RAPPORT

M-80/2013

RIVERINE INPUTS AND DIRECT DISCHARGES TO NORWEGIAN COASTAL WATERS – 2012

Preface

This report presents the results of the 2012 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".

The Norwegian Environment 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 the Norwegian Environment Agency has been Eivind Farmen.

At NIVA, Kari Austnes has co-ordinated the RID programme. 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 writing the 2012 report. Per Stålnacke has carried out and reported the statistical trend analyses with the assistance of Annelene Pengerud.

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 Øyvind Kaste, 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 Norwegian Environment Agency for data on effluents from industrial plants; the Directorate of Fisheries (Fdir) for data on fish farming.

Oslo, November 2013

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Project co-ordinator, NIVA

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Tittel – norsk og engelsk

Riverine inputs and direct discharges to Norwegian coastal waters – 2012
Elvetilførsler og direkte tilførsler til norske kystområder – 2012

Sammendrag – summary

Riverine inputs and direct discharges to Norwegian coastal waters in 2012 have been estimated in accordance with the requirements of the OSPAR Commission. Water discharges in 2012 were lower than in 2011, but higher than the 30-year normal. This caused a small but overall decrease in inputs since 2011, with an exception of zinc, which increased in the overall loads due to an increase in River Glomma. The reason is presently unknown. 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 ammonium in one river. Fish farming continued to be a major source of nutrients, with an increase of about 15 % of phosphorus and nitrogen loads since last year. Inputs of PCBs and the pesticide lindane were, as in previous years, insignificant.

4 emneord

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Overvåking

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Abstract

Riverine inputs and direct discharges to Norwegian coastal waters in 2012 have been estimated in accordance with the requirements of the OSPAR Commission. Water discharges in 2012 were lower than in 2011, but higher than the 30-year normal. This caused a small but overall decrease in inputs since 2011, with an exception of zinc, which increased in the overall loads due to an increase in River Glomma. The reason is presently unknown. 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 ammonium in one river. Fish farming continued to be a major source of nutrients, with an increase of about 15 % of phosphorus and nitrogen loads since last year. Inputs of PCBs and the pesticide lindane were, as in previous years, insignificant.

4 keywords, Norwegian	4 keywords, English
1. Elvetilførsler	1. Riverine inputs
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3. Norske kystområder	3. Norwegian coastal waters
4. Overvåking	4. Monitoring

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Contents

Summary

This report presents the 2012 results of the Norwegian Programme on Riverine Inputs and Direct Discharges to coastal waters (RID). The programme is part of the OSPAR Convention (the Convention for the Protection of the Marine Environment of the North-East 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 2012 was similar to that in 2011 and as reported by Skarbøvik *et al.* (2012). 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 2012 was characterised by temperatures and precipitation above normal, and water discharges that were relatively high as compared to the 30 year normal in most rivers. However, they were in general lower than in 2011.

The total nutrient inputs to coastal Norwegian waters in 2012 were estimated to about 13 000 tonnes of phosphorus, 169 000 tonnes of nitrogen, 460 000 tonnes of silicate, 550 000 tonnes of total organic carbon, and 938 000 tonnes of suspended particulate matter. The inputs of metals were estimated to 181 kg of mercury, 2.3 tonnes of cadmium, 27 tonnes of arsenic, 43 tonnes of lead, 64 tonnes of chromium, 124 tonnes of nickel, 865 tonnes of zinc, and 1022 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 2011, there were relatively small changes in riverine inputs, with an overall reduction due to reduced water discharges since the previous year. One marked exception is the increase in riverine loads of zinc; this is due to increases in zinc loads in River Glomma. For the direct discharges, there were only smaller changes since 2011, but nutrient loads from fish farming continue to increase.

Source apportioning was similar to previous years. Fish farming was the most important source for all nutrients, except for the Skagerrak region where riverine inputs was 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.

Analyses of long-term trends (1990-2012) of nutrient loads from nine main rivers revealed that, where statistical trends were found, these were mainly downwards. The only exception was a tendency of an increase in ammonium-N in the River Numedalslågen. For the metals Cu, Zn, and Pb downward trends were detected in a majority of the rivers. For the other metals (Cd and Ni) there are statistically downward trends in almost all rivers, but here there are major uncertainties due to low concentrations and variable detection limits. For PCB7 and lindane, trend analyses make little sense since concentrations in most samples have been below the detection limits throughout the monitoring period.

Sammendrag

Resultater fra Elvetilførselsprogrammet (RID) i 2012 er presentert i denne rapporten. Programmet er en del av OSPAR-programmet (OSPAR: Convention for the Protection of the Marine Environment of the North-East Atlantic) og har pågått siden 1990. Fire havområder inngår i Norges rapportering. Disse er Skagerrak, Nordsjøen, Norskehavet og Barentshavet.

Det har ikke vært noen endringer i metodikk siden 2011-rapporteringen (Skarbøvik *et al.,* 2012). Til sammen 46 vassdrag overvåkes. I tillegg er tilførsler beregnet fra det resterende landområdet som drenerer til Atlanterhavet, herunder 109 vassdrag som tidligere er overvåket en gang i året innenfor RID-programmet (1990-2003). Områder som ikke overvåkes omfatter 92 elver som aldri er overvåket i programmet, områder nedstrøms overvåkingsstasjonene og kystområder mellom elvene. Fra disse områdene blir næringsstoff fra diffus avrenning modellert, og direkte utslipp fra industri, kloakkrenseanlegg og akvakulturanlegg beregnet.

I 2012 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 hjelpeparametere (suspendert partikulært materiale, pH, ledningsevne og totalt organisk karbon).

Året 2012 hadde både temperatur og nedbør over 30-års normalene, og vannføringen var derfor relativt sett høy. Vannføringen var allikevel jevnt over noe lavere enn i 2011.

Tilførsler til norske kystområder i 2012 omfattet om lag 13 000 tonn fosfor, 169 000 tonn nitrogen, 460 000 tonn silikat, 550 000 tonn total organisk karbon, 938 000 tonn suspendert sediment, 181 kg kvikksølv, 2,3 tonn kadmium, 27 tonn arsenikk, 43 tonn bly, 64 tonn krom, 124 tonn nikkel, 865 tonn sink og 1022 tonn kobber. Mengden av tilført PCB7 og lindan er ubetydelig, med nesten alle målte konsentrasjoner under deteksjonsgrensen.

I forhold til 2011 var det relativt små forskjeller i elvetilførsler. Unntaket er for sink, her var det en økning som skyldes økte sinktilførsler fra Glomma. Årsaken til dette er foreløpig ikke kjent. For direktetilførslene fra industri og kloakkrenseanlegg var det bare små endringer både for næringsstoff og metaller. Utslipp av næringsstoffer fra fiskeoppdrett er fortsatt høy, og økende.

Forholdet mellom de ulike kildene (industri, kloakkrenseanlegg, fiskeoppdrett og elvetilførsler[1]) har endret seg lite de siste årene. Akvakultur er den viktigste kilden til næringsstoffer, med unntak av Skagerrakregionen hvor elvene tilfører mest næringsstoffer, fulgt av direktetilførsler fra renseanlegg. Elvetilførsler står for 80-90 % av metalltilførslene, med unntak av kobber hvor en stor andel kommer fra fiskeoppdrett.

Analyser av langtidstrender (1990-2012) av næringsstoff i ni hovedvassdrag viste at der det ble funnet statistiske trender så var disse for det meste nedadgående. Det eneste unntaket var en svak økning i ammonium-N i Numedalslågen. For tilførsler av metallene kobber, sink og bly har det stort sett vært nedadgående trender i overvåkingsperioden. Også for metallene kadmium og nikkel er det funnet statistisk nedadgående trender i nesten alle elver, men det må påpekes at disse resultatene er usikre pga. lave konsentrasjoner og varierende deteksjonsgrenser i perioden. For PCB7 og lindan gir det liten mening å utføre trendanalyser siden konsentrasjonen i de fleste prøver har vært under deteksjonsgrensen gjennom hele overvåkingsperioden.

[1] Merk at kilden “elvetilførsler” vil omfatte alle diffuse og direkte utslipp oppstrøms prøvetakingslokaliteten. Denne kildetypen vil derfor bestå av mange ulike kilder, herunder f.eks. både industri og renseanlegg.

1. Introduction

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 2012 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 2012, 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.

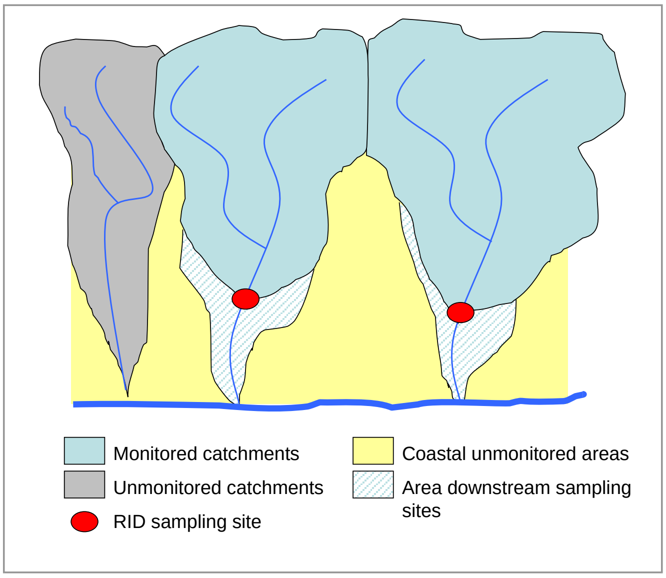


Figure 1. Illustration of RID areas. Areas covered by RID monitoring stations (blue); areas downstream of the sampling sites (blue shaded); coastal areas between catchments (yellow); and unmonitored catchments (grey).

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 to 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 2012 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 changes since 2010. Details on former changes in 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 estimated, 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. All discharges from point sources in unmonitored areas are reported as direct discharges. Loads from previously monitored rivers (109 rivers) are reported as riverine inputs.

1.3 Outline of the 2012 RID Report

The 2012 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 2012, source apportionment of nutrients, 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 put 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 2012; the calculated annual loads of each river in 2012; as well as overview tables of all loads to the four coastal areas of Norway in 2012.

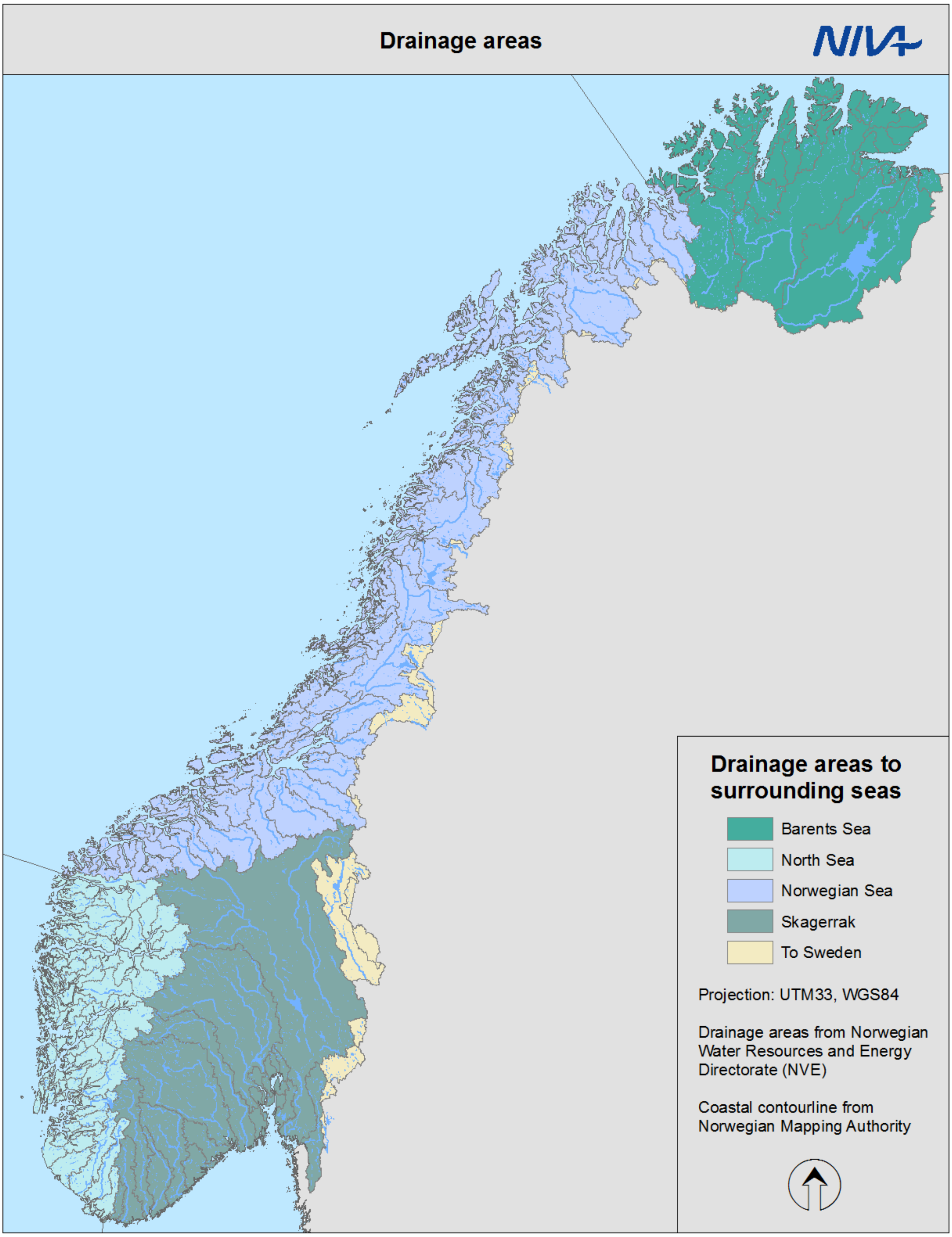


Figure 2. Norway has been divided into four drainage areas, i.e. Skagerrak, the North Sea, the Norwegian Sea and the Barents Sea. Minor parts of Norway drain to Sweden.

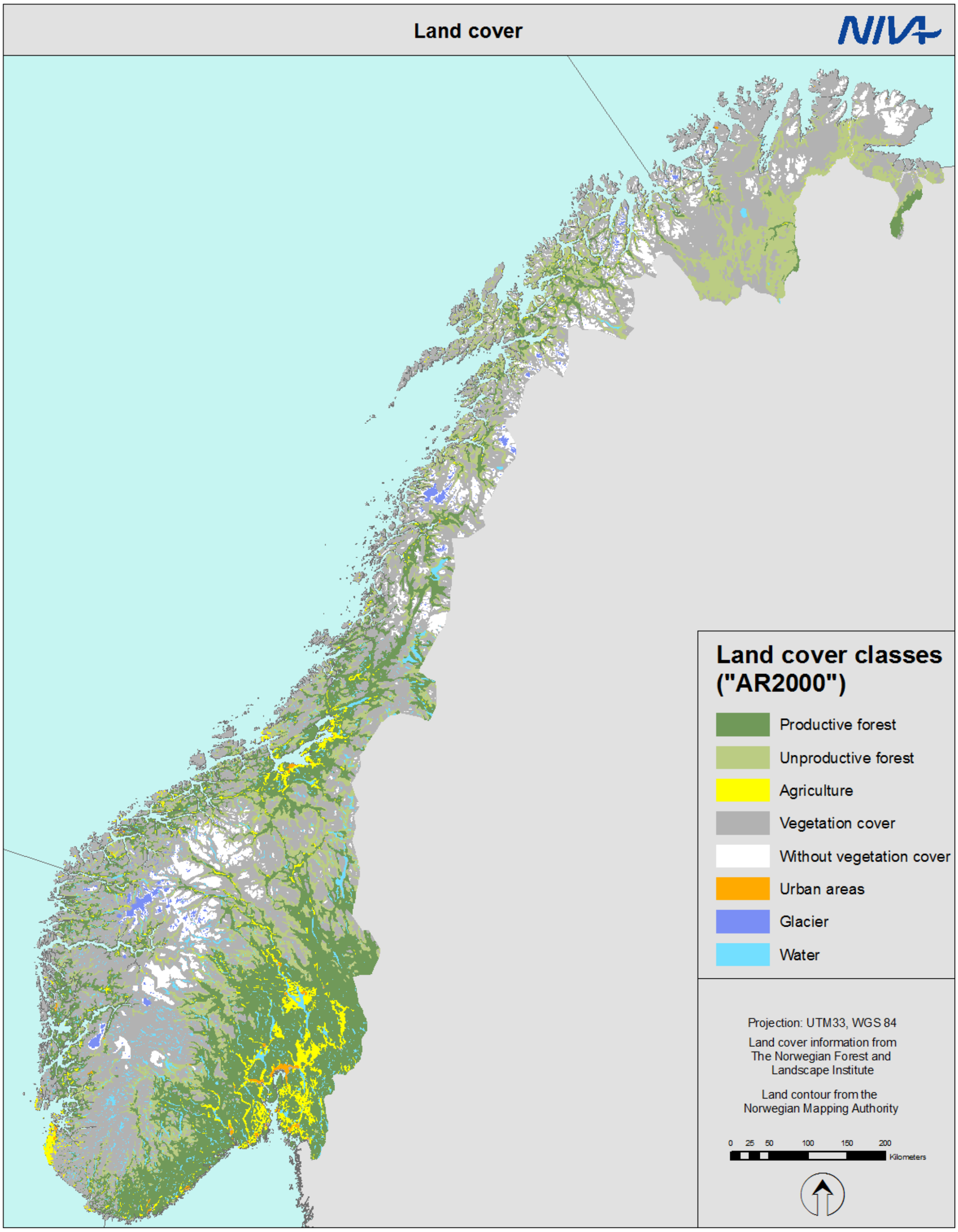


Figure 3. Land cover map of Norway. See also Figure 4 in which the land use in the catchments of the 10 main RID rivers is shown.

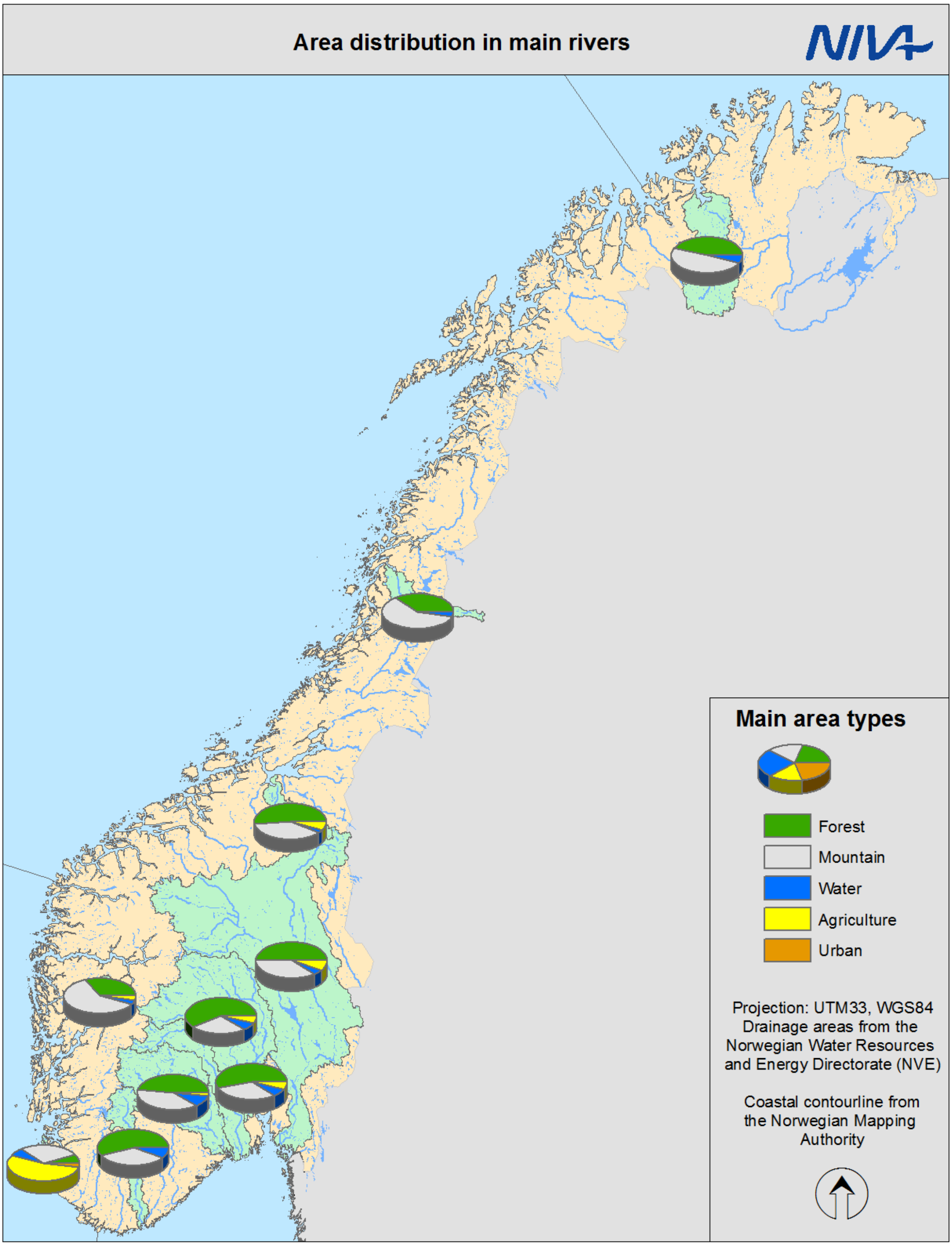


Figure 4. Land use in the catchment areas of the 10 main rivers. 'Water' refers to lakes in the catchment; 'Mountain' includes moors and mountain plateaus not covered by forest. Based on data from The Norwegian Forest and Landscape Institute.

2. Materials and methods

2.1 Selection of RID Rivers

Table 1 gives an overview of the major "types" of Norwegian rivers draining to 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 excluded until River Vosso 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. 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.*, 2012).

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.

Tables 2 and 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.

Table 2. Sampling frequency and dates of sampling in 2012 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	09.01	03.01	04.01	18.01	04.01	04.01	23.01	12.01	02.01	07.01
	06.02	**02.02**	**06.02**	**02.02**	**06.02**	**06.02**	**07.02**	**07.02**	02.02	**10.02**
	05.03	06.03	05.03	13.03	05.03	06.03	05.03	05.03	**05.03**	09.03
	09.04	10.04	02.04	17.04	10.04	10.04	10.04	10.04	10.04	10.04
	06.05	**08.05**	**07.05**	**06.05**	**02.05**	**07.05**	**08.05**	**08.05**	**08.05**	**10.05**
	14.05	15.05								
	25.05	24.05								
	04.06	05.06	06.06		11.06	05.06	11.06		06.06	08.06
	14.06	15.06								
	29.06	25.06		20.06				06.06		
	09.07	03.07	04.07	17.07	10.07	03.07	03.07	04.07	04.07	12.07
	06.08	**07.08**	**07.08**	**31.08**	**13.08**	**15.08**	**06.08**	**06.08**	**13.08**	**07.08**
	10.09	11.09	05.09	20.09	05.09	10.09	04.09	05.09	06.09	08.09
	08.10	**09.10**	**04.10**	**23.10**	**08.10**	**02.10**	**03.10**	**04.10**	**05.10**	**10.10**
	05.11	06.11	07.11	06.11	06.11	06.11	05.11	07.11	06.11	16.11
	10.12	04.12	06.12	11.12	04.12	04.12	04.12	06.12	05.12	07.12
Sum	**16**	**16**	**12**	**12**	**12**	**12**	**12**	**12**	**12**	**12**

Table 3. Sampling frequency and dates in 2012 for the 36 tributary rivers.

River	Tista	Tokkeelva	Nidelva (south)	Tovdalselva	Mandalselva	Lyngdalselva
Date	06.02.2012	08.02.2012	08.02.2012	06.02.2012	08.02.2012	07.02.2012
	06.05.2012	09.05.2012	14.05.2012	02.05.2012	03.05.2012	03.05.2012
	06.08.2012	08.08.2012	08.08.2012	13.08.2012	15.08.2012	15.08.2012
	08.10.2012	15.10.2012	15.10.2012	08.10.2012	04.10.2012	04.10.2012
River	Kvina	Sira	Bjerkreimselva	Figgjoelva	Lyseelva	Årdalselva
Date	07.02.2012	07.02.2012	07.02.2012	07.02.2012	12.02.2012	14.02.2012
	03.05.2012	03.05.2012	08.05.2012	07.05.2012	06.05.2012	14.05.2012
	15.08.2012	15.08.2012	07.08.2012	15.08.2012	19.08.2012	14.08.2012
	04.10.2012	04.10.2012	08.10.2012	02.10.2012	15.10.2012	15.10.2012
River	Ulla	Sauda	Vikedalselva	Suldalslågen	Jostedøla	Gaular
Date	14.02.2012	13.02.2012	07.02.2012	13.02.2012	06.02.2012	03.02.2012
	14.05.2012	08.05.2012	08.05.2012	07.05.2012	08.05.2012	15.05.2012
	14.08.2012	14.08.2012	14.08.2012	06.08.2012	07.08.2012	17.08.2012
	15.10.2012	09.10.2012	08.10.2012	08.10.2012	09.10.2012	19.10.2012
River	Jølstra	Nausta	Breimselva	Driva	Surna	Gaula
Date	03.02.2012	03.02.2012	11.02.2012	13.02.2012	07.02.2012	07.02.2012
	15.05.2012	15.05.2012	06.06.2012	30.05.2012	23.05.2012	10.05.2012
	17.08.2012	17.08.2012	15.08.2012	22.08.2012	22.08.2012	09.08.2012
	19.10.2012	19.10.2012	10.10.2012	18.10.2012	03.10.2012	08.10.2012
River	Nidelva	Stjørdalselva	Verdalselva	Snåsa	Namsen	Røssåga
Date	08.02.2012	08.02.2012	08.02.2012	08.02.2012	13.02.2012	03.02.2012
	10.05.2012	10.05.2012	10.05.2012	10.05.2012	14.05.2012	08.05.2012
	09.08.2012	09.08.2012	09.08.2012	09.08.2012	07.08.2012	09.08.2012
	08.10.2012	08.10.2012	09.10.2012	11.10.2012	09.10.2012	05.10.2012
River	Ranaelva	Beiarelva	Målselv	Barduelva	Tanaelva	Pasvikelva
Date	03.02.2012	27.02.2012	08.02.2012	08.02.2012	07.02.2012	07.02.2012
	08.05.2012	23.05.2012	07.05.2012	07.05.2012	03.05.2012	03.05.2012
	09.08.2012	26.08.2012	13.08.2012	13.08.2012	07.08.2012	07.08.2012
	05.10.2012	11.10.2012	14.10.2012	14.10.2012	09.10.2012	09.10.2012

2.3 Chemical parameters – detection limits and analytical methods

The parameters monitored in 2012 are listed in the Introduction in Chapter 1. Information on methodology and detection limits (also called level of detection - LOD) for all parameters included in the sampling programme is 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 differ 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 2012 (Table 4). Also as in former years, PCB7 compounds were 100% below the detection limit; whereas lindane had 97.5% of the samples below the detection limit (only one of 40 samples was above). 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 2012.

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.

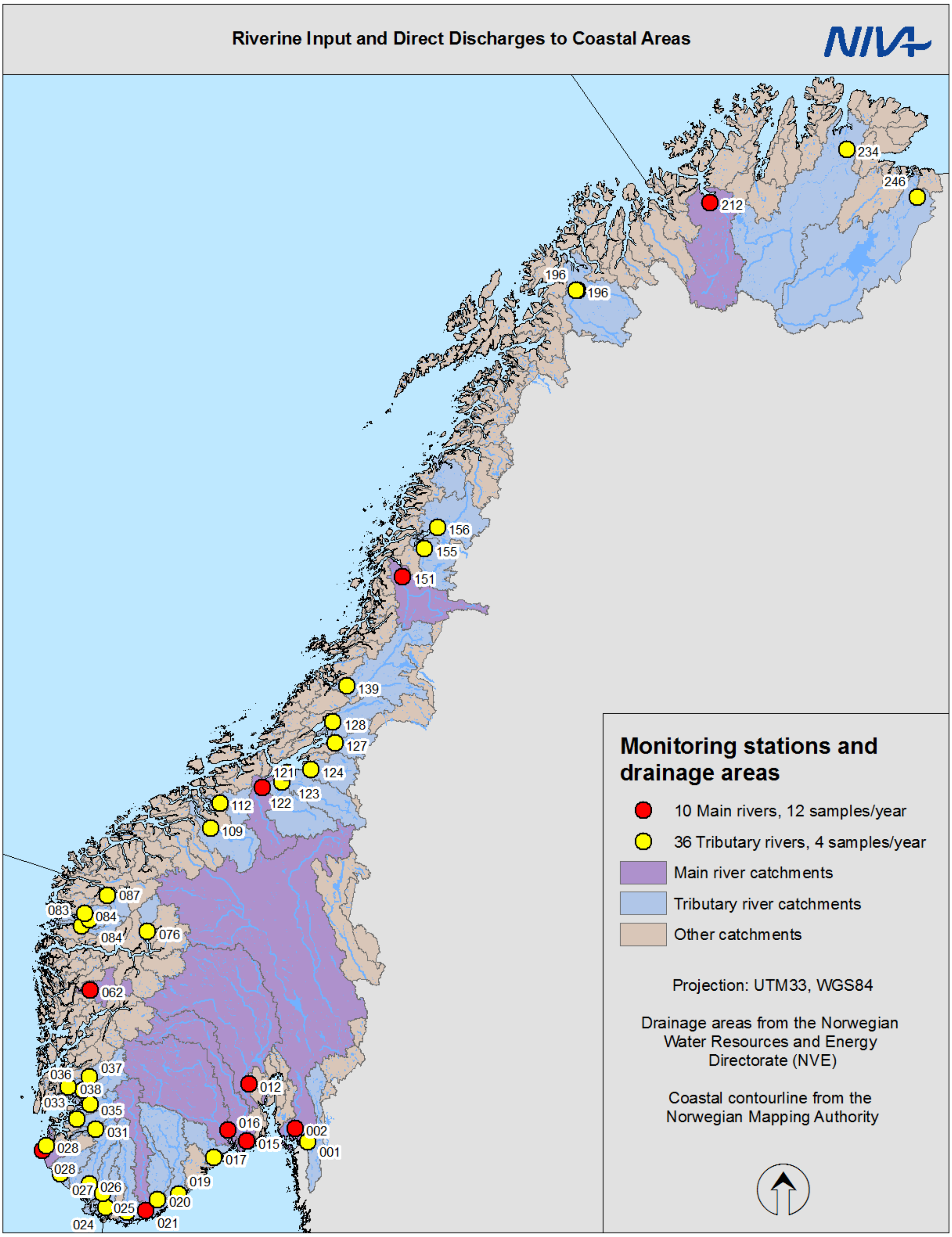


Figure 5. River sampling sites in the Norwegian RID programme. Red dots represent the 10 main rivers. Yellow dots represent the 36 'tributary' rivers. Numbers refer to the national river register (REGINE; www.nve.no).

Table 4. The proportion of analyses below the detection limit for all parameters included in the sampling programme in 2012. 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	2	272	5
TOC	mg C/l	0	272	0
TOT-P	µg P/l	1	272	4
PO4-P	µg P/l	25	272	67
TOT-N	µg N/l	0	272	0
NO3-N	µg N/l	1	272	3
NH4-N	µg N/l	13	272	35
SiO2	mg/l	0	272	0
Pb	µg/l	1	272	4
Cd	µg/l	24	272	66
Cu	µg/l	0	272	0
Zn	µg/l	0	272	0
As	µg/l	16	272	44
Hg	ng/l	40	272	109
Cr	µg/l	36	272	98
Ni	µg/l	1	272	4
Lindane(HCHG)	ng/l	97.5	40	39
PCB(CB101)	ng/l	100	40	40
PCB(CB118)	ng/l	100	40	40
PCB(CB138)	ng/l	100	40	40
PCB(CB153)	ng/l	100	40	40
PCB(CB180)	ng/l	100	40	40
PCB(CB28)	ng/l	100	40	40
PCB(CB52)	ng/l	100	40	40

2.5 Water discharge and hydrological modelling

For the main rivers, daily water discharge measurements were, as in former years, used for the calculation of loads. The only exception is River Orkla, where modelled discharge is used. 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 River Orkla, 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.,* 2012). The water discharge has been adjusted to fit with the location where the water samples are, or has been (the 109 rivers), collected.

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 2012 was multiplied with average concentration for the period 1990-2003.
- For metals, the modelled annual water volume in 2012 was multiplied with average concentration for the period 2000-2003 (data from earlier years were not used due to high detection limits).

2.7 Unmonitored areas

For the unmonitored areas (i.e. 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.*, 2011). 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. This means that the contribution of metals from diffuse sources in unmonitored areas has been set to zero in the RID estimates. However, 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 calculated in this programme comprise effluents from point sources in the unmonitored areas. This includes unmonitored rivers and areas downstream of the sampling sites in monitored rivers, as well as unmonitored coastal areas. The estimates are based on national statistical information, including:

- Sewage: Municipal wastewater and scattered dwellings (Statistics Norway - SSB / the KOSTRA Database);
- Industry: the database "Forurensning" from the Norwegian Environment Agency.
- Aquaculture: Nutrients (from the Directorate of Fisheries / the ALTINN-database (altinn.no)) and copper (based on sales statistics of antifouling products made available by the Norwegian Environment Agency)

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.

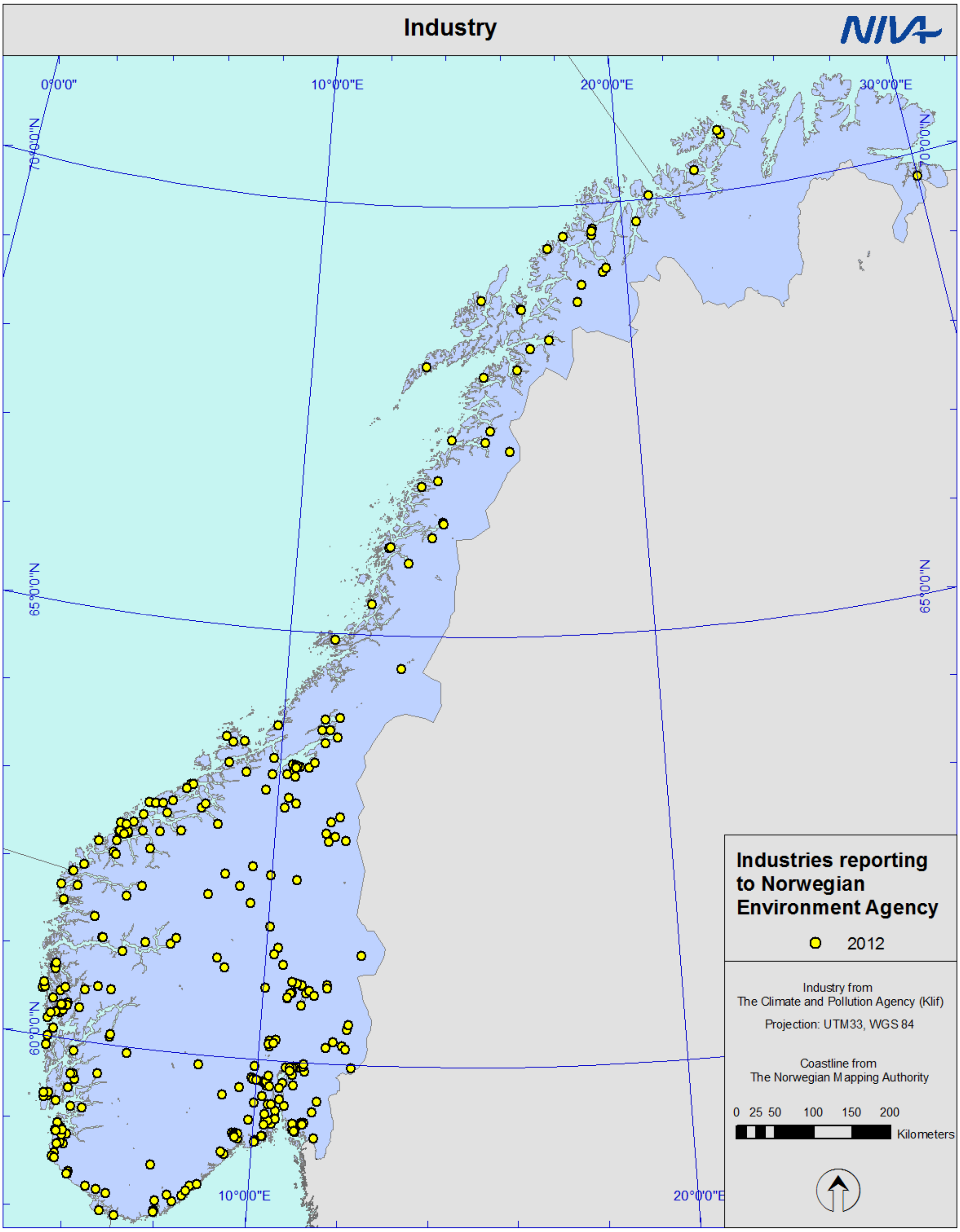


Figure 6. Industrial units reporting discharges of nitrogen and phosphorus in 2012. Data from the database 'Forurensning' (Norwegian Environment Agency).

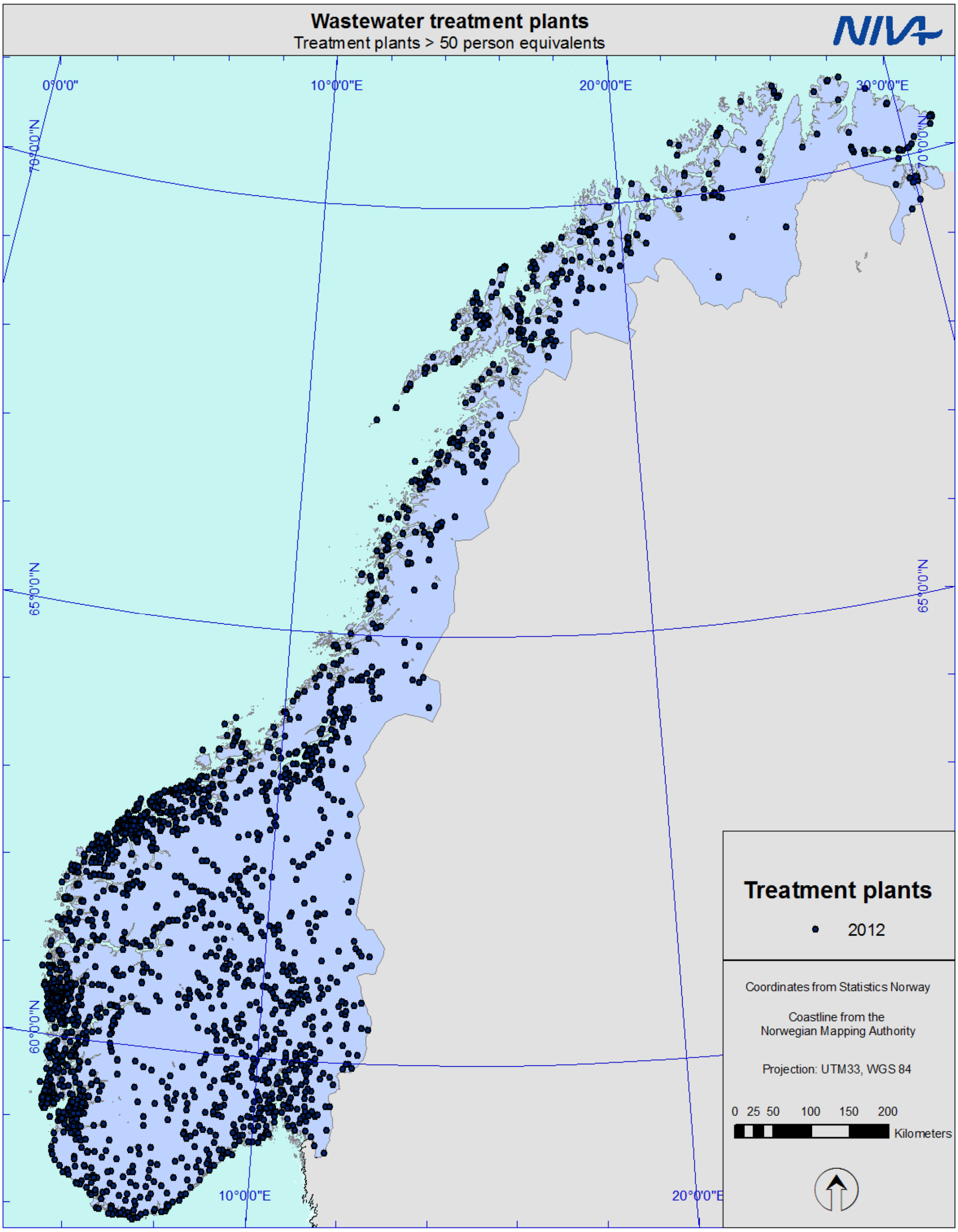


Figure 7. Sewage treatment plants > 50 p.e. in Norway in 2012. Data from KOSTRA/SSB (Statistics Norway).

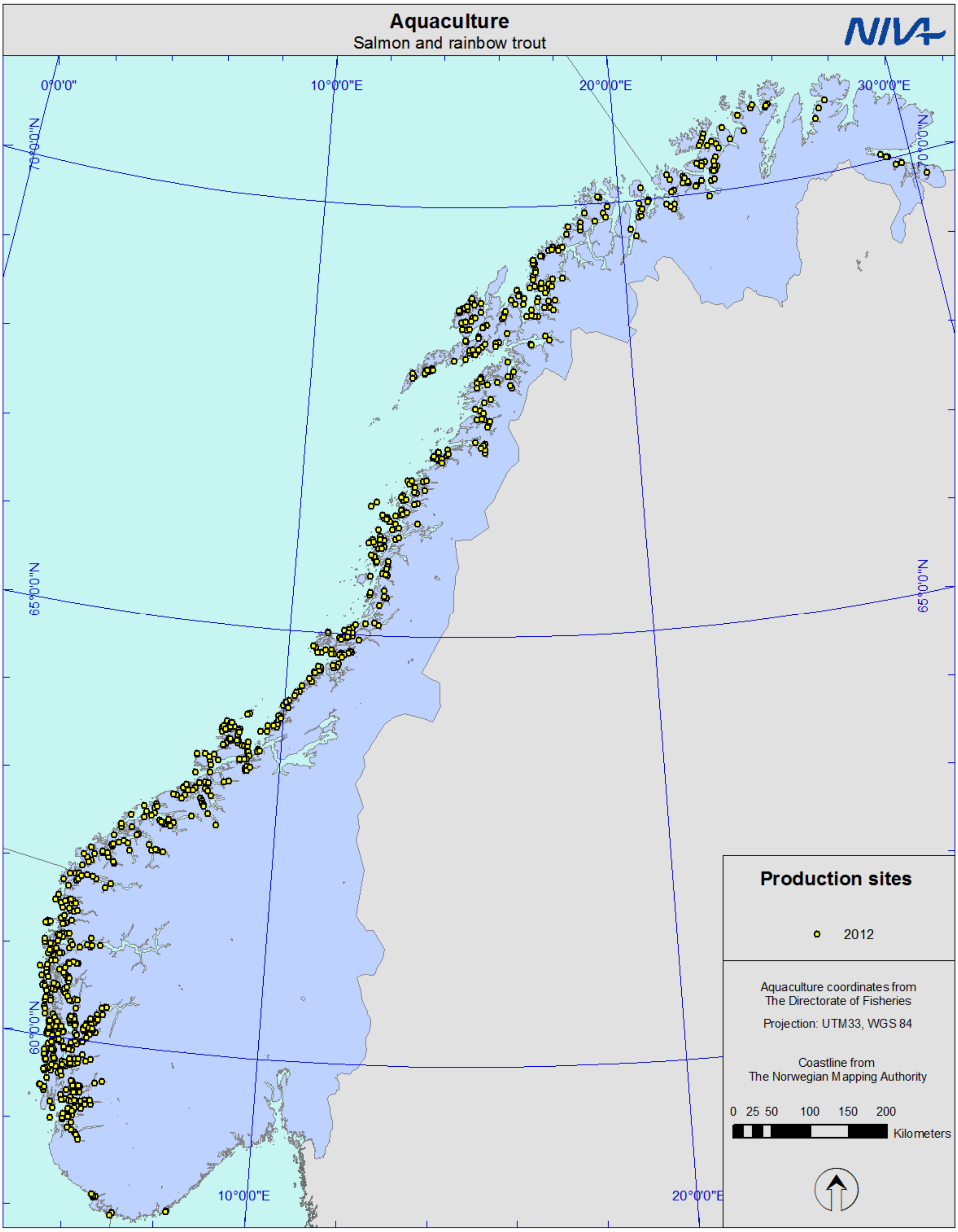


Figure 8. Fish farms for salmon and trout in Norway in 2012. Based on data from the Directorate of Fisheries/ALTINN.

