1.844	2.561		
Barduelva	*lower avg.*	16 808	25 914	30 959	22	61	75	19	1 358	43 029	0.140	0.176	0.021	3.348	4.091	2.583	2.622	10.657		
	upper avg.	16 808	25 914	30 959	22	61	75	26	1 358	43 029	0.318	0.176	0.039	3.348	4.091	2.583	2.648	12.065		
Tanaelva	*lower avg.*	14 360	7 312	16 014	5	28	113	79	1 157	22 784	0.801	0.668	0.124	13.264	13.032	27.963	0.600	3.729		
	upper avg.	14 360	7 312	16 014	8	28	113	79	1 157	22 784	0.801	0.668	0.124	13.264	13.032	27.963	0.711	7.106		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Pasvikelva	*lower avg.*	2 278	1 827	7 826	3	11	406	9	708	2 741	0.243	0.175	0.019	1.399	10.157	0.537	0.243	0.268		
	upper avg.	2 278	1 827	7 826	3	11	406	9	708	2 741	0.243	0.175	0.019	1.399	10.157	0.537	0.250	0.921		
TRIBUTARY RIVERS(109)																				
Mosselva	*lower avg.*	900	2 212	2 537	1	9	144	5	300	138	0.124	0.085	0.001	0.493	0.490	0.335	0.000	0.493		
	upper avg.	900	2 212	2 537	1	9	144	5	300	138	0.124	0.085	0.001	0.493	0.490	0.335	0.003	0.493		
Hølenelva	*lower avg.*	129	314	469	2	4	66	2	91	417	0.032	0.025	0.001	0.115	0.204	0.134	0.000	0.118		
	upper avg.	129	314	469	2	4	66	2	91	417	0.032	0.025	0.001	0.115	0.204	0.134	0.000	0.118		
Årungelva	*lower avg.*	57	58	120	0	1	57	0	71	50	0.004	0.002	0.000	0.039	0.020	0.024	0.000	0.031		
	upper avg.	57	58	120	0	1	57	0	71	50	0.004	0.002	0.000	0.039	0.020	0.024	0.000	0.031		
Gjersjøelva	*lower avg.*	96	30	251	0	0	40	1	53	174	0.009	0.002	0.000	0.053	0.014	0.074	0.000	0.079		
	upper avg.	96	30	251	0	0	40	1	53	174	0.009	0.002	0.000	0.053	0.014	0.074	0.000	0.079		
Ljanselva	*lower avg.*	59	129	115	1	2	20	1	26	137	0.012	0.005	0.000	0.053	0.000	0.054	0.010	0.065		
	upper avg.	59	129	115	1	2	20	1	26	137	0.012	0.005	0.000	0.053	0.000	0.054	0.010	0.065		
Loelva	*lower avg.*	99	578	213	2	5	41	8	65	261	0.020	0.035	0.001	0.158	0.339	0.063	0.029	0.000		
	upper avg.	99	578	213	2	5	41	8	65	261	0.020	0.035	0.001	0.158	0.339	0.063	0.029	0.036		
Akerselva	*lower avg.*	324	137	483	0	2	25	4	49	420	0.030	0.074	0.002	0.163	0.590	0.038	0.008	0.502		
	upper avg.	324	137	483	0	2	25	4	49	420	0.030	0.074	0.002	0.163	0.590	0.038	0.008	0.502		
Frognerelva	*lower avg.*	29	32	46	0	1	13	1	17	63	0.005	0.000	0.000	0.049	0.019	0.016	0.002	0.037		
	upper avg.	29	32	46	0	1	13	1	17	63	0.005	0.000	0.000	0.049	0.019	0.016	0.002	0.037		
Lysakerelva	*lower avg.*	263	100	537	0	0	18	1	28	223	0.032	0.009	0.000	0.000	0.045	0.004	0.010	0.192		
	upper avg.	263	100	537	0	0	18	1	28	223	0.032	0.009	0.000	0.001	0.045	0.004	0.010	0.192		
Sandvikselva	*lower avg.*	287	123	544	1	2	18	1	33	487	0.038	0.000	0.000	0.061	0.000	0.035	0.049	0.000		
	upper avg.	287	123	544	1	2	18	1	33	487	0.038	0.001	0.000	0.061	0.001	0.035	0.049	0.000		
Åroselva	*lower avg.*	174	802	450	1	2	101	2	115	428	0.042	0.061	0.003	0.140	0.235	0.069	0.075	0.111		
	upper avg.	174	802	450	1	2	101	2	115	428	0.042	0.061	0.003	0.140	0.235	0.069	0.075	0.111		
Lierelva	*lower avg.*	435	5 881	1 154	2	8	125	0	145	1 131	0.130	0.222	0.007	0.393	2.141	0.195	0.301	0.566		
	upper avg.	435	5 881	1 154	2	8	125	0	145	1 131	0.130	0.222	0.007	0.393	2.141	0.195	0.301	0.566		
Sandeelva	*lower avg.*	297	902	483	0	1	45	2	70	398	0.083	0.148	0.013	0.357	3.923	0.135	0.077	0.162		
	upper avg.	297	902	483	0	1	45	2	70	398	0.083	0.148	0.013	0.357	3.923	0.135	0.077	0.162		
Aulielva	*lower avg.*	484	2 469	1 115	8	29	258	19	306	1 502	0.164	0.091	0.010	0.479	0.890	0.482	0.129	0.773		
	upper avg.	484	2 469	1 115	8	29	258	19	306	1 502	0.164	0.091	0.010	0.479	0.890	0.482	0.129	0.773		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Farriselva-Siljanvassdraget	*lower avg.*	1 256	317	2 185	1	1	154	2	228	1 734	0.069	0.000	0.020	0.000	4.673	0.039	0.009	0.000		
	upper avg.	1 256	317	2 185	1	1	154	2	228	1 734	0.069	0.002	0.020	0.003	4.673	0.039	0.009	0.458		
Gjerstadelva	*lower avg.*	983	432	1 961	0	2	63	10	126	609	0.086	0.168	0.004	0.181	1.693	0.213	0.022	0.538		
	upper avg.	983	432	1 961	0	2	63	10	126	609	0.086	0.168	0.004	0.181	1.693	0.213	0.022	0.538		
Vegårdselva	*lower avg.*	1 018	481	2 018	1	2	51	4	116	364	0.101	0.104	0.008	0.223	0.082	0.202	0.037	0.372		
	upper avg.	1 018	481	2 018	1	2	51	4	116	364	0.101	0.104	0.008	0.223	0.082	0.202	0.037	0.372		
Søgneelva-Songdalselva	*lower avg.*	784	277	1 259	1	3	113	6	168	183	0.074	0.112	0.015	0.155	1.530	0.150	0.000	0.286		