Estimation of nutrient inputs from fish farming followed the same procedure as in recent 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, 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 The Norwegian Environment Agency (see Skarbøvik *et al.*, 2011). As a result, nutrient loads were adjusted from the year 2000 onwards. The nutrient content of the fish fodder has been kept at the same level as last year because no new information was available (see Appendix IV). 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). The increase from 2011 to 2012 is 17%.

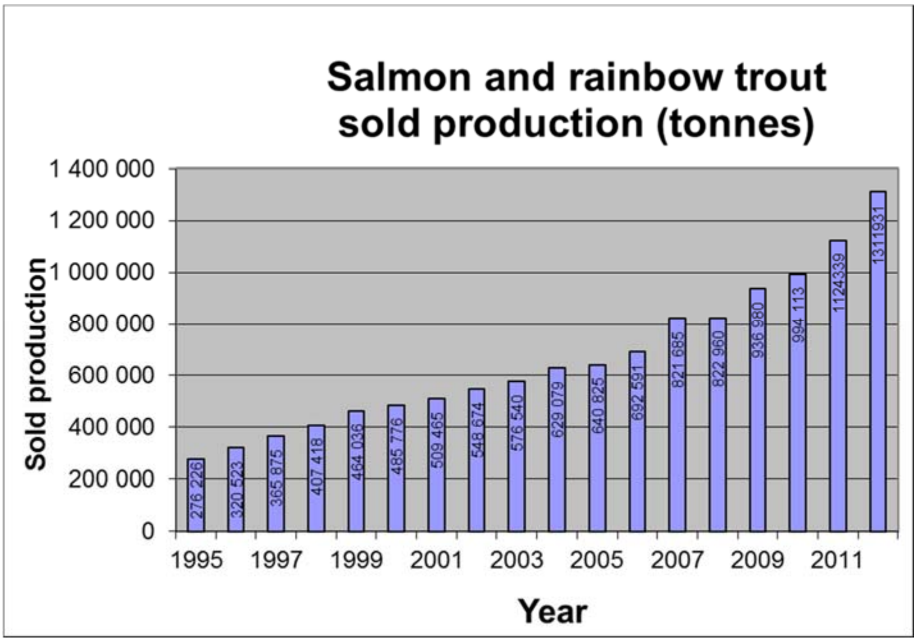


Figure 9. Quantities of sold trout and salmon for the period 1995-2012. Based on data from SSB (Statistics Norway).

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). The Norwegian Environment Agency 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 from unmonitored areas; the total discharges amounted to 678 tonnes in 2012.

Figure 10 indicates a decrease in the discharge of copper from antifouling agents used in fish farming, but the data are deemed as very uncertain by the Norwegian Environment Agency. Hence, no firm conclusions should be drawn on this issue.

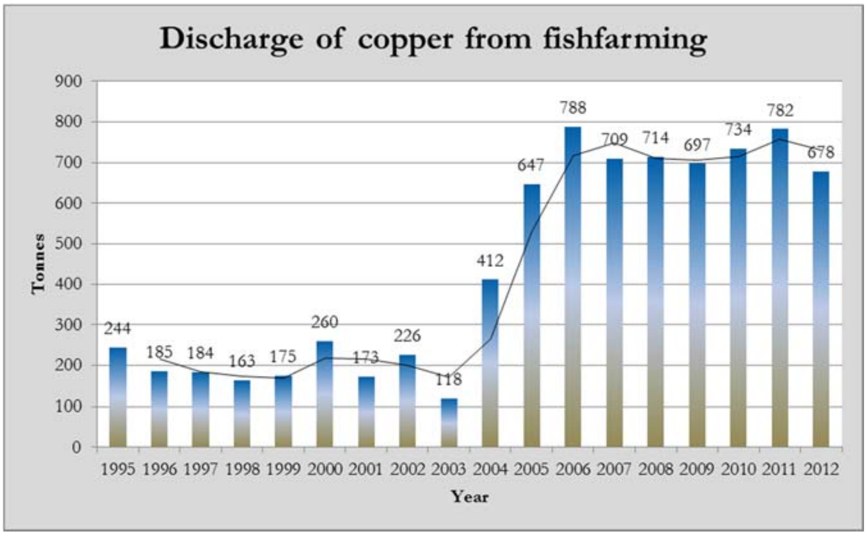


Figure 10. Discharge of copper from fish farming, deriving from antifouling impregnation of net cages, in the period 1995-2012. The figures represent total losses, including those above the RID rivers' sampling locations. It should be noted that the basis for these data is uncertain.

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[2] are included in these trend analyses, due to the lower sampling frequency for the tributary rivers.

Some historical 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 below or at 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[3] trends (including linear trends) in annual riverine inputs and monthly concentrations measured in nine of the ten main rivers. The method has its methodological basis in the seasonal Mann-Kendall-test (Hirsch and Slack, 1984) with the difference that water discharge is included as explanatory variable. The test also includes a correction for serial correlation up to a user-defined time span; in our case a span of one year was used. The method also offers convenient handling of missing values.

[2] Neither River Suldalslågen nor River Vosso have been analysed for trends due to incomplete datasets.
[3] 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.

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)[4], and trend slopes were 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).

[4] 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

3.1 Climatic conditions in 2012

Average air temperature in 2012 for Norway as a whole was 0.4 °C above normal (1961-1990). In parts of eastern and northern Norway average air temperatures were up to 1.5 °C above normal. The highest positive deviations from normal temperatures were recorded in January-March and November-December. Spring and summer temperatures were in general close to normal.

Total precipitation was 105% of normal precipitation for the country as a whole, but with considerable variation in precipitation relative to normal in different parts of the country (50-175%). Total precipitation relative to normal was highest in winter (125%) and spring (140%). In parts of mid- and northern Norway total precipitation reached 200-250% of normal in spring (Norwegian Meteorological Institute, 2012).

3.2 Water discharges in 2012

Whereas there was an increase in water discharges from 2010 to 2011, the total water discharge in 2012 (combined for 155 rivers) was slightly lower than in 2011 (Table 5).

Table 5. River water discharges (1000 m^3/d) to the Norwegian coast in 2012 as compared to 2011. The data are based on 155 rivers (the 10 main rivers and 36+109 tributary rivers). Reductions greater than 5% are marked in green.

	Total Norway	Skagerrak	North Sea	Norwegian Sea	Barents Sea
2012	558 311	177 469	162 060	165 222	53 559
2011	614 350	206 449	161 966	191 472	54 463
% change	-9	-14	0	-14	-2

Hydrological stations in nine of the ten main rivers have historical data that can be used to assess long-term changes. The monthly mean water discharges in 2012 at these stations have been compared to the mean water discharges of the 30-year normal (1971-2000) and in 2011 (Table 6). In addition, comparisons with the mean water discharges in the previous 30-year period 1982-2011 are given in Figure 11 and 12.

Rivers Orkla (Norwegian Sea) and Alta (Barents Sea) were the only ones with an increase since 2011; the remaining seven rivers had either small changes or reductions in discharges compared to the former year. The greatest reduction in water discharge is seen in River Vefsna with a decrease of 26% since 2011. When compared to the 30-year normal, however, all rivers except River Vefsna had higher water discharges in 2012.

Table 6. Average annual water discharges in the 30-year period 1971-2000, in 2011, and 2012. 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) or green (decrease).

Station	30-year normal (1971-2000)	2011	2012	Difference 2011-2012	Maritime area
	m^3/s	m^3/s	m^3/s	%	
Solbergfoss in Glomma	678.0	891.2	842.2	-5	Skagerrak
Døvikfoss in Drammenselva	281.3	387.2	335.9	-13	
Holmsfoss in Numedalslågen	104.7	130.5	130.7	0	
Norsjø in Skienselva	259.5	321.3	298.2	-7	
Heisel in Otra	145.6	145.4	150.5	4	
Bulken in Vosso	72.8	91.0	80.7	-11	North Sea
Syrstad in Orkla*	48.5	58.1	68.0	17	Norwegian Sea
Laksfors in Vefsna	150.0	195.7	144.8	-26	
Kista in Alta	75.4	77.8	87.8	13	Barents Sea

* The water discharge in this station is presently modelled; the monitored normal is nevertheless shown here.

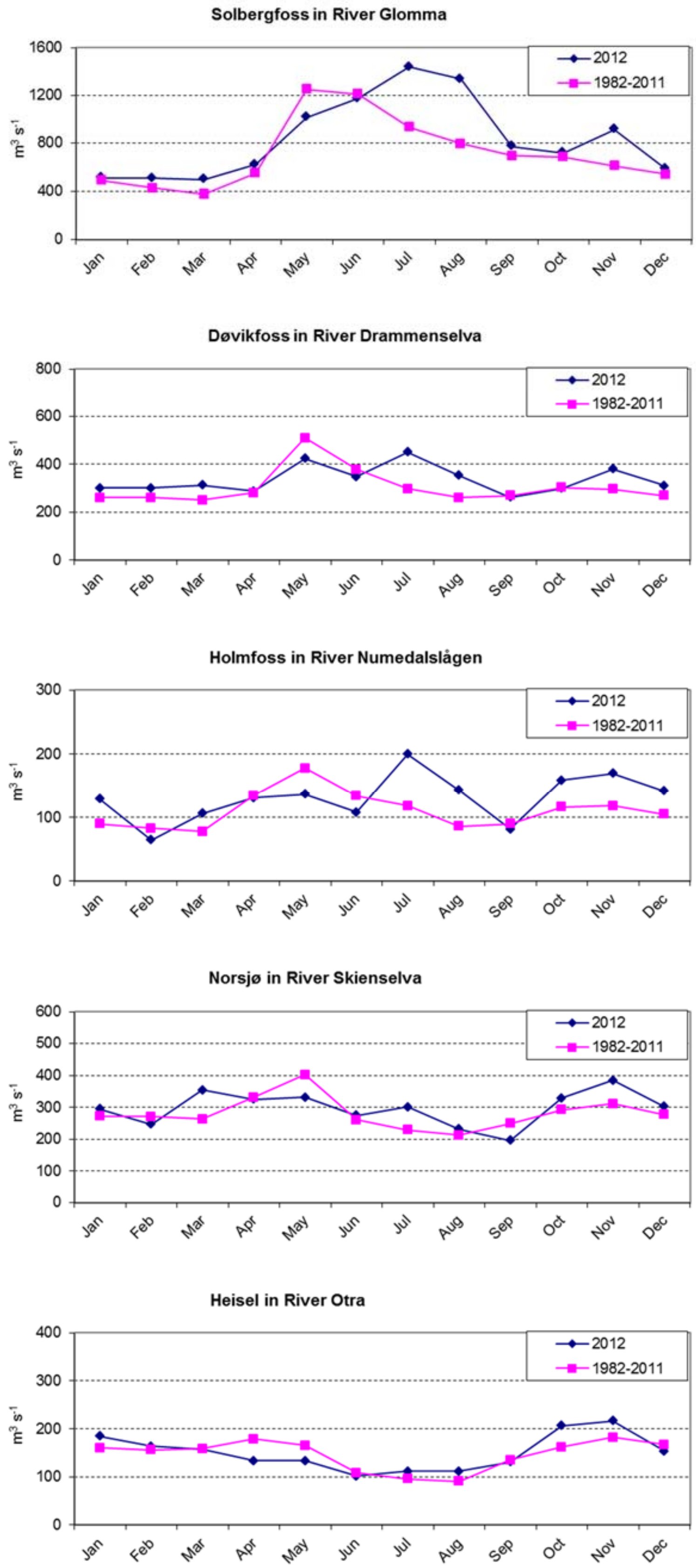


Figure 11a. Monthly mean water discharge in 2012 and as mean of 30 years (1982-2011) derived from hydrological stations in 5 of the main rivers monitored monthly (data from the Norwegian Water Resources and Energy Directorate, NVE).

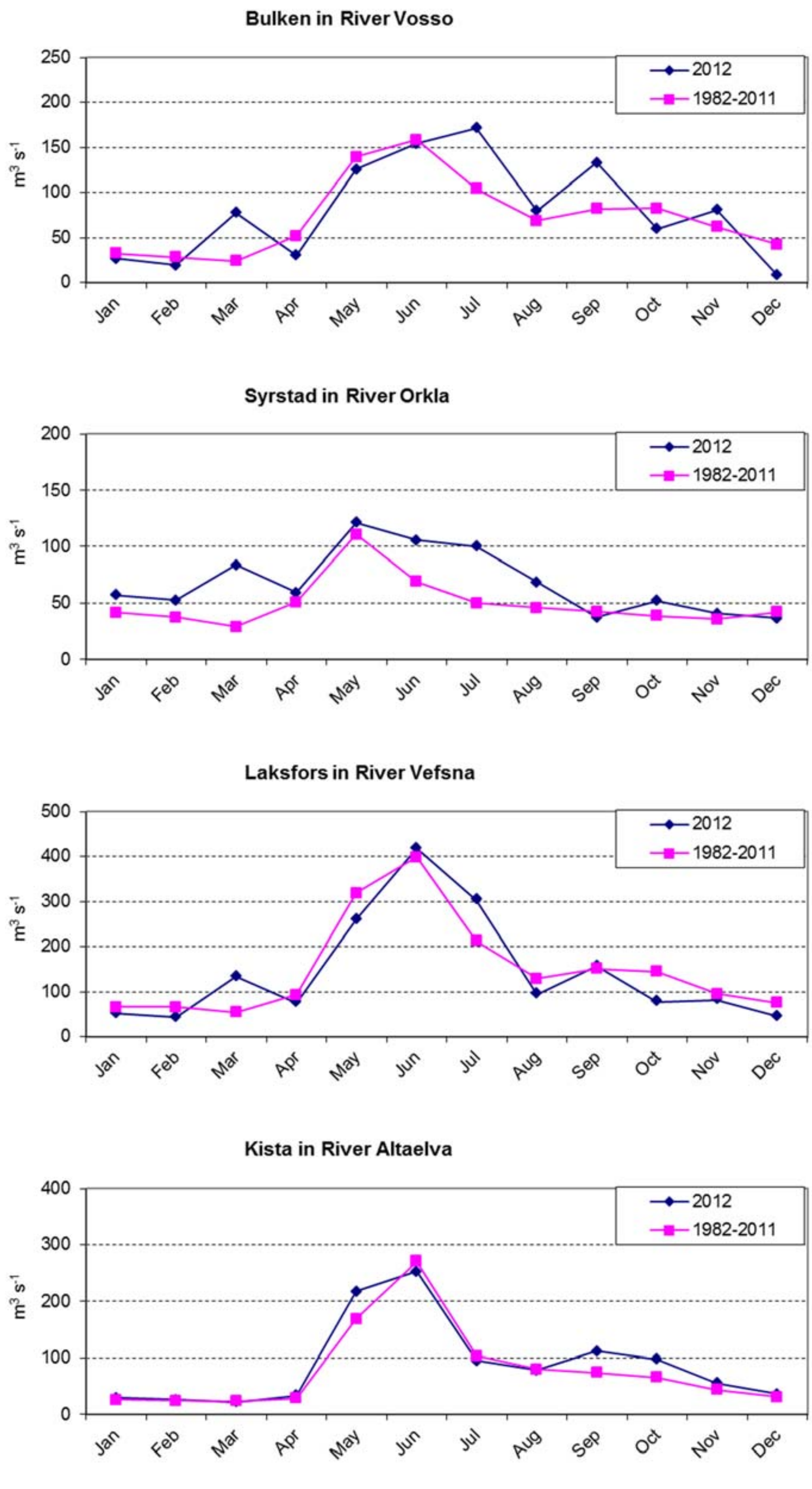


Figure 11b. Monthly mean water discharge in 2012 and as mean of 30 years (1982-2011) derived from hydrological stations in 4 of the main rivers monitored monthly (data from the Norwegian Water Resources and Energy Directorate, NVE).

3.3 Total nutrient and particle inputs in 2012

The total inputs[5] to coastal Norwegian waters in 2012 were estimated to about 13 000 tonnes of phosphorus and about 169 000 tonnes of nitrogen (Figure 12). Total silicate inputs were estimated to about 460 000 tonnes and total organic carbon (TOC) to about 550 000 tonnes. The input of suspended particulate matter amounted to about 938 000 tonnes.

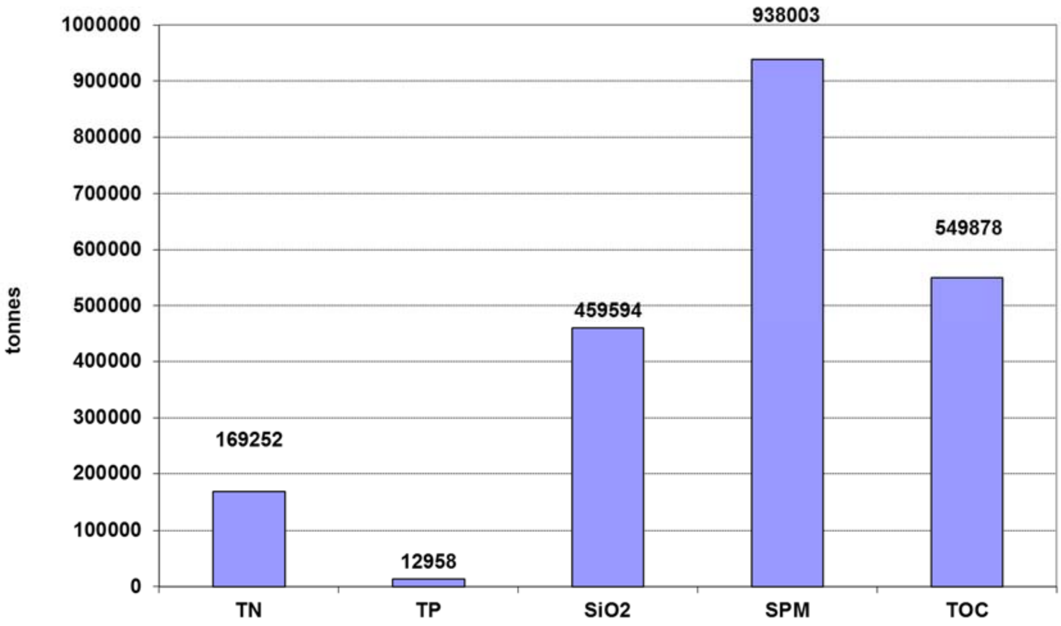


Figure 12. Total inputs (riverine and direct) of total nitrogen (TN), total phosphorus (TP), silicate (SiO_2), suspended particulate matter (SPM) and total organic carbon (TOC) to Norwegian coastal waters in 2012 (lower estimates).

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. It should be noted that this ‘source apportionment’ is not complete, since riverine inputs also comprise upstream discharges from industry and sewage treatment plants.

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

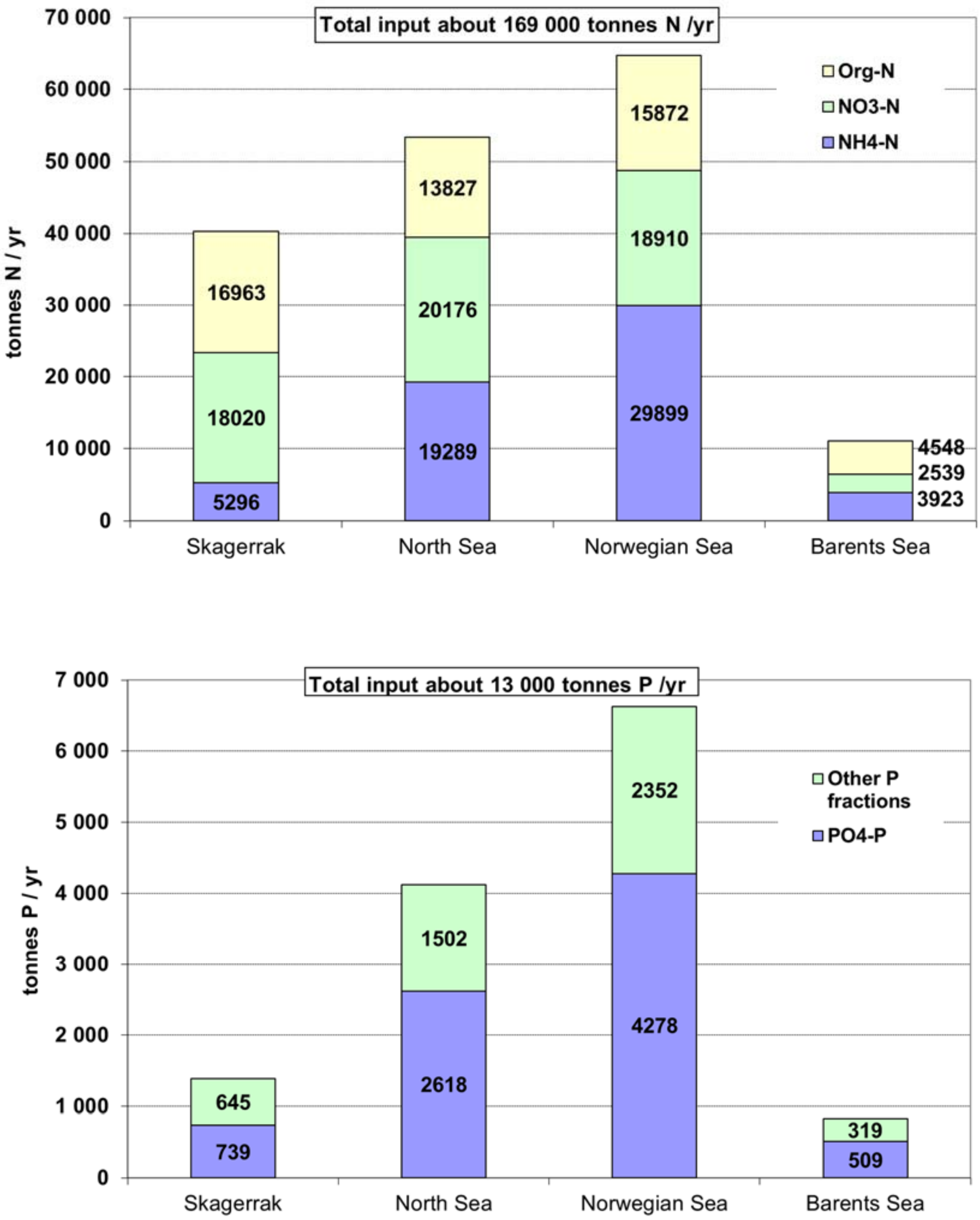


Figure 13. Inputs of total nitrogen (upper panel) and total phosphorus (lower panel) divided into different fractions for the four Norwegian maritime areas (lower estimates).

Suspended particulate matter came mainly from rivers, with a total of about 938 000 tonnes; the relative decrease since 2011 is due to overall lower water discharges in 2012.

The proportion of reported sources of nutrients and particulate matter 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. The loads of these substances are not estimated for unmonitored areas. Particulate matter is also discharged from fish farming; and silicate from some types of industry, but neither is reported and therefore not shown in the chart. The 46 monitored rivers account for about 80-90% of the riverine nitrogen and phosphorus inputs.

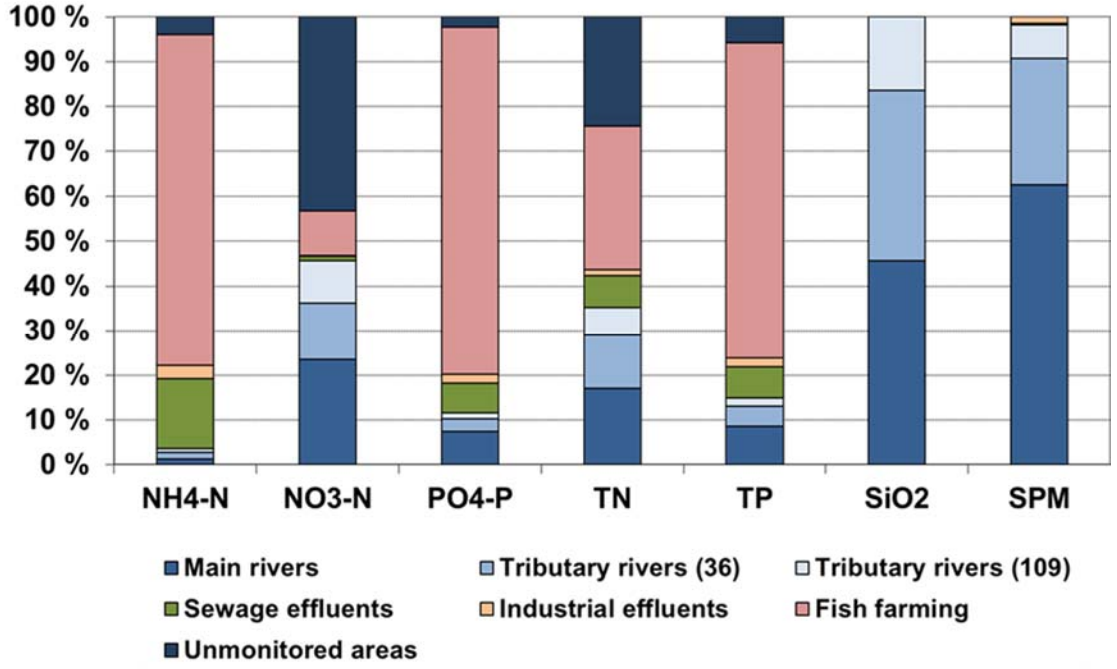


Figure 14. Main sources for nutrients, silicate and suspended particulate matter (SPM). For SPM or silica there are no estimates of inputs from fish farming or unmonitored areas.

Source apportionment is presently not a part of the RID programme, but in Norway, the TEOTIL model is run for the entire country (i.e. not using river monitoring data), and source apportionments for nitrogen and phosphorus are therefore shown in Figures 15 and 16, respectively.

Especially for the three northernmost coastal areas, fish farming contributes to a significant part of the nutrient inputs.

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. These relationships are unchanged since 2011.

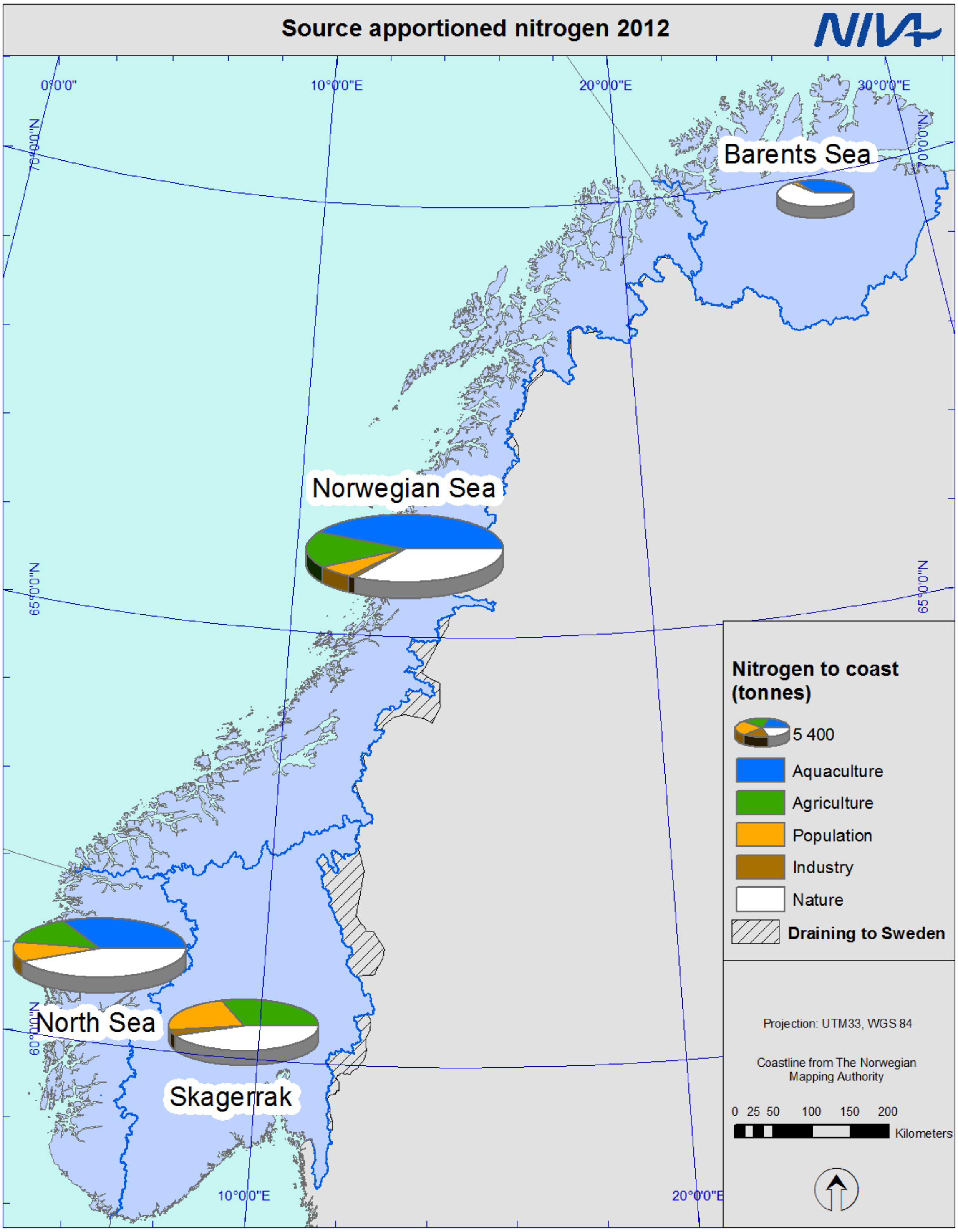


Figure 15. Source apportionment of nitrogen in 2012. Based on the TEOTIL model.

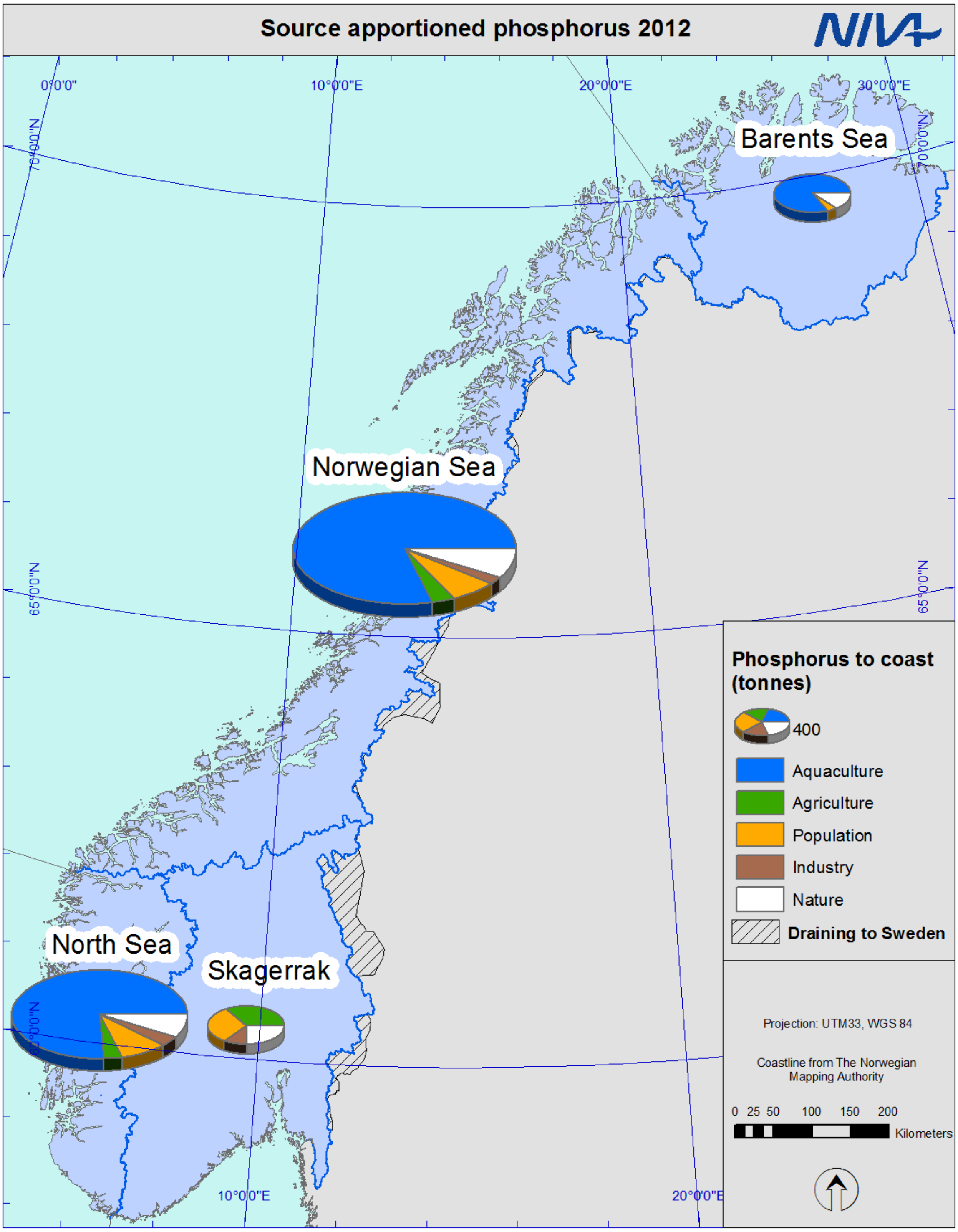


Figure 16. Source apportionment of phosphorus in 2012. Based on the TEOTIL model.

3.4 Total metal inputs in 2012

In 2012, the inputs of metals to the Norwegian coastal areas were estimated to 181 kg of mercury, 2.3 tonnes of cadmium, 27 tonnes of arsenic, 43 tonnes of lead, 64 tonnes of chromium, 124 tonnes of nickel, 865 tonnes of zinc and 1022 tonnes of copper (lower estimates; Figure 17).

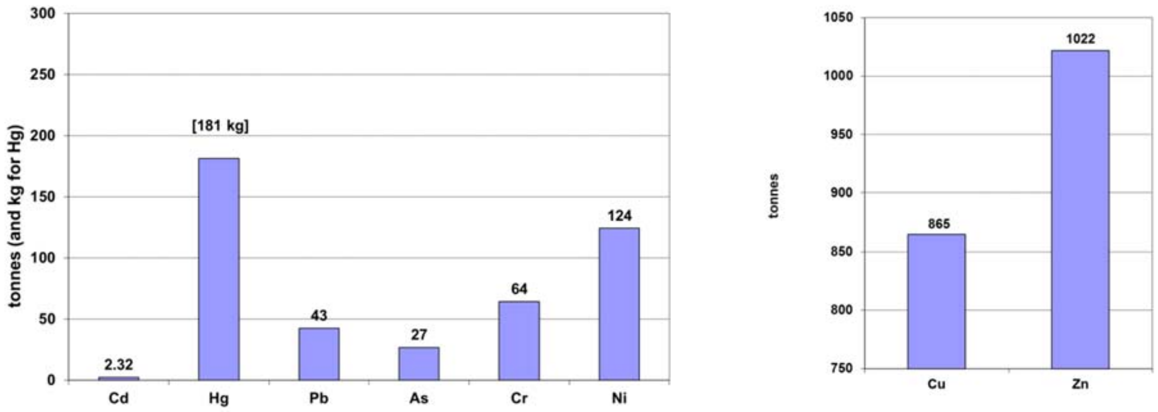


Figure 17. Total inputs of metals in 2012 (lower estimates). Left hand: Cadmium (Cd), mercury (Hg), lead (Pb), arsenic (As), chromium (Cr) and nickel (Ni). Note that mercury (Hg) is given in kg. Right hand: Copper (Cu) and Zinc (Zn).

For all metals except copper the riverine loads account for about 90% of the total inputs to Norwegian coastal waters (Figure 18). 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. Discharges of other metals from fish farming, including any residues from the fish fodder, are not estimated. The metal inputs per sub-region and other details are given in the Addendum (Table 3).

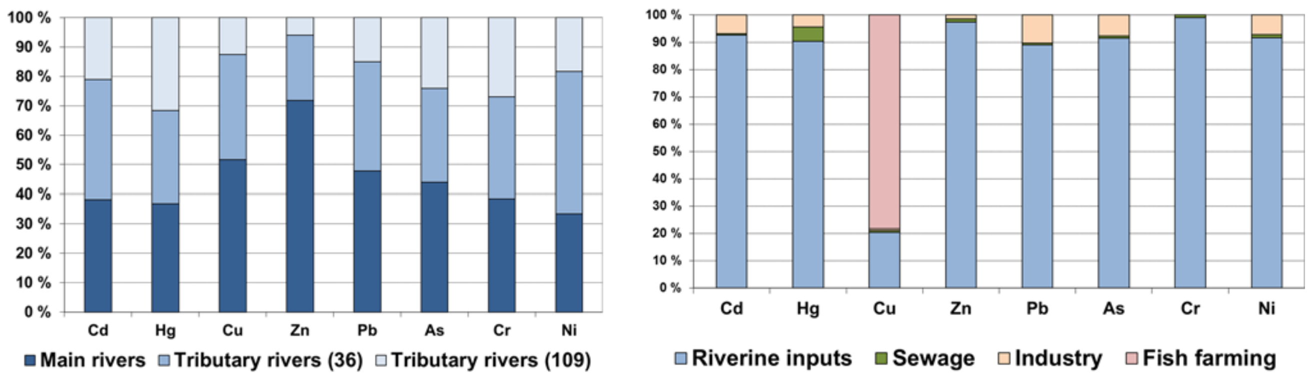


Figure 18. Relative share of reported riverine and direct discharges to the total inputs of metals to Norwegian coastal waters in 2012 (lower estimates).

3.5 Total lindane and PCB7 inputs in 2012

Lindane and PCB7 were only measured in the main rivers and not the tributary rivers. As in most previous years, all measured concentrations of river water in 2012 were below the detection limit for PCB7. This means that the lower estimate was 0, and the upper estimate reflected the detection limit and this year's water discharges (Figure 19). Discharges of PCB7 have also been reported from sewage treatment plants, and amounted to 47 kg. For lindane, only one sample out of 40 was above the detection limit. The lower estimate was 1 kg/yr and the upper estimate 13.5 kg/yr.

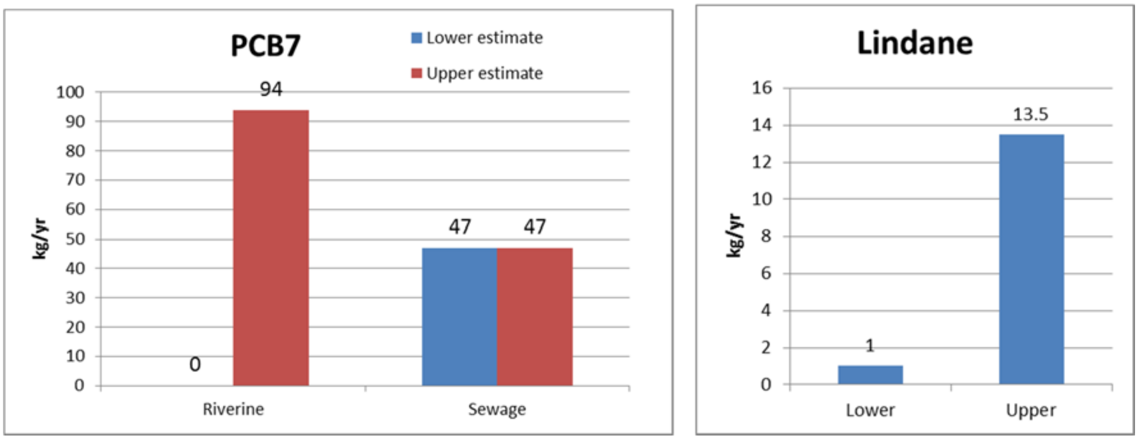


Figure 19. Total inputs of PCB7 (distributed between riverine and sewage treatment plants) and lindane in 2012 (lower and upper estimates).

4. Discussion

4.1 Comparison of riverine inputs in 2011 and 2012

The below 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, coastal areas, and areas below sampling points) were not included. Changes in loads from the 109 tributary rivers not monitored since 2003 only reflect between-year variations in annual water discharge, as the concentrations have not been measured since 2003.

The reduced water discharges in 2012 as compared to 2011 (Table 5) resulted in an overall decrease in nutrient and sediment loads to the Norwegian coastal waters (Table 7). The only exception is increases in nitrogen loads to the Barents Sea, despite a slight decrease in water discharge. Here, there has been a steady increase in nitrogen loads since 2010, when the load was at 2860 tonnes, and the increase is found in all the rivers presently monitored in this region. The reason for this is not yet known, but it is recommended that this issue is kept in mind for next year's assessment. Also, nitrogen loads to the North Sea were almost similar as in 2011, mainly because the decrease in the main and 109 tributary rivers was counteracted by an increase in the 36 tributary rivers. This is directly linked to differences in water discharges, as the water discharge in monitored tributary rivers in the Barents Sea increased since 2011.

Table 7. Total riverine loads of total nitrogen (TN), total phosphorus (TP) and suspended particulate matter (SPM) in 2011 and 2012. Changes greater than 5% are marked in orange (increase) and green (decrease).

Maritime area	Nitrogen (tonnes)		Phosphorus (tonnes)		SPM (1000 tonnes)	
	2011	2012	2011	2012	2011	2012
Skagerrak	36 316	31 400	1 160	1 137	600	581
North Sea	13 371	13 370	349	298	98	77
Norwegian Sea	12 487	10 034	539	383	400	241
Barents Sea	3 636	4 802	113	108	41	23
Total Norway	65 809	59 606	2 160	1 926	1 139	922

Table 8 shows the difference in metal inputs in 2012 as compared to 2011, as a total for Norway. Clearly, the slight decrease in water flow caused a decrease in metal inputs to the sea. However, the riverine inputs of zinc increased significantly. This is due to a rather marked increase in River Glomma. The reason for this is not known, since no significant increase in direct discharges upstream of the sampling location has been reported.

Table 8. Changes in metal inputs from the different types of rivers from 2011 to 2012. Changes greater than 5% are marked in orange (increase) and green (decrease).

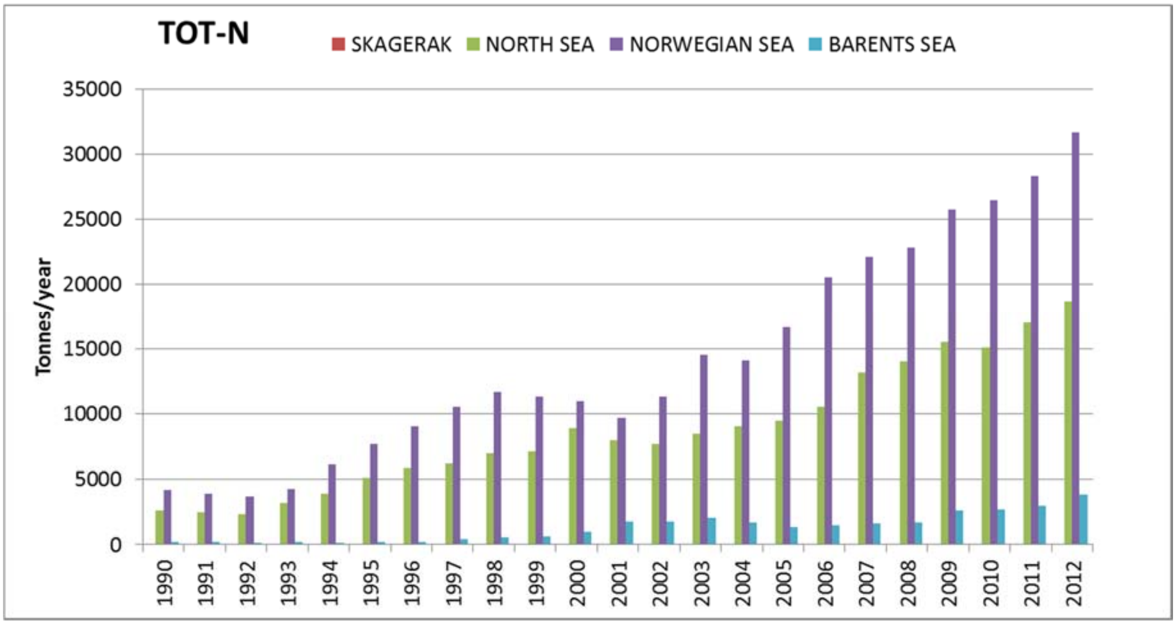
Change 2011-2012	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg
Source:	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	kg
Main Rivers	-3	-3	0	-29	191	-13	-8	-23
Tributary Rivers(36)	-1	-2	0	-29	5	-11	-7	-33
Tributary Rivers(109)	-1	0	0	-2	-5	-2	-5	-6
Total Riverine Inputs	-5	-5	-1	-60	191	-26	-20	-63
% change	%	%	%	%	%	%	%	%
Total riverine Norway	-16	-13	-19	-25	24	-19	-24	-28

Differences in loads of PCB7 and lindane from one year to the next are, in general, difficult to assess, since concentrations of these two substances usually are below LOD.

4.2 Comparison of direct discharges in 2011 and 2012

When compared to 2011, the nutrient discharges from fish farming increased with about 15 % both for total phosphorus and total nitrogen (cf. Figures 9 and 20). Fish farming now comprises 70 % of all phosphorus inputs, and 32 % of all nitrogen inputs to the sea. Phosphorus discharges from industry also increased (about 7 %) but otherwise there were few changes (Table 9).

In terms of direct discharges of metals from sewage treatment plants and industry, there were relatively small changes from 2011, although even small changes result in high percentage differences (Table 10). The only increase was in mercury discharges, where an increase from sewage treatment plants caused an overall increase of about 9%. Whereas zinc increased in the riverine loads in 2012, the direct discharges were more or less similar as to those found in 2011. The most marked decrease compared to 2011 was for chromium, where the discharges in 2012 were 77% lower than in 2011. Arsenic discharges from industry have tended to vary considerably from year to year; but this year there were practically no changes from 2011.



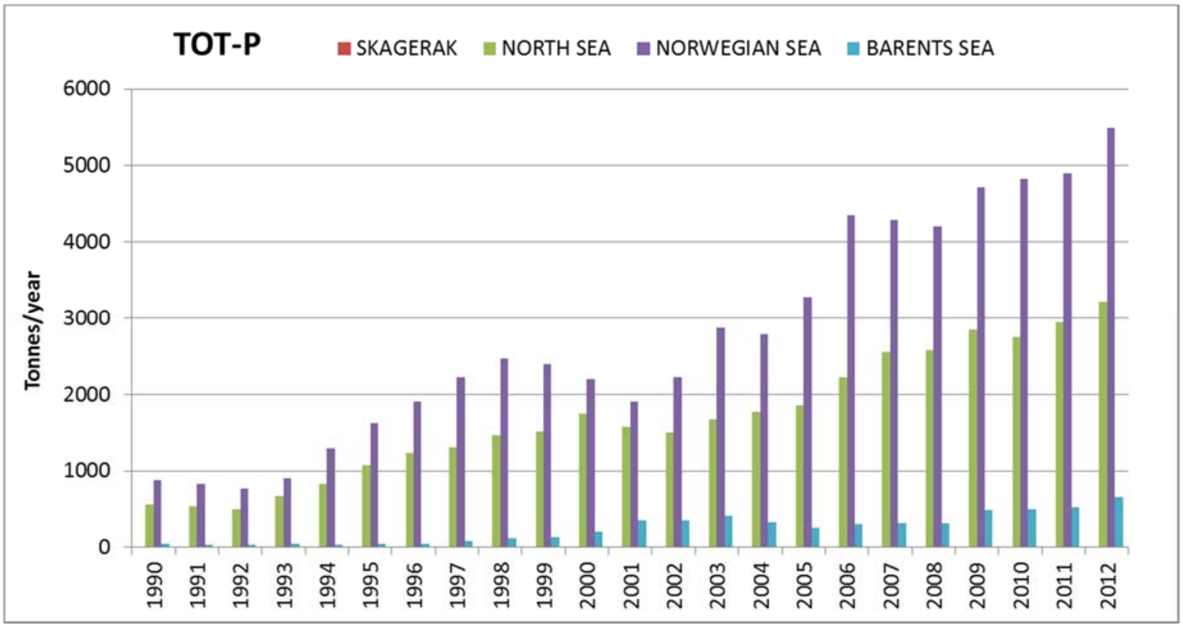


Figure 20. Phosphorus and nitrogen inputs from fish farming since 1990.

Table 9. Nutrient discharges from three sectors to the Norwegian coast in 2011 and 2012. Totals for all four maritime areas (STP: Sewage treatment plants). Changes above 5% have been marked with orange (increase) and green (decrease).

Sector	2011 (tonnes)	2012 (tonnes	Change (tonnes)	% change
Total nitrogen:				
Fish farming	46 848	53 981	7133	15.2
Industry	2 378	2 268	-110	-4.6
STP	12 094	12 140	46	0.4
Total phosphorus:				
Fish farming	7 899	9 112	1213	15.4
Industry	241	258	17	7.1
STP	923	910	-13	-1.4

Table 10. Changes in direct discharges (except fish farming) of metals (lower estimates) to the Norwegian coastal areas from 2011 to 2012. Changes above 5% have been marked with orange (increase) and green (decrease).

Change 2011-2012	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg
Source	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	tonnes	kg
STP	-0.02	-0.19	-0.01	-0.04	-0.31	-0.34	-0.40	3.40
Industry	0.02	-0.67	-0.01	-1.01	-0.03	-0.43	-1.57	-1.94
Sum	0.00	-0.86	-0.01	-1.05	-0.34	-0.76	-1.97	1.46
	%	%	%	%	%	%	%	%
% change	0	-16	-7	-9	-1	-7	-77	9

Copper from fish farming seems to have decreased with around 13%; from 780 tonnes in 2011 to 680 tonnes in 2012. However, the data on which these estimates are based are uncertain. Data are imported into the database annually and not monthly; variations from one year to the next will therefore depend on when data are reported to the database (e.g., in December or in January). The producers also report that the use of impregnation chemicals varies from year to year, which means that the apparent reduction can be a result of arbitrary variations. Variations in copper from fish farming therefore need to be assessed in a larger time-scale than from one year to the next.

4.3 Long-term trends in loads and concentrations in main rivers 1990-2012

In this section, an analysis of long-term temporal trends (1990-2012) 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.

Chemical variables analysed for trends include 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), cadmium (Cd), copper (Cu), lead (Pb), zinc (Zn) and nickel (Ni). 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. 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.)

4.3.1 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 are further commented in the sections below for each pollutant separately.

Table 11A. Long-term trends in annual water discharge (Q; estimated from daily measurements except in Orkla were modelled), nutrient and particle loads (upper estimates; upper and lower estimates given for orthophosphate) in nine Norwegian main rivers 1990- 2012. 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	0.0248	0.0009	0.6787	0.4187	0.6445	0.6046	0.2356	0.1451
Drammenselva	0.0121	0.0836	0.7022	0.3929	0.4544	0.3874	0.2549	0.3192
Numedalslågen	0.0369	0.3427	0.8194	0.0603	0.6744	0.7215	0.8457	0.5512
Skienselva	0.3553	0.0447	<0.0001	0.0011	0.3726	0.7041	0.4515	0.6572
Otra	0.9789	0.4259	<0.0001	0.2245	0.6169	0.036	0.0658	0.0426
Orreelva	0.1463	0.0297	0.1276	0.9578	0.8544	0.8544	0.2612	0.1068
Orkla	0.2346	0.0206	0.3943	0.1281	0.9223	0.3968	0.717	0.4738
Vefsna	0.6158	<0.0001	<0.0001	0.004	0.0793	0.0326	0.0008	0.2290
Altaelva	0.4437	0.0080	0.0039	0.0037	0.0249	0.0128	0.0055	0.1499

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

Table 11B. Long-term trends in nutrient and particle concentrations (upper estimates; upper and lower estimates given for orthophosphate) in nine Norwegian main rivers 1990- 2012. The table shows the p-values. The colours indicate the degree of statistical significance (see legend).

CONCENTRATIONS

River	Q	NH_4-N	NO_3-N	Tot-N	PO_4-P (1)	PO_4-P (2)	Tot-P	SPM
Glomma		0.0060	0.7977	0.0936	0.1401	0.1444	0.3643	0.3388
Drammenselva		0.2398	0.7202	0.0823	0.5832	0.5655	0.1926	0.4381
Numedalslågen		0.2600	0.0787	0.0080	0.6991	0.7806	0.0136	0.4344
Skienselva		0.0852	0	0.0001	0.0188	0.9694	0.3559	0.8317
Otra		0.3782	0.0012	0.1766	0.0823	0.0058	0.0169	0.0009
Orreelva		0.2180	0.0373	0.1701	0.5583	0.5638	0.6053	0.7522
Orkla		0.0099	0.5189	0.3542	0.1324	0.0589	0.1836	0.1031
Vefsna		0.0001	0.0001	0.0115	0.0898	0.0009	0.0513	0.0154
Altaelva		0.0011	0.0058	0.2706	0.0025	0.0014	0.0600	0.1486

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

4.3.2 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; 2011). Time series of actual[6] annual water discharges are presented in Appendix V.

Statistically significant upward trends in annual water discharge were detected in three rivers: Glomma, Drammenselva and Numedalslågen ($p<0.05$) (Table 11A). This is mainly due to an increase in water discharge the last 3-4 years.

4.3.3 Trends in nutrient loads and concentrations

Nitrogen

Statistically significant trends in total nitrogen (TN) loads were detected in three out of nine rivers (Table 11A). All three trends were downward. An apparent upward trend was noted in Numedalslågen ($p<0.07$). For ammonium and nitrate loads, statistically significant *downward* trends were detected in six and four rivers, respectively. For TN-concentrations, two rivers showed a downward trend and one upward (Table 11B).

A clear downward trend (1990-2012) in total nitrogen loads and concentrations (as well as for the ammonium and nitrate loads and concentrations; Table 11) was detected in River Vefsna (Figure 21). As reported in the last years (Skarbøvik *et al.,* 2012) 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 had 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 (1990-2012) 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 22 and 23. The TN-concentrations in River Skienselva showed a statistically significant downward trend. However, no statistically significant downward trend was detected for the TN-concentrations in Altaelva (Table 11B). Notable are the historically low nitrogen loads in 2012 in Skienselva. For Altaelva, a substantial interannual variability combined with a correlation between adjacent years (e.g., high loads in one year had a tendency to be followed by high loads the following year, which is somewhat peculiar. These riverine load 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 and statistically significant downward trend for nitrate loads and concentrations was detected (Figure 24). However this was not the case with TN. The reason for this probable increase in organic nitrogen is not known.

A statistically significant upward trend was detected for total nitrogen concentrations and the upward trend in total nitrogen loads was almost significant in river Numedalslågen (Table 11; Figure 25). This seems to be related to an almost statistically significant upward trend in nitrate-N concentrations ($p<0.08$). In addition, data for total organic carbon (TOC) (not part of the official RID-reporting) show a statistically upward trend (not shown), to some extent supporting an increased transport of organically bound nitrogen in this river.

A statistically significant downward trend in ammonium load was detected in Rivers Glomma, Skienselva, Orreelva, Orkla, Vefsna, and Altaelva (Table 11A). Statistically significant downward trends were also detected for ammonium concentrations in four of these rivers (Table 11B). Changes in

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

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 (through nitrification processes) and is thus a less informative parameter for long-term trend assessments.

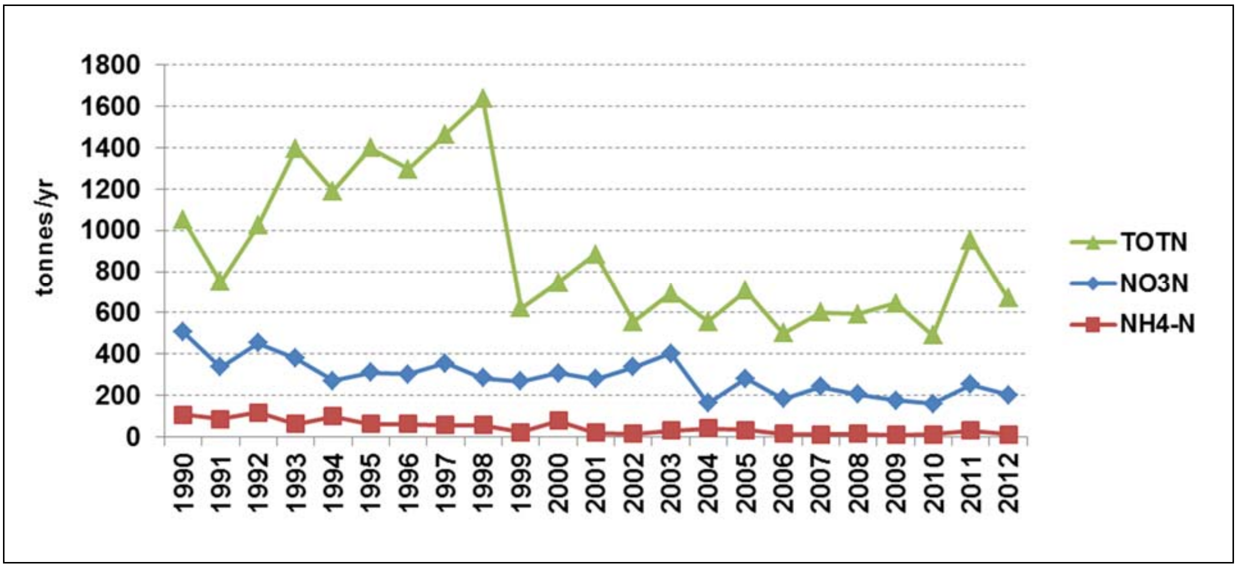


Figure 21. Annual riverine loads in River Vefsna of total nitrogen, nitrate nitrogen and ammonium in 1990-2012. Loads shown are the upper estimates. See text for discussions.

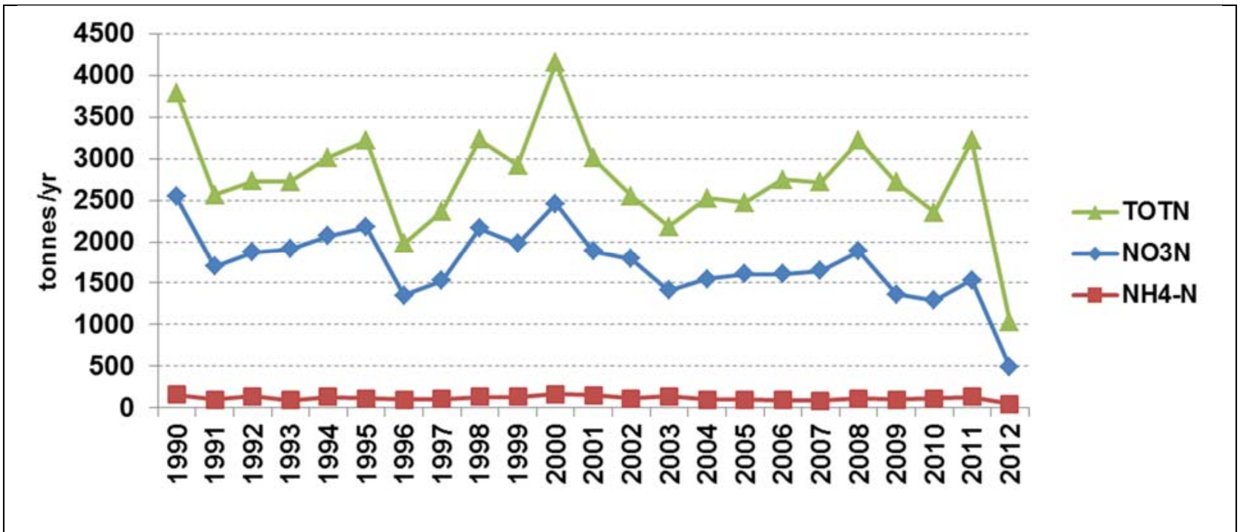


Figure 22. Annual riverine loads in River Skienselva of total nitrogen, nitrate nitrogen and ammonium in 1990-2012. Loads shown are the upper estimates. See text for discussions.

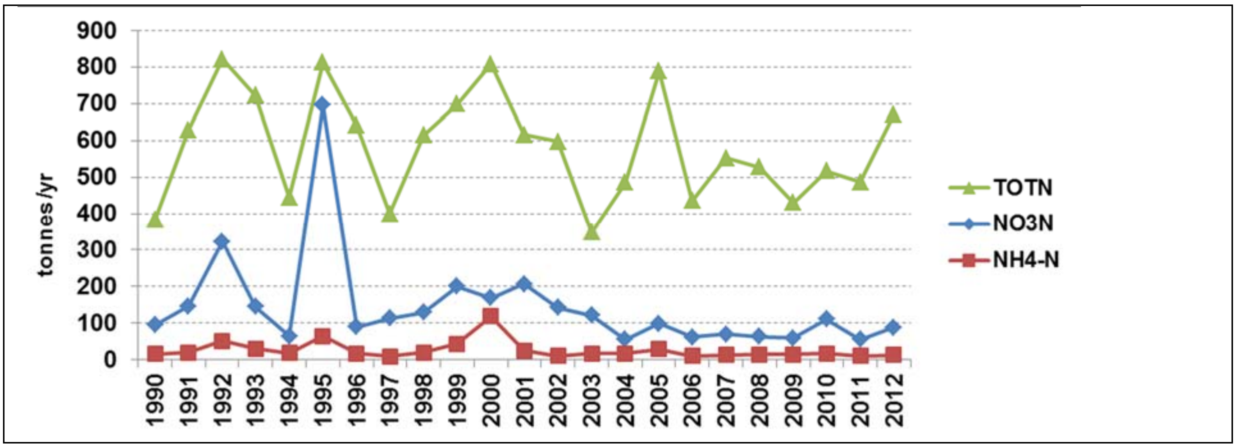


Figure 23. Annual riverine loads in River Altaelva of total nitrogen, nitrate nitrogen and ammonium in 1990-2012. See text for discussions.

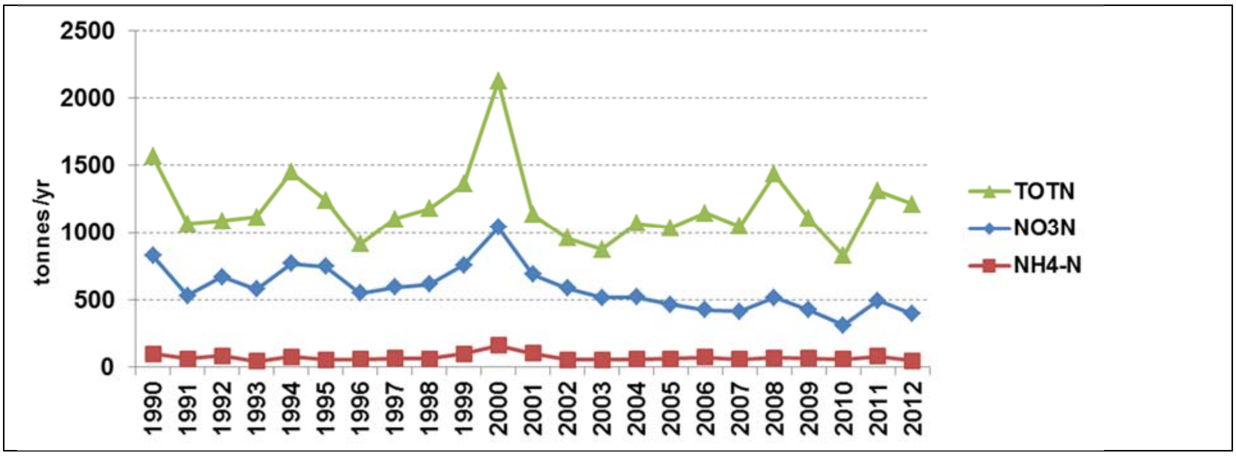


Figure 24. Annual riverine loads in River Otra of total nitrogen, nitrate nitrogen and ammonium in 1990-2012. See text for discussions.

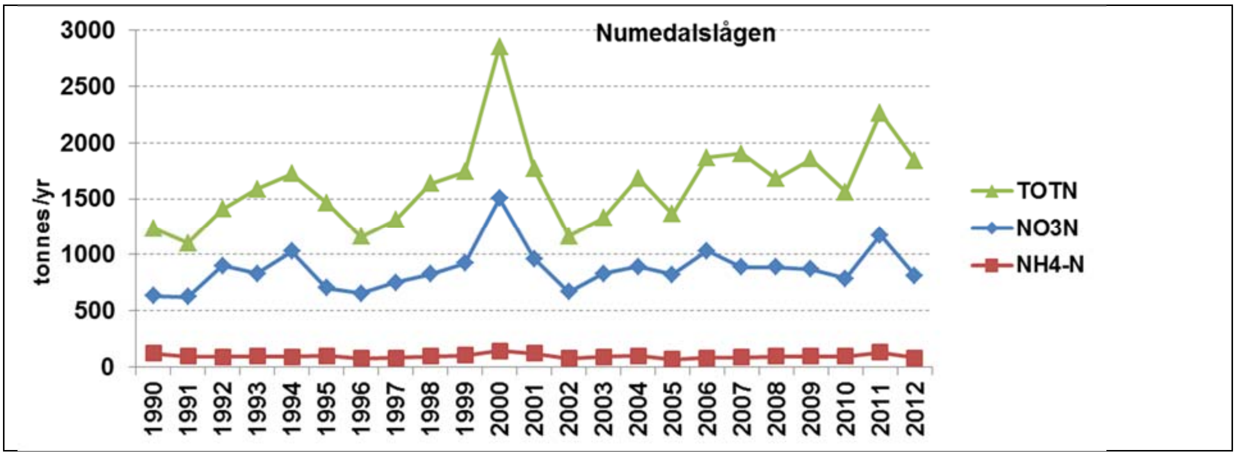


Figure 25. Annual riverine loads in River Numedalslågen of total nitrogen, nitrate nitrogen and ammonium in 1990-2012. See text for discussions.

Phosphorus
Statistically significant downward trends in total phosphorus loads were detected in two out of nine rivers (Table 11A): Vefsna and Alta. For concentrations, also two rivers showed statistically significant trends but here an upward trend was noted in Numedalslågen and a downward one in Otra (Table 11B). For the orthophosphate loads, statistically significant downward trends were detected in one river (upper estimates) or three rivers (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 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 26). Apparently, the high phosphorus loads in Vefsna in 1995 was linked to high particle (SPM) loads the same year (Figure 26; upper panel). Similarly, in River Altaelva, the peak years in phosphorus loads can be explained by corresponding peaks in the particle transport (Figure 26; lower panel).

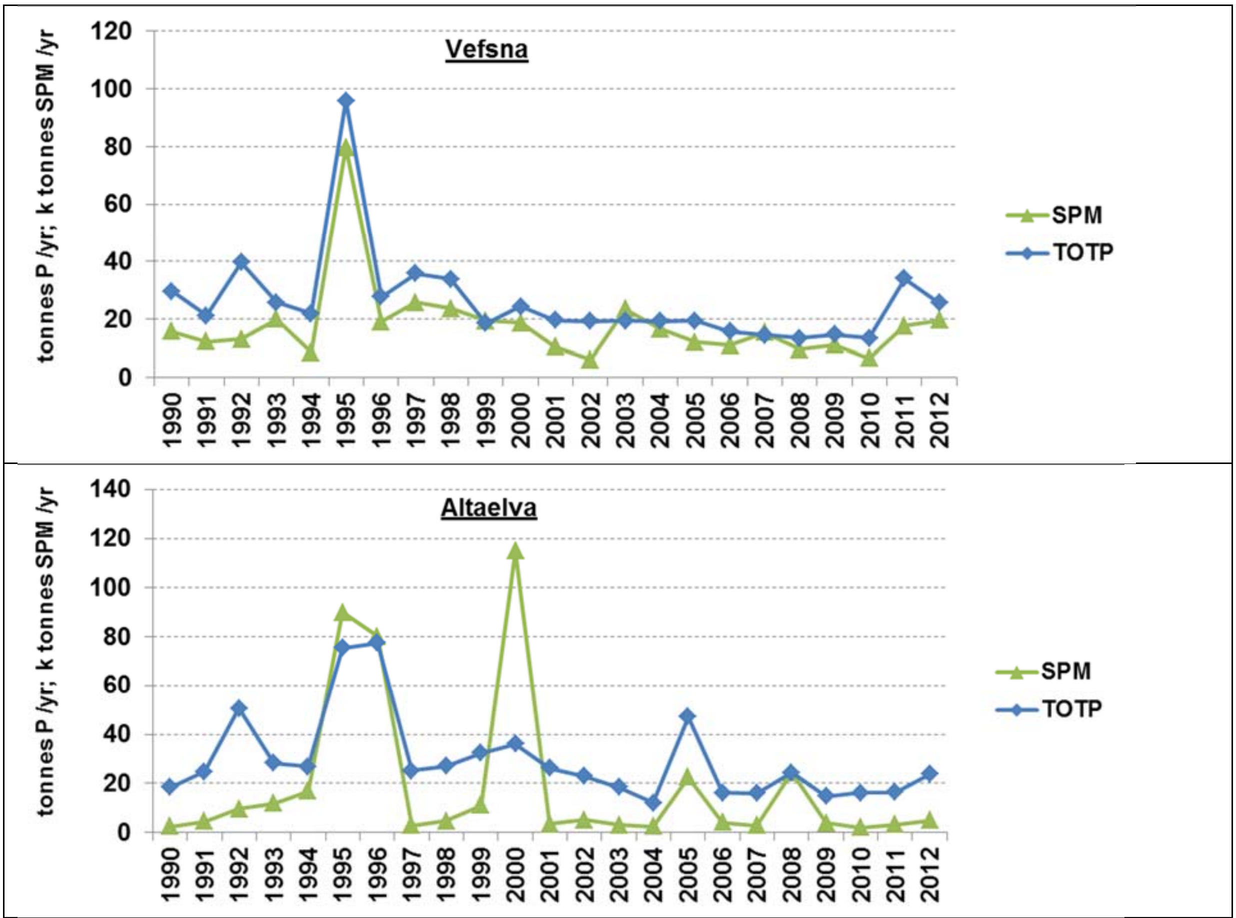


Figure 26. Riverine loads of total phosphorus (tot-P) and suspended particulate matter (SPM) in River Vefsna (upper panel) and Altaelva (lower panel) 1990-2012. It should be noted that total phosphorus loads in 1999-2003 are based on interpolation, not monitoring data (cf. Stålnacke et al., 2009). See text for discussions.

Of the other seven rivers there were some tendencies of declining trends in total phosphorus loads in Rivers Glomma and Otra, but due to the high inter-annual variability, no statistically significant trends were detected (Table 11A). Total phosphorus usually varies with water discharge, and monthly sampling will therefore imply relatively uncertain estimates of this parameter.

For the total phosphorus 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 27). Worthwhile to notice is the decline in Rivers Altaelva and Vefsna ($0.05<p<0.06$).

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 River Altaelva showed a statistical significant trend for loads ($p<0.05$); and a near-significant trend was detected for loads in Vefsna ($p<0.08$). It should be noted that orthophosphate concentrations in most samples in all rivers were very low (1-2 µg/l) or at LOD, with the LOD having changed during the course of the monitoring period (between 0.5 and 1 µg/l). This implies that interpretation of orthophosphate trends should be made with great caution.

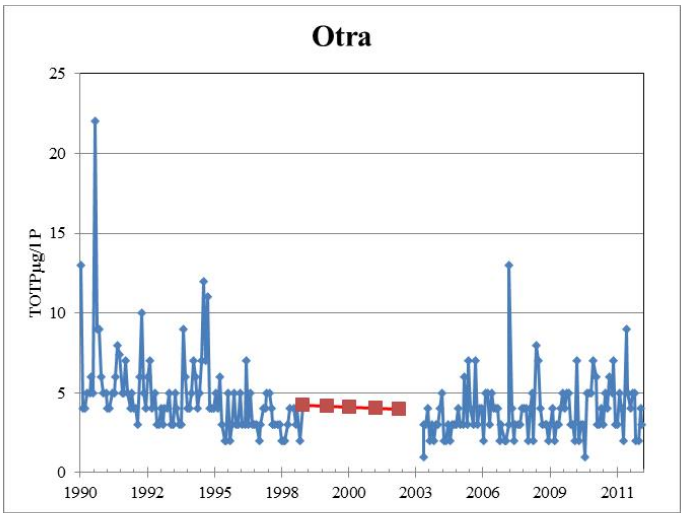


Figure 27. Monthly concentrations of total phosphorus in River Otra, 1990-2012. The red dots and lines indicate estimated values.

Particulate matter

Statistically significant downward trends in particulate matter concentrations were detected in two out of nine rivers: Otra and Vefsna; for loads only Otra showed a statistically significant trend (Table 11; Figure 28). For Vefsna, the SPM concentrations have become lower during the 2000s compared to the 1990s (Figure 29).

As for total phosphorus, there has been major inter-annual variability in loads of suspended particulate matter (SPM), and monthly sampling will give high uncertainties. More frequent sampling would have improved this uncertainty factor. 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) and Skarbøvik et al. (2010).

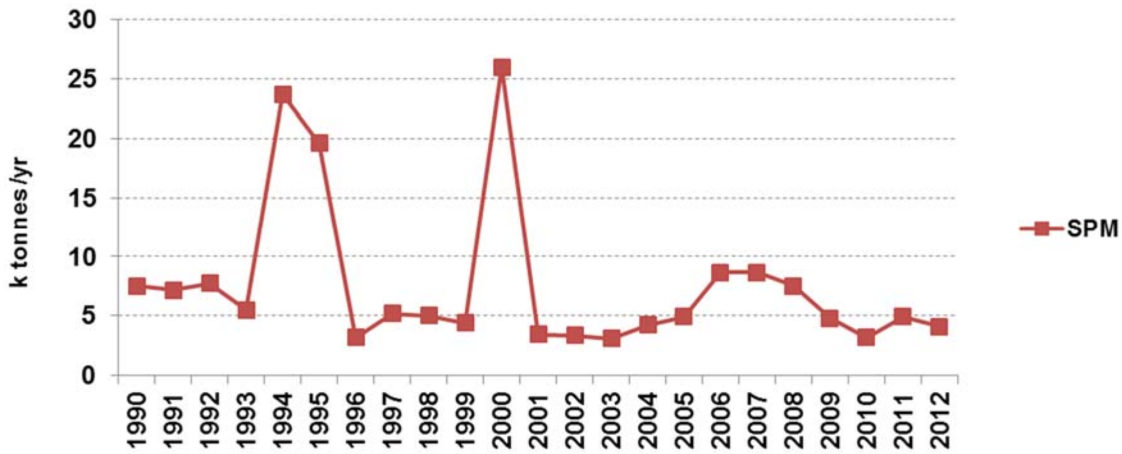


Figure 28. Riverine loads of suspended particulate matter (SPM) in River Otra 1990-2012.

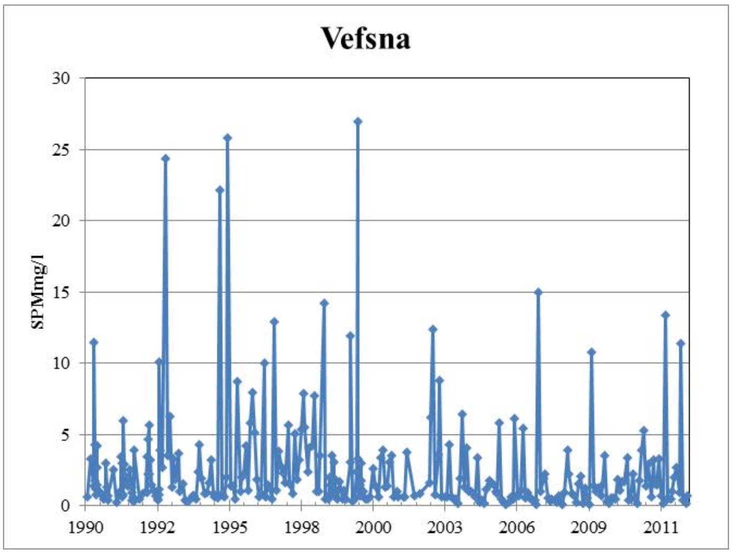


Figure 29. Monthly concentrations of suspended particulate matter (SPM) in Vefsna 1990-2012.

4.3.4 Trends in metal loads and concentrations

In this section the annual riverine loads of metals in the nine main rivers during the period 1990-2012 are assessed. All charts are given in Appendix V for loads and Appendix VI for concentrations. The metals for which long-term trends are statistically investigated are:

- Copper (Cu)
- Lead (Pb)
- Zinc (Zn)
- Cadmium (Cd)
- Nickel (Ni)

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 45 trend tests carried out for the metal loads, 33 were statistically significant downward ($p<0.05$) for the upper and 28 for the lower estimate, respectively. For the concentrations series, 37 downward trends were statistically significant ($p<0.05$) for the upper and 22 for the lower estimate, respectively.

It should be emphasised that no firm conclusions can be drawn about long-term changes in metal loads, except for copper, zinc and to some extent lead. This is due to the problem with changed detection limits over time and/or large numbers of samples reported at or below the detection limit (see Skarbøvik *et al*., 2007 and Stålnacke *et al*., 2009 for details). Apparent visual trends in the data are, therefore, not necessarily explained by 'real' changes in loads. Thus, interpretations of metal trends should be done with great caution.

Table 12A. Long-term trends for metal loads in nine Norwegian main rivers 1990-2012. 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	0.0248	0.0041	0.0732	0.0118	0.0051	0.1996
Drammenselva	0.0121	0.0001	0.7411	0.5097	0.3531	0.3777
Numedalslågen	0.0369	0.0013	0.0282	0.0081	0.0074	0.0089
Skienselva	0.3553	0.0001	0.0039	0.0001	0.2465	0.0011
Otra	0.9789	0.0001	0.1186	0.0015	0.0283	0.0068
Orreelva	0.1463	0.0449	0.3515	0.0009	0.2172	0.822
Orkla	0.2346	0.0028	0.0039	0.0077	0.0031	0.0009
Vefsna	0.6158	<0.0001	0.0010	0.0000	0.0003	0.0014
Altaelva	0.4437	<0.0001	0.0004	0.0016	0.0164	0.5237

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 12B. Long-term trends for metal concentrations in nine Norwegian main rivers 1990-2012. 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.

CONCENTRATIONS

River	Cd	Cu	Ni	Pb	Zn
Glomma	0.0012	0.0485	0.008	0.0022	0.3798
Drammenselva	0.0005	0.2910	0.1162	0.0658	0.1132
Numedalslågen	0.0008	0.0132	0.0049	0.0201	0.0046
Skienselva	<0.0001	0.0058	0.0001	0.0353	0.0003
Otra	0.0007	0.0846	0.0041	0.0014	<0.0001
Orreelva	0.0010	0.7837	0.0005	0.0075	0.5668
Orkla	0.0021	0.0023	0.001	0.0003	0.0001
Vefsna	<0.0001	0.0001	0.0006	0.0001	<0.0001
Altaelva	0.0007	0.0009	0.0116	<0.0001	0.0098

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 13A. Long-term trends for metal loads in nine Norwegian main rivers 1990-2012. 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	0.0248	0.1901	0.0732	0.0118	0.0282	0.1996
Drammenselva	0.0121	0.0017	0.7411	0.9287	0.4122	0.3777
Numedalslågen	0.0369	0.0105	0.0282	0.1875	0.023	0.0089
Skienselva	0.3553	0.001	0.0046	0.0223	0.3049	0.0011
Otra	0.9789	0.0862	0.1186	0.0011	0.0692	0.0068
Orreelva	0.1463	0.1996	0.3515	0.0009	0.2818	0.8220
Orkla	0.2346	0.0059	0.0039	0.0077	0.0037	0.0009
Vefsna	0.6158	0.0005	0.0010	0.0002	0.0009	0.0029
Altaelva	0.4437	0.0034	0.0004	0.0032	0.4022	0.1996

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 13B. Long-term trends for metal concentrations in nine Norwegian main rivers 1990-2012. 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.

CONCENTRATIONS

River	Cd	Cu	Ni	Pb	Zn
Glomma	0.4998	0.0485	0.008	0.1122	0.3798
Drammenselva	0.2115	0.2910	0.1968	0.5378	0.1123
Numedalslågen	0.3932	0.0132	0.0048	0.0664	0.0046
Skienselva	0.0106	0.0058	0.038	0.5375	0.0003
Otra	0.3754	0.0846	0.0068	0.0765	<0.0001
Orreelva	0.6415	0.7837	0.0005	0.0253	0.6123
Orkla	0.0857	0.0023	0.0010	0.0509	0.0001
Vefsna	0.0018	0.0001	0.0013	0.0035	0.0001
Altaelva	0.0578	0.0013	0.0578	0.2174	0.0572

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 1990-2012. 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). Statistically significant downward trends in the concentrations were detected in 6 rivers (for both lower and upper estimates). 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 (1999-2012) the loads dropped to 2-5 tonnes (Figure 30; 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 30; middle panel). The decline in loads in Rivers Numedalslågen and Skienselva can be related to high loads in single years, i.e. 1993 in River Numedalslågen and 1990 in River Skienselva. The high copper load in River Numedalslågen in 1993 (Appendix V) 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 four times during the time period 1994-2012 (Appendix VI). The high load in River Skienselva in 1990 (Figure 30; 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 (Appendix VI).

The copper concentrations in River Otra show a parabolic pattern over the time period, with declining concentrations from 1990 to the mid 1990s and increasing concentrations since 2003 and onwards (Figure 31). The pattern is also reflected in the loads (Appendix V). The higher concentrations at the start of the time series are related to one single sample with high concentration (6 µg/l) in combination with several observations around or above 1 µg/l. The increase since 2003 is particularly pronounced, and is also reflected in a low p-value in the trend analysis ($0.05<p<0.1$). The reason for this concentration pattern is not known.

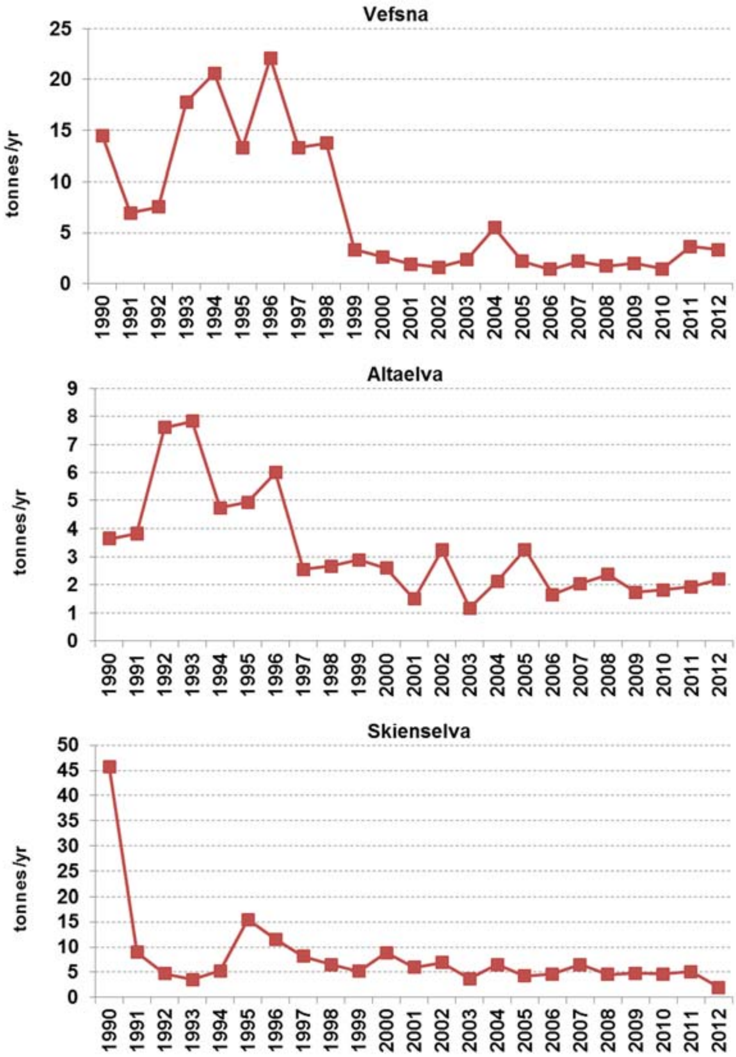


Figure 30. Annual riverine loads of copper in River Vefsna, Altaelva and River Skienselva, 1990-2012.

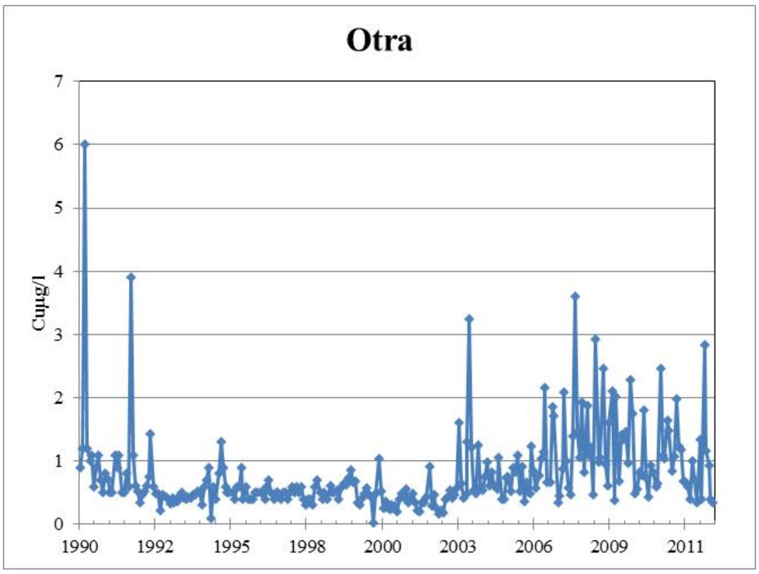


Figure 31. Monthly concentrations of copper in Otra 1990-2012.

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 (1990-2012). 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 upper and lower load in six and four rivers, respectively (Table 12A and 13A). The most prominent load trends were found in Rivers Glomma and Vefsna (Figure 32).

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 12B). Only two of the rivers showed statistically significant downward trends when the lower estimates were considered (Table 13B).

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

Year	1990	1991	1992 -1998	1999	2000	2001	2002-2003	2004-2012
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.