	upper avg.	784	277	1 259	1	3	113	6	168	183	0.074	0.112	0.015	0.155	1.530	0.150	0.002	0.286		
Audnedalselva	*lower avg.*	1 399	485	1 864	1	3	154	6	246	467	0.100	0.220	0.014	0.156	2.928	0.174	0.000	0.638		
	upper avg.	1 399	485	1 864	1	3	154	6	246	467	0.100	0.220	0.014	0.156	2.928	0.174	0.004	0.638		
Soknedalselva	*lower avg.*	1 950	897	1 331	2	6	179	12	253	840	0.114	0.205	0.017	0.356	2.282	1.711	0.052	0.890		
	upper avg.	1 950	897	1 331	2	6	179	12	253	840	0.114	0.205	0.017	0.356	2.282	1.711	0.052	0.890		
Hellelandselva	*lower avg.*	1 577	620	1 344	2	4	169	9	247	599	0.086	0.224	0.013	0.212	1.913	0.183	0.045	0.719		
	upper avg.	1 577	620	1 344	2	4	169	9	247	599	0.086	0.224	0.013	0.212	1.913	0.183	0.045	0.719		
Håelva	*lower avg.*	455	444	787	2	6	163	12	284	427	0.074	0.027	0.002	0.146	0.669	0.090	0.000	0.249		
	upper avg.	455	444	787	2	6	163	12	284	427	0.074	0.027	0.002	0.146	0.669	0.090	0.001	0.249		
Imselva	*lower avg.*	352	121	437	0	1	69	2	93	4	0.013	0.011	0.001	0.067	0.245	0.062	0.000	0.128		
	upper avg.	352	121	437	0	1	69	2	93	4	0.013	0.011	0.001	0.067	0.245	0.062	0.001	0.128		
Oltedalselva,utløp Ragsvatnet	*lower avg.*	825	205	498	0	0	85	4	102	617	0.020	0.045	0.006	0.120	0.893	0.124	0.033	0.000		
	upper avg.	825	205	498	0	0	85	4	102	617	0.020	0.045	0.006	0.120	0.893	0.124	0.033	0.301		
Dirdalsåna	*lower avg.*	1 291	182	777	0	1	117	1	157	467	0.050	0.086	0.003	0.125	0.603	0.346	0.000	0.589		
	upper avg.	1 291	182	777	0	1	117	1	157	467	0.050	0.086	0.003	0.125	0.603	0.346	0.004	0.589		
Frafjordelva	*lower avg.*	1 454	262	839	0	2	103	6	132	491	0.038	0.121	0.006	0.165	0.508	0.027	0.049	0.531		
	upper avg.	1 454	262	839	0	2	103	6	132	491	0.038	0.121	0.006	0.165	0.508	0.027	0.049	0.531		
Espedalselva	*lower avg.*	1 127	223	572	1	2	72	2	115	588	0.021	0.052	0.003	0.024	0.278	0.072	0.080	0.412		
	upper avg.	1 127	223	572	1	2	72	2	115	588	0.021	0.052	0.003	0.024	0.278	0.072	0.080	0.412		
Førrelva	*lower avg.*	1 246	227	799	1	2	28	1	42	733	0.027	0.065	0.002	0.050	0.194	0.105	0.039	0.000		
	upper avg.	1 246	227	799	1	2	28	1	42	733	0.027	0.065	0.002	0.050	0.194	0.105	0.039	0.910		
Åbøelva	*lower avg.*	900	140	296	1	1	30	0	42	108	0.024	0.022	0.001	0.044	0.309	0.063	0.089	0.411		
	upper avg.	900	140	296	1	1	30	0	42	108	0.024	0.022	0.001	0.044	0.309	0.063	0.089	0.411		
Etneelva	*lower avg.*	1 667	461	710	1	2	190	3	241	419	0.105	0.047	0.008	0.236	0.666	0.500	0.700	1.065		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	1 667	461	710	1	2	190	3	241	419	0.105	0.047	0.008	0.236	0.666	0.500	0.700	1.065		
Opo	*lower avg.*	4 953	5 123	1 506	6	4	170	18	286	2 149	0.364	0.723	0.000	0.454	2.884	0.617	0.000	0.000		
	upper avg.	4 953	5 123	1 506	6	4	170	18	286	2 149	0.364	0.723	0.000	0.454	2.884	0.617	0.014	1.808		
Tysso	*lower avg.*	3 289	455	1 957	3	0	179	6	242	881	0.134	0.061	0.007	1.016	4.135	0.792	0.153	1.801		
	upper avg.	3 289	455	1 957	3	1	179	6	242	881	0.134	0.061	0.007	1.016	4.135	0.792	0.153	1.801		
Kinso	*lower avg.*	1 567	566	325	2	0	15	6	51	112	0.058	0.028	0.000	0.000	0.042	0.063	0.157	0.572		
	upper avg.	1 567	566	325	2	0	15	6	51	112	0.058	0.028	0.000	0.000	0.042	0.063	0.157	0.572		
Veig	*lower avg.*	2 766	606	995	3	2	28	3	91	1 350	0.047	0.047	0.003	0.083	0.000	0.429	0.233	1.010		
	upper avg.	2 766	606	995	3	2	28	3	91	1 350	0.047	0.047	0.003	0.083	0.010	0.429	0.233	1.010		
Bjoreio	*lower avg.*	3 302	862	2 537	1	4	50	6	127	1 240	0.110	0.088	0.000	0.424	0.280	0.723	0.000	1.205		
	upper avg.	3 302	862	2 537	1	4	50	6	127	1 240	0.110	0.088	0.000	0.424	0.280	0.723	0.010	1.205		
Sima	*lower avg.*	809	225	125	0	1	25	1	39	665	0.021	0.008	0.000	0.030	0.213	0.089	0.013	0.295		
	upper avg.	809	225	125	0	1	25	1	39	665	0.021	0.008	0.000	0.030	0.213	0.089	0.013	0.295		
Austdøla	*lower avg.*	747	175	86	1	0	21	3	31	83	0.016	0.016	0.002	0.033	0.124	0.030	0.012	0.341		
	upper avg.	747	175	86	1	0	21	3	31	83	0.016	0.016	0.002	0.033	0.124	0.030	0.012	0.341		
Nordøla /Austdøla	*lower avg.*	224	81	16	0	0	9	0	11	99	0.008	0.005	0.000	0.010	0.001	0.040	0.005	0.000		
	upper avg.	224	81	16	0	0	9	0	11	99	0.008	0.005	0.000	0.010	0.001	0.040	0.005	0.082		
Tysselvi Samnangervassdraget	*lower avg.*	2 038	462	1 258	1	2	62	5	131	177	0.069	0.121	0.010	0.216	1.041	0.179	0.000	0.744		
	upper avg.	2 038	462	1 258	1	2	62	5	131	177	0.069	0.121	0.010	0.216	1.041	0.179	0.006	0.744		
Oselva	*lower avg.*	917	358	1 096	1	3	47	3	108	317	0.051	0.086	0.006	0.335	0.000	0.178	0.000	0.000		
	upper avg.	917	358	1 096	1	3	47	3	108	317	0.051	0.086	0.006	0.335	0.003	0.178	0.003	0.335		
DaleelviBergsdalsvassdraget	*lower avg.*	1 835	463	753	1	1	55	5	117	344	0.055	0.127	0.008	0.227	1.112	0.164	0.000	0.000		
	upper avg.	1 835	463	753	1	1	55	5	117	344	0.055	0.127	0.008	0.227	1.112	0.164	0.005	0.670		
Ekso -Storelvi	*lower avg.*	4 617	1 180	2 506	3	7	90	13	269	324	0.057	0.211	0.017	0.000	0.000	0.286	0.110	0.000		
	upper avg.	4 617	1 180	2 506	3	7	90	13	269	324	0.057	0.211	0.017	0.012	0.017	0.286	0.110	1.685		
Modalselva -Moelvi	*lower avg.*	4 230	772	1 321	1	5	134	7	200	853	0.046	0.201	0.015	0.000	0.364	0.321	0.282	0.000		
	upper avg.	4 230	772	1 321	1	5	134	7	200	853	0.046	0.201	0.015	0.011	0.364	0.321	0.282	1.544		
Nærøydalselvi	*lower avg.*	1 934	568	429	1	2	52	4	106	1 692	0.035	0.000	0.000	0.162	0.609	0.062	0.152	0.706		
	upper avg.	1 934	568	429	1	2	52	4	106	1 692	0.035	0.004	0.000	0.162	0.609	0.062	0.152	0.706		
Flåmselvi	*lower avg.*	1 093	492	170	1	1	23	3	40	246	0.039	0.010	0.000	0.043	0.248	0.112	0.076	0.000		
	upper avg.	1 093	492	170	1	1	23	3	40	246	0.039	0.010	0.000	0.043	0.248	0.112	0.076	0.399		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Aurlandselvi	*lower avg.*	3 175	1 118	695	2	1	102	5	151	1 234	0.093	0.174	0.000	0.385	0.983	0.280	0.057	0.000		
	upper avg.	3 175	1 118	695	2	1	102	5	151	1 234	0.093	0.174	0.000	0.385	0.983	0.280	0.057	1.159		
Erdalselvi	*lower avg.*	444	85	155	0	0	1	0	13	94	0.009	0.007	0.000	0.013	0.014	0.014	0.039	0.000		
	upper avg.	444	85	155	0	0	1	0	13	94	0.009	0.007	0.000	0.013	0.014	0.014	0.039	0.162		
Lærdalselva /Mjeldo	*lower avg.*	3 771	860	1 087	2	3	117	6	230	1 520	0.093	0.082	0.000	0.440	0.554	0.298	0.225	0.000		
	upper avg.	3 771	860	1 087	2	3	117	6	230	1 520	0.093	0.082	0.000	0.440	0.554	0.298	0.225	1.376		
Årdalselvi	*lower avg.*	3 568	886	912	1	4	87	7	148	2 155	0.052	0.025	0.006	1.302	0.456	0.343	0.000	3.907		
	upper avg.	3 568	886	912	1	4	87	7	148	2 155	0.052	0.025	0.006	1.302	0.456	0.343	0.000	3.907		
Fortundalselva	*lower avg.*	2 561	2 543	425	1	3	84	3	118	1 339	0.143	0.056	0.011	0.807	1.070	0.247	0.131	1.869		
	upper avg.	2 561	2 543	425	1	3	84	3	118	1 339	0.143	0.056	0.011	0.807	1.070	0.247	0.131	1.869		
Mørkrisdalselvi	*lower avg.*	1 422	2 251	222	1	1	30	2	55	959	0.036	0.067	0.000	0.284	0.902	0.262	0.184	0.000		
	upper avg.	1 422	2 251	222	1	1	30	2	55	959	0.036	0.067	0.000	0.284	0.902	0.262	0.184	0.519		
Årøyelva	*lower avg.*	3 229	1 453	896	1	3	79	7	153	1 697	0.066	0.090	0.000	0.078	0.839	0.157	0.200	0.000		
	upper avg.	3 229	1 453	896	1	3	79	7	153	1 697	0.066	0.090	0.000	0.078	0.839	0.157	0.200	1.179		
Sogndalselva	*lower avg.*	1 245	304	548	3	2	38	3	72	186	0.041	0.046	0.006	0.090	0.740	0.027	0.173	0.000		
	upper avg.	1 245	304	548	3	2	38	3	72	186	0.041	0.046	0.006	0.090	0.740	0.027	0.173	0.455		
Oselva	*lower avg.*	3 069	762	2 801	1	5	59	17	173	661	0.185	0.108	0.000	0.358	1.904	0.351	0.000	1.680		
	upper avg.	3 069	762	2 801	1	5	59	17	173	661	0.185	0.108	0.000	0.358	1.904	0.351	0.009	1.680		
Hopselva	*lower avg.*	886	244	226	0	1	29	2	42	78	0.017	0.028	0.003	0.009	0.335	0.023	0.133	0.323		
	upper avg.	886	244	226	0	1	29	2	42	78	0.017	0.028	0.003	0.009	0.335	0.023	0.133	0.323		
Ååelva (Gjengedalselva)	*lower avg.*	2 039	589	1 109	1	3	45	4	90	227	0.061	0.046	0.000	0.137	0.582	0.069	0.141	1.451		
	upper avg.	2 039	589	1 109	1	3	45	4	90	227	0.061	0.046	0.000	0.137	0.582	0.069	0.141	1.451		
Oldenelva	*lower avg.*	1 509	799	427	0	2	71	6	110	630	0.116	0.058	0.006	0.165	0.359	0.078	0.059	0.000		
	upper avg.	1 509	799	427	0	2	71	6	110	630	0.116	0.058	0.006	0.165	0.359	0.078	0.059	0.551		
Loelvi	*lower avg.*	1 744	986	318	0	3	55	3	88	876	0.139	0.046	0.006	0.182	0.093	0.051	0.156	0.000		
	upper avg.	1 744	986	318	0	3	55	3	88	876	0.139	0.046	0.006	0.182	0.093	0.051	0.156	0.636		
Stryneelva	*lower avg.*	3 554	1 664	649	1	5	125	9	228	1 525	0.143	0.077	0.008	0.785	1.168	0.252	0.226	1.297		
	upper avg.	3 554	1 664	649	1	5	125	9	228	1 525	0.143	0.077	0.008	0.785	1.168	0.252	0.226	1.297		
Hornindalselva(Horndøla)	*lower avg.*	3 261	893	1 428	1	6	144	10	211	1 383	0.136	0.035	0.006	0.341	0.957	0.365	0.000	1.190		
	upper avg.	3 261	893	1 428	1	6	144	10	211	1 383	0.136	0.035	0.006	0.341	0.957	0.365	0.010	1.190		