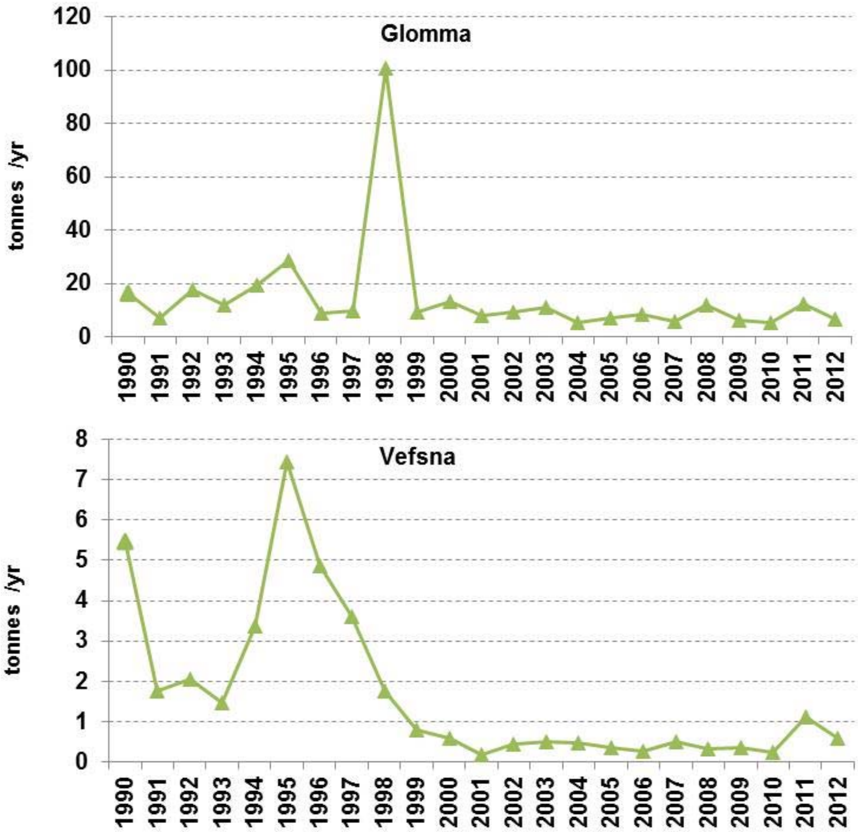
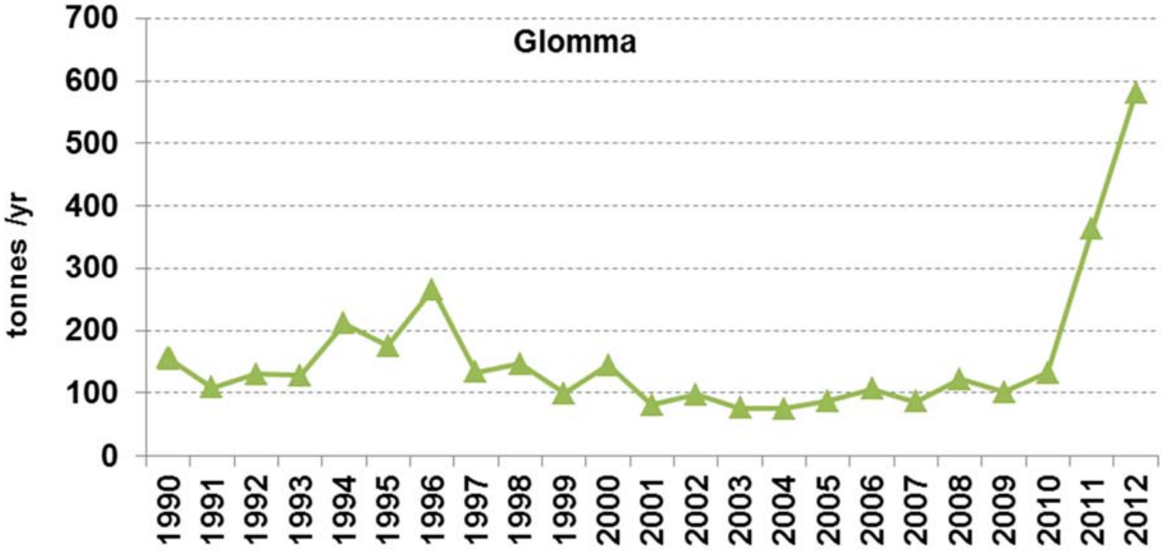


Figure 32. Annual riverine loads of lead (upper estimate) in River Glomma and River Vefsna, 1990-2012.

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 for the upper estimate. 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; Appendix VI). Elevated loads in 2011 and 2012 in river Glomma can be noted in the upper panel of Figure 33. As seen from the raw-data series (the lower panel of Figure 33), there is a general increase in the concentrations both in 2011 and 2012 although elevated concentrations have been observed in earlier timer periods (i.e. 1996-1999). The reason for this phenomenon in 2011 and 2012 is not known.



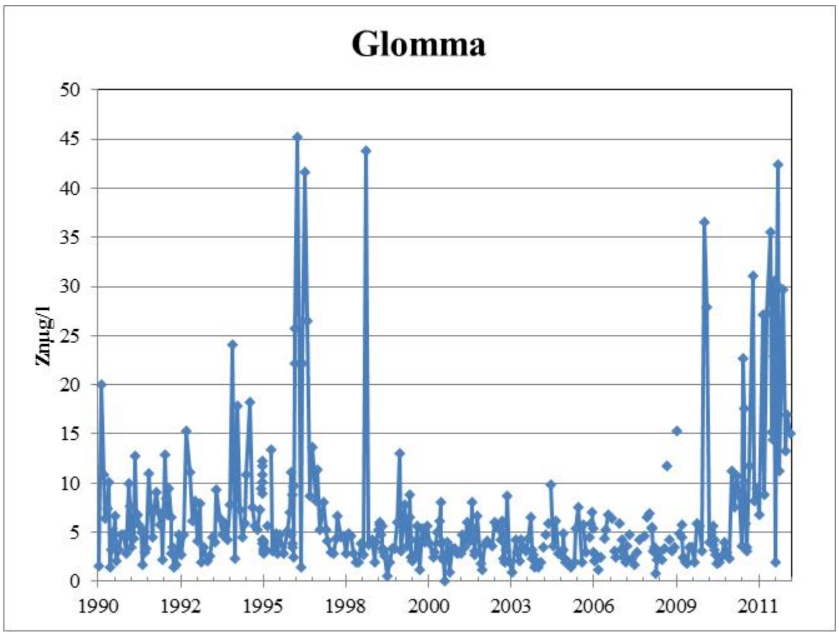


Figure 33. Annual riverine loads (upper panel) and monthly concentrations (lower panel) of zinc in River Glomma, 1990-2012.

Cadmium (Cd)
For the upper estimates, all nine rivers showed a statistically significant downward trend for both the loads and concentrations of cadmium (Table 12), while for the lower estimates six and two downward 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 2004-2012. 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.

Nickel (Ni)
For the upper estimates, eight out of nine rivers showed a statistically significant downward trend for both the loads and concentrations (Table 12), while for the lower estimates seven significant downward trends were detected for the loads and concentrations (Table 13). As for lead the LOD have changed over the monitoring period, so firm conclusions about time-trends were difficult to draw.

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.

4.3.5 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.

4.3.6 Overview of trends in riverine loads and concentrations
The main conclusions of the trend analysis on annual loads for the period 1990-2012 are summarised as follows:

- For water discharge, statistically significant upward trends could be detected in Rivers Drammenselva, Glomma and Numedalslågen.
- For nutrients:
  - In Rivers Skienselva, Vefsna and Altaelva, downward trends in nitrogen loads (total-N and nitrate-N, the latter also in River Otra);
  - Downward trends in ammonium loads in six rivers;
  - In Rivers Vefsna and Altaelva, downward trends in total phosphorus load;
  - In Rivers Otra, Vefsna and Altaelva, downward trends in orthophosphate load (lower estimates).
- For suspended particles, downward trends were detected in River Otra.
- For copper there were downward trends in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva.
- For zinc, there were downward trends in Rivers Orkla, Vefsna, Numedalslågen, Skienselva and Otra.

- For lead, downward trends were detected in six (upper estimate) and four (lower estimate) rivers. The LOD for lead has changed by a factor of 100 during the monitoring period (1990-2012), 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 concentration series with some exceptions:

- The TN-concentrations in Altaelva did not showed any statistical downward trend
- The nitrate-N concentrations in Orrelva showed a significant downward trend
- A statistically significant upward trend in total-N and total-P concentrations was detected in River Numedalslågen
- Out of 45 (for each estimate) performed trend tests for the metal loads, 33 were downward statistically significant ($p<0.05$) for the upper and 28 for the lower estimate, respectively. For the concentrations series, 37 downward trends were statistically significant ($p<0.05$) for the upper and 22 for the lower estimate, respectively.

5. Conclusions

Climate and water discharges
Average air temperature in 2012 for Norway as a whole was 0.4 °C above normal (1961-1990), whereas the total precipitation was 105% of normal precipitation for the country as a whole. Water discharges were, in general for all rivers, lower than in 2011 but higher than the 30-year normal, with some regional variations and exceptions.

Nutrients and suspended particulate matter
The total nutrient inputs to coastal Norwegian waters in 2012 were estimated to about 13 000 tonnes of phosphorus, 169 000 tonnes of nitrogen, 460 000 tonnes of silicate, 550 000 tonnes of total organic carbon, and 938 000 tonnes of suspended particulate matter.

Nutrient inputs from rivers were in general lower than in 2011 due to generally lower water discharges, with some regional exceptions. The exceptions are due to regional variations in water discharges, and do not reflect any major increases in nutrient sources. For the direct discharges, there were only small changes in nutrients from industry and STPs, but the increase in both phosphorus and nitrogen from fish farming since 2011 amounted to about 15 %.

Long-term trend analyses on loads for the period 1990-2012 revealed that:

- In Rivers Skienselva, Vefsna and Altaelva there were downward trends in nitrogen loads (total-N and nitrate-N, the latter also in River Otra);
- In Rivers Glomma, Skienselva, Vefsna, Otra, 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, Vefsna and Altaelva there were downward trends in orthophosphate loads (lower estimates).

Metals
The inputs of metals to Norwegian coastal waters in 2012 were estimated to 181 kg of mercury, 2.3 tonnes of cadmium, 27 tonnes of arsenic, 43 tonnes of lead, 64 tonnes of chromium, 124 tonnes of nickel, 865 tonnes of zinc, and 1022 tonnes of copper.

For all metals except copper the riverine loads accounted 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 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 there were downward trends in Rivers Orkla, Vefsna, Numedalslågen, Skienselva and Otra.

For the other metals there are many uncertainties related to the trend analyses.

Pesticides
PCB7 and lindane were, as in former years, low in Norwegian waters. In only one case lindane was found in quantities above the detection limit of the analytical methods.

Distribution between sources
There were no significant changes since 2011 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 Objectives**
Appendix II **Water sampling personnel**
Appendix III **Catchment information for the 10 main and the 36 tributary rivers**
Appendix IV **Methodology, detailed information and changes over time**
Appendix V **Long-term trends in riverine loads - complementary figures**
Appendix VI **Long-term trends in riverine concentrations - complementary figures**

Appendix I

The RID 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%.

Appendix II

Water sampling personnel

An overview of the personnel for water sampling in 2012 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) Vibeke Svenne (Drammen) Vebjørn Opdahl (Vefsna) Anders Bjordal (Alta) Joar Skauge (Orkla) Geir Ove Henden (Vosso) Peder Vidnes/ Anette Hardli (Skien) Sverre Holm (Numedalslågen) Einar Helland (Orre) Ellen Grethe Ruud Åtland (Otra)	Olav Smestad Svein Gitle Tangen Leif Magnus Dale Hallgeir Hansen Vanessa Venema Vebjørn Opdahl Inger Astrid M. Kårvatn/ Gudmund Kårvatn Øystein Nøtsund Egil Moen Øystein Iselvmo Einar Pettersen Ellen Grethe Ruud Åtland Einar Helland Nils Haakensen Asbjørn Bjerkan Bjarne Stangvik Rune Roaldkvam Odd Birger Nilsen Jan Stokkeland Inger Moe Harald Viken/ Daniel Melkersen

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 it 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[7] 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[8] 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, Årdalselv and Ulla in the west; and Pasvik in the north, are more or less entirely dominated by mountains, moors, and mountain plateaus.

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

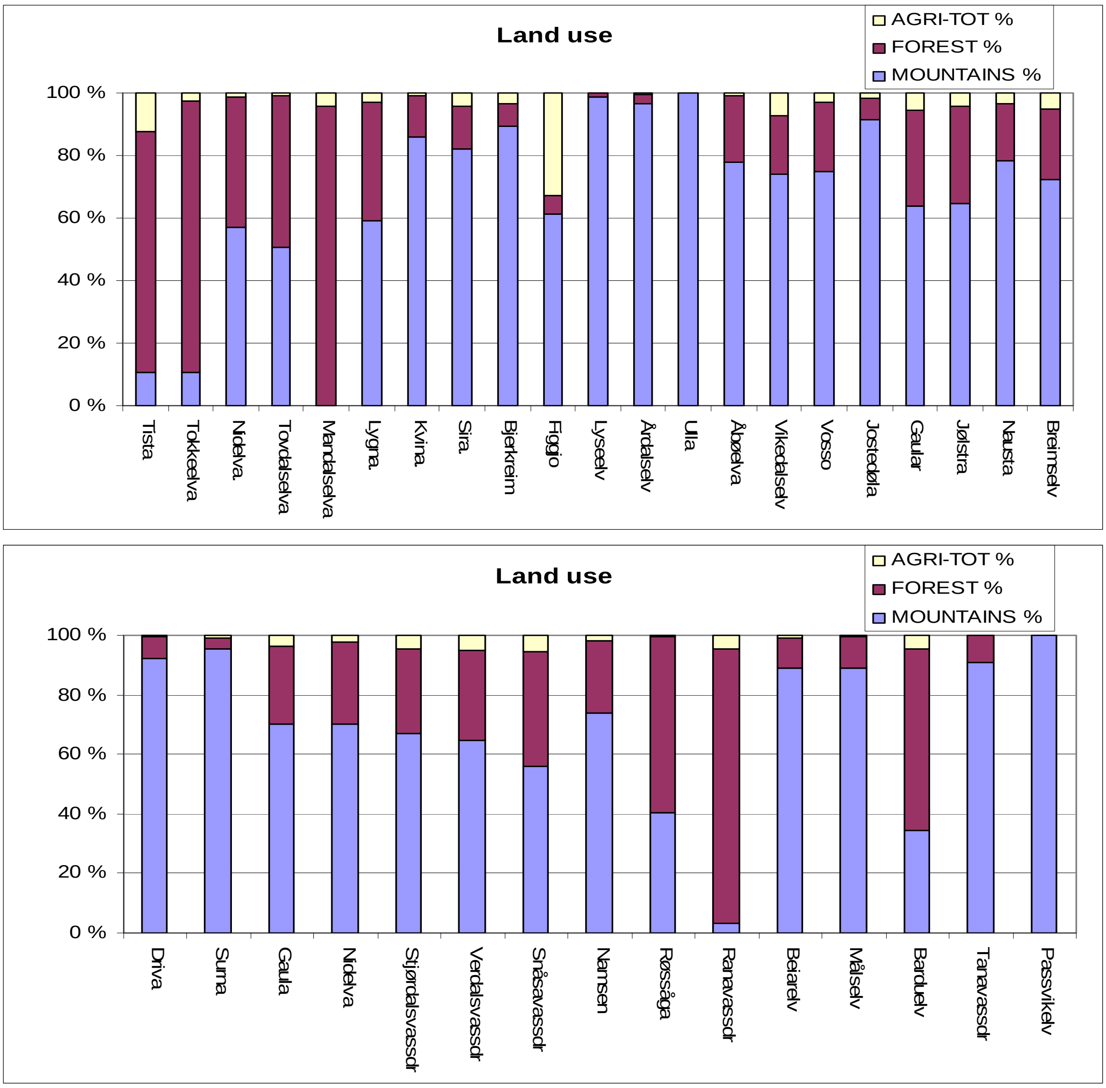

Figure A-III-1. Land use distribution in the catchment areas of the 36 rivers monitored quarterly. “Agri-tot” means total agricultural land. “Mountains” include moors and mountain plateaus not covered by forest.

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. However, River Vosso became a 'main river' as late as 2008/2009, when it replaced River Suldalslågen.

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 monitored "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.

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.

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.

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 gives the analytical methods and detection limits used.

Table A-IV-3. Analytical methods and limits of detection for parameters included in the sampling programme in 2012.

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	NS 4725 – Peroxidisulphate oxidation method
Orthophosphate (PO4-P) (µg P/L)	1	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	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. The only exception is Orkla where modelled discharge has been used since 2005. 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 River Orkla, 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') have been introduced in TEOTIL in order to improve load estimates for smaller basins (tributaries).

The gridded HBV-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 evapo-transpiration, 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.

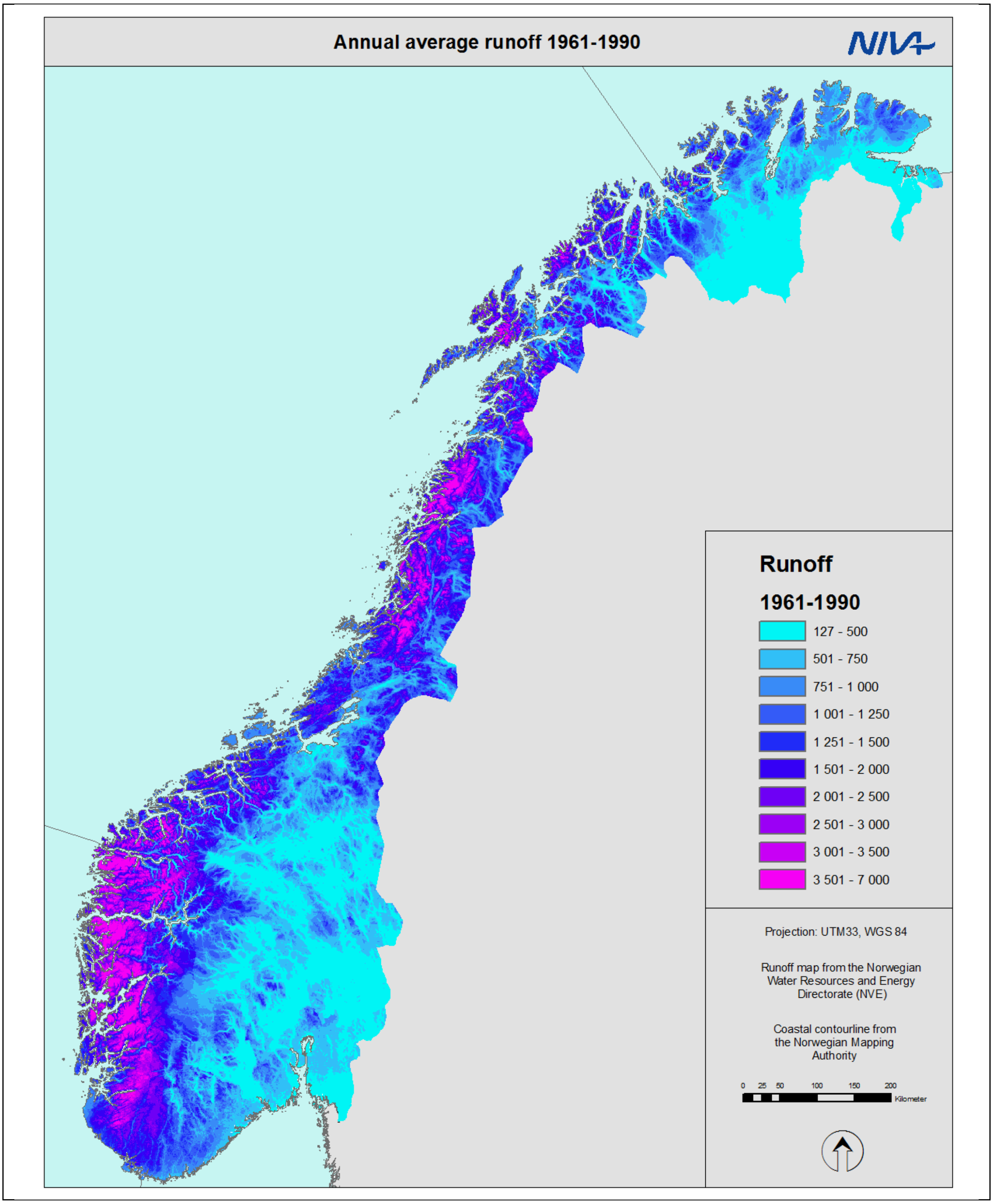

Figure A-IV-1. Average annual runoff (mm/year) for Norway for the period 1961-1990.

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 / the KOSTRA Database);
- Industry: the database "Forurensning" from the Norwegian Environment Agency.
- Aquaculture: Nutrients (from the Directorate of Fisheries / the ALTINN-database (altinn.no)) and copper (based on sales statistics of antifouling products made available by the Norwegian Environment Agency)

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. 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 (North Sea) 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 Norwegian Environment Agency 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 is 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. The "Principles of the Comprehensive Study of Riverine Inputs and Direct Discharges" (PARCOM, 1988) recommends the derived per capita loads listed in the table below. The Norwegian per capita loads are based on studies of Norwegian sewerage districts (Farestveit *et al.*, 1995), and are listed in the same table. The latter are used in the Norwegian reporting.

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
SPM (kg SPM./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 the database “Forurensning” (Norwegian Environment Agency) 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 the 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.

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, few years. 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 (see Skarbøvik *et al.*, 2011). As a result, nutrient loads were adjusted from the year 2000 onwards.

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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.

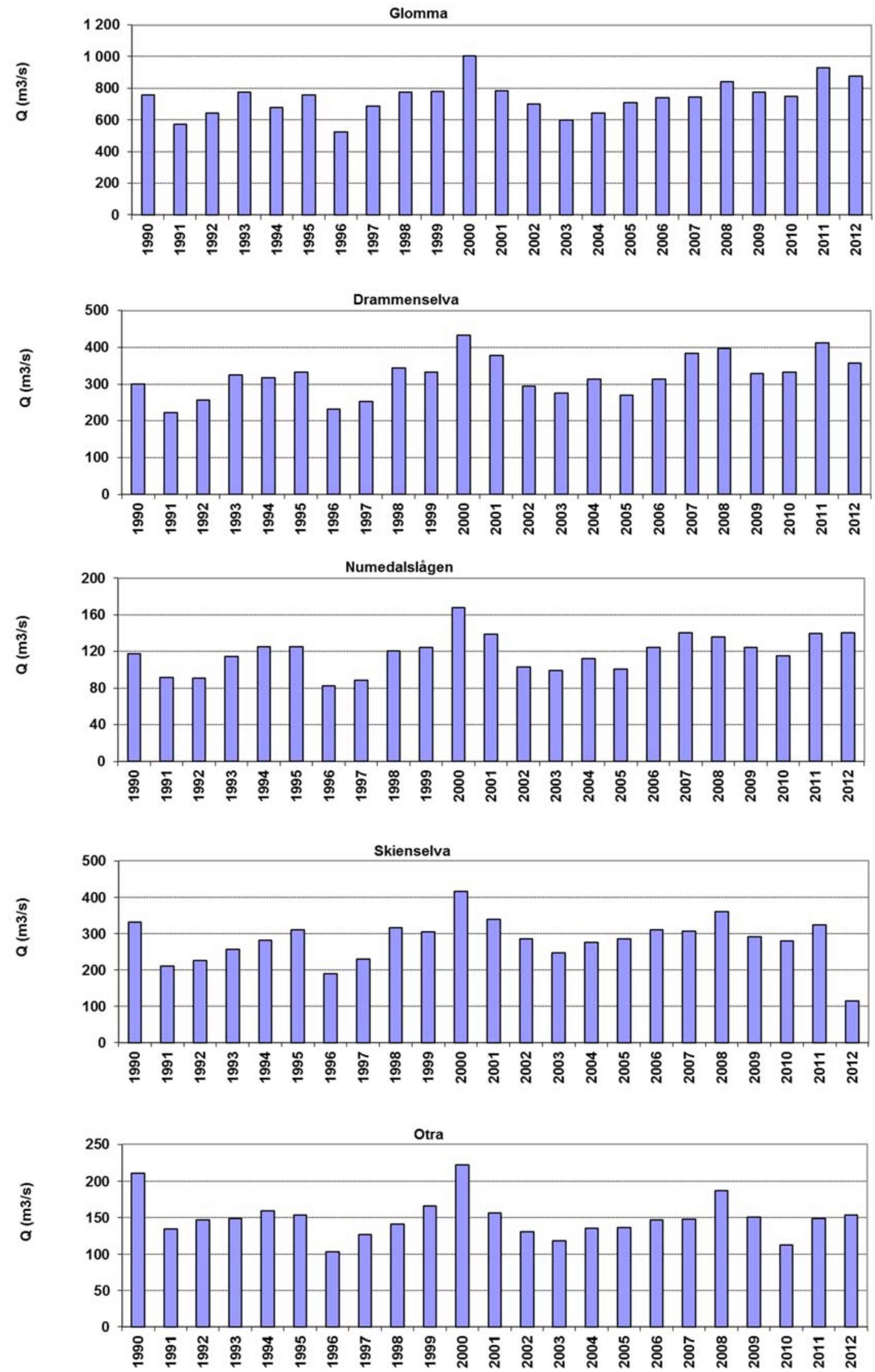

Figure A-V-1a. Annual water discharge (Q) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

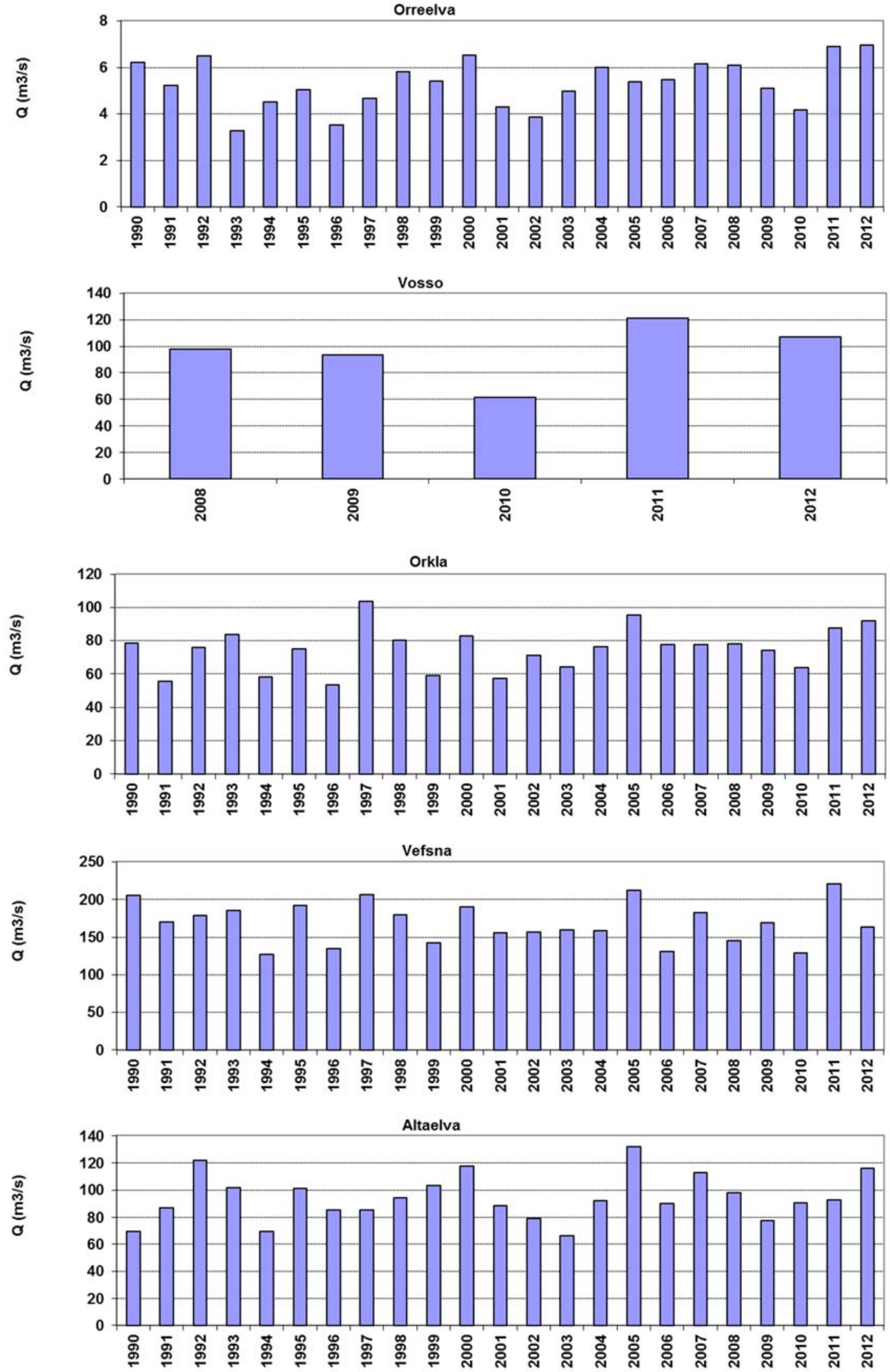

Figure A-V-1b. Annual water discharge (Q) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

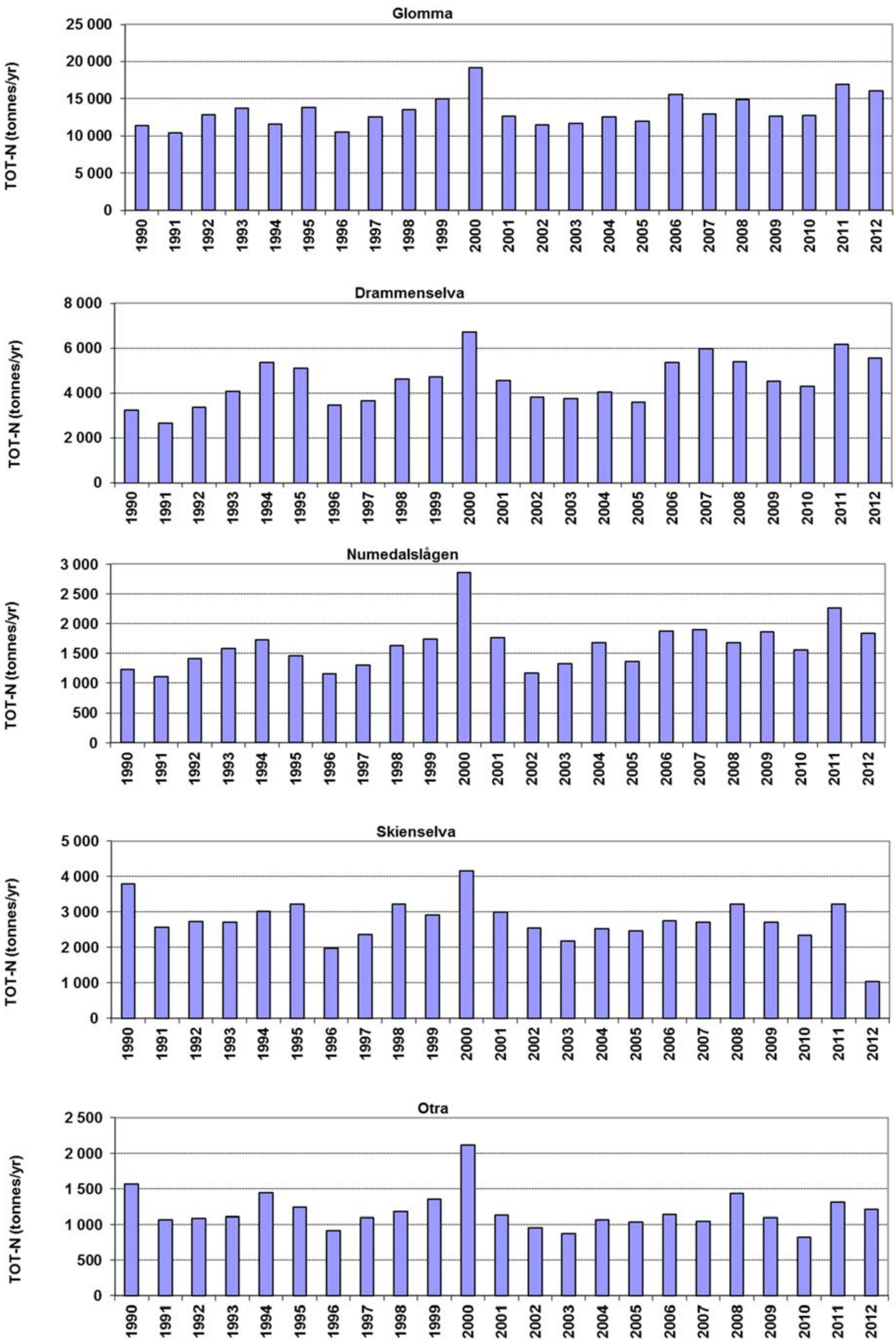

Figure A-V-2a. Annual riverine loads of total nitrogen (Tot-N) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

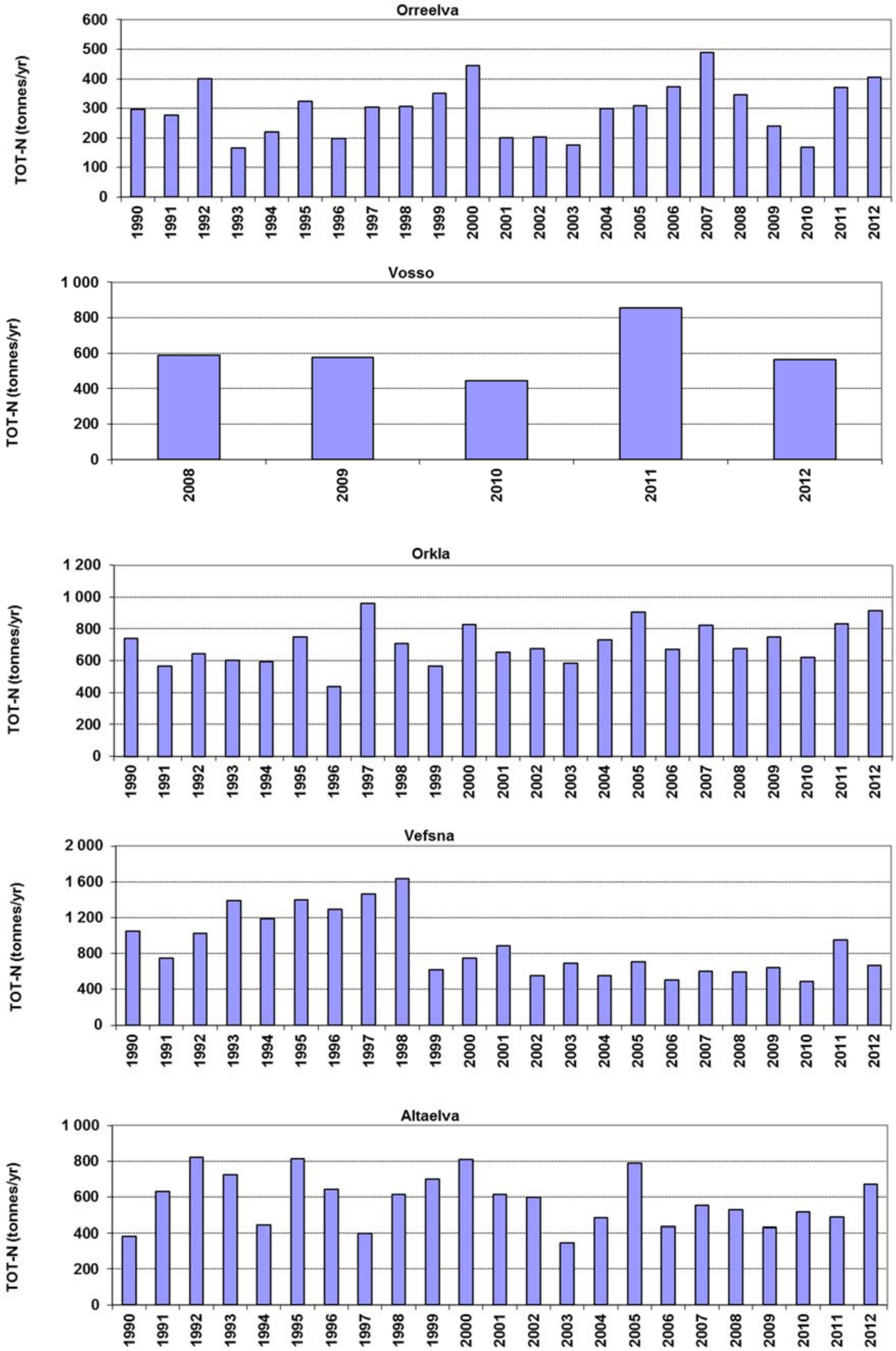

Figure A-V-2b. Annual riverine loads of total nitrogen (Tot-N) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

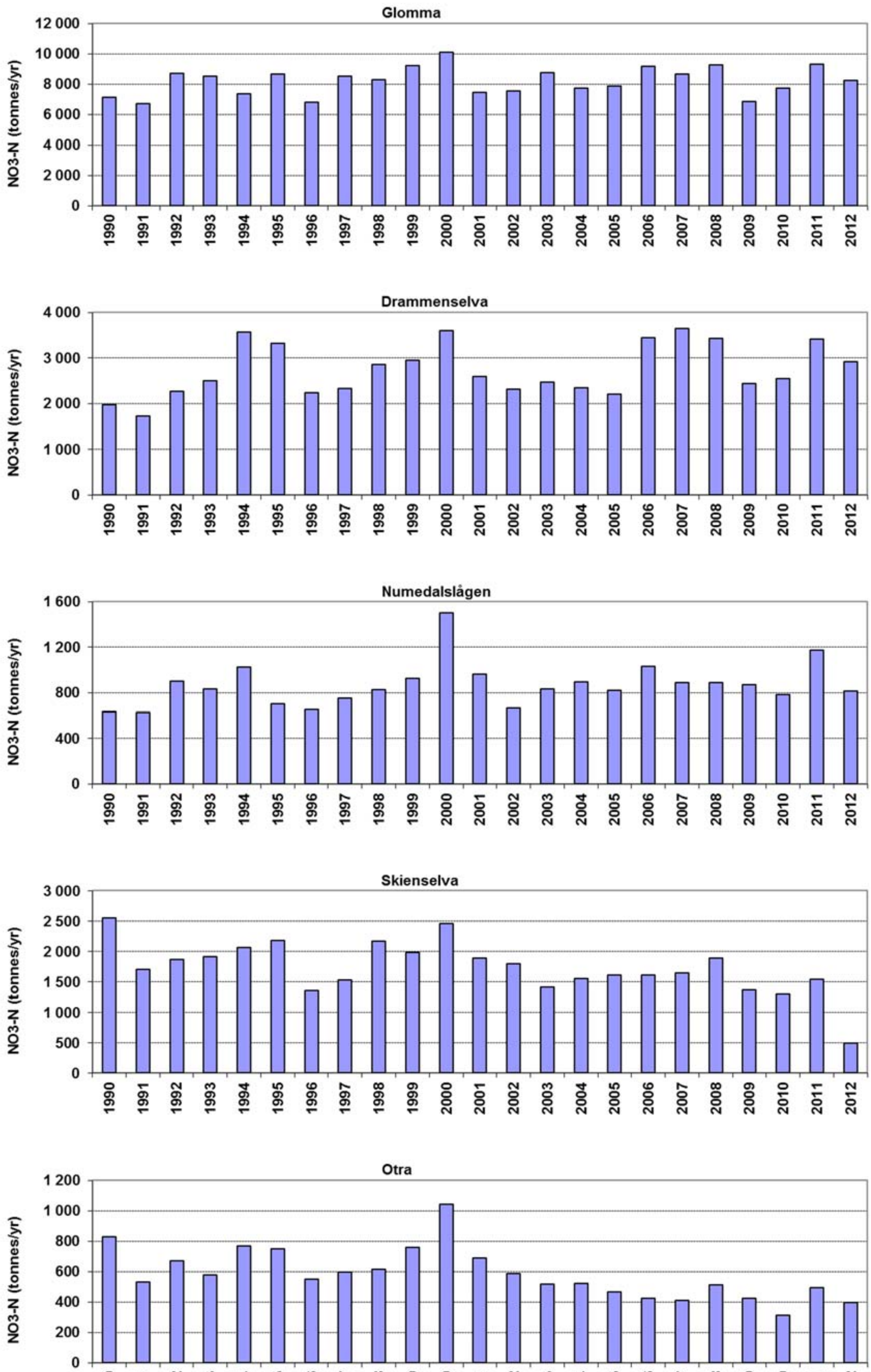

Figure A-V-3a. Annual riverine loads of nitrate-nitrogen (NO_3-N) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

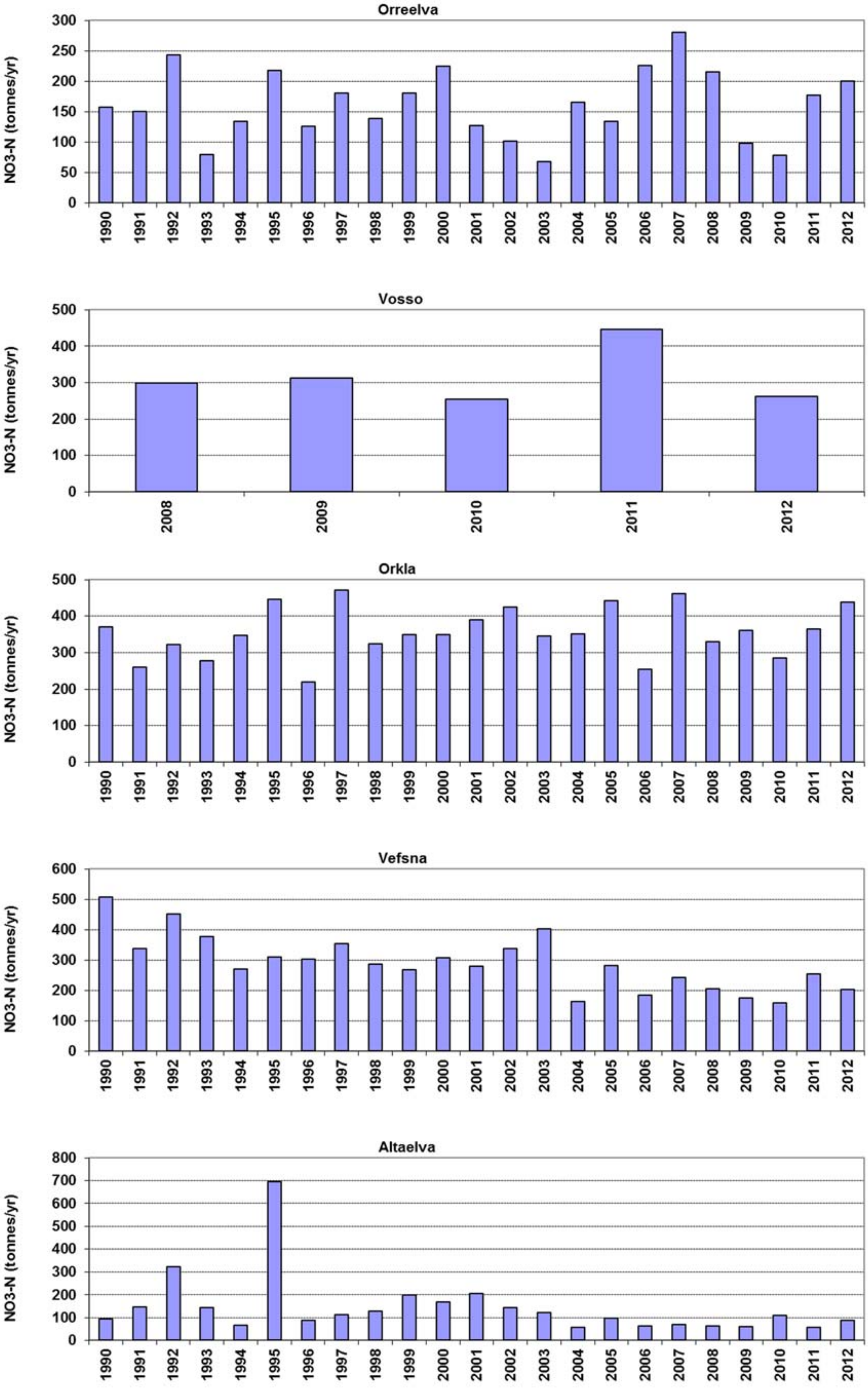

Figure A-V-3b. Annual riverine loads of nitrate-nitrogen (NO_3-N) from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

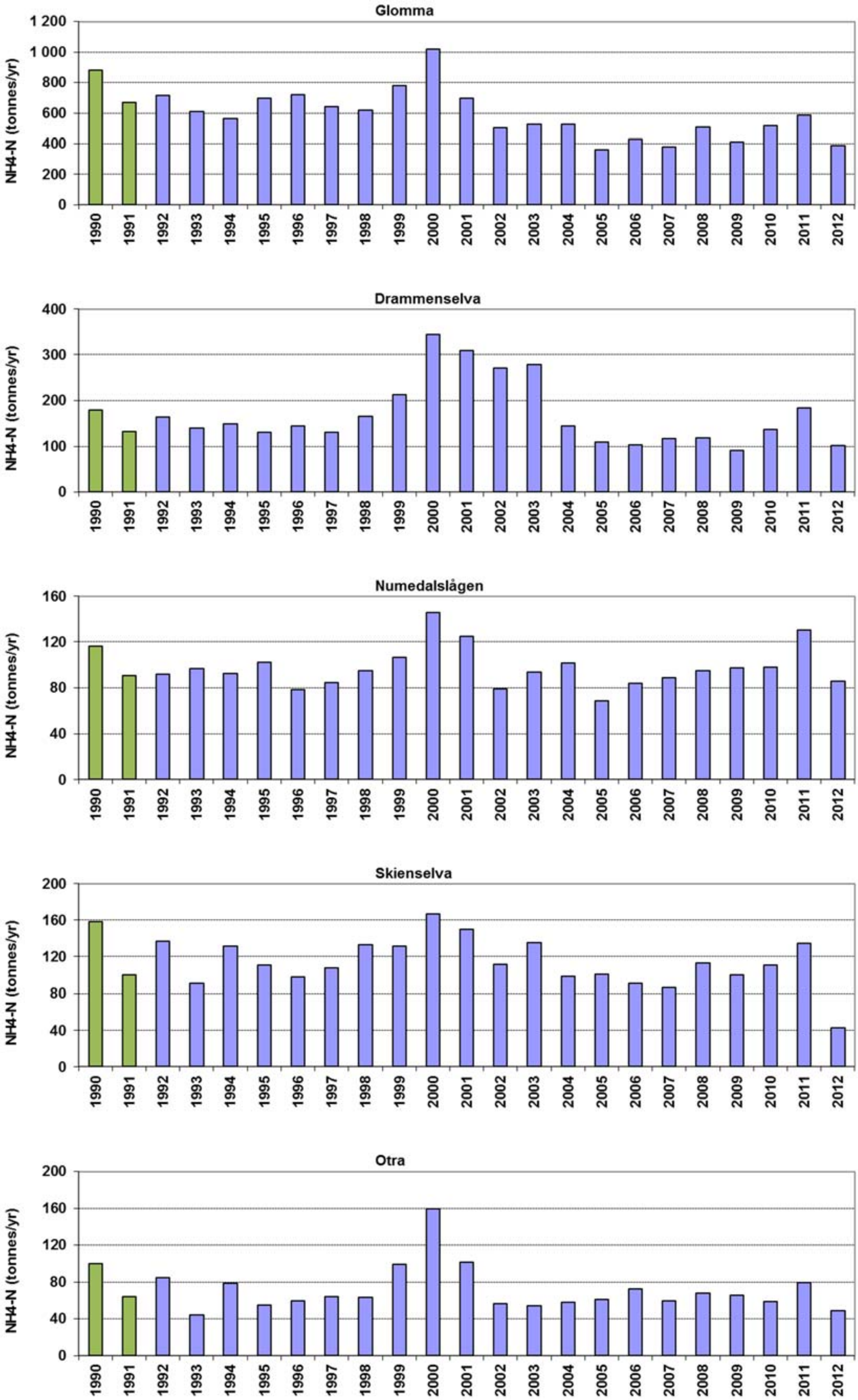

Figure A-V-4a. Annual riverine loads of ammonium-nitrogen (NH_4-N) in the five main rivers draining to Skagerrak, Norway, 1990-2012. Years with extra- or interpolated values are given in green.