Ørstaelva	*lower avg.*	1 150	348	656	4	9	42	6	87	703	0.039	0.008	0.000	0.135	0.396	0.118	0.000	0.420		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	1 150	348	656	4	9	42	6	87	703	0.039	0.008	0.000	0.135	0.396	0.118	0.003	0.420		
Valldøla	*lower avg.*	2 437	534	458	0	2	0	5	0	648	0.045	0.005	0.002	0.169	0.625	0.080	0.049	0.000		
	upper avg.	2 437	534	458	0	2	1	5	9	648	0.045	0.005	0.002	0.169	0.625	0.080	0.049	0.889		
Rauma	*lower avg.*	6 575	1 368	1 452	1	5	41	12	133	1 833	0.137	0.080	0.000	0.730	1.212	0.406	0.000	0.000		
	upper avg.	6 575	1 368	1 452	1	5	41	12	133	1 833	0.137	0.080	0.000	0.730	1.212	0.406	0.019	2.400		
Isa	*lower avg.*	967	282	192	0	1	5	2	6	552	0.018	0.000	0.000	0.110	0.013	0.078	0.086	0.353		
	upper avg.	967	282	192	0	1	5	2	6	552	0.018	0.002	0.000	0.110	0.013	0.078	0.086	0.353		
Eira	*lower avg.*	5 457	0	1 170	1	3	209	9	295	3 970	0.199	0.025	0.000	0.569	0.528	0.239	0.498	2.988		
	upper avg.	5 457	100	1 170	1	3	209	9	295	3 970	0.199	0.025	0.000	0.569	0.528	0.239	0.498	2.988		
Litledalselva	*lower avg.*	1 009	210	221	0	1	51	1	58	1 319	0.020	0.000	0.000	0.013	0.018	0.243	0.103	0.000		
	upper avg.	1 009	210	221	0	1	51	1	58	1 319	0.020	0.002	0.000	0.013	0.018	0.243	0.103	0.368		
Ålvunda	*lower avg.*	791	419	510	0	1	37	2	67	557	0.012	0.023	0.000	0.241	0.217	0.057	0.016	0.361		
	upper avg.	791	419	510	0	1	37	2	67	557	0.012	0.023	0.000	0.241	0.217	0.057	0.016	0.361		
Toåa	*lower avg.*	998	211	457	0	1	6	2	35	393	0.011	0.017	0.000	0.163	0.080	0.016	0.000	0.000		
	upper avg.	998	211	457	0	1	6	2	35	393	0.011	0.017	0.000	0.163	0.080	0.016	0.003	0.364		
Bøvra	*lower avg.*	904	247	841	0	0	41	3	85	445	0.027	0.008	0.002	0.078	0.076	0.058	0.014	0.000		
	upper avg.	904	247	841	0	0	41	3	85	445	0.027	0.008	0.002	0.078	0.076	0.058	0.014	0.330		
Børselva	*lower avg.*	257	413	521	1	1	30	3	56	127	0.020	0.005	0.000	0.131	0.000	0.131	0.015	0.328		
	upper avg.	257	413	521	1	1	30	3	56	127	0.020	0.005	0.000	0.131	0.001	0.131	0.015	0.328		
Vigda	*lower avg.*	386	1 480	524	1	1	27	1	51	281	0.025	0.008	0.000	0.130	0.000	0.000	0.000	0.317		
	upper avg.	386	1 480	524	1	1	27	1	51	281	0.025	0.008	0.000	0.130	0.001	0.001	0.001	0.317		
Homla	*lower avg.*	427	106	1 044	0	1	6	3	34	249	0.076	0.003	0.002	0.101	0.000	0.077	0.000	0.312		
	upper avg.	427	106	1 044	0	1	6	3	34	249	0.076	0.003	0.002	0.101	0.002	0.077	0.001	0.312		
Gråe	*lower avg.*	266	221	532	1	1	43	2	69	19	0.032	0.000	0.000	0.105	0.000	0.037	0.025	0.000		
	upper avg.	266	221	532	1	1	43	2	69	19	0.032	0.000	0.000	0.105	0.001	0.037	0.025	0.097		
Figgja	*lower avg.*	740	1 713	2 062	1	4	101	2	125	405	0.077	0.044	0.001	0.297	0.176	0.229	0.100	0.000		
	upper avg.	740	1 713	2 062	1	4	101	2	125	405	0.077	0.044	0.001	0.297	0.176	0.229	0.100	0.270		
Årgårdselva	*lower avg.*	1 985	2 023	4 830	1	12	71	12	269	1 100	0.031	0.069	0.000	0.492	0.228	0.324	0.000	2.300		
	upper avg.	1 985	2 023	4 830	1	12	71	12	269	1 100	0.031	0.069	0.000	0.492	0.228	0.324	0.006	2.300		
Moelva(Salsvatenelva)	*lower avg.*	2 085	393	1 513	1	0	44	4	93	761	0.077	0.015	0.004	0.000	0.780	0.096	0.000	0.000		
	upper avg.	2 085	393	1 513	1	1	44	4	93	761	0.077	0.015	0.004	0.005	0.780	0.096	0.006	0.761		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Åelva(Åbjøra)	*lower avg.*	3 104	846	1 164	1	3	34	10	105	456	0.084	0.052	0.000	0.181	0.736	0.275	0.114	0.000		
	upper avg.	3 104	846	1 164	1	3	34	10	105	456	0.084	0.052	0.000	0.181	0.736	0.275	0.114	1.133		
Skjerva	*lower avg.*	544	367	665	1	3	19	14	87	261	0.048	0.062	0.004	0.209	0.399	0.296	0.011	0.397		
	upper avg.	544	367	665	1	3	19	14	87	261	0.048	0.062	0.004	0.209	0.399	0.296	0.011	0.397		
Fusta	*lower avg.*	3 691	1 192	1 196	1	6	18	28	154	612	0.173	0.024	0.027	0.184	0.931	0.303	0.000	1.347		
	upper avg.	3 691	1 192	1 196	1	6	18	28	154	612	0.173	0.024	0.027	0.184	0.931	0.303	0.011	1.347		
Drevja	*lower avg.*	1 196	653	325	1	1	7	3	37	134	0.011	0.000	0.007	0.100	0.163	0.025	0.000	0.000		
	upper avg.	1 196	653	325	1	1	7	3	37	134	0.011	0.002	0.007	0.100	0.163	0.025	0.003	0.437		
Bjerkaelva	*lower avg.*	2 103	724	1 463	1	0	19	7	78	630	0.033	0.065	0.002	0.386	0.523	0.486	0.027	1.919		
	upper avg.	2 103	724	1 463	1	0	19	7	78	630	0.033	0.065	0.002	0.386	0.523	0.486	0.027	1.919		
Dalselva	*lower avg.*	1 228	285	700	0	2	3	3	31	361	0.000	0.016	0.000	0.168	0.004	0.217	0.036	1.232		
	upper avg.	1 228	285	700	0	2	3	3	31	361	0.004	0.016	0.000	0.168	0.004	0.217	0.036	1.232		