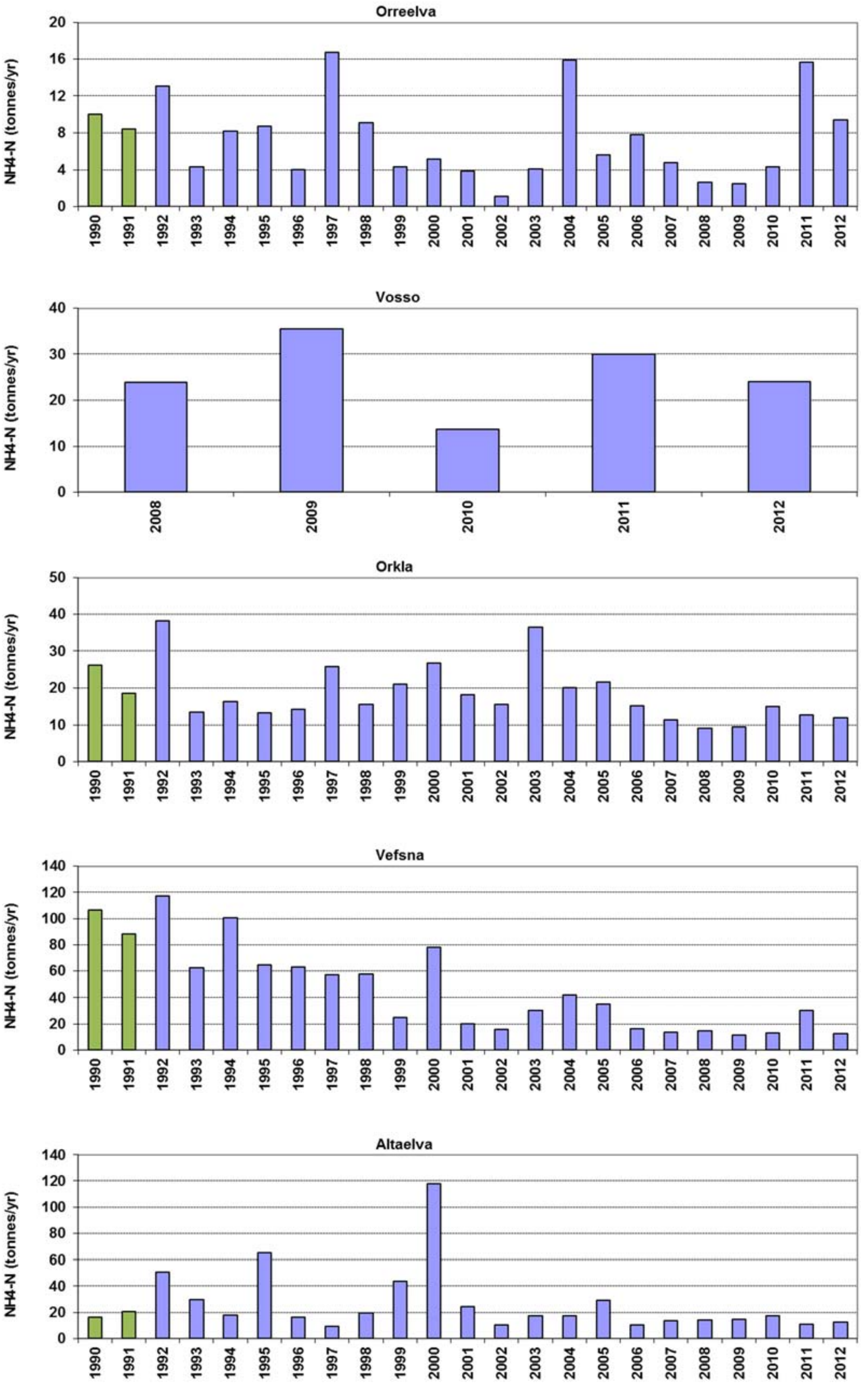

Figure A-V-4b. Annual riverine loads of ammonium-nitrogen (NH_4-N) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso). Years with extra- or interpolated values are given in green.

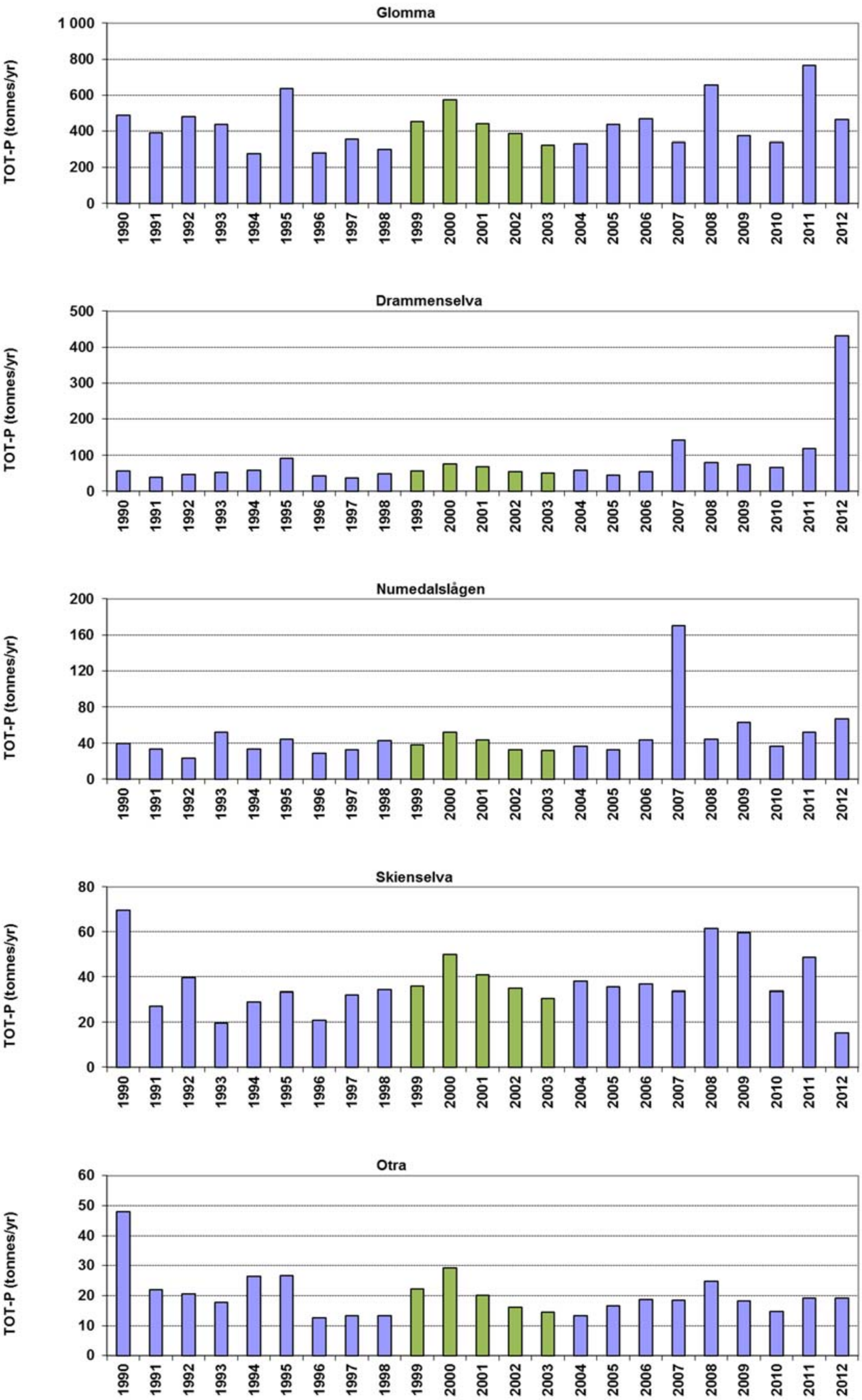

Figure A-V-5a. Annual riverine loads of total phosphorus (Tot-P) in the five main rivers draining to Skagerrak, Norway, 1990-2012. Years with extra- or interpolated values are given in green.

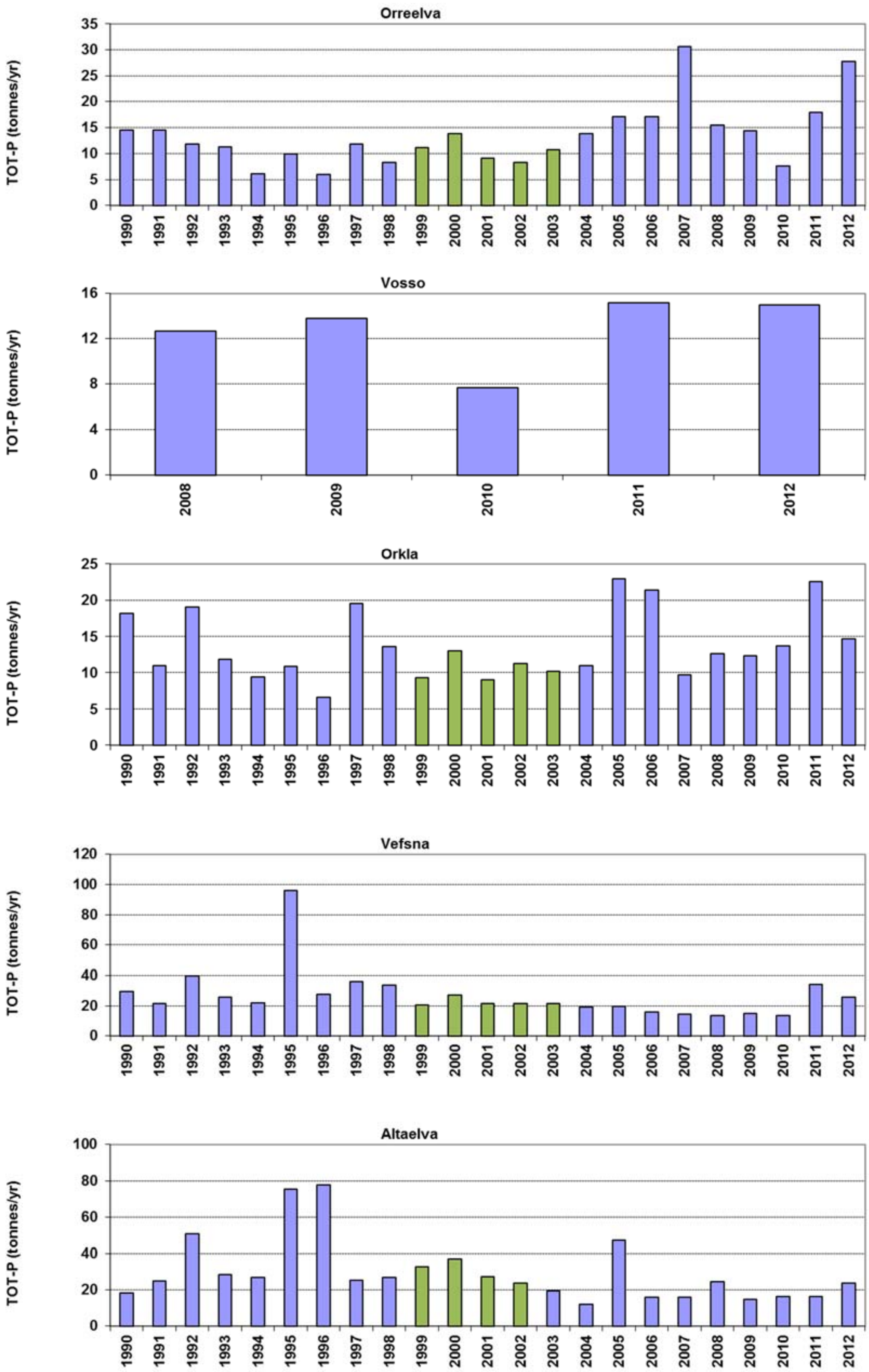

Figure A-V- 5b. Annual riverine loads of total phosphorus (Tot-P) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso). Years with extra- or interpolated values are given in green.

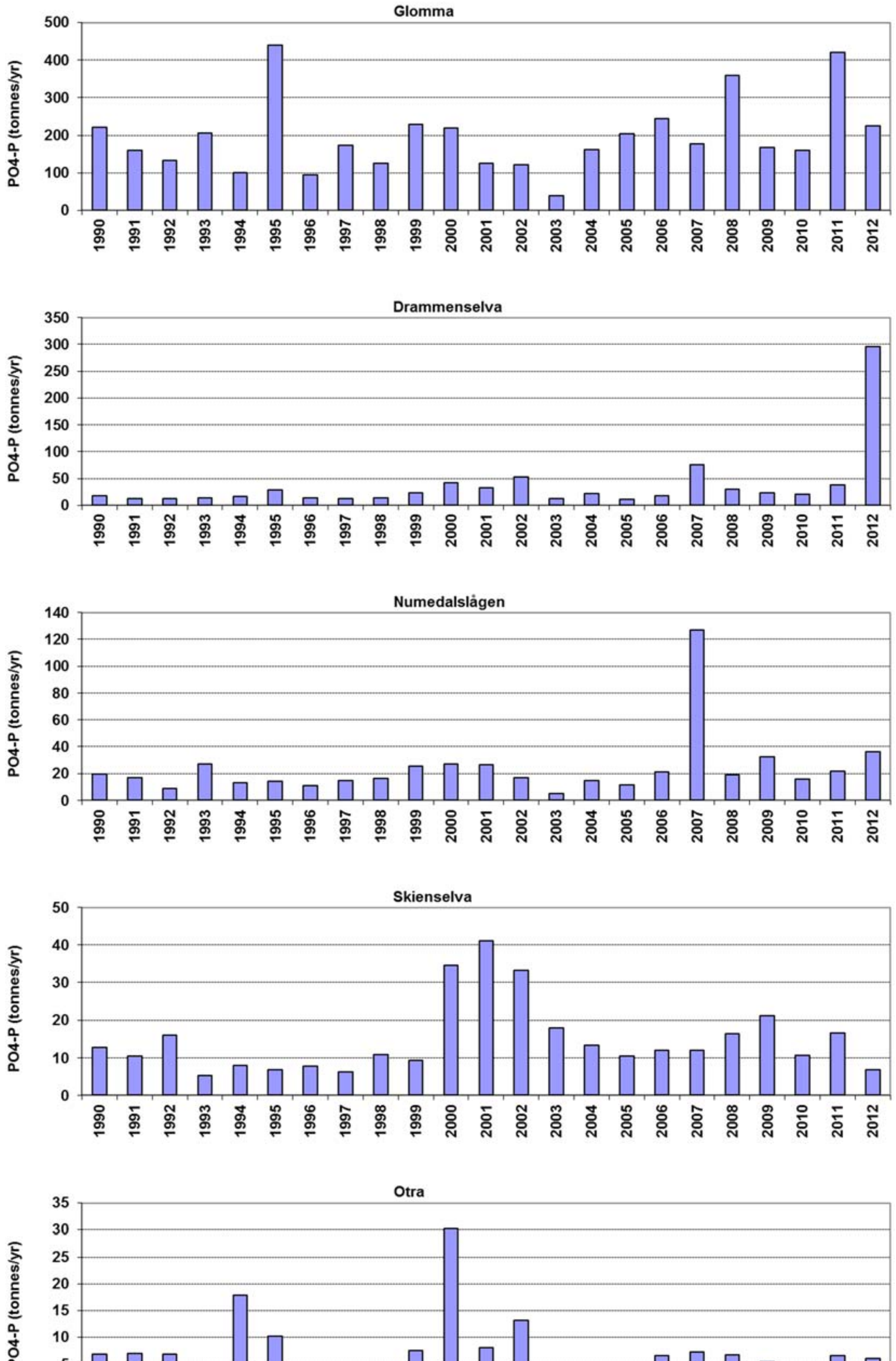

Figure A-V-6a. Annual riverine loads of orthophosphate-phosphorus (PO_4-P) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

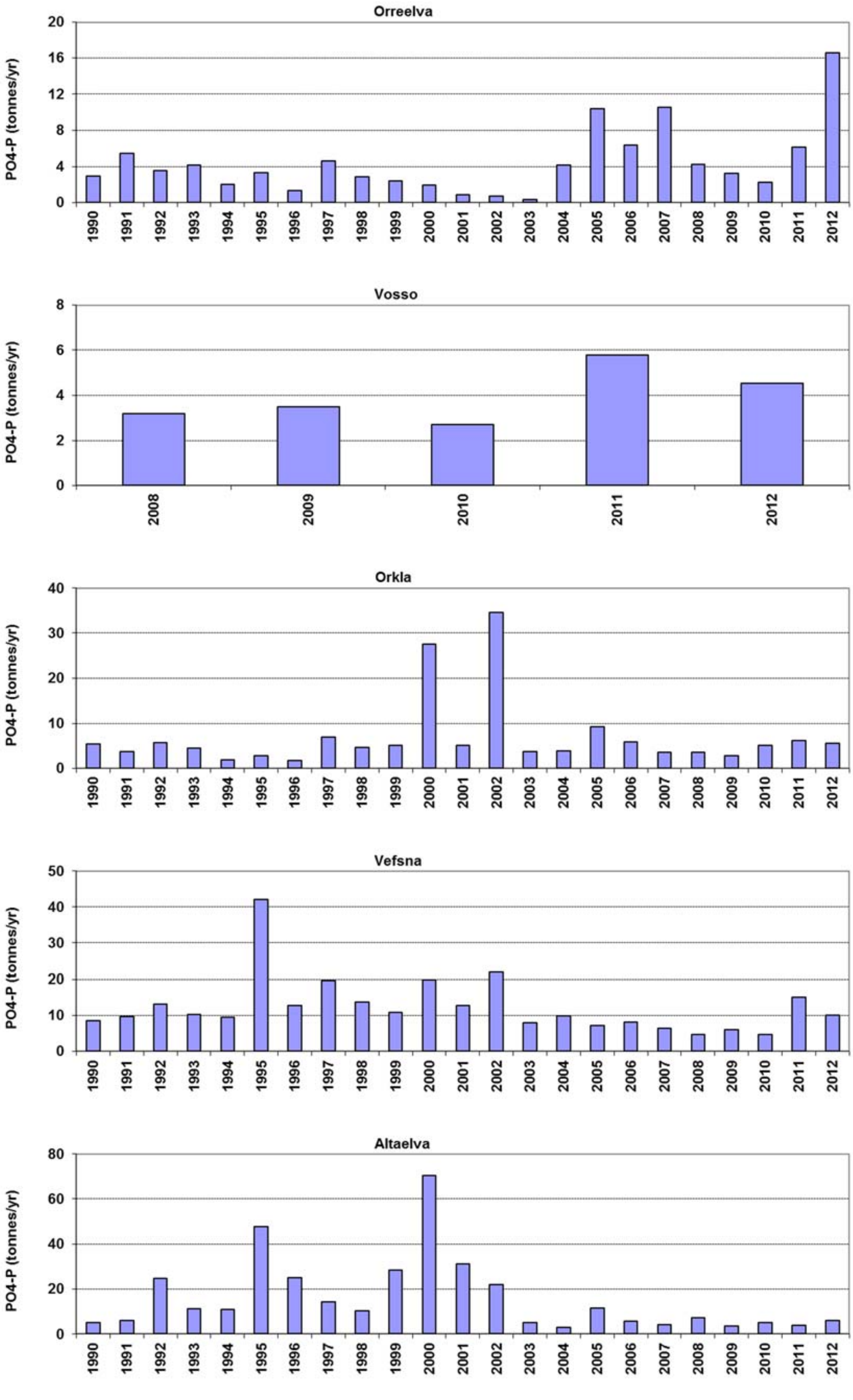

Figure A-V-6b. Annual riverine loads of orthophosphate-phosphorus (PO_4-P) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

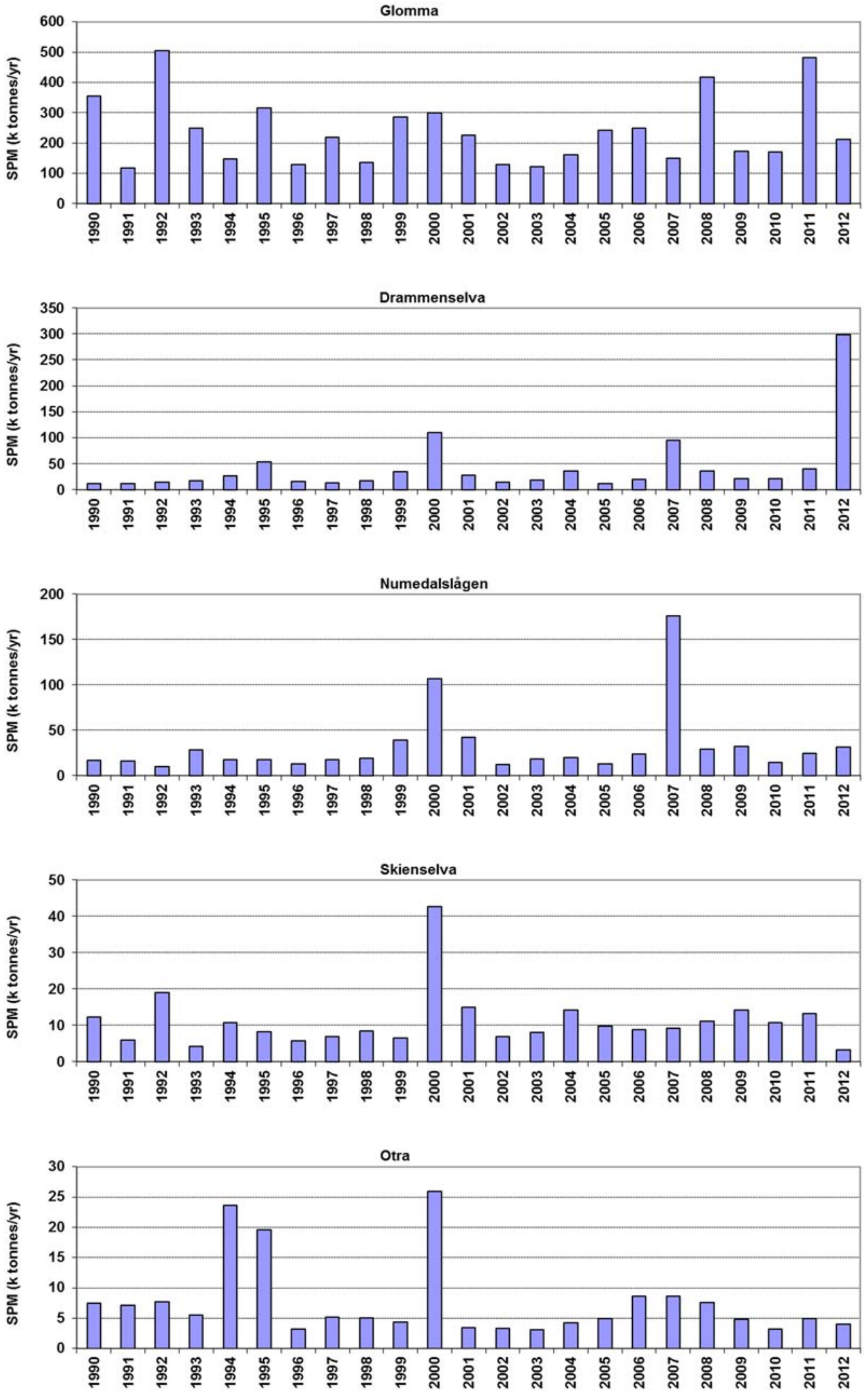

Figure A-V-7a. Annual riverine loads of suspended particulate matter (SPM) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

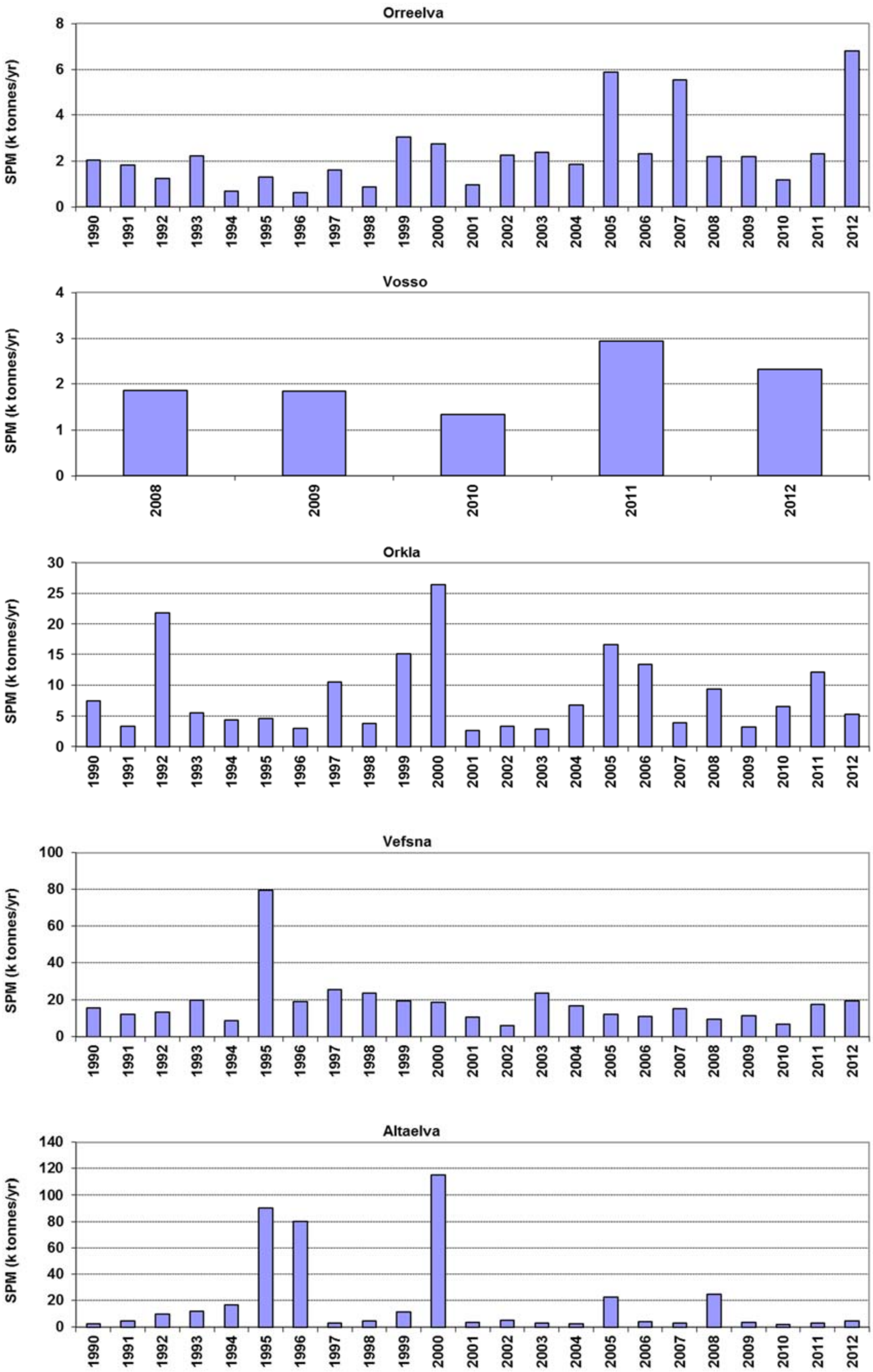

Figure A-V-7b. Annual riverine loads of suspended particulate matter (SPM) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

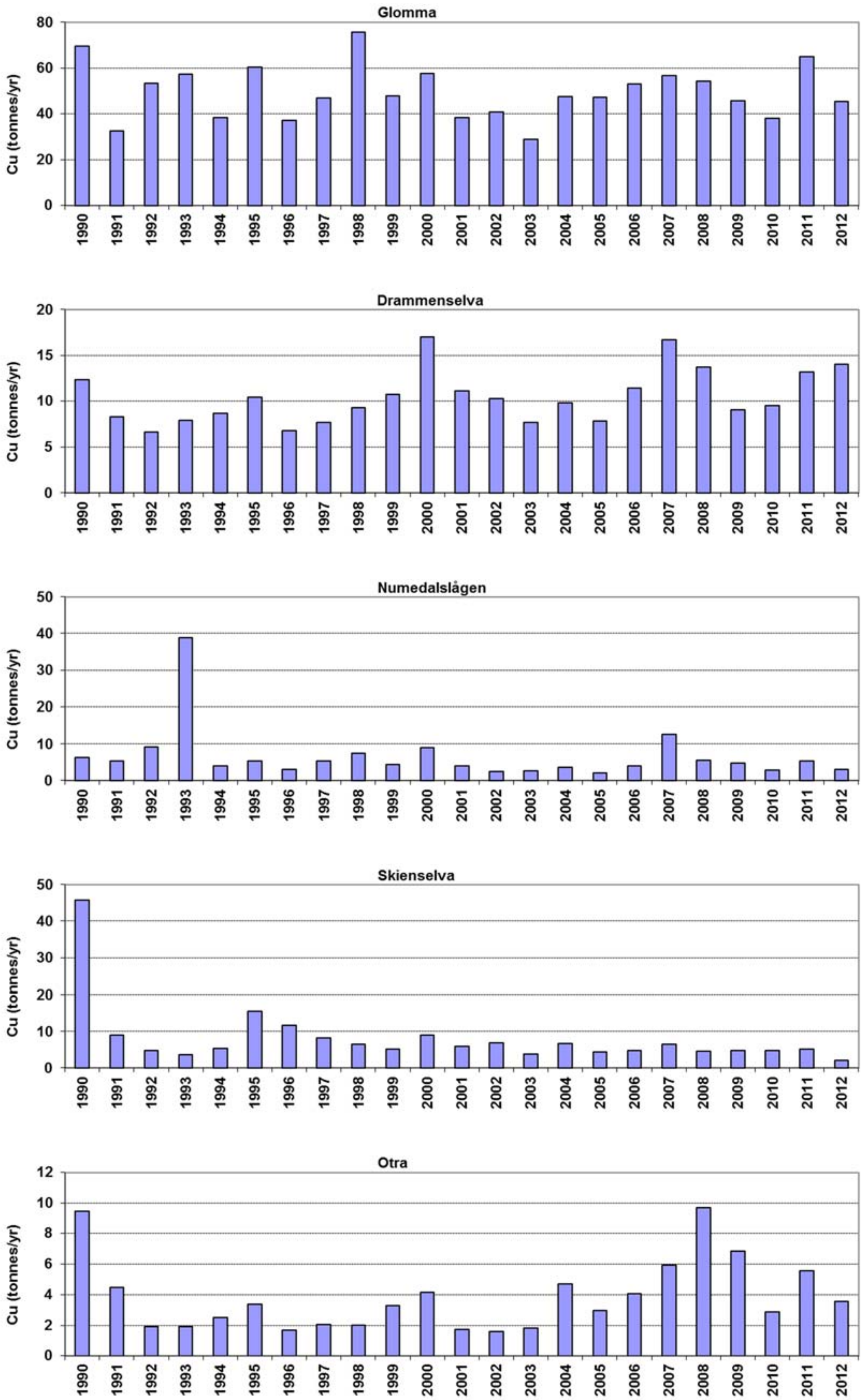

Figure A-V-8a. Annual riverine loads of copper (Cu) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

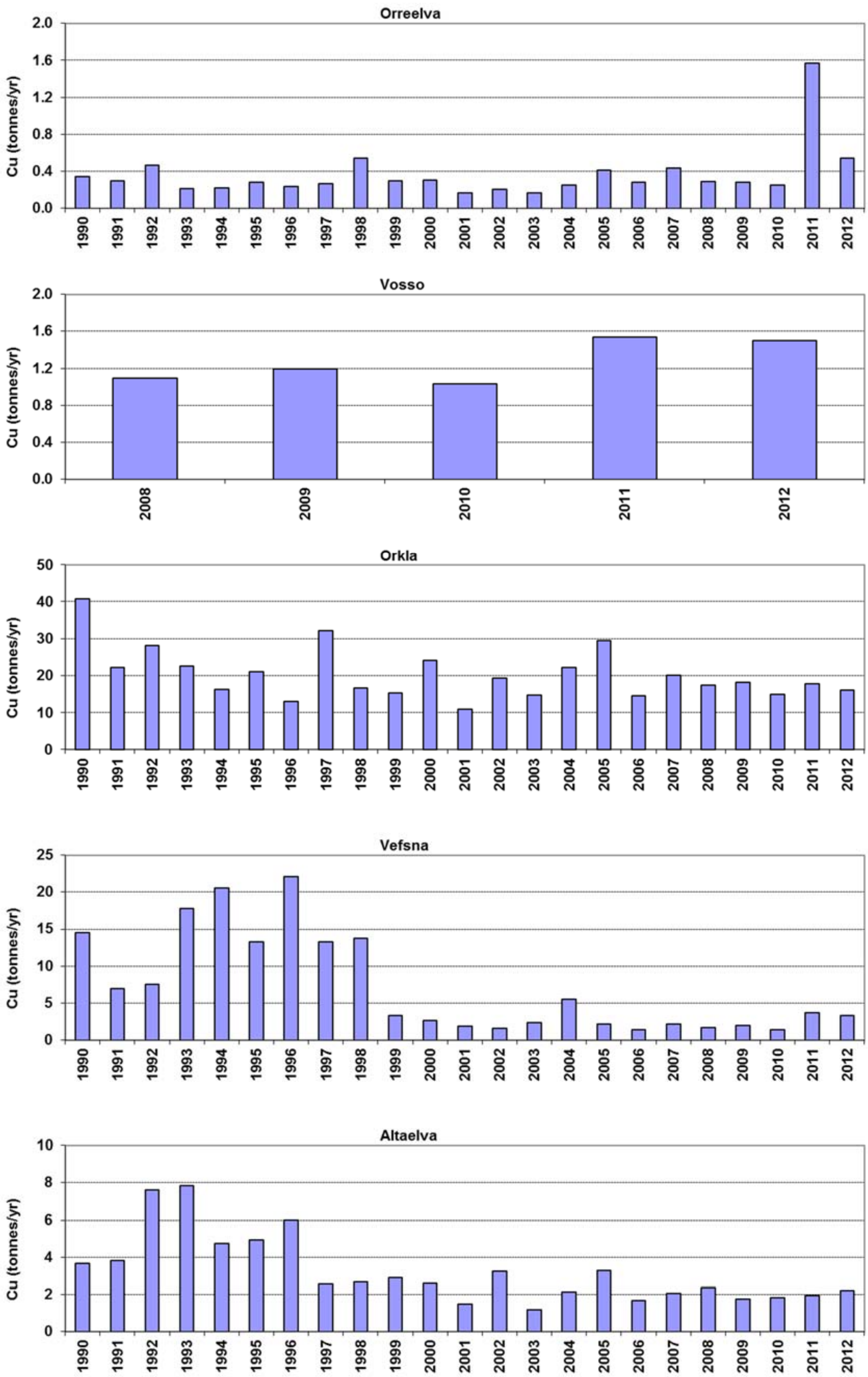

Figure A-V-8b. Annual riverine loads of copper (Cu) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

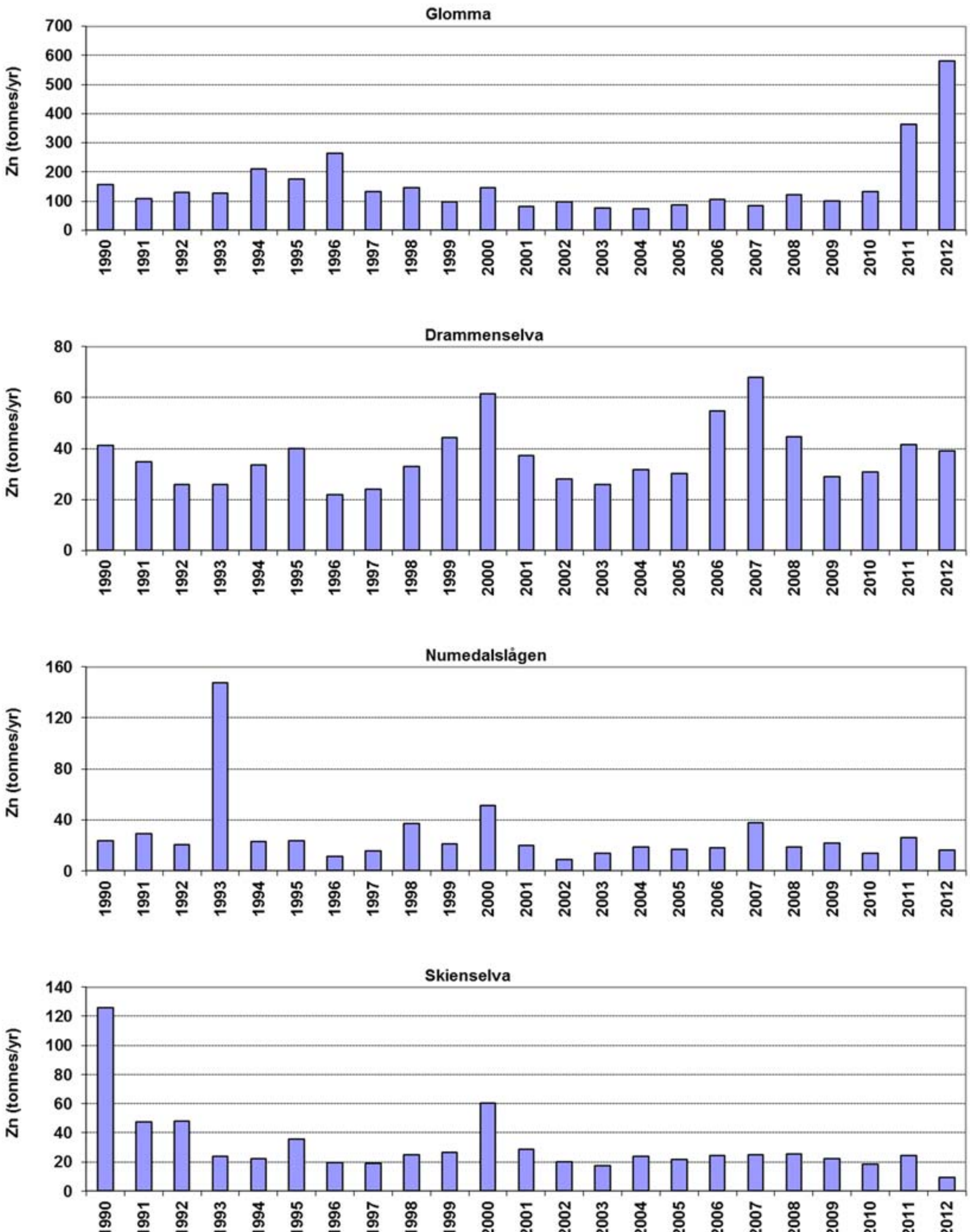

Figure A-V-9a. Annual riverine loads of zinc (Zn) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