Fykanåga	*lower avg.*	1 866	1 263	341	1	2	24	5	55	237	0.129	0.000	0.000	0.077	0.350	0.078	0.000	0.000		
	upper avg.	1 866	1 263	341	1	2	24	5	55	237	0.129	0.003	0.000	0.077	0.350	0.078	0.005	0.681		
Saltelva	*lower avg.*	3 719	5 580	662	2	0	31	7	114	2 546	0.132	0.000	0.000	0.317	1.577	0.380	3.109	0.000		
	upper avg.	3 719	5 580	662	2	1	31	7	114	2 546	0.132	0.007	0.000	0.317	1.577	0.380	3.109	1.358		
SulitjelmavassdragetUtl Øvrevt	*lower avg.*	3 679	0	1 410	2	0	15	11	80	866	0.000	0.000	0.000	0.000	0.000	0.210	8.521	3.022		
	upper avg.	3 679	67	1 410	2	0	15	11	80	866	0.013	0.007	0.000	0.009	0.013	0.210	8.521	3.022		
Kobbelva	*lower avg.*	2 082	566	304	1	0	21	3	52	823	0.068	0.005	0.011	0.038	0.009	0.118	0.000	0.000		
	upper avg.	2 082	566	304	1	0	21	3	52	823	0.068	0.005	0.011	0.038	0.009	0.118	0.006	0.760		
Elvegårdselva	*lower avg.*	3 444	2 789	1 395	1	4	12	10	79	2 259	0.091	0.159	0.018	0.534	1.143	0.786	0.849	2.200		
	upper avg.	3 444	2 789	1 395	1	4	12	10	79	2 259	0.091	0.159	0.018	0.534	1.143	0.786	0.849	2.200		
Spanselva	*lower avg.*	539	123	111	0	0	6	1	17	287	0.010	0.014	0.003	0.092	0.096	0.197	0.000	0.000		
	upper avg.	539	123	111	0	0	6	1	17	287	0.010	0.014	0.003	0.092	0.096	0.197	0.002	0.197		
Salangselva	*lower avg.*	2 124	405	822	1	1	13	6	48	608	0.000	0.028	0.016	0.194	0.233	0.352	0.496	0.000		
	upper avg.	2 124	405	822	1	1	13	6	48	608	0.008	0.028	0.016	0.194	0.233	0.352	0.496	0.775		
Lakselva(Rossfjordelva)	*lower avg.*	459	146	292	0	0	0	1	17	102	0.009	0.006	0.001	0.025	0.031	0.068	0.000	0.335		
	upper avg.	459	146	292	0	0	0	1	17	102	0.009	0.006	0.001	0.025	0.031	0.068	0.001	0.335		
Nordkjoselva	*lower avg.*	525	156	220	0	0	4	1	14	390	0.023	0.008	0.002	0.049	0.080	0.000	0.144	0.000		
	upper avg.	525	156	220	0	0	4	1	14	390	0.023	0.008	0.002	0.049	0.080	0.002	0.144	0.192		
Signaldalselva	*lower avg.*	1 380	485	932	2	1	9	4	31	1 042	0.044	0.000	0.005	0.262	0.008	0.206	0.000	0.000		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	1 380	485	932	2	1	9	4	31	1 042	0.044	0.003	0.005	0.262	0.008	0.206	0.004	0.504		
Skibotnelva	*lower avg.*	1 333	342	803	0	0	11	2	30	784	0.030	0.007	0.007	0.211	0.000	0.504	0.341	1.217		
	upper avg.	1 333	342	803	0	0	11	2	30	784	0.030	0.007	0.007	0.211	0.005	0.504	0.341	1.217		
Kåfjordelva	*lower avg.*	959	140	245	0	0	21	1	40	525	0.010	0.018	0.005	0.341	0.030	0.227	0.072	0.000		
	upper avg.	959	140	245	0	0	21	1	40	525	0.010	0.018	0.005	0.341	0.030	0.227	0.072	0.350		
Reisaelva	*lower avg.*	4 920	1 488	3 093	3	3	65	12	184	4 346	0.136	0.138	0.020	1.298	1.369	1.244	0.000	6.286		
	upper avg.	4 920	1 488	3 093	3	3	65	12	184	4 346	0.136	0.138	0.020	1.298	1.369	1.244	0.014	6.286		
Mattiselva	*lower avg.*	368	86	480	0	0	1	0	13	197	0.016	0.000	0.003	0.089	0.026	0.040	0.162	0.000		
	upper avg.	368	86	480	0	0	1	0	13	197	0.016	0.001	0.003	0.089	0.026	0.040	0.162	0.134		
Tverrelva	*lower avg.*	264	96	555	0	0	4	1	20	206	0.009	0.001	0.001	0.074	0.047	0.034	0.014	0.000		
	upper avg.	264	96	555	0	0	4	1	20	206	0.009	0.001	0.001	0.074	0.047	0.034	0.014	0.096		
Repparfjordelva	*lower avg.*	2 568	553	4 739	1	1	14	10	114	1 085	0.063	0.000	0.009	1.237	0.297	0.281	0.055	1.875		
	upper avg.	2 568	553	4 739	1	1	14	10	114	1 085	0.063	0.005	0.009	1.237	0.297	0.281	0.055	1.875		
Stabburselva	*lower avg.*	1 647	138	1 443	1	1	10	4	38	1 289	0.032	0.005	0.004	0.069	0.340	0.060	0.250	0.000		
	upper avg.	1 647	138	1 443	1	1	10	4	38	1 289	0.032	0.005	0.004	0.069	0.340	0.060	0.250	0.601		
Lakseelv	*lower avg.*	1 503	1 540	1 590	1	3	6	4	56	1 131	0.030	0.021	0.005	0.301	0.000	0.326	0.300	0.000		
	upper avg.	1 503	1 540	1 590	1	3	6	4	56	1 131	0.030	0.021	0.005	0.301	0.005	0.326	0.300	0.548		
Børselva	*lower avg.*	1 273	465	465	0	0	2	6	36	1 319	0.002	0.051	0.003	0.093	0.245	0.101	0.293	0.000		
	upper avg.	1 273	465	465	0	0	2	6	36	1 319	0.002	0.051	0.003	0.093	0.245	0.101	0.293	0.465		
Mattusjåkka	*lower avg.*	152	27	72	0	0	3	1	4	67	0.003	0.023	0.002	0.023	0.213	0.045	0.134	0.000		
	upper avg.	152	27	72	0	0	3	1	4	67	0.003	0.023	0.002	0.023	0.213	0.045	0.134	0.056		
Stuorrajåkka	*lower avg.*	1 040	0	266	0	0	9	2	34	895	0.034	0.084	0.009	0.000	0.323	0.062	0.164	0.000		
	upper avg.	1 040	19	266	0	0	9	2	34	895	0.034	0.084	0.009	0.003	0.323	0.062	0.164	0.380		
Soussjåkka	*lower avg.*	139	0	66	0	0	2	0	4	138	0.002	0.004	0.001	0.004	0.021	0.002	0.037	0.000		
	upper avg.	139	3	66	0	0	2	0	4	138	0.002	0.004	0.001	0.004	0.021	0.002	0.037	0.051		
Adamselva	*lower avg.*	1 122	27	655	0	0	1	3	38	916	0.051	0.016	0.008	0.044	0.336	0.000	0.000	1.228		
	upper avg.	1 122	27	655	0	0	1	3	38	916	0.051	0.016	0.008	0.044	0.336	0.004	0.003	1.228		
Syltefjordelva(Vesterelva)	*lower avg.*	1 132	0	330	1	1	3	4	25	907	0.067	0.000	0.007	0.024	0.074	0.000	0.727	0.826		
	upper avg.	1 132	21	330	1	1	3	4	25	907	0.067	0.002	0.007	0.024	0.074	0.004	0.727	0.826		
Jakobselv	*lower avg.*	1 057	140	1 080	1	1	0	2	48	1 368	0.029	0.000	0.004	0.029	0.000	0.004	0.013	0.000		
	upper avg.	1 057	140	1 080	1	1	0	2	48	1 368	0.029	0.002	0.004	0.029	0.004	0.004	0.013	0.386		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Neidenelva	*lower avg.*	2 698	1 133	4 723	2	1	18	12	187	1 970	0.064	0.000	0.020	0.512	0.000	0.222	0.571	0.000		
	upper avg.	2 698	1 133	4 723	2	1	18	12	187	1 970	0.064	0.005	0.020	0.512	0.010	0.222	0.571	0.985		
Grense Jakobselv	*lower avg.*	311	86	411	0	0	0	1	15	339	0.020	0.007	0.002	0.256	0.216	0.884	0.338	0.341		
	upper avg.	311	86	411	0	0	0	1	15	339	0.020	0.007	0.002	0.256	0.216	0.884	0.338	0.341		

Table 3.
Total inputs from Norway 2011

TOTAL INPUTS																				
Discharge region	**Estimate**	**Flow rate (km^3/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: TOTAL NORWAY																				
RIVERINE INPUTS																				
Main Rivers	low avg.	214 393	602 246	306 252	531	1 109	17 231	1 212	33 439	241 323	13.82	20.78	1.11	120.55	522.87	50.80	32.41	84	0	0
	upp avg.		602 246	306 252	540	1 110	17 231	1 215	33 439	241 323	13.87	20.79	1.15	120.55	522.87	50.80	34.03	119	16	126
Tributary Rivers (36)	low avg.	227 639	457 264	254 490	418	797	7 988	727	21 325	208 261	8.93	16.40	1.05	91.86	215.88	66.38	28.65	85		
	upp avg.		457 320	254 490	448	798	7 991	755	21 325	208 261	9.91	16.42	1.18	91.86	215.96	66.81	30.69	126		
Tributary Rivers (109)	low avg.	172 317	79 174	103 175	114	254	5 898	535	11 045	82 032	6.47	6.07	0.50	24.11	64.55	22.84	22.44	58		
	upp avg.		79 382	103 175	115	259	5 899	536	11 054	82 032	6.49	6.12	0.50	24.15	64.62	22.85	22.60	88		
Total Riverine Inputs	**low avg.**	614 350	1 138 684	663 917	1 063	2 160	31 118	2 474	65 809	531 616	29.21	43.26	2.66	236.52	803.30	140.02	83.51	227	0	0
	upp avg.		1 138 948	663 917	1 103	2 167	31 122	2 505	65 818	531 616	30.27	43.32	2.83	236.56	803.45	140.46	87.32	333	16	126
Sewage Effluents	low avg.		3 848		554	923	605	9 071	12 094		0.21	0.48	0.02	5.32	11.82	1.70	1.00	6		45
	upp avg.		3 848		554	923	605	9 071	12 094		0.21	0.48	0.02	5.32	11.82	1.70	1.00	6		45
Industrial Effluents	low avg.		14 311	6 329	144	241	119	1 783	2 378		2.06	5.06	0.17	6.78	15.93	9.43	1.57	10		0
	upp avg.		14 311	6 329	144	241	119	1 783	2 378		2.06	5.06	0.17	6.78	15.93	9.43	1.57	10		0
Fish Farming	low avg.				5 450	7 899	5 153	37 478	46 848					757.56						
	upp avg.				5 450	7 899	5 153	37 478	46 848					757.56						
Total Direct Inputs	**low avg.**		18 160	6 329	6 149	9 063	5 877	48 333	61 320		2.27	5.54	0.18	769.66	27.74	11.13	2.57	16		45
	upp avg.		18 160	6 329	6 149	9 063	5 877	48 333	61 320		2.27	5.54	0.18	769.66	27.74	11.13	2.57	16		45
Unmonitored Areas	low avg.	453 874			195	793	27 803	2 447	44 485											
	upp avg.				195	793	27 803	2 447	44 485											
REGION TOTAL	**low avg.**	1 068 224	1 156 843	670 246	7 407	12 017	64 797	53 253	171 614	531 616	31	49	3	1 006	831	151	86	242	0	45
	upp avg.		1 157 107	670 246	7 447	12 023	64 801	53 284	171 623	531 616	33	49	3	1 006	831	152	90	349	16	171

TOTAL INPUTS

Discharge region	Estimate	Flow rate (km^3/d)	SPM [tonnes]	TOC [tonnes]	PO4-P [tonnes]	TOTP [tonnes]	NO3-N [tonnes]	NH4-N [tonnes]	TOTN [tonnes]	SiO2 [tonnes]	As [tonnes]	Pb [tonnes]	Cd [tonnes]	Cu [tonnes]	Zn [tonnes]	Ni [tonnes]	Cr [tonnes]	Hg [kg]	HCHG [kg]	SUMPCB [kg]
INPUTS TO OSPAR REGION: Skagerak																				
RIVERINE INPUTS																				
Main Rivers	low avg.	168 646	563 910	269 632	499	1 003	15 935	1 115	29 944	208 074	11.79	18.94	0.93	94.15	472.41	43.44	29.18	64	0	0
	upp avg.		563 910	269 632	503	1 004	15 935	1 115	29 944	208 074	11.79	18.94	0.93	94.15	472.41	43.44	30.21	93	13	102
Tributary Rivers (36)	low avg.	28 728	20 698	57 346	18	79	1 641	156	4 117	22 931	2.37	4.15	0.34	14.07	54.43	3.35	1.60	18		
	upp avg.		20 698	57 346	22	79	1 641	156	4 117	22 931	2.37	4.15	0.34	14.07	54.43	3.35	1.78	22		