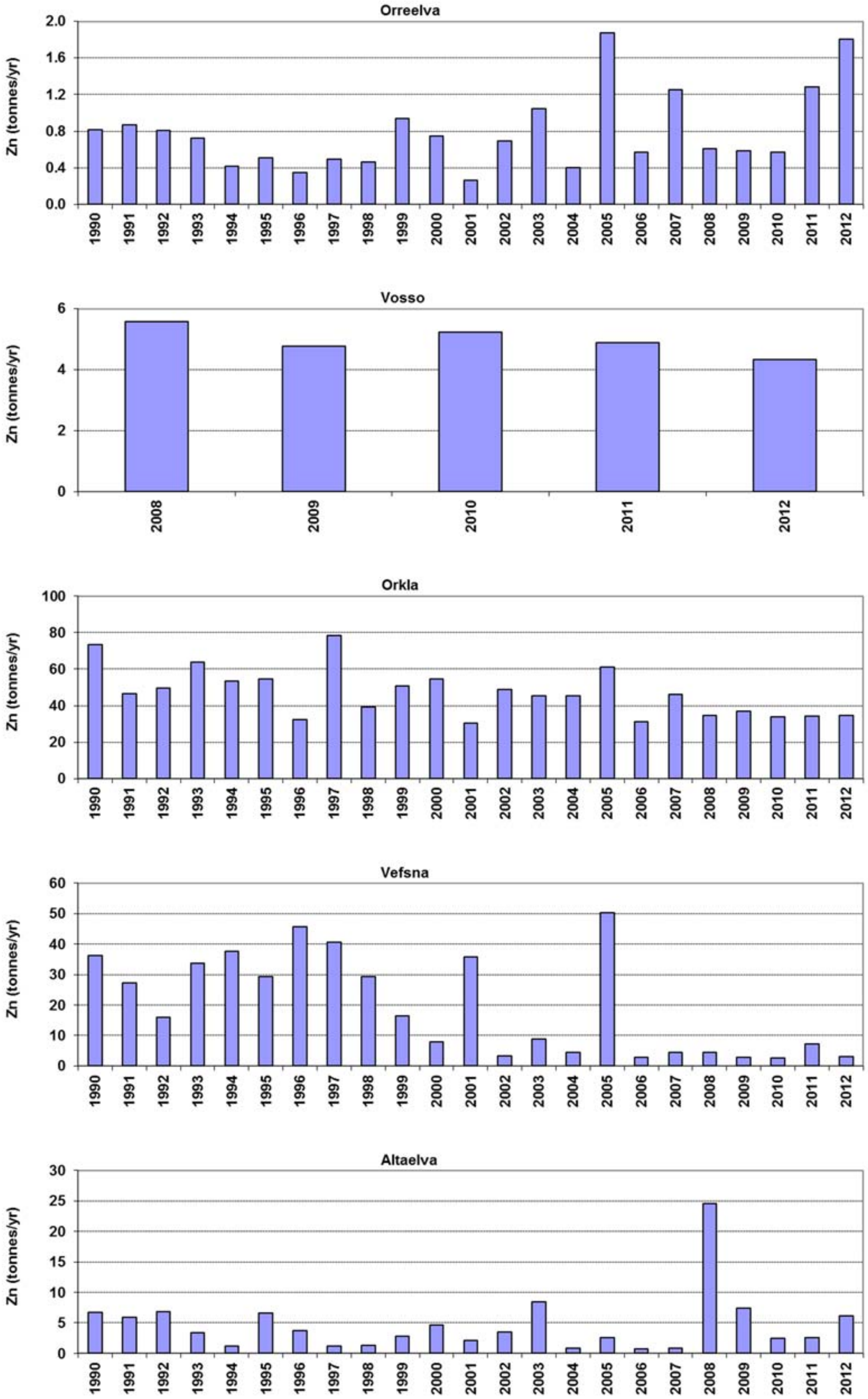

Figure A-V-9b. Annual riverine loads of zinc (Zn) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

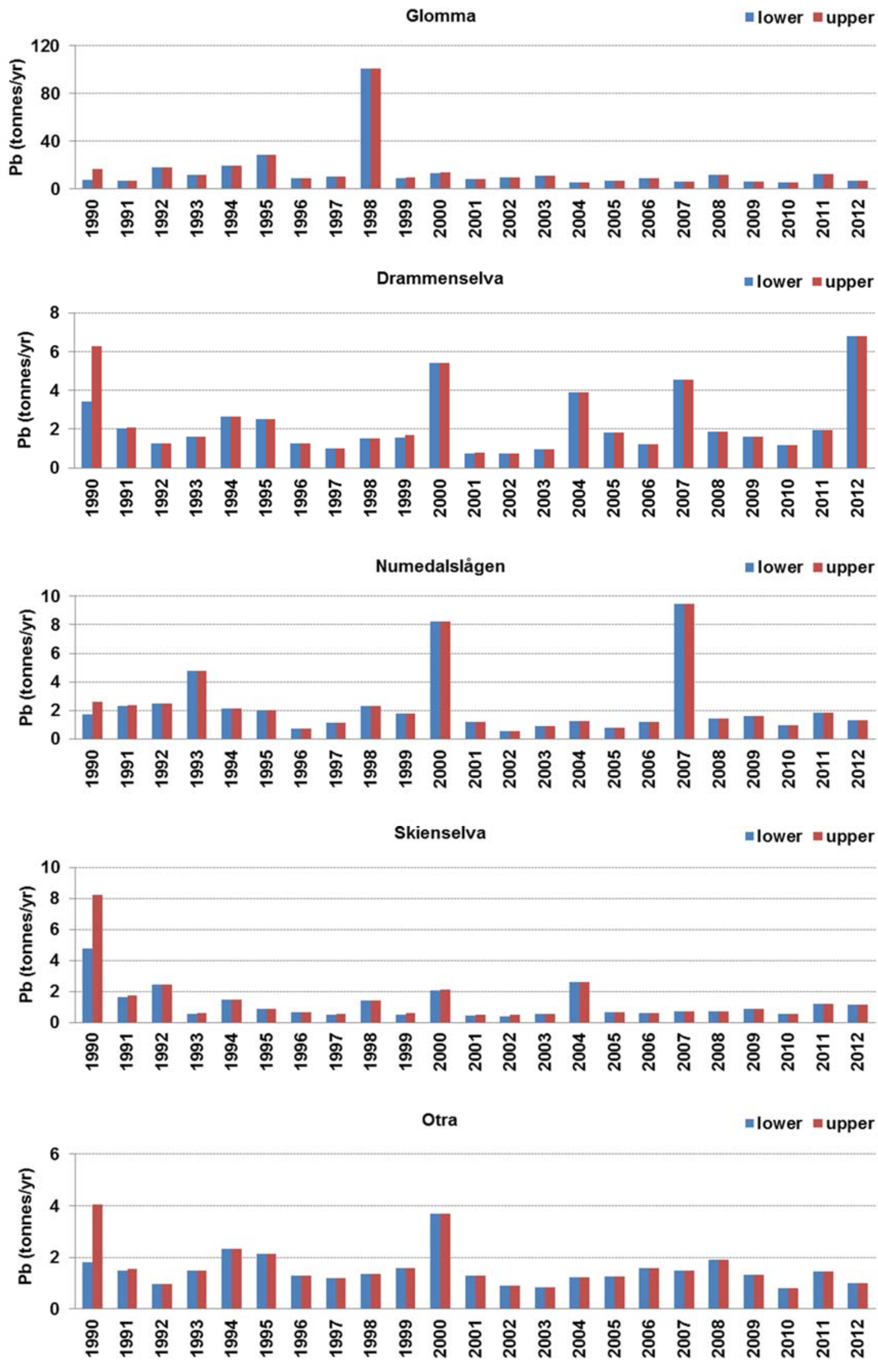

Figure A-V-10a. Annual riverine loads (upper and lower estimates) of lead (Pb) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

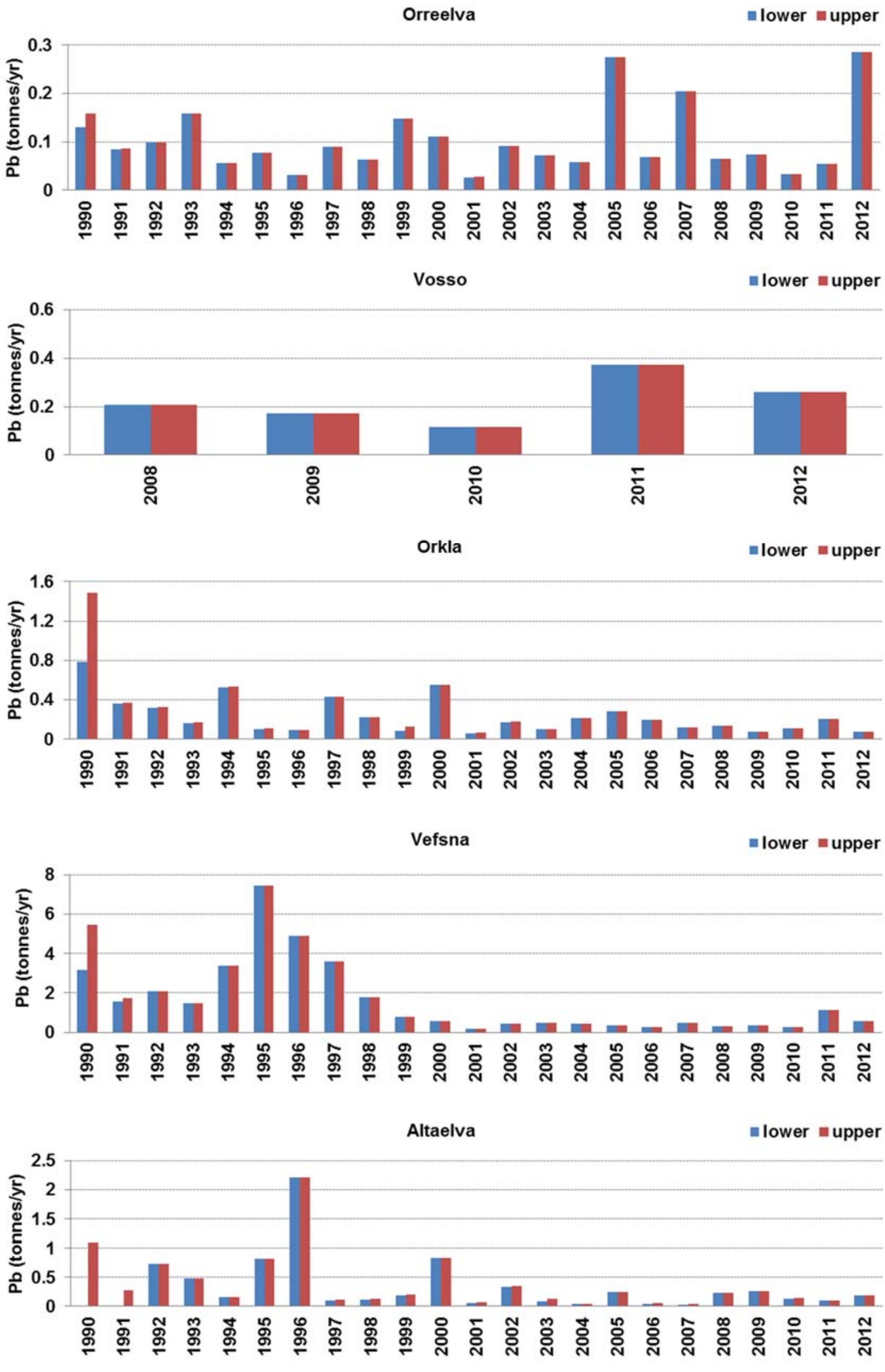

Figure A-V-10b. Annual riverine loads (upper and lower estimates) of lead (Pb) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

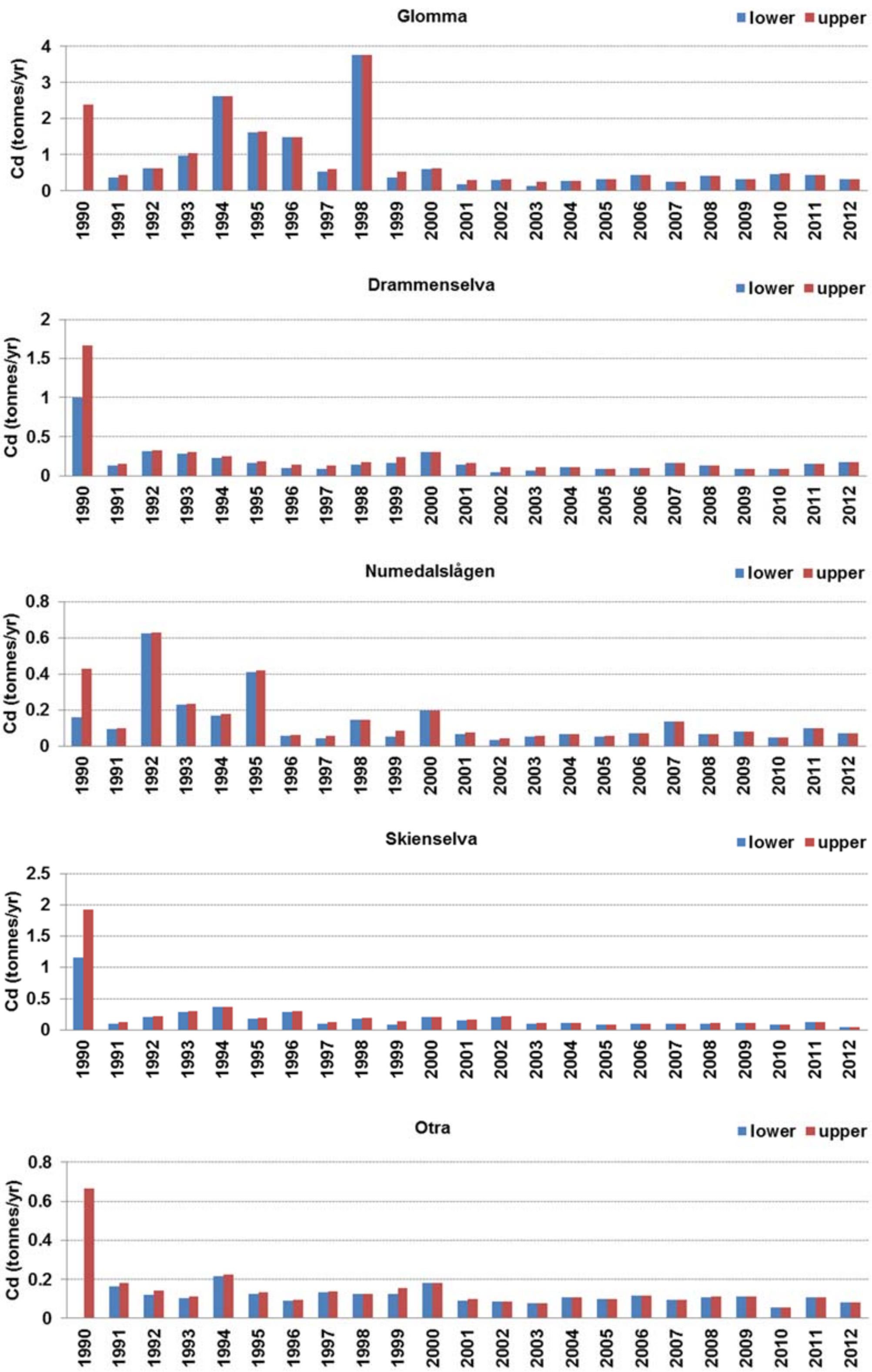

Figure A-V-11a. Annual riverine loads (upper and lower estimates) of cadmium (Cd) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

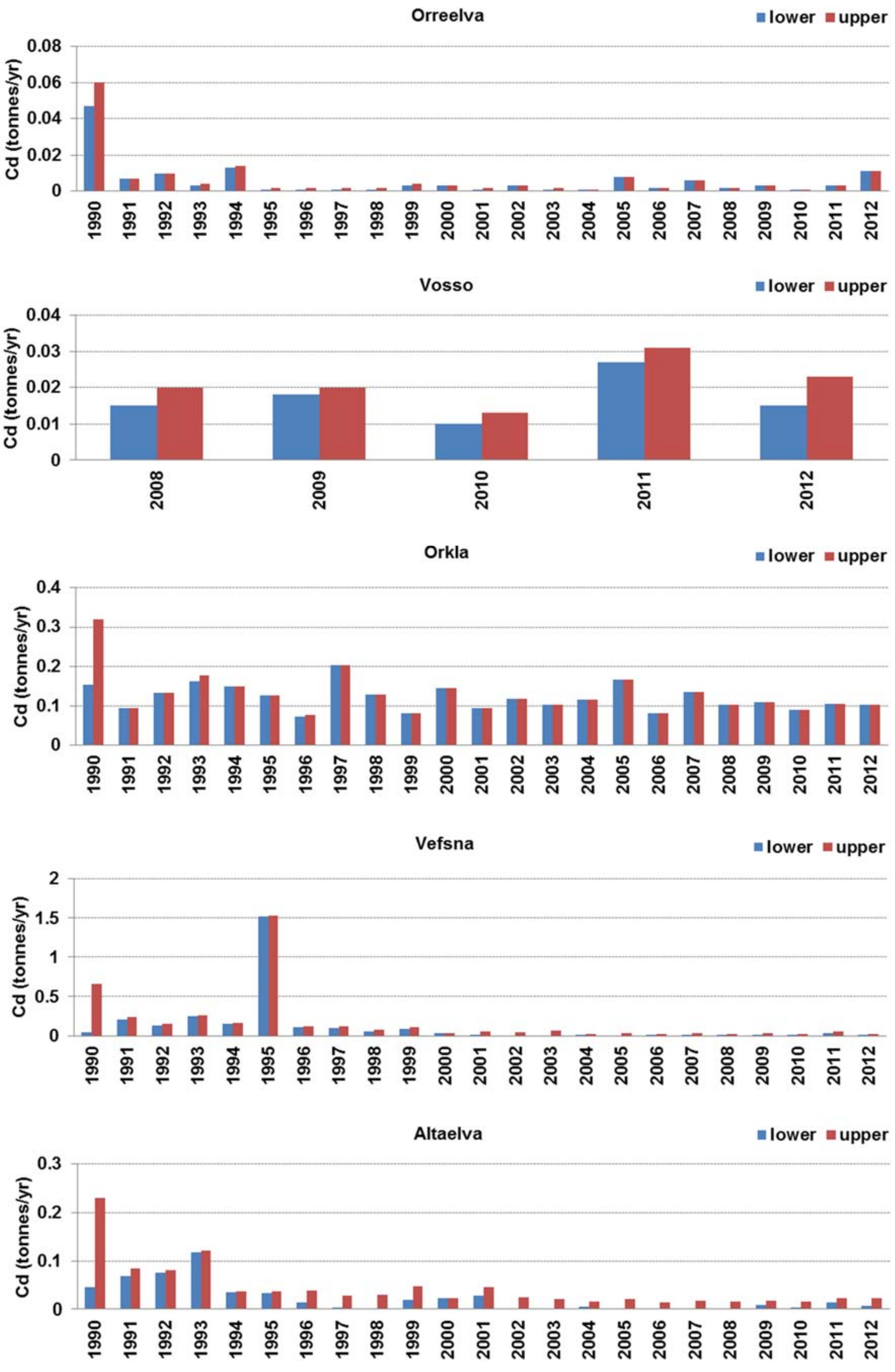

Figure A-V-11b. Annual riverine loads (upper and lower estimates) of cadmium (Cd) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

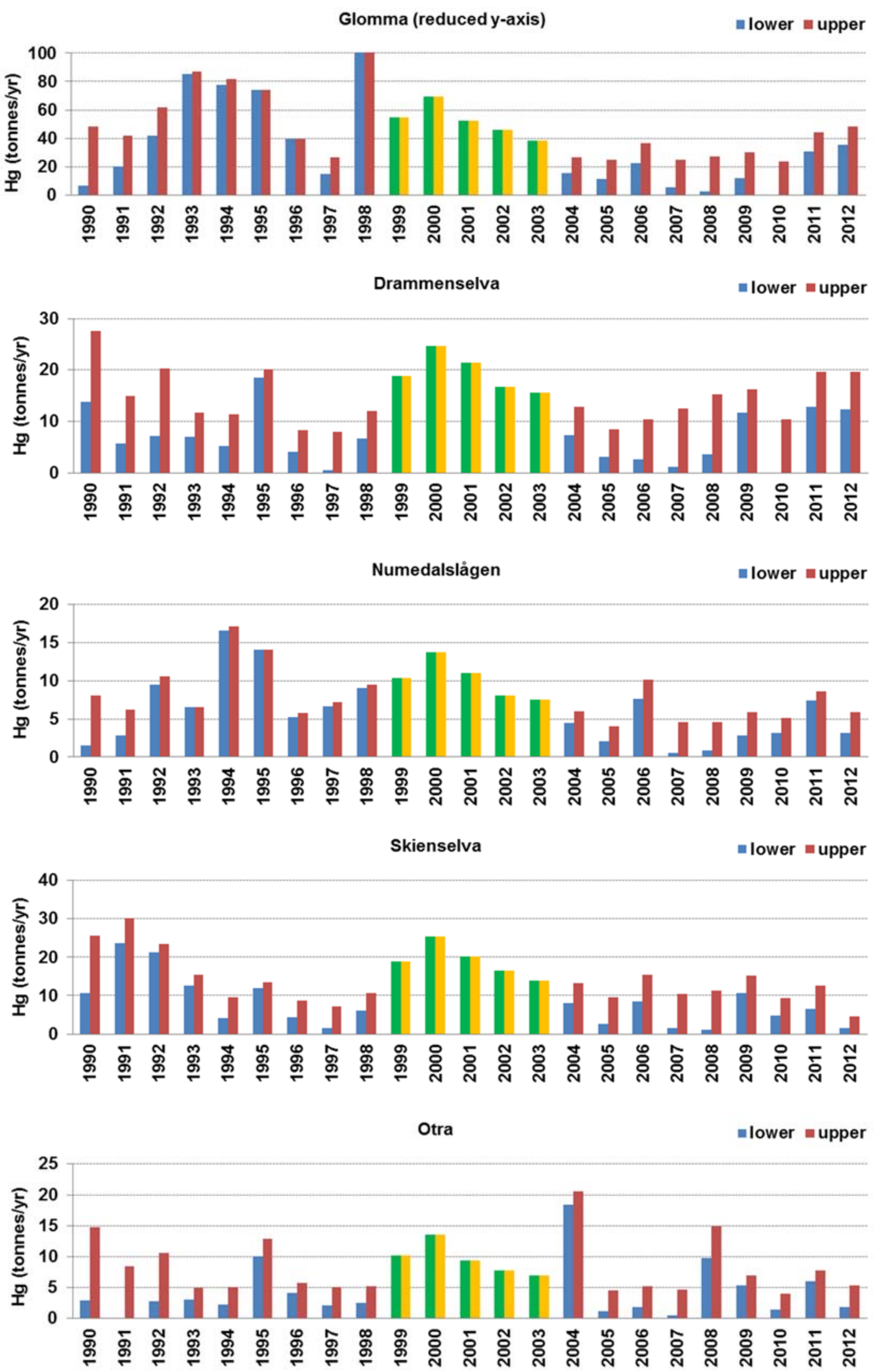

Figure A-V-12a. Annual riverine loads (upper and lower estimates) of mercury (Hg) in the five main rivers draining to Skagerrak, Norway, 1990-2012. Years with interpolated loads are given in green (lower estimates) and yellow (upper estimates). Note Glomma with reduced y-axis.

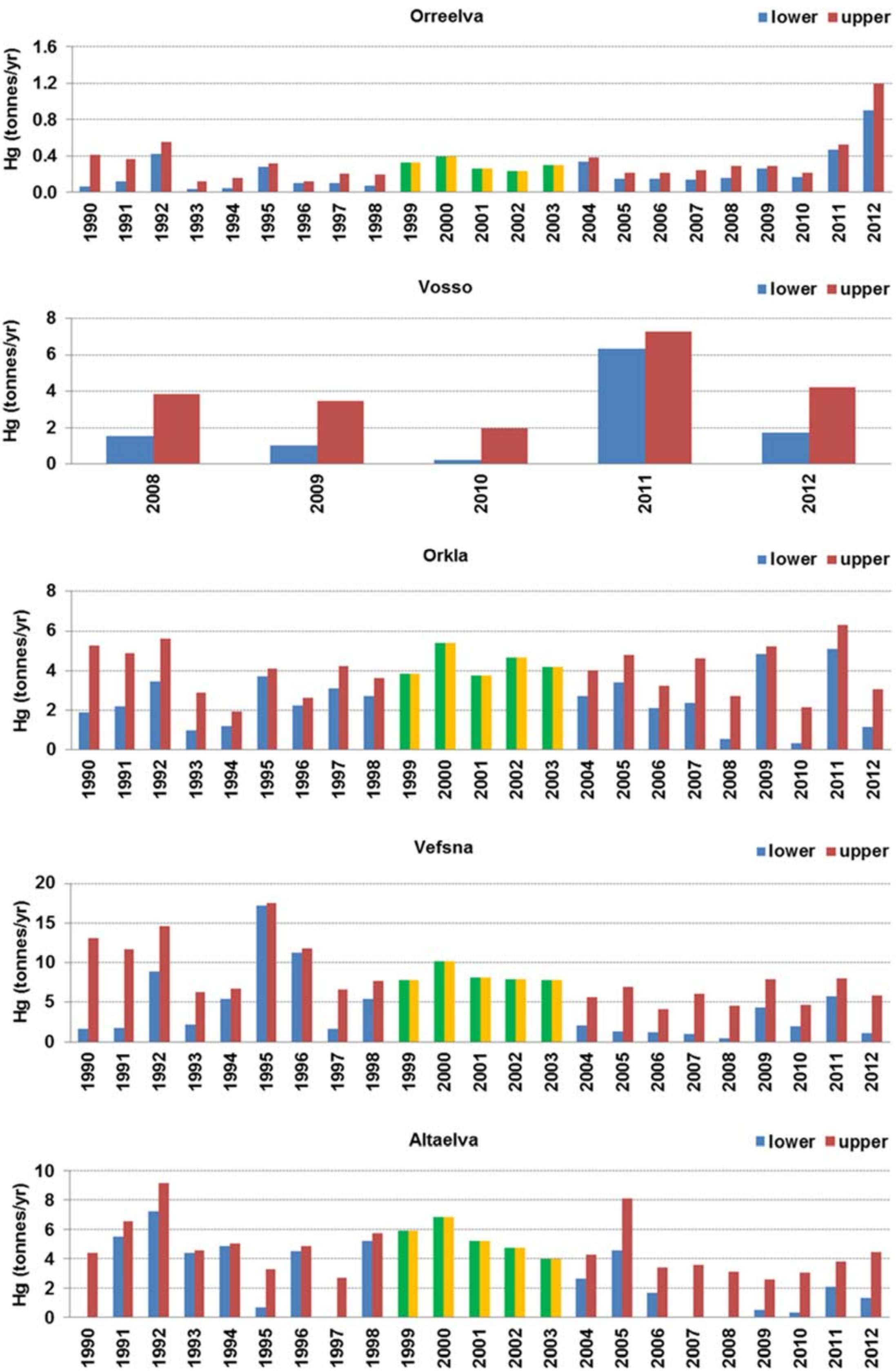

Figure A-V-12b. Annual riverine loads (upper and lower estimates) of mercury (Hg) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso). Years with interpolated loads are given in green (lower estimates) and yellow (upper estimates).

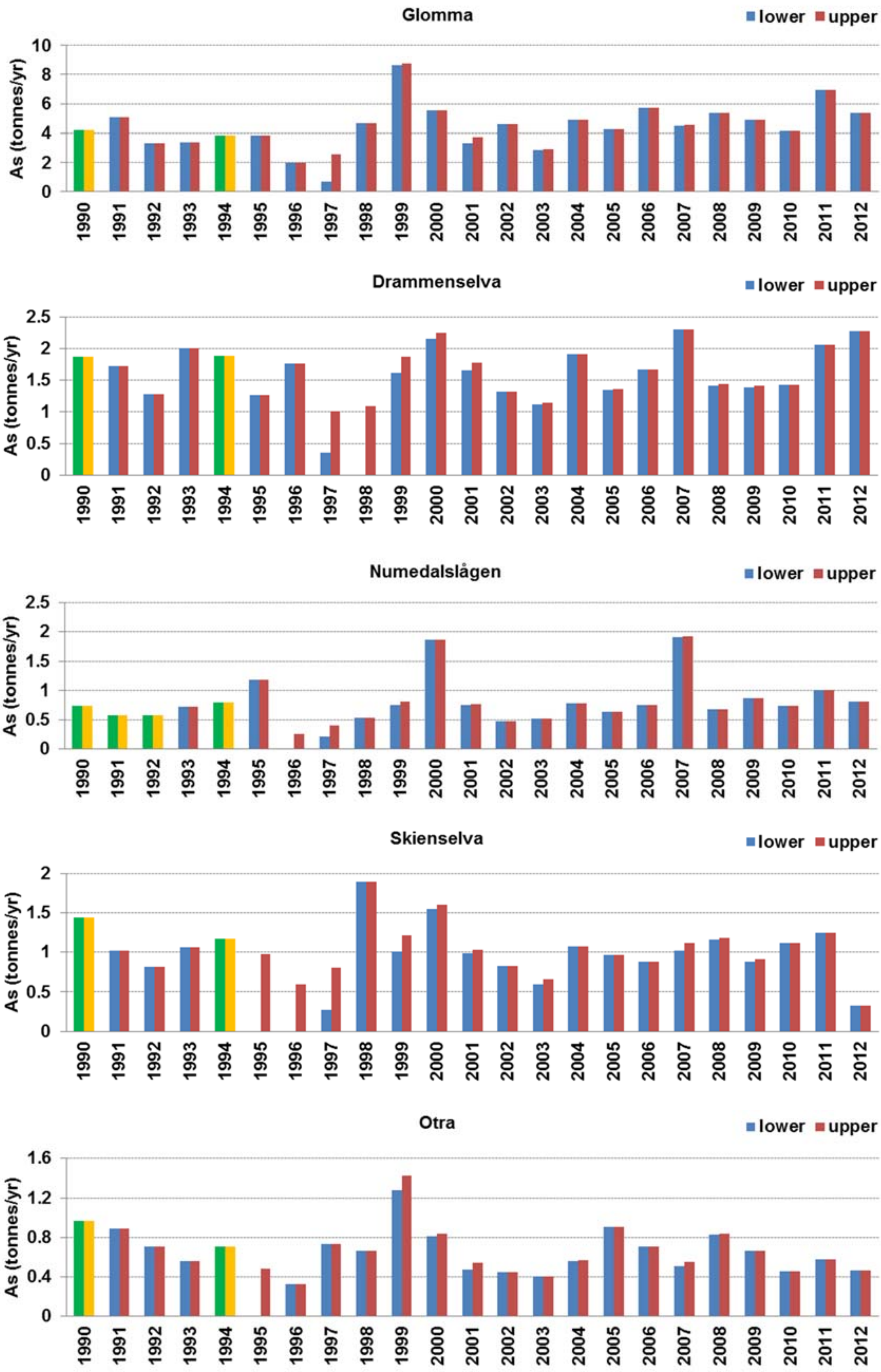

Figure A-V-13a. Annual riverine loads (upper and lower estimates) of arsenic (As) in the five main rivers draining to Skagerrak, Norway, 1990-2012. Years with extra- or interpolated loads are given in green (lower estimates) and yellow (upper estimates).

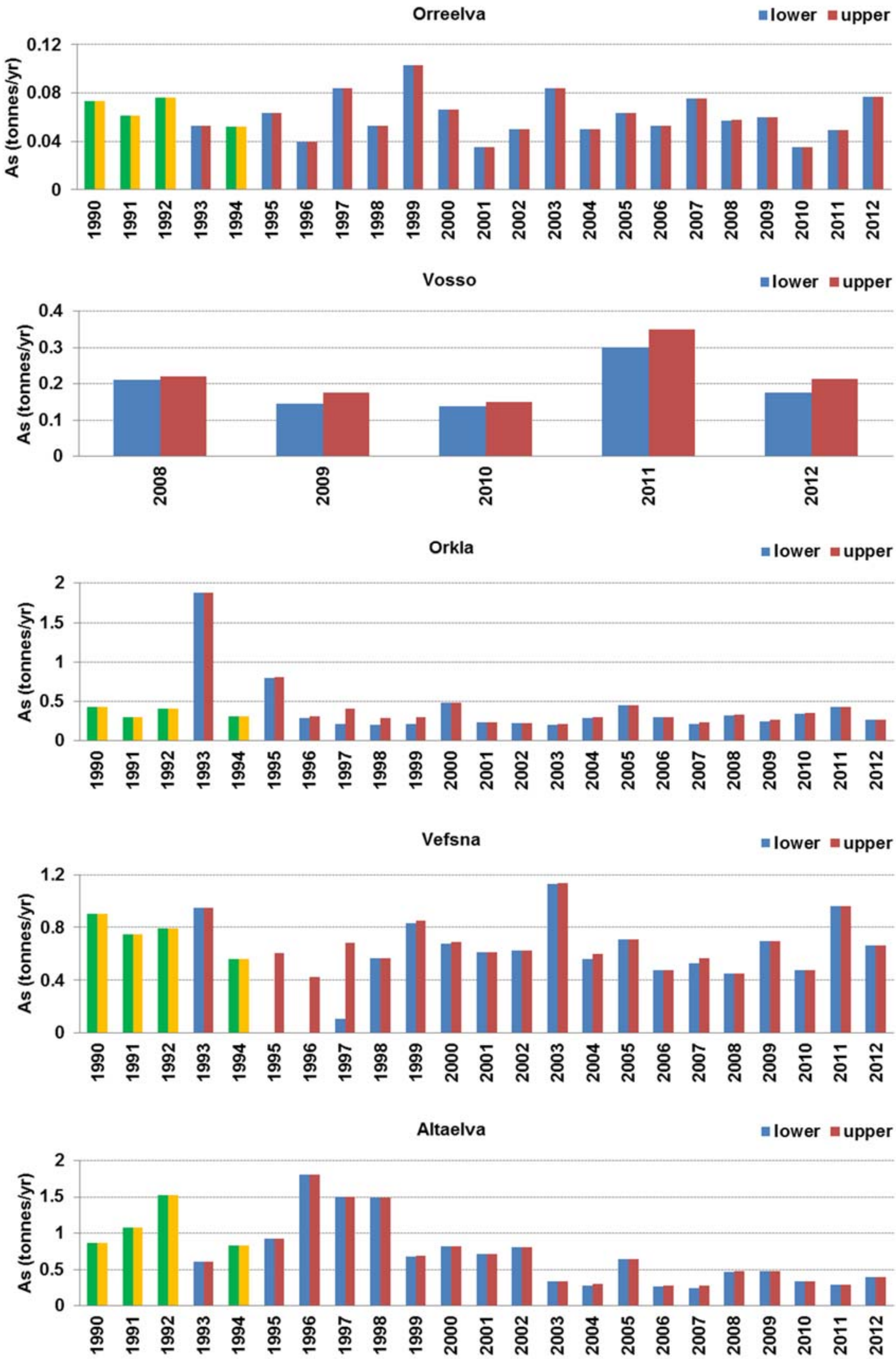

Figure A-V-13b. Annual riverine loads (upper and lower estimates) of arsenic (As) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso). Years with extra- or interpolated loads are given in green (lower estimates) and yellow (upper estimates).

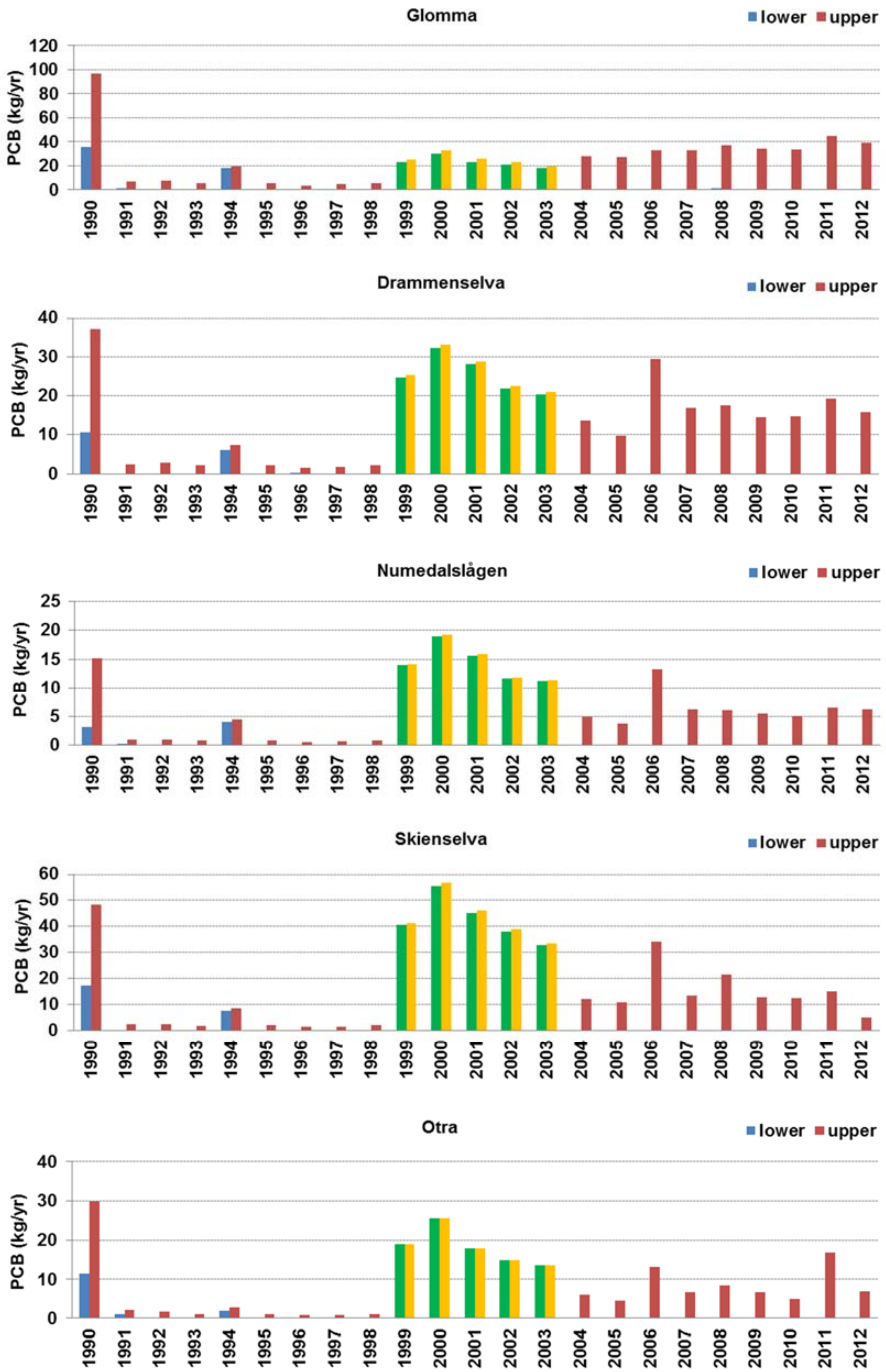

Figure A-V-14a. Annual riverine loads (upper and lower estimates) of PCB7 in the five main rivers draining to Skagerrak, Norway, 1990-2012. Years with extra- or interpolated loads are given in green (lower estimates) and yellow (upper estimates).

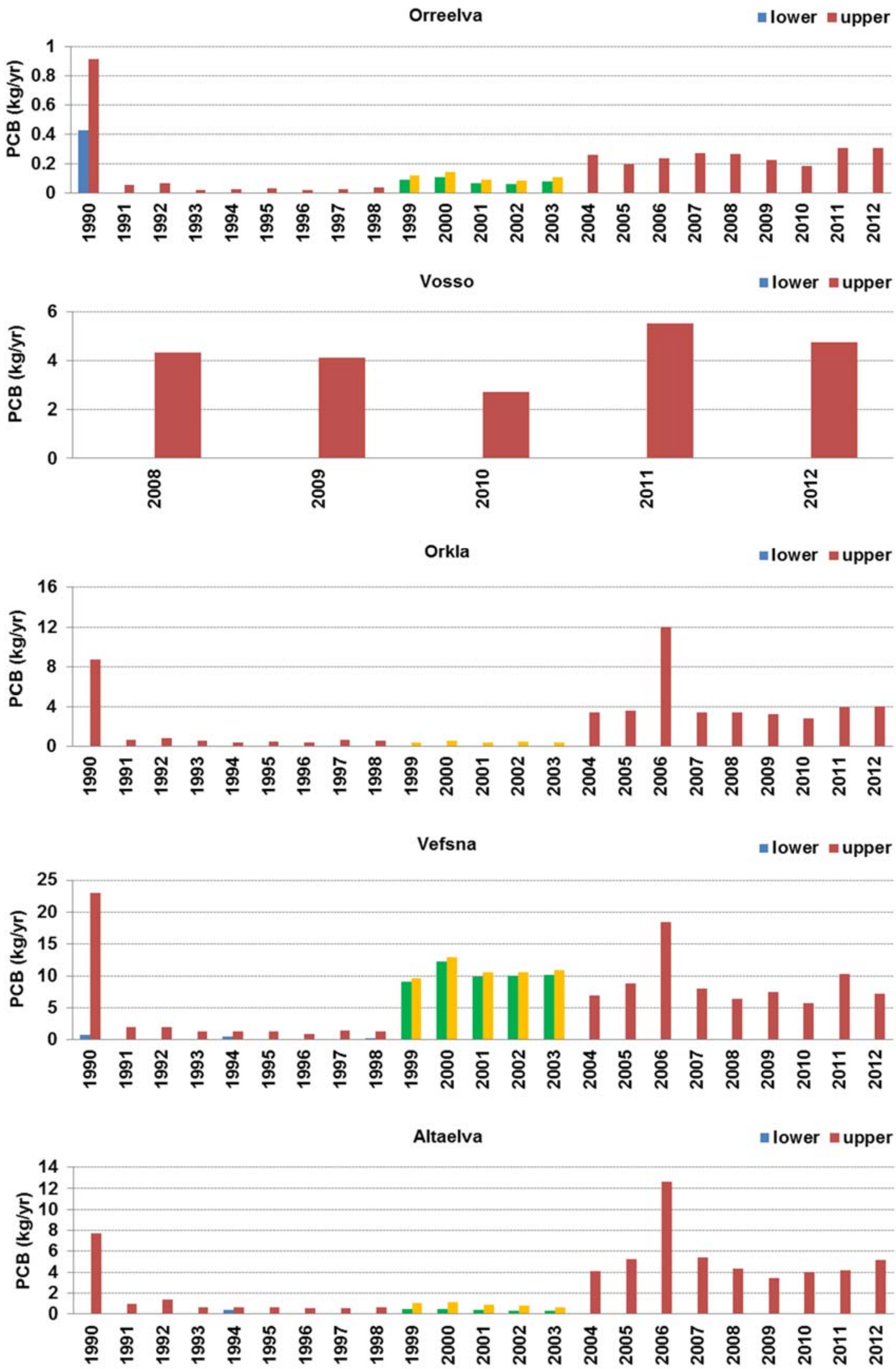

Figure A-V-14b. Annual riverine loads (upper and lower estimates) of PCB7in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso). Years with extra- or interpolated loads are given in green (lower estimates) and yellow (upper estimates).

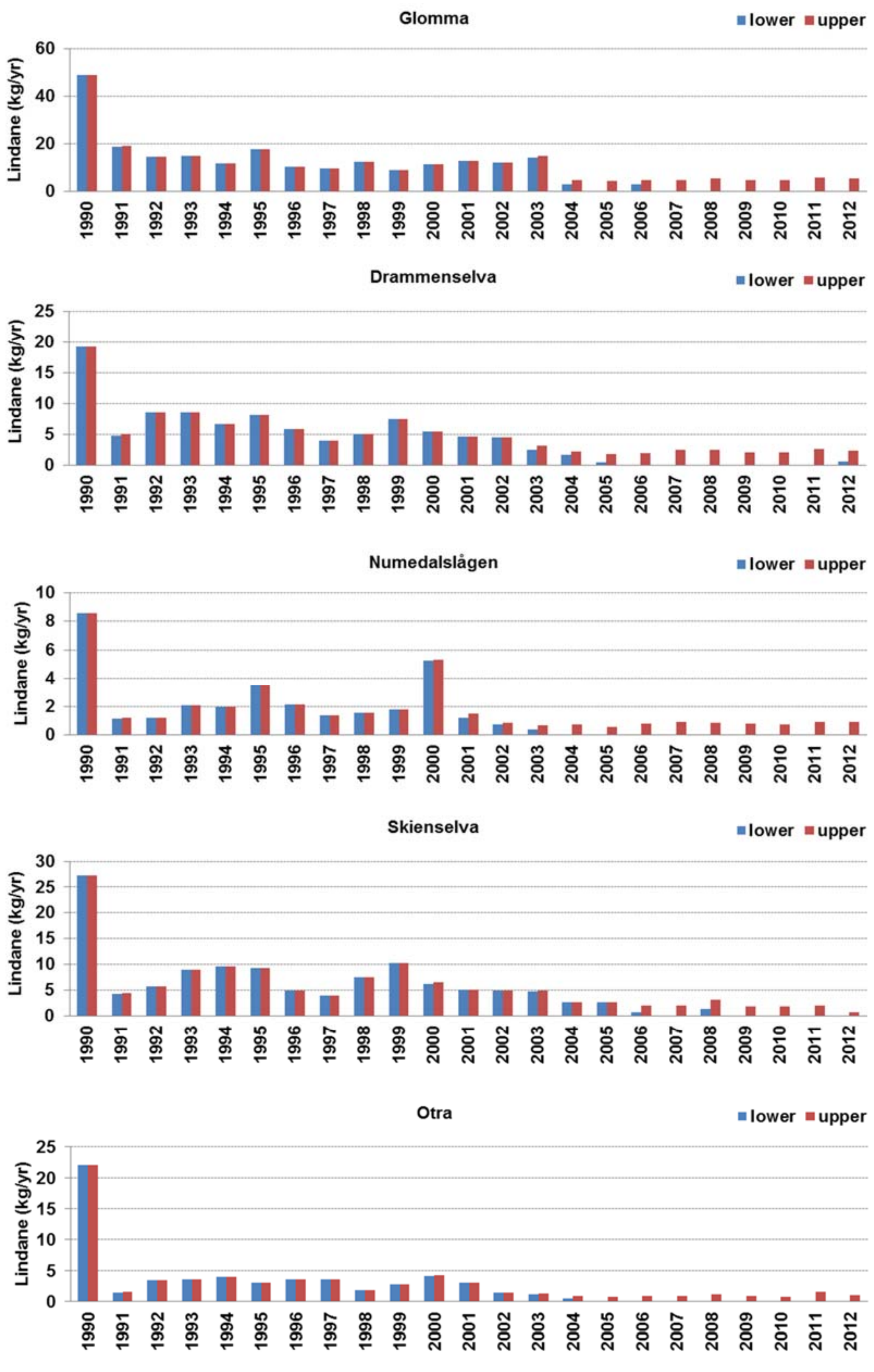

Figure A-V-15a. Annual riverine loads (upper and lower estimates) of lindane in the five main rivers draining to Skagerrak, Norway, 1990-2012.

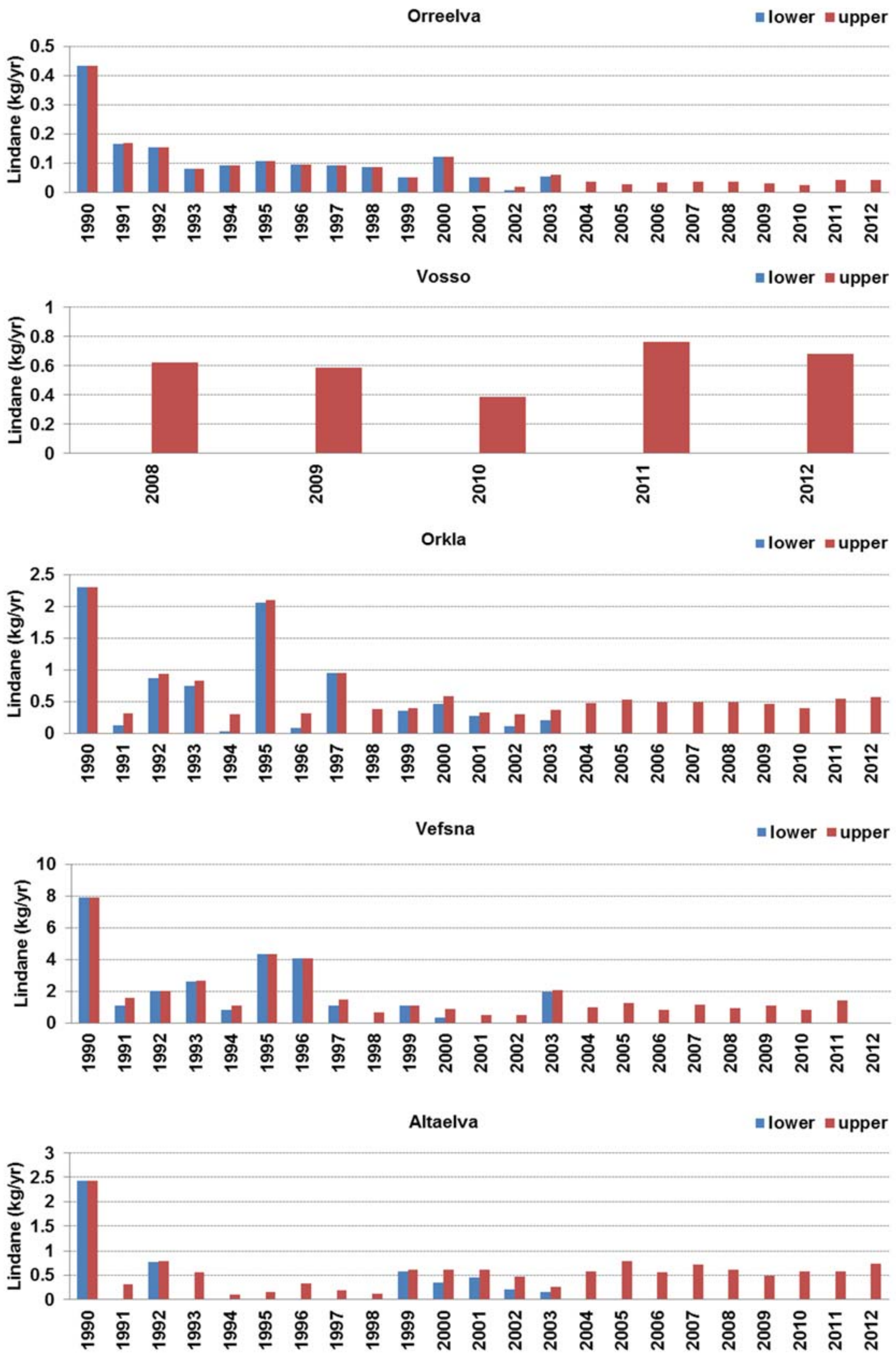

Figure A-V-15b. Annual riverine loads (upper and lower estimates) of lindane in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012 (2008-2012 for River Vosso).

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.

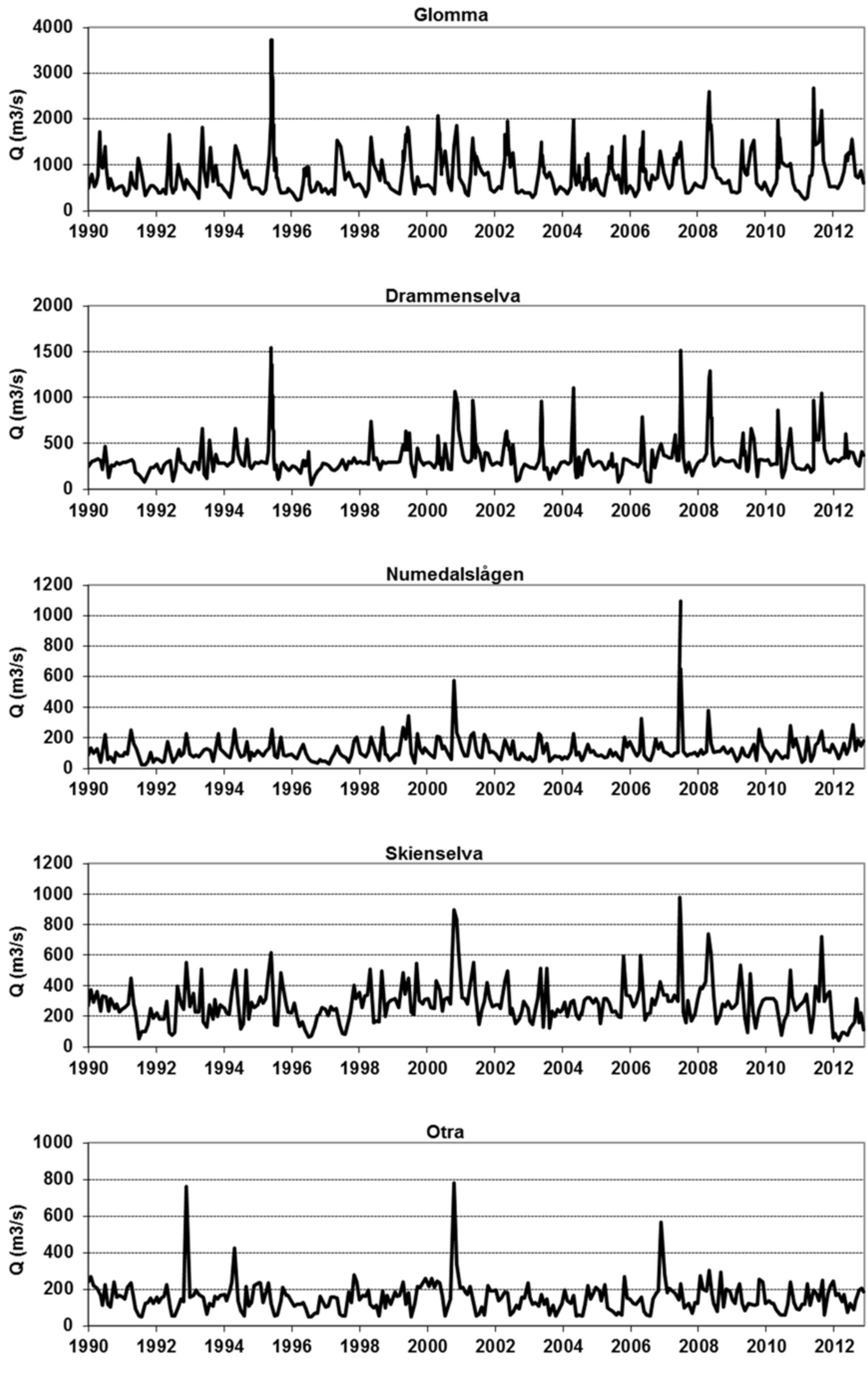

Figure A-VI-1a. Monthly water discharge (Q; based only on data at the day of water quality sampling) for the five main rivers draining to Skagerrak, Norway, 1990-2012.

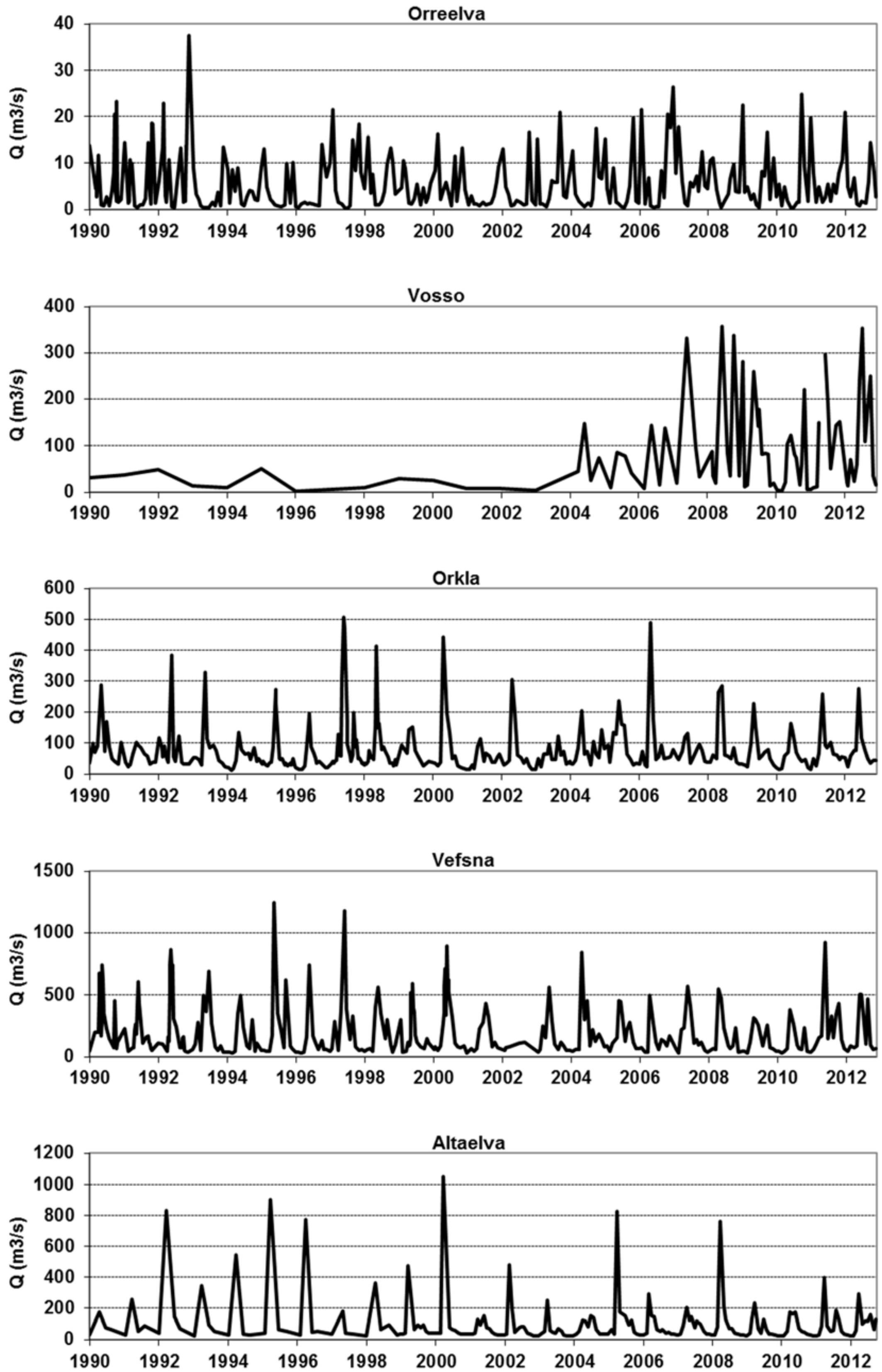

Figure A-VI-1b. Monthly water discharge (Q; based only on data at the day of water quality sampling) for the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

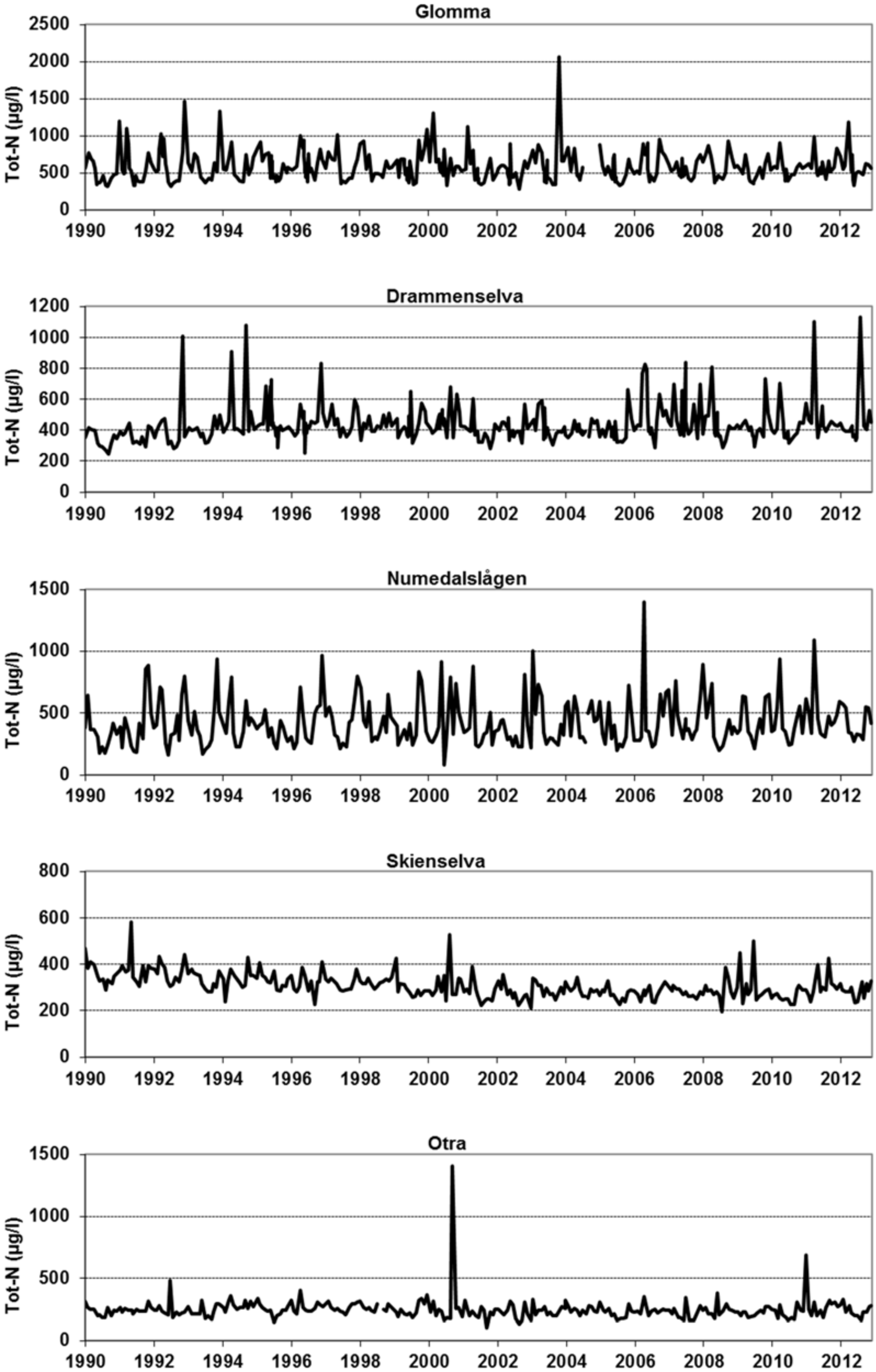

Figure A-VI-2a. Monthly concentrations of total nitrogen (Tot-N) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

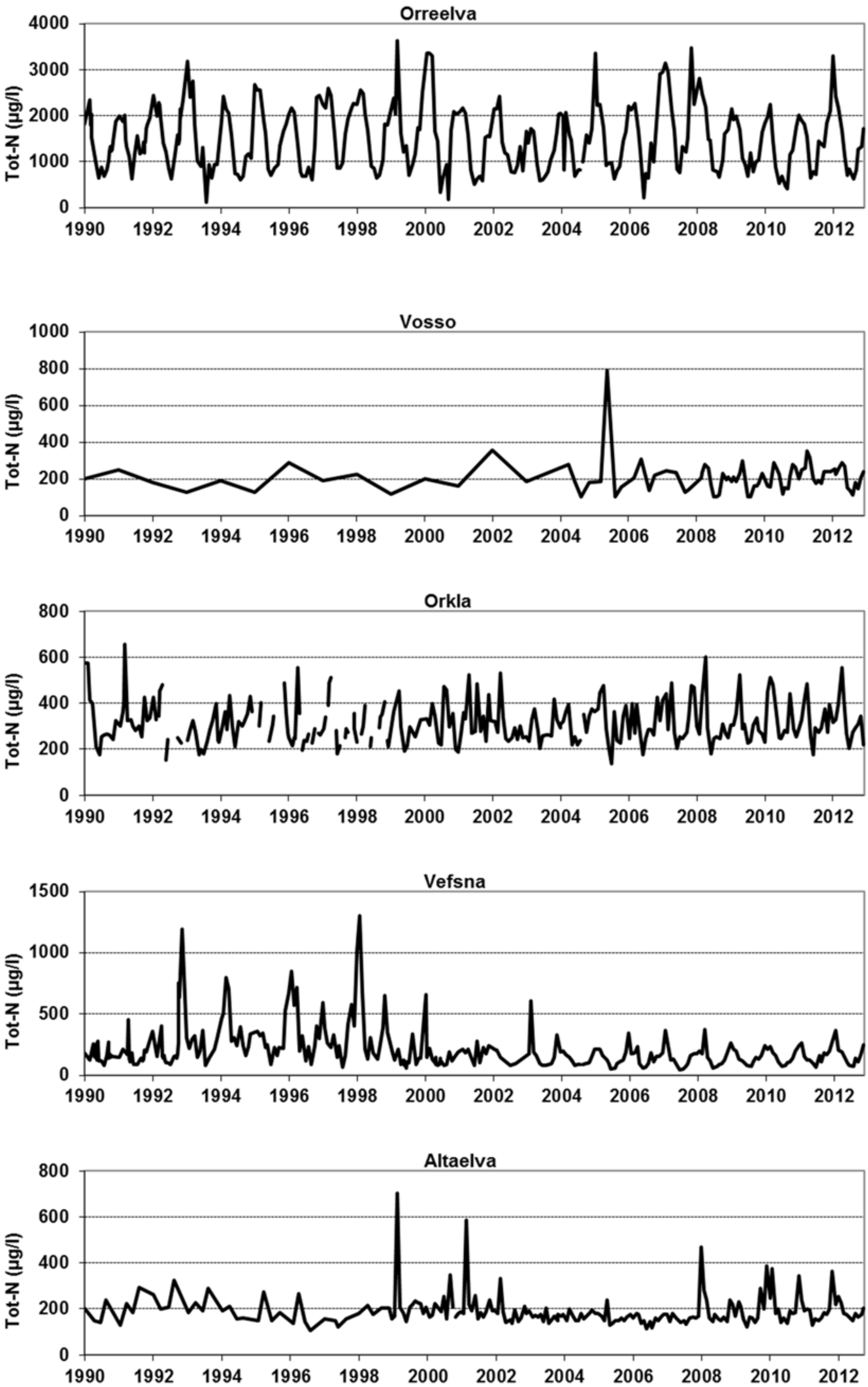

Figure A-VI-2b. Monthly concentrations of total nitrogen (Tot-N) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

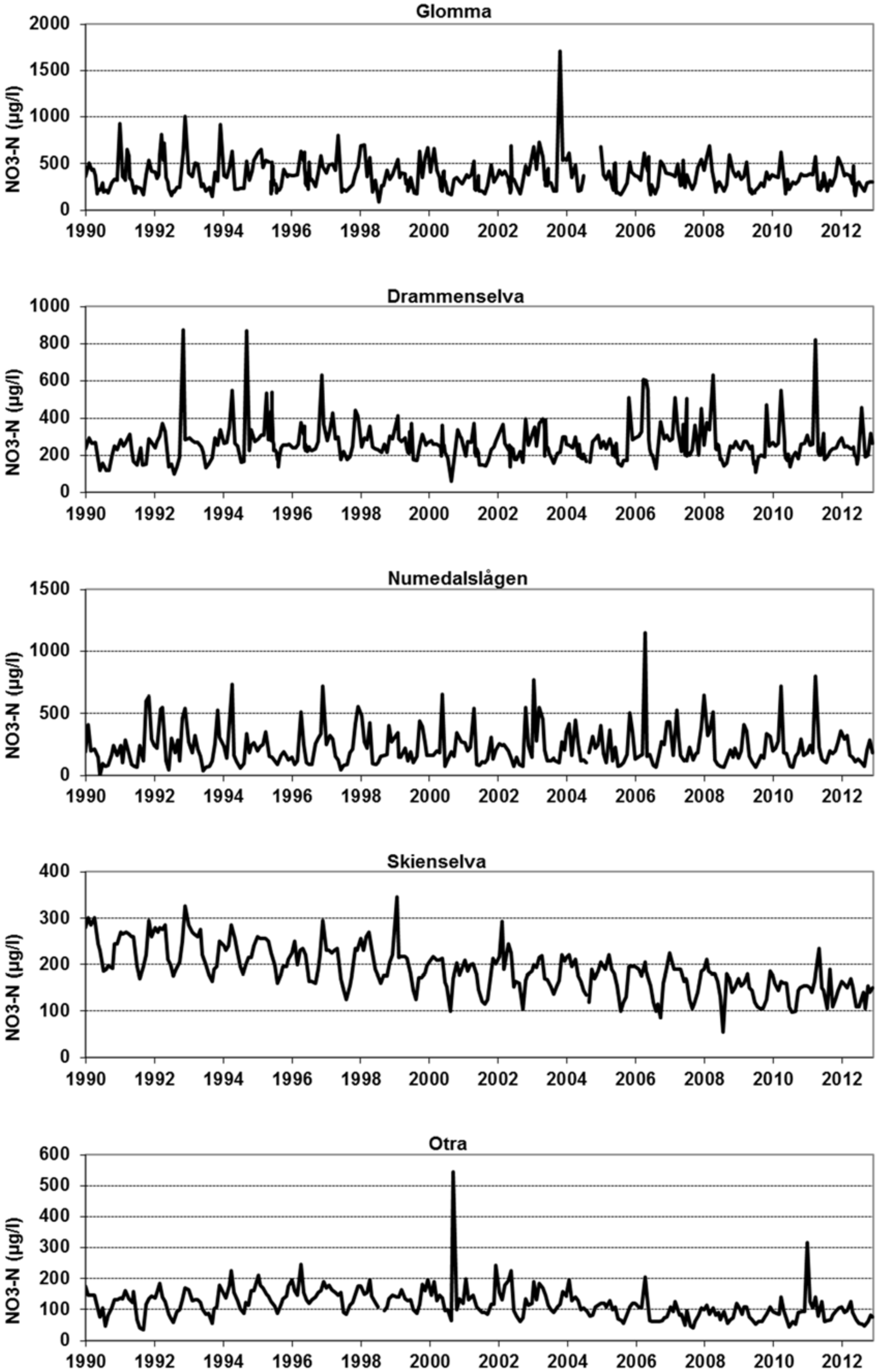

Figure A-VI-3a. Monthly concentrations of nitrate-nitrogen (NO_3-N) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

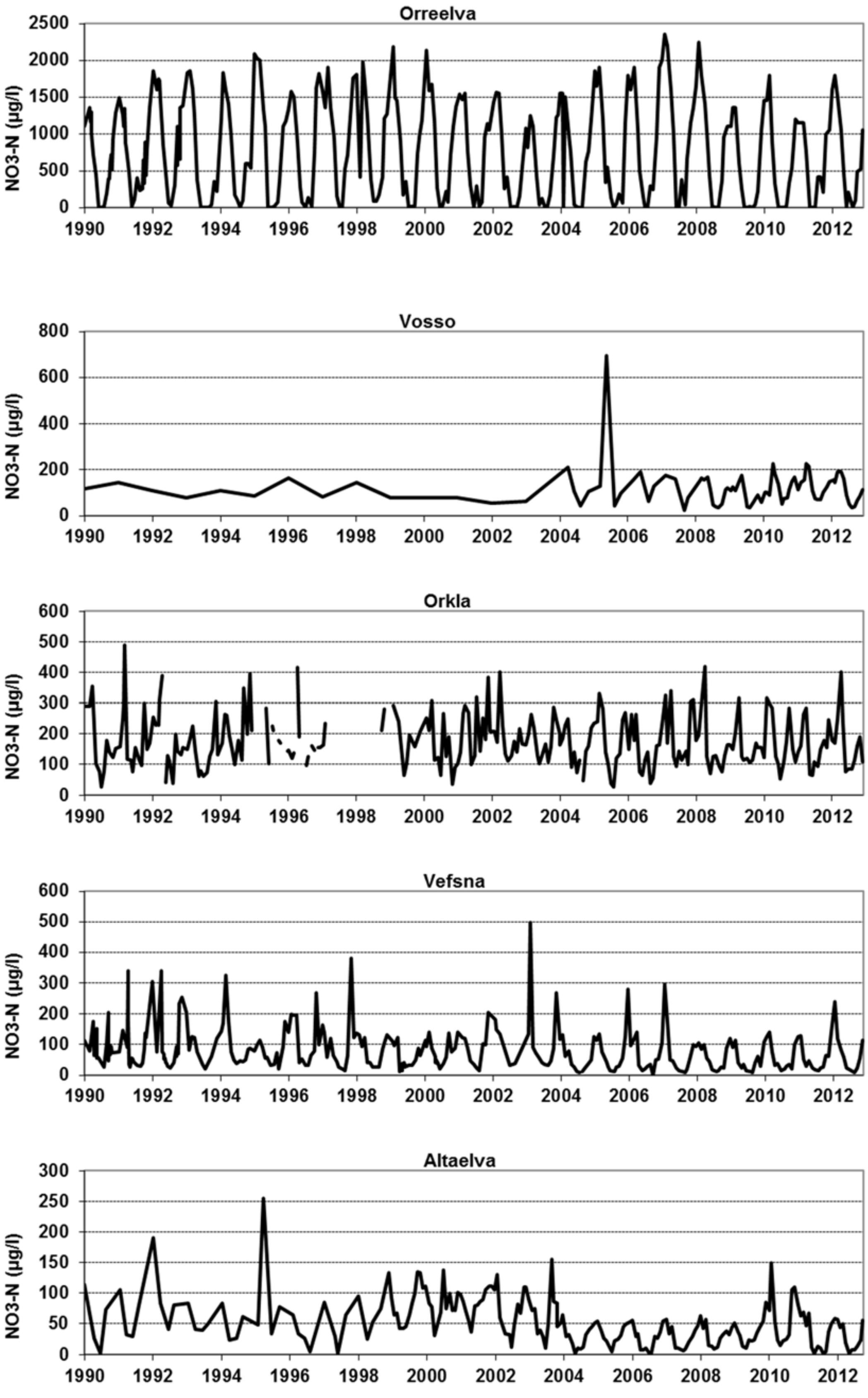

Figure A-VI-3b. Monthly concentrations of nitrate-nitrogen (NO_3-N) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

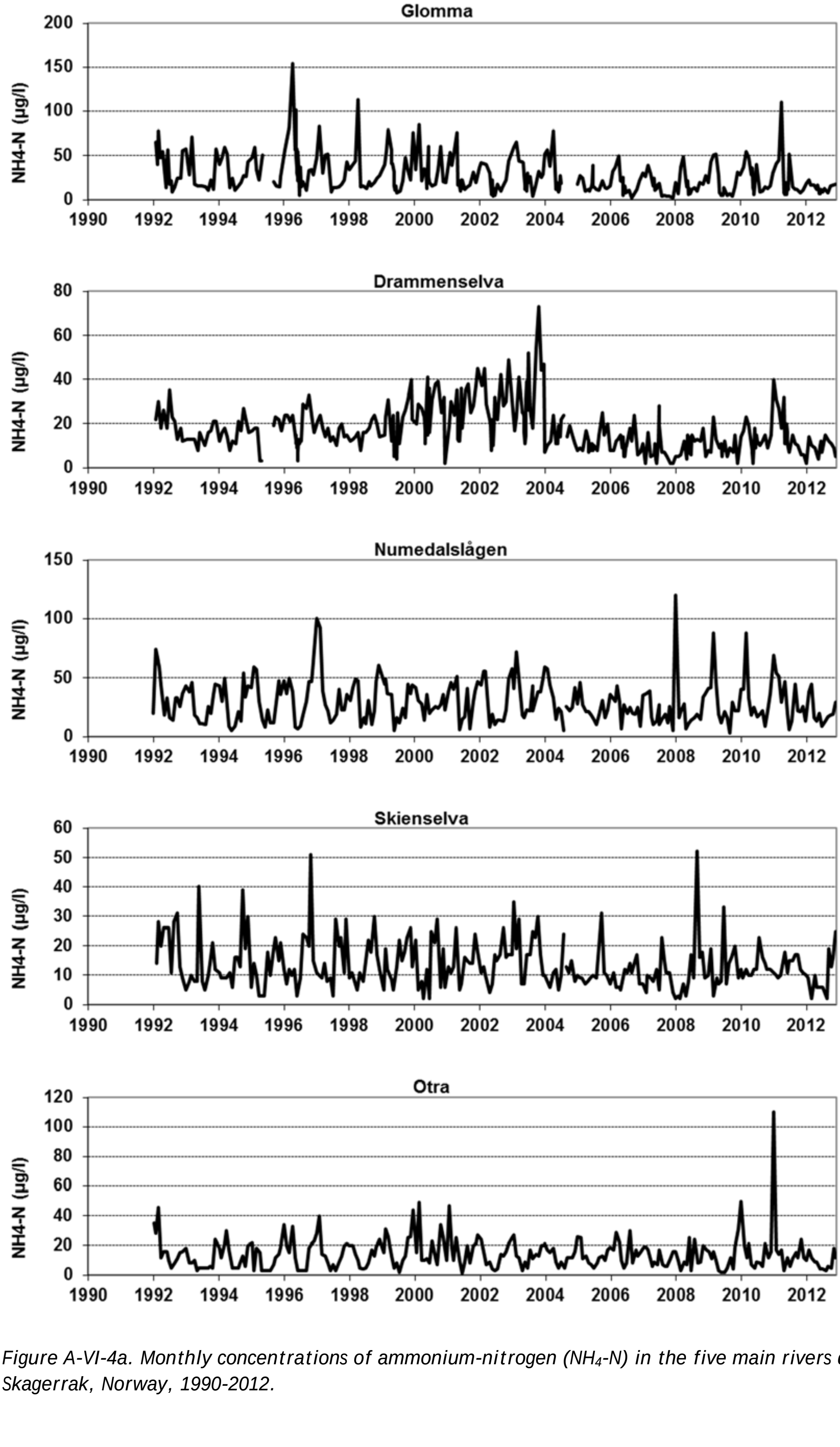

Figure A-VI-4a. Monthly concentrations of ammonium-nitrogen (NH_4-N) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

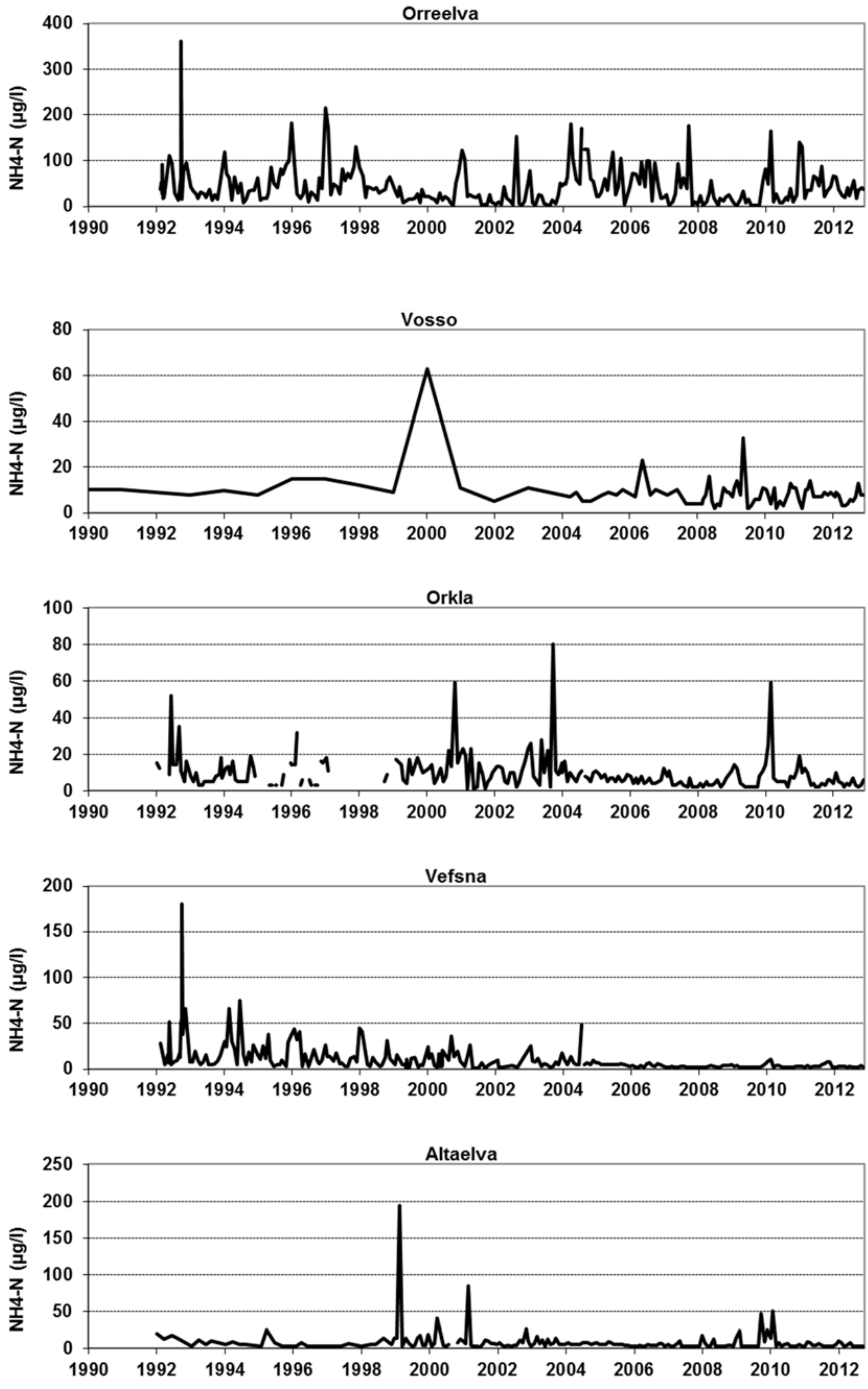

Figure A-VI-4b. Monthly concentrations of ammonium-nitrogen (NH_4-N) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

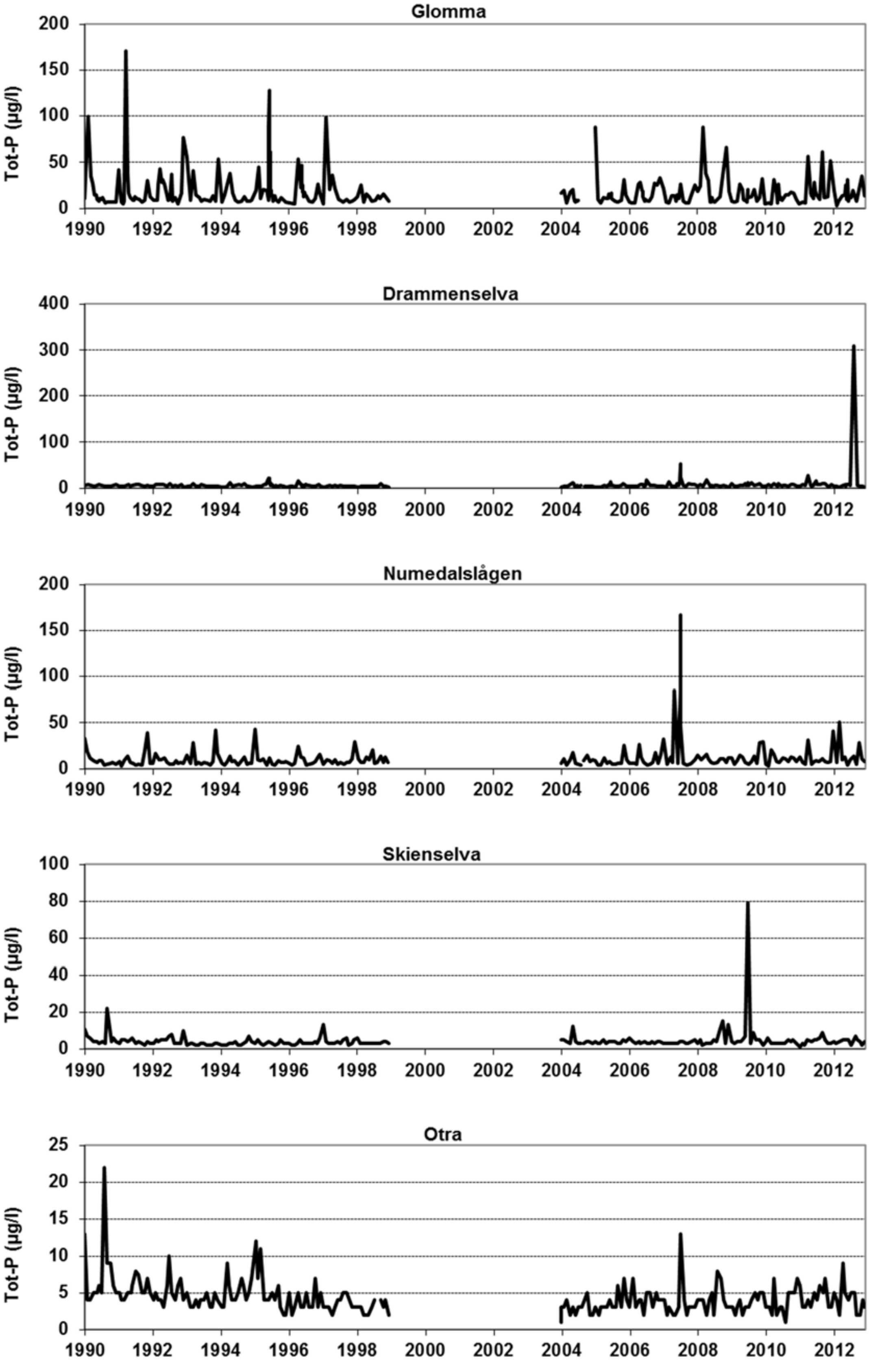

Figure A-VI-5a. Monthly concentrations of total phosphorus (Tot-P) in the five main rivers draining to Skagerrak. Norway, 1990-2012.