Tributary Rivers (109)	low avg.	9 074	15 759	17 805	22	77	1 506	76	2 254	9 186	1.15	1.36	0.10	3.27	19.81	2.44	0.76	5		
	upp avg.		15 759	17 805	22	77	1 506	76	2 254	9 186	1.15	1.37	0.10	3.27	19.82	2.44	0.77	5		
Total Riverine Inputs	**low avg.**	206 449	600 367	344 783	539	1 160	19 082	1 346	36 316	240 191	15.31	24.45	1.37	111.48	546.65	49.22	31.54	87	0	0
	upp avg.		600 367	344 783	547	1 160	19 082	1 346	36 316	240 191	15.31	24.45	1.37	111.49	546.65	49.22	32.75	121	13	102
Sewage Effluents	low avg.		666		69	114	233	3 496	4 661		0.14	0.36	0.01	4.05	9.08	1.41	0.49	3		44
	upp avg.		666		69	114	233	3 496	4 661		0.14	0.36	0.01	4.05	9.08	1.41	0.49	3		44
Industrial Effluents	low avg.		1 263	5 680	43	71	52	780	1 040		0.20	0.30	0.04	5.72	6.13	2.82	1.02	6		0
	upp avg.		1 263	5 680	43	71	52	780	1 040		0.20	0.30	0.04	5.72	6.13	2.82	1.02	6		0
Fish Farming	low avg.				2	3	2	14	17					0.28						
	upp avg.				2	3	2	14	17					0.28						
Total Direct Inputs	**low avg.**		1 929	5 680	113	188	287	4 289	5 718		0.34	0.66	0.05	10.06	15.21	4.23	1.51	9		44
	upp avg.		1 929	5 680	113	188	287	4 289	5 718		0.34	0.66	0.05	10.06	15.21	4.23	1.51	9		44
Unmonitored Areas	low avg.	8 354			17	70	1 962	173	3 139											
	upp avg.				17	70	1 962	173	3 139											
REGION TOTAL	**low avg.**	214 803	602 297	350 463	670	1 417	21 331	5 809	45 173	240 191	16	25	1	122	562	53	33	95	0	44
	upp avg.		602 297	350 463	678	1 418	21 331	5 809	45 173	240 191	16	25	1	122	562	53	34	129	13	146

TOTAL INPUTS																				
Discharge region	**Estimate**	**Flow rate (km^3/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: North Sea																				
RIVERINE INPUTS																				
	low avg.	11 049	5 263	6 427	10	33	623	46	1 225	4 602	0.35	0.43	0.03	3.10	6.17	1.30	0.30	7	0	0
Main Rivers	upp avg.		5 263	6 427	12	33	623	46	1 225	4 602	0.40	0.43	0.03	3.10	6.17	1.30	0.57	8	1	6
	low avg.	68 275	60 645	56 127	92	219	3 056	237	6 705	33 991	1.92	5.87	0.28	16.57	54.95	3.55	3.60	24		
Tributary Rivers (36)	upp avg.		60 700	56 127	101	219	3 058	245	6 705	33 991	2.47	5.87	0.32	16.57	54.95	3.88	4.75	34		
	low avg.	82 642	31 605	35 370	50	97	3 232	215	5 441	30 389	3.01	3.58	0.18	9.95	30.57	10.18	4.00	23		
Tributary Rivers (109)	upp avg.		31 605	35 370	50	99	3 232	215	5 441	30 389	3.01	3.59	0.18	9.98	30.60	10.18	4.06	37		
Total Riverine	**low avg.**	161 966	97 514	97 923	152	349	6 911	498	13 371	68 982	5.29	9.88	0.50	29.63	91.68	15.04	7.90	54	0	0
Inputs	**upp avg.**		97 569	97 923	163	350	6 913	506	13 371	68 982	5.89	9.88	0.53	29.65	91.71	15.37	9.39	79	1	6
	low avg.		211		207	345	179	2 683	3 577		0.01	0.02	0.00	0.23	0.74	0.04	0.03	0		
Sewage Effluents	upp avg.		211		207	345	179	2 683	3 577		0.01	0.02	0.00	0.23	0.74	0.04	0.03	0		
	low avg.		7 371	326	56	93	21	309	412		1.80	0.95	0.06	0.75	8.27	4.68	0.45	3		
Industrial Effluents	upp avg.		7 371	326	56	93	21	309	412		1.80	0.95	0.06	0.75	8.27	4.68	0.45	3		
	low avg.				1 951	2 827	1 844	13 414	16 767					270.69						
Fish Farming	upp avg.				1 951	2 827	1 844	13 414	16 767					270.69						
	low avg.		7 582	326	2 213	3 265	2 044	16 406	20 756		1.81	0.98	0.06	271.66	9.01	4.72	0.48	3		
Total Direct Inputs	**upp avg.**		7 582	326	2 213	3 265	2 044	16 406	20 756		1.81	0.98	0.06	271.66	9.01	4.72	0.48	3		
	low avg.	154 452			64	261	11 145	981	17 833											
Unmonitored Areas	upp avg.				64	261	11 145	981	17 833											
	low avg.	316 418	105 096	98 249	2 429	3 874	20 100	17 885	51 960	68 982	7	11	1	301	101	20	8	57	0	0
REGION TOTAL	**upp avg.**		105 151	98 249	2 440	3 876	20 102	17 892	51 960	68 982	8	11	1	301	101	20	10	82	1	6

TOTAL INPUTS																				
Discharge region	**Estimate**	**Flow rate (km^3/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: Norwegian Sea																				
RIVERINE INPUTS																				
Main Rivers	low avg.	26 677	29 874	22 120	18	56	618	41	1 783	18 068	1.39	1.32	0.14	21.36	41.69	5.28	2.46	11	0	0
	upp avg.		29 874	22 120	21	57	618	43	1 783	18 068	1.39	1.32	0.17	21.36	41.69	5.28	2.72	14	2	14
Tributary Rivers (36)	low avg.	99 467	342 696	94 045	280	410	3 104	236	7 988	85 527	3.70	5.55	0.28	44.60	89.38	28.93	20.24	29		
	upp avg.		342 696	94 045	295	412	3 104	249	7 988	85 527	3.95	5.56	0.36	44.60	89.46	29.04	20.80	51		
Tributary Rivers (109)	low avg.	65 327	27 517	33 125	35	72	1 086	196	2 716	30 628	1.88	0.91	0.14	8.13	12.03	8.16	14.63	25		
	upp avg.		27 684	33 125	35	74	1 087	196	2 725	30 628	1.90	0.94	0.14	8.15	12.05	8.17	14.71	37		
Total Riverine Inputs	**low avg.**	191 472	400 087	149 290	334	539	4 808	473	12 487	134 223	6.97	7.78	0.56	74.10	143.10	42.38	37.32	65	0	0
	upp avg.		400 254	149 290	351	542	4 809	488	12 496	134 223	7.25	7.82	0.67	74.11	143.21	42.48	38.23	102	2	14
Sewage Effluents	low avg.		2 950		259	432	181	2 708	3 611		0.06	0.10	0.00	1.04	2.00	0.25	0.48	3		0
	upp avg.		2 950		259	432	181	2 708	3 611		0.06	0.10	0.00	1.04	2.00	0.25	0.48	3		0
Industrial Effluents	low avg.		5 677	323	46	77	46	694	926		0.06	3.80	0.06	0.30	1.53	1.93	0.11	1		
	upp avg.		5 677	323	46	77	46	694	926		0.06	3.80	0.06	0.30	1.53	1.93	0.11	1		
Fish Farming	low avg.				3 154	4 571	2 983	21 697	27 121					438.97						
	upp avg.				3 154	4 571	2 983	21 697	27 121					438.97						
Total Direct Inputs	**low avg.**		8 627	323	3 460	5 080	3 210	25 099	31 658		0.12	3.90	0.07	440.32	3.53	2.18	0.59	4		0
	upp avg.		8 627	323	3 460	5 080	3 210	25 099	31 658		0.12	3.90	0.07	440.32	3.53	2.18	0.59	4		0
Unmonitored Areas	low avg.	248 121			103	420	13 152	1 157	21 043											
	upp avg.				103	420	13 152	1 157	21 043											
REGION TOTAL	**low avg.**	439 592	408 714	149 613	3 897	6 039	21 171	26 730	65 188	134 223	7	12	1	514	147	45	38	69	0	0
	upp avg.		408 880	149 613	3 914	6 043	21 171	26 745	65 196	134 223	7	12	1	514	147	45	39	106	2	14

TOTAL INPUTS																				
Discharge region	**Estimate**	**Flow rate (km^3/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: Barents Sea																				
RIVERINE INPUTS																				
Main Rivers	low avg.	8 021	3 198	8 073	3	16	55	10	487	10 579	0.29	0.10	0.01	1.94	2.61	0.78	0.47	2	0	0
	upp avg.		3 198	8 073	4	16	56	11	487	10 579	0.29	0.10	0.02	1.94	2.61	0.78	0.53	4	1	4
Tributary Rivers (36)	low avg.	31 168	33 226	46 973	27	89	188	98	2 515	65 813	0.94	0.84	0.15	16.61	17.12	30.55	3.22	14		
	upp avg.		33 226	46 973	30	89	188	105	2 515	65 813	1.12	0.84	0.16	16.61	17.12	30.55	3.36	19		
Tributary Rivers (109)	low avg.	15 274	4 292	16 875	7	8	74	48	634	11 828	0.42	0.21	0.08	2.75	2.14	2.06	3.06	4		
	upp avg.		4 334	16 875	7	9	74	48	634	11 828	0.42	0.23	0.08	2.76	2.16	2.07	3.06	8		
Total Riverine Inputs	**low avg.**	54 463	40 716	71 920	38	113	317	156	3 636	88 220	1.65	1.15	0.24	21.30	21.87	33.38	6.75	21	0	0
	upp avg.		40 758	71 920	41	114	318	164	3 636	88 220	1.83	1.17	0.26	21.31	21.89	33.39	6.95	31	1	4
Sewage Effluents	low avg.		22		19	32	12	184	245											
	upp avg.		22		19	32	12	184	245											
Industrial Effluents	low avg.			1	0	0	0	0	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1		
	upp avg.			1	0	0	0	0	0		0.00	0.00	0.00	0.00	0.00	0.00	0.00	1		
Fish Farming	low avg.				344	498	324	2 354	2 943					47.62						
	upp avg.				344	498	324	2 354	2 943					47.62						
Total Direct Inputs	**low avg.**		22	1	363	530	336	2 538	3 188		0.00	0.00	0.00	47.62	0.00	0.00	0.00	1		
	upp avg.		22	1	363	530	336	2 538	3 188		0.00	0.00	0.00	47.62	0.00	0.00	0.00	1		
Unmonitored Areas	low avg.	42 947			10	43	1 543	136	2 469											
	upp avg.				10	43	1 543	136	2 469											
REGION TOTAL	**low avg.**	97 410	40 737	71 921	411	686	2 196	2 830	9 293	88 220	2	1	0	69	22	33	7	21	0	0
	upp avg.		40 779	71 921	414	687	2 197	2 838	9 293	88 220	2	1	0	69	22	33	7	31	1	4

Statlig program for forurensningsovervåking

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Om Statlig program for forurensningsovervåking

Statlig program for forurensningsovervåking omfatter overvåking av forurensningsforholdene i luft og nedbør, skog, vassdrag, fjorder og havområder. Overvåkingsprogrammet dekker langsiktige undersøkelser av:

- overgjødsling
- forsuring (sur nedbør)
- ozon (ved bakken og i stratosfæren)
- klimagasser
- miljøgifter

Overvåkingsprogrammet skal gi informasjon om tilstanden og utviklingen av forurensningssituasjonen, og påvise eventuell uheldig utvikling på et tidlig tidspunkt. Programmet skal dekke myndighetenes informasjonsbehov om forurensningsforholdene, registrere virkningen av iverksatte tiltak for å redusere forurensningen, og danne grunnlag for vurdering av nye tiltak. Klima- og forurensningsdirektoratet er ansvarlig for gjennomføringen av overvåkingsprogrammet.

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