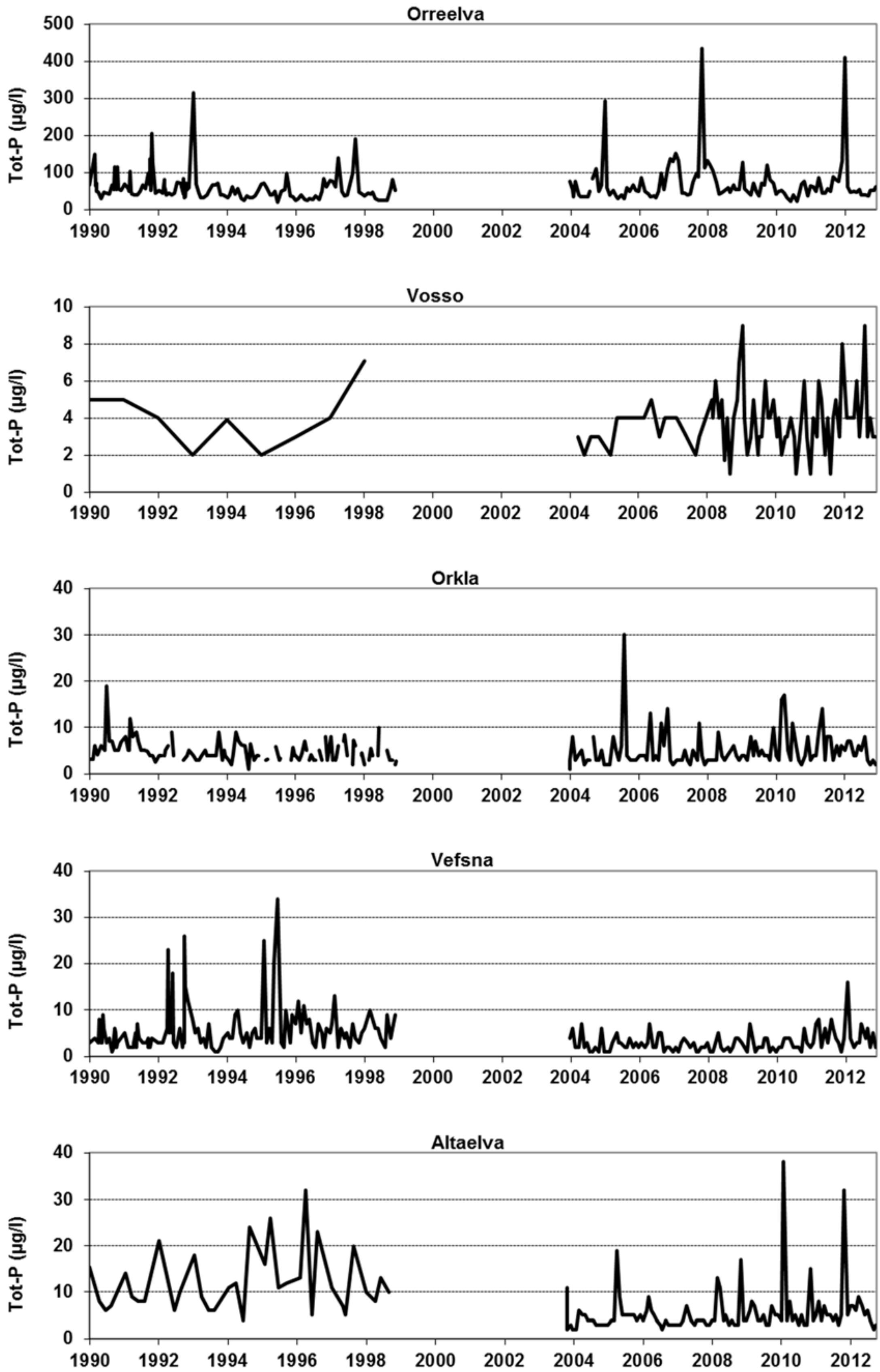

Figure A-VI-5b. Monthly concentrations of total phosphorus (Tot-P) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

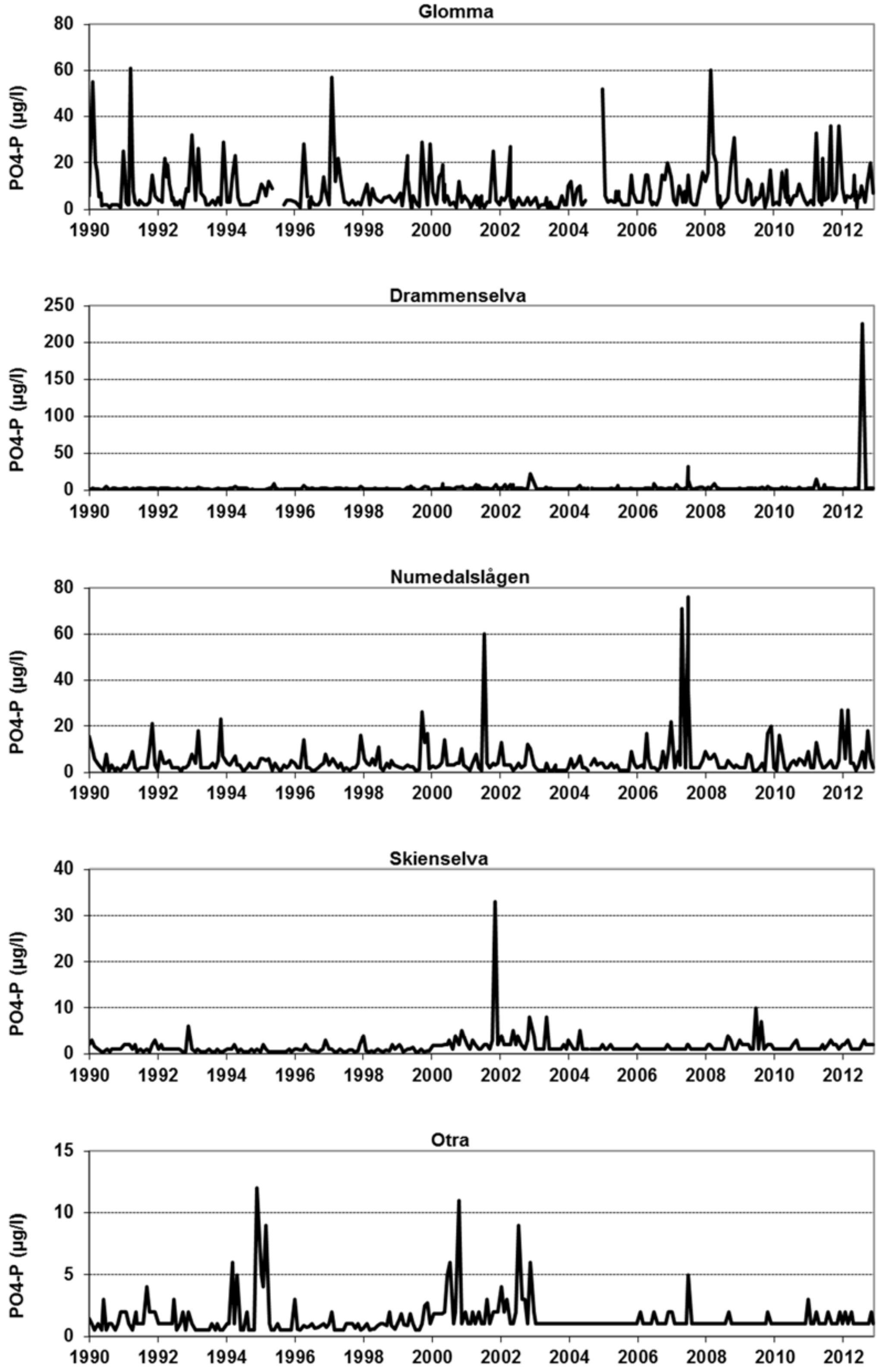

Figure A-VI-6a. Monthly concentrations of orthophosphate-phosphorus (PO_4-P) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

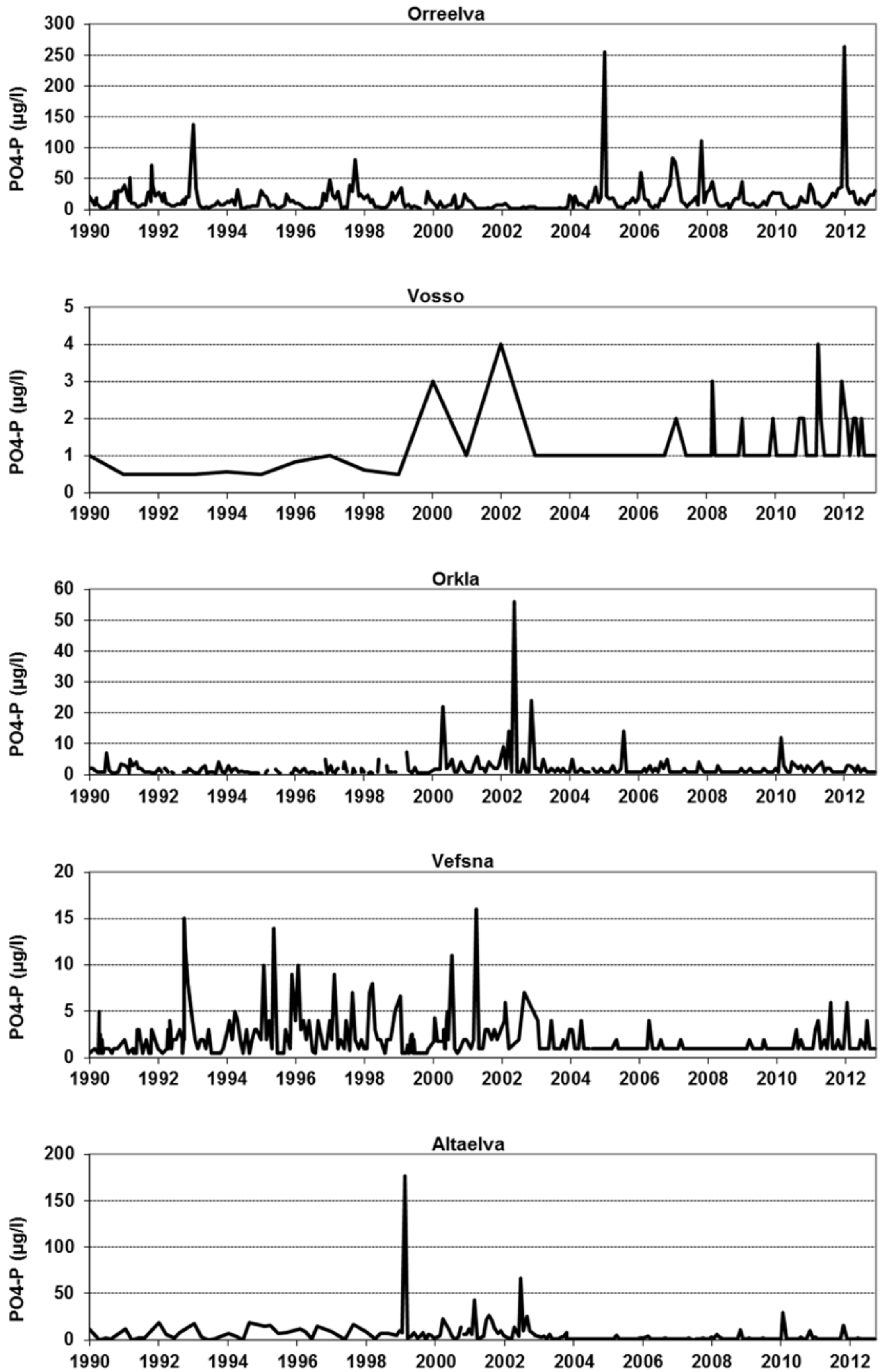

Figure A-VI-6b. Monthly concentrations of otrhophosphate-phosphorus (PO_4-P) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

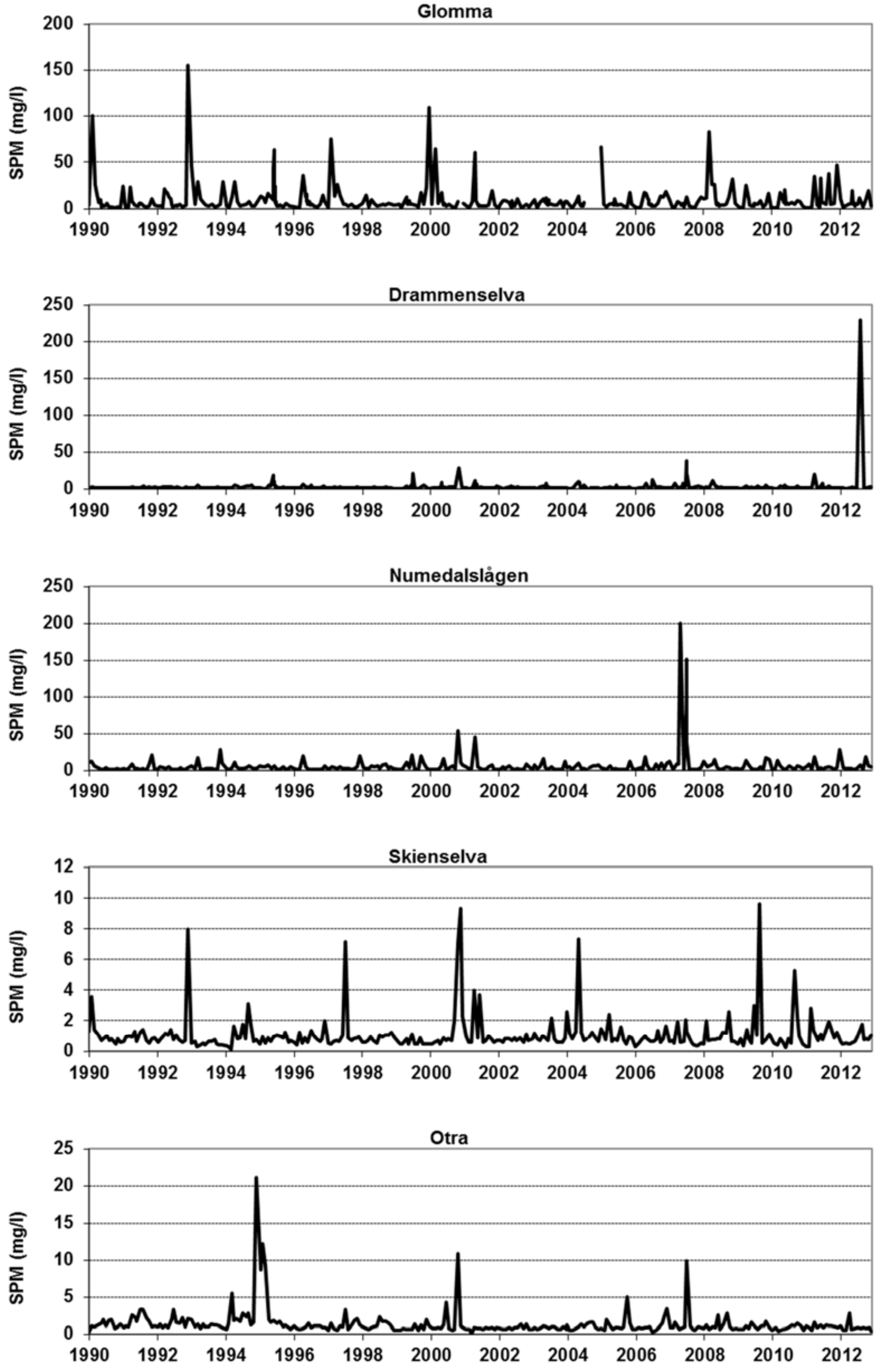

Figure A-VI-7a. Monthly concentrations of suspended particulate matter (SPM) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

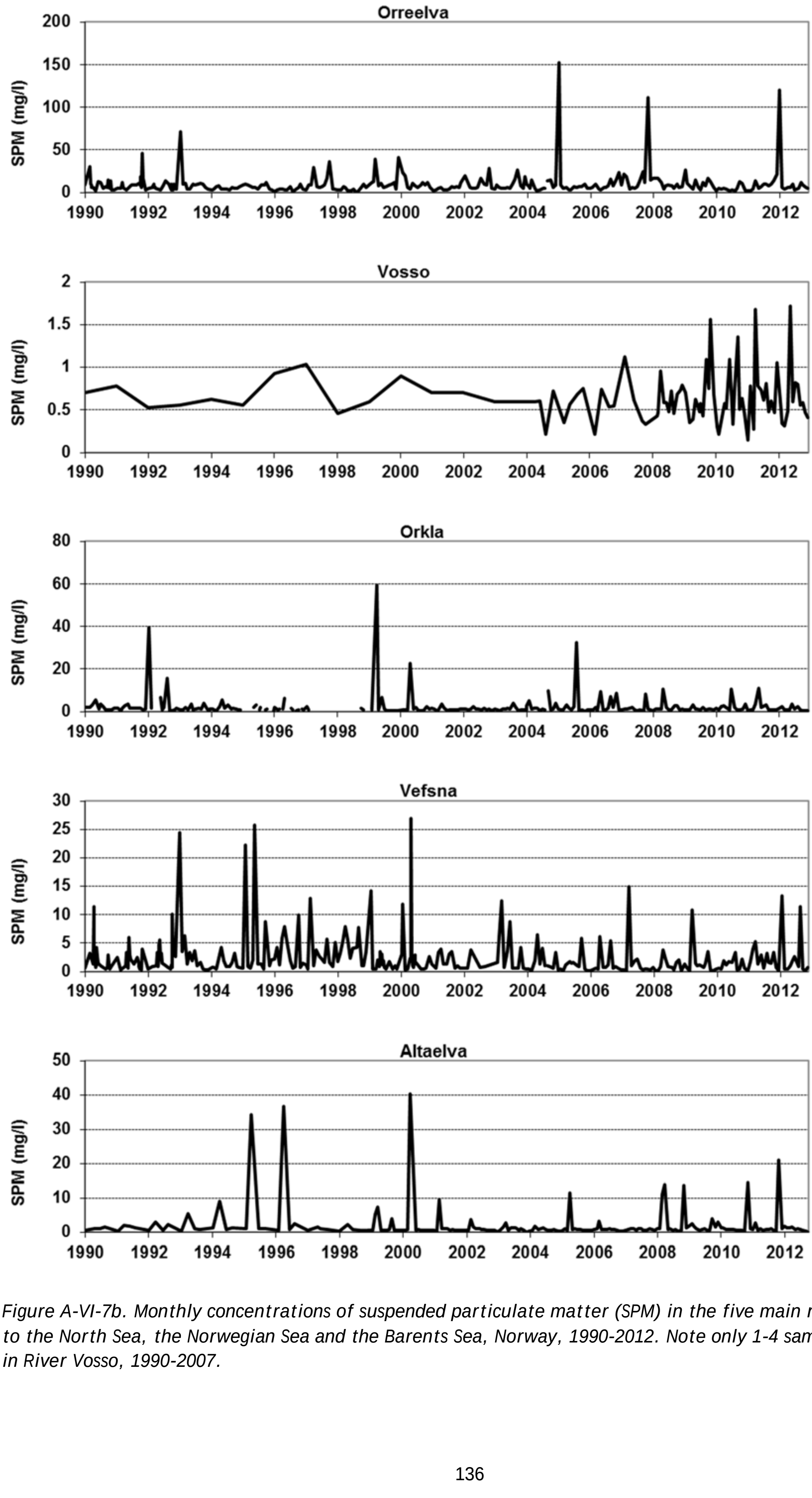

Figure A-VI-7b. Monthly concentrations of suspended particulate matter (SPM) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

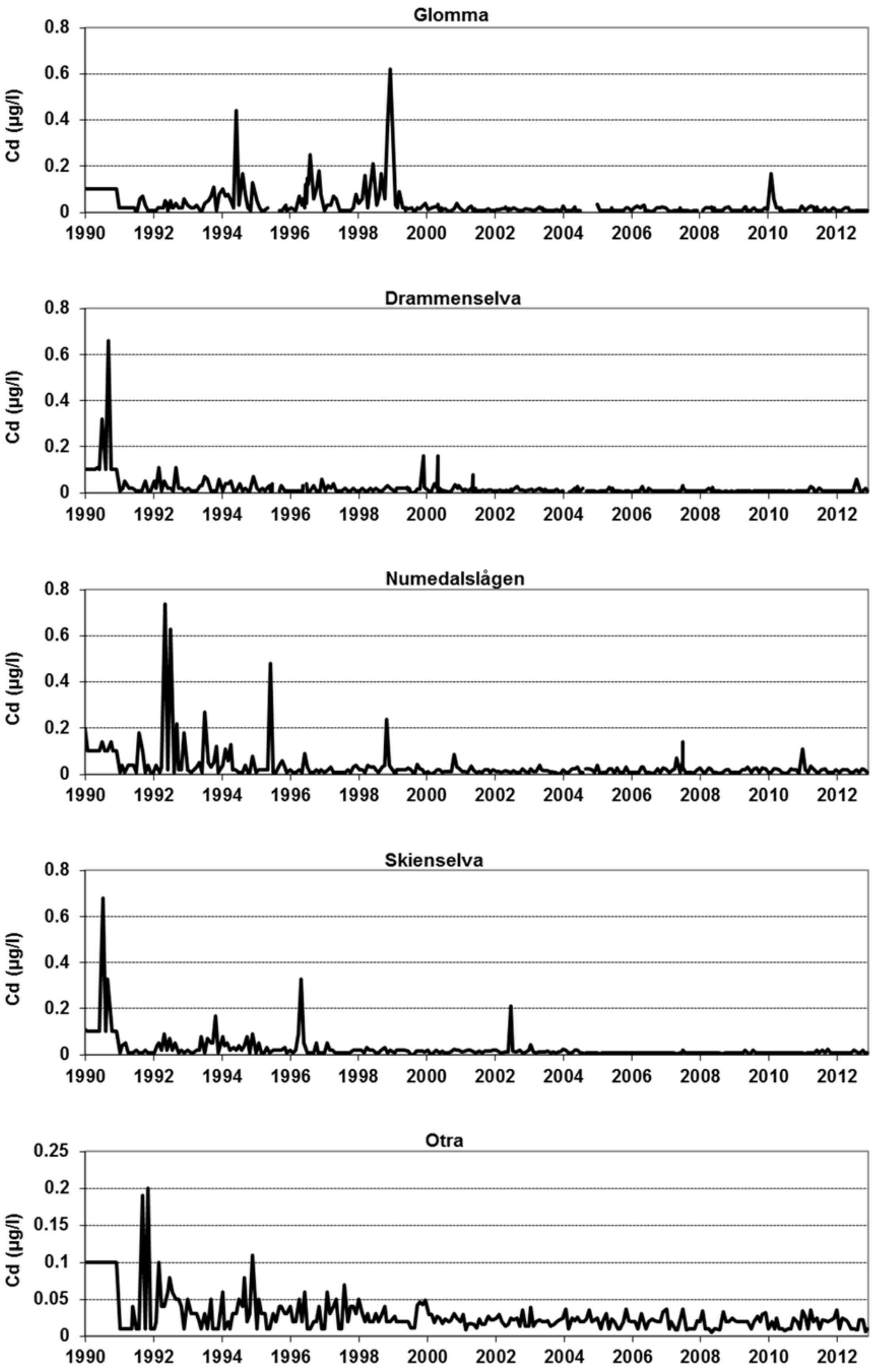

Figure A-VI-8a. Monthly concentrations of cadmium (Cd) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

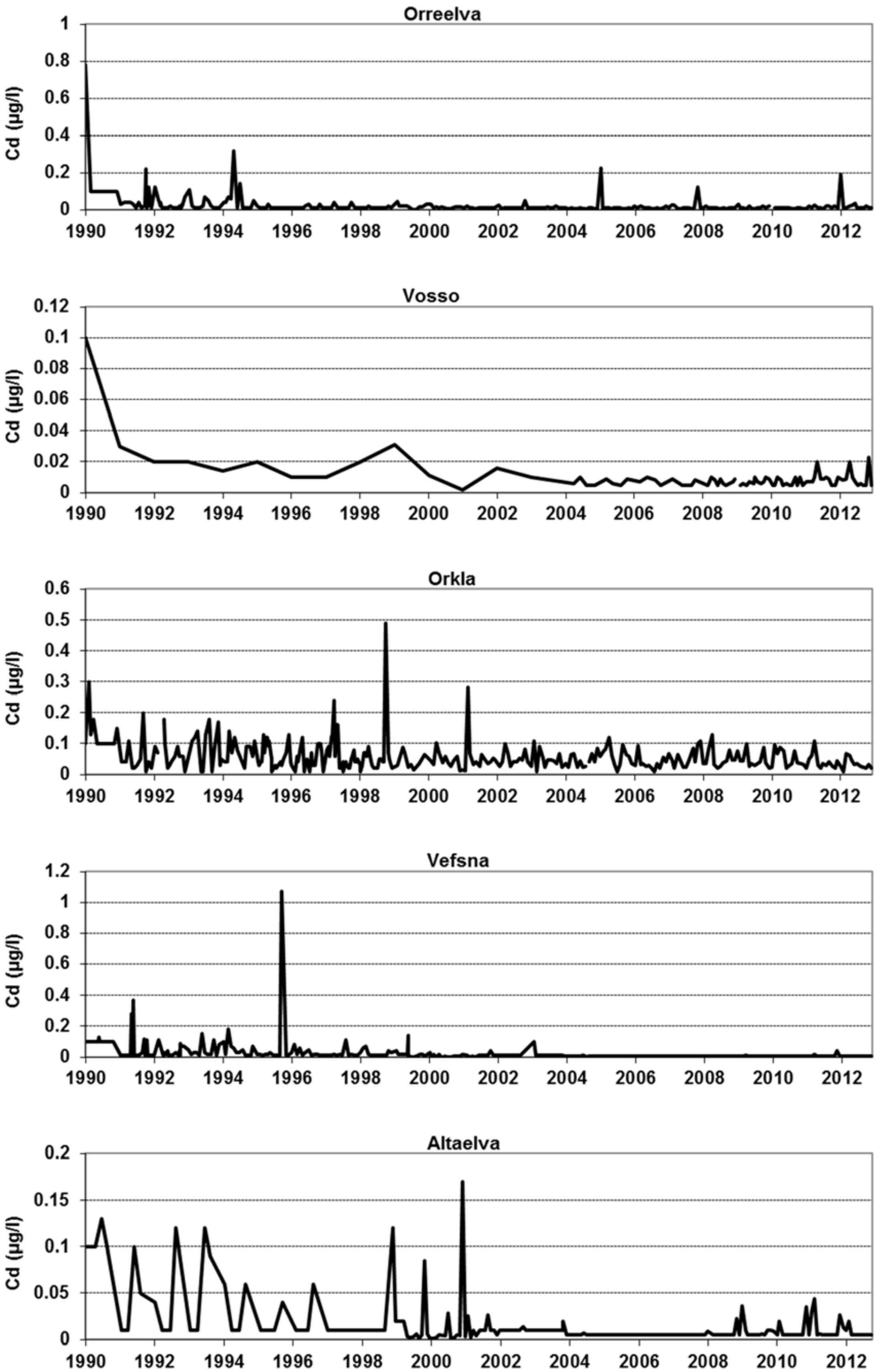

Figure A-VI-8b. Monthly concentrations of cadmium (Cd) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

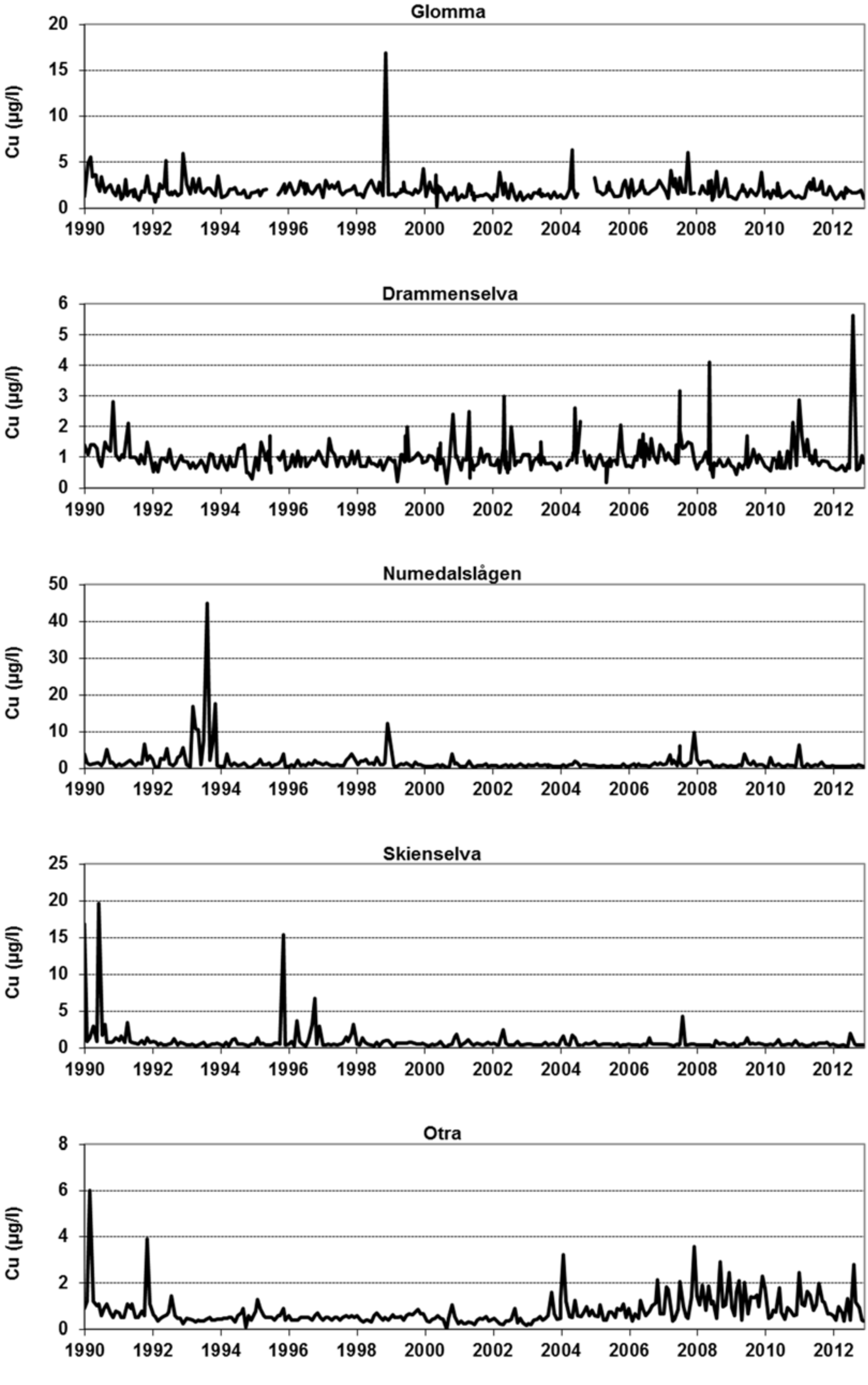

Figure A-VI-9a. Monthly concentrations of copper (Cu) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

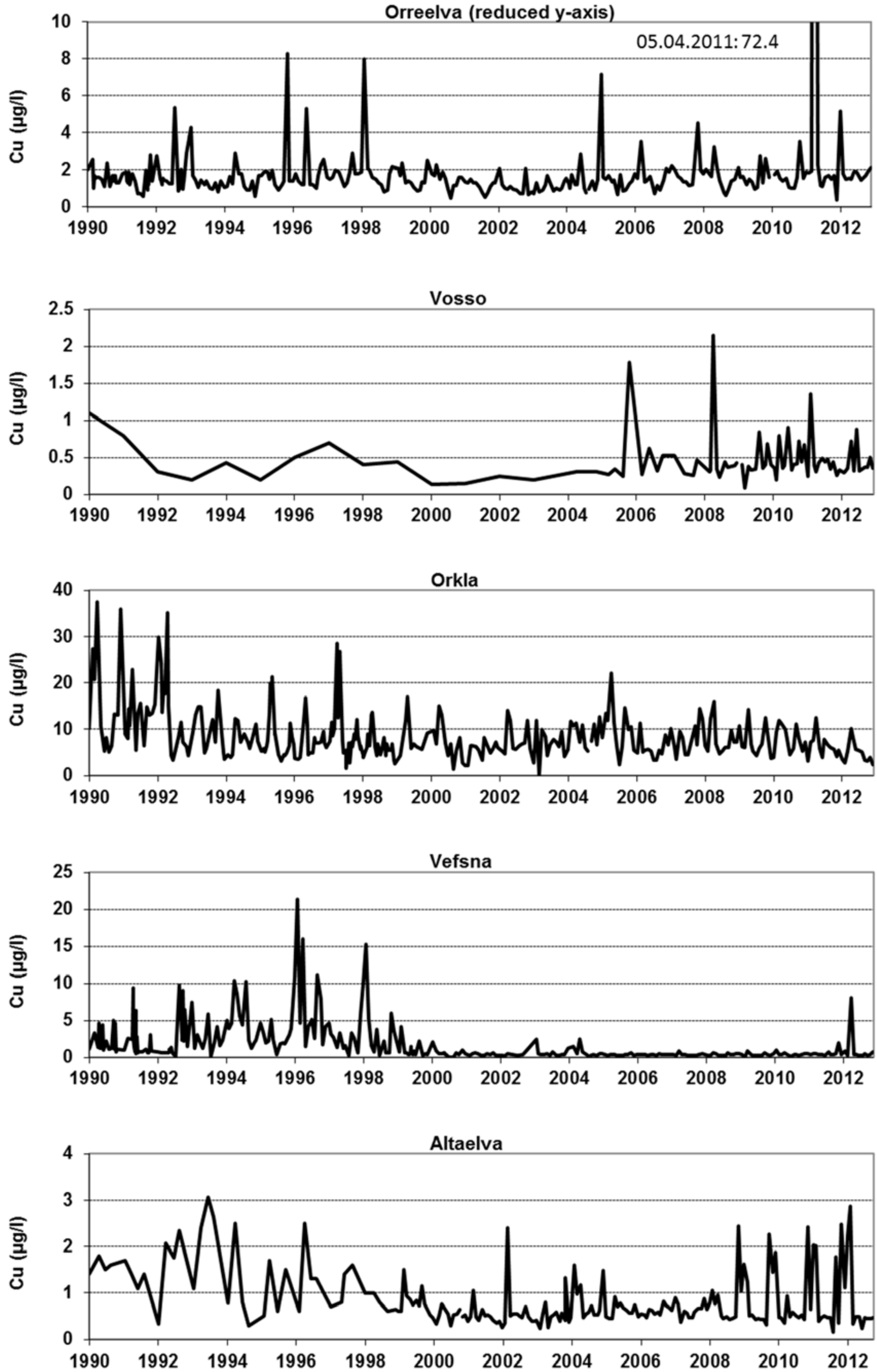

Figure A-VI-9b. Monthly concentrations of copper (Cu) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note Orreelva with reduced y-axis, and only 1-4 samples per year in River Vosso, 1990-2007.

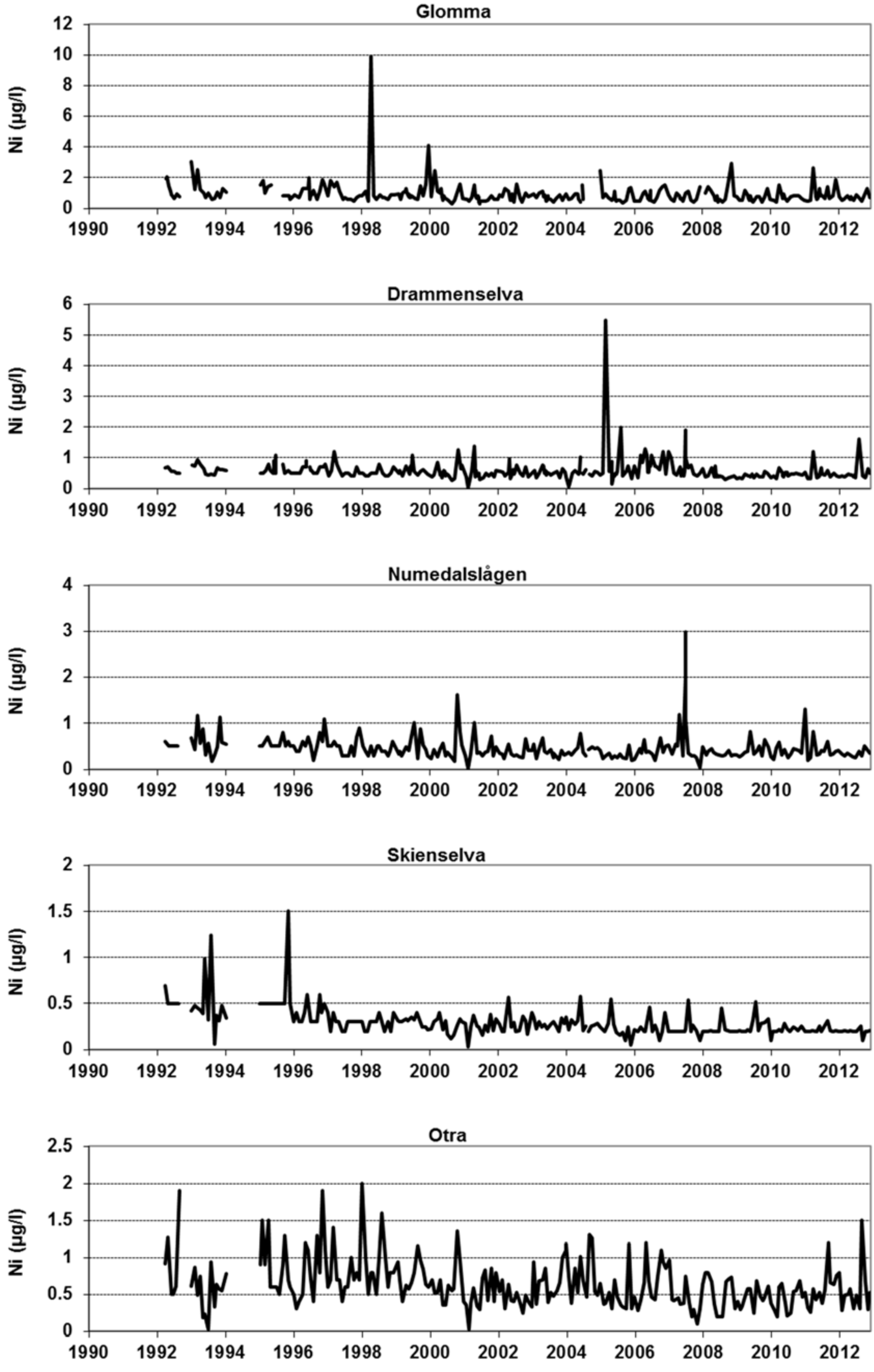

Figure A-VI-10a. Monthly concentrations of nickel (Ni) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

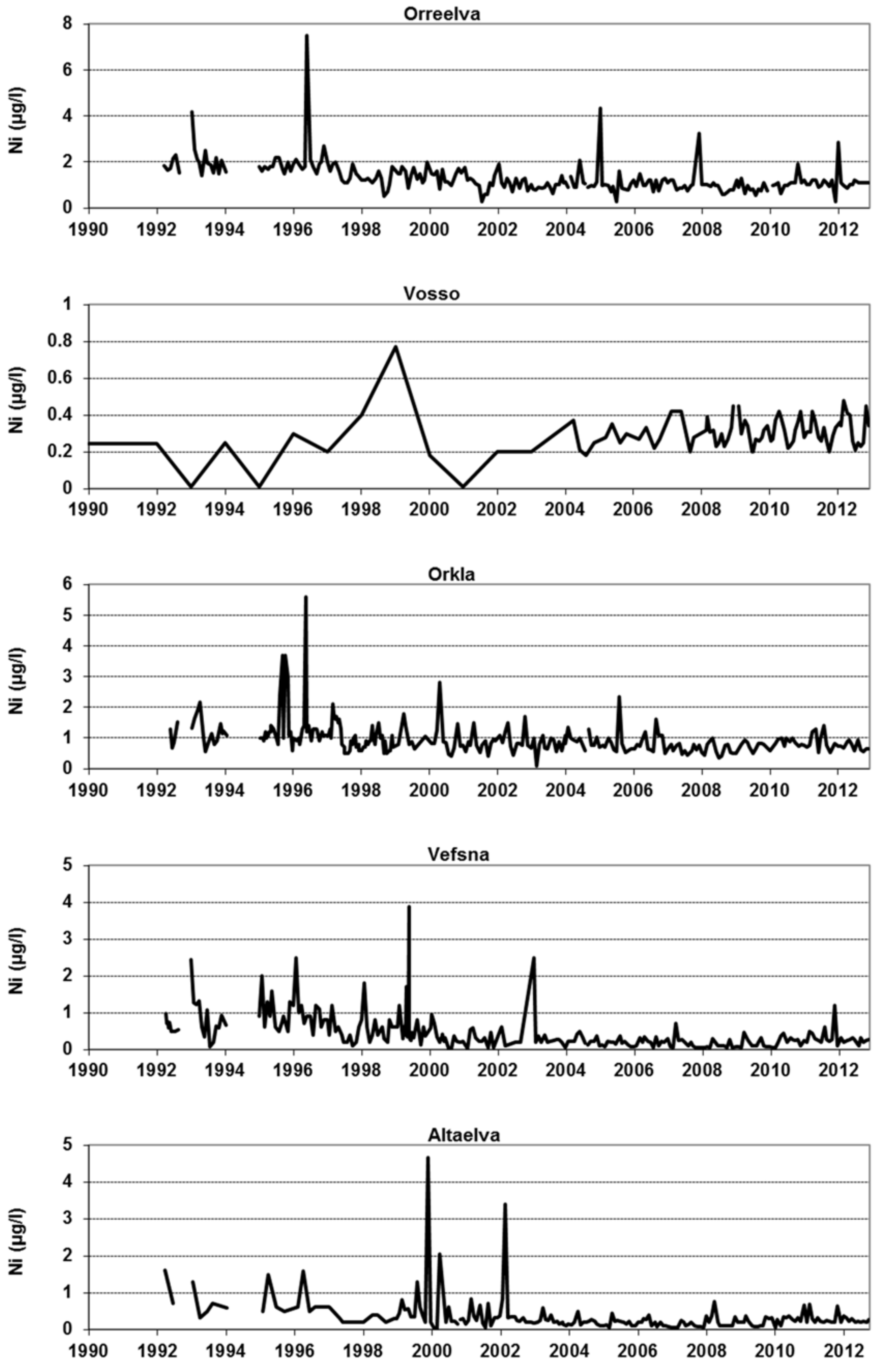

Figure A-VI-10b. Monthly concentrations of nickel (Ni) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

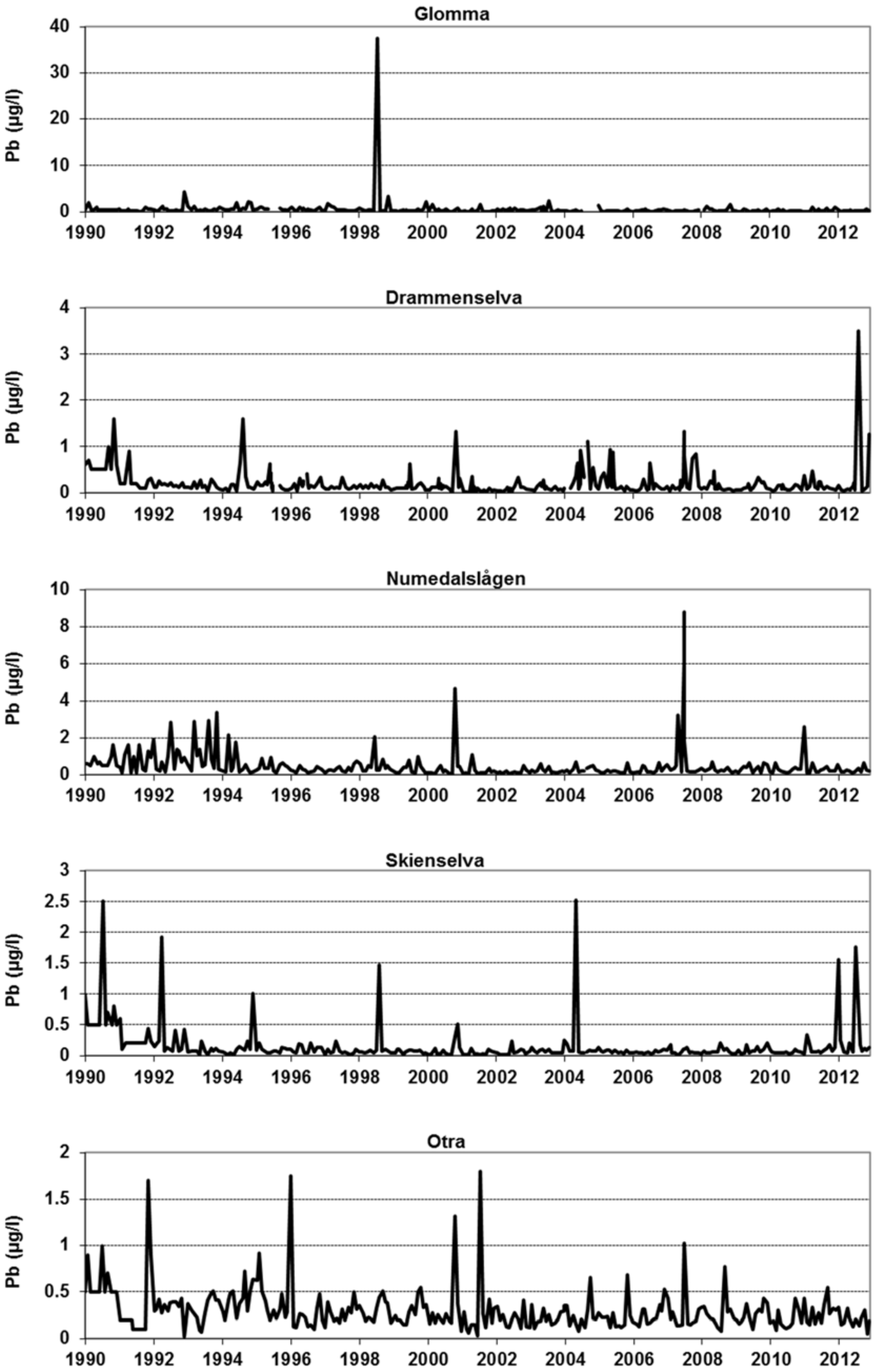

Figure A-VI-11a. Monthly concentrations of lead (Pb) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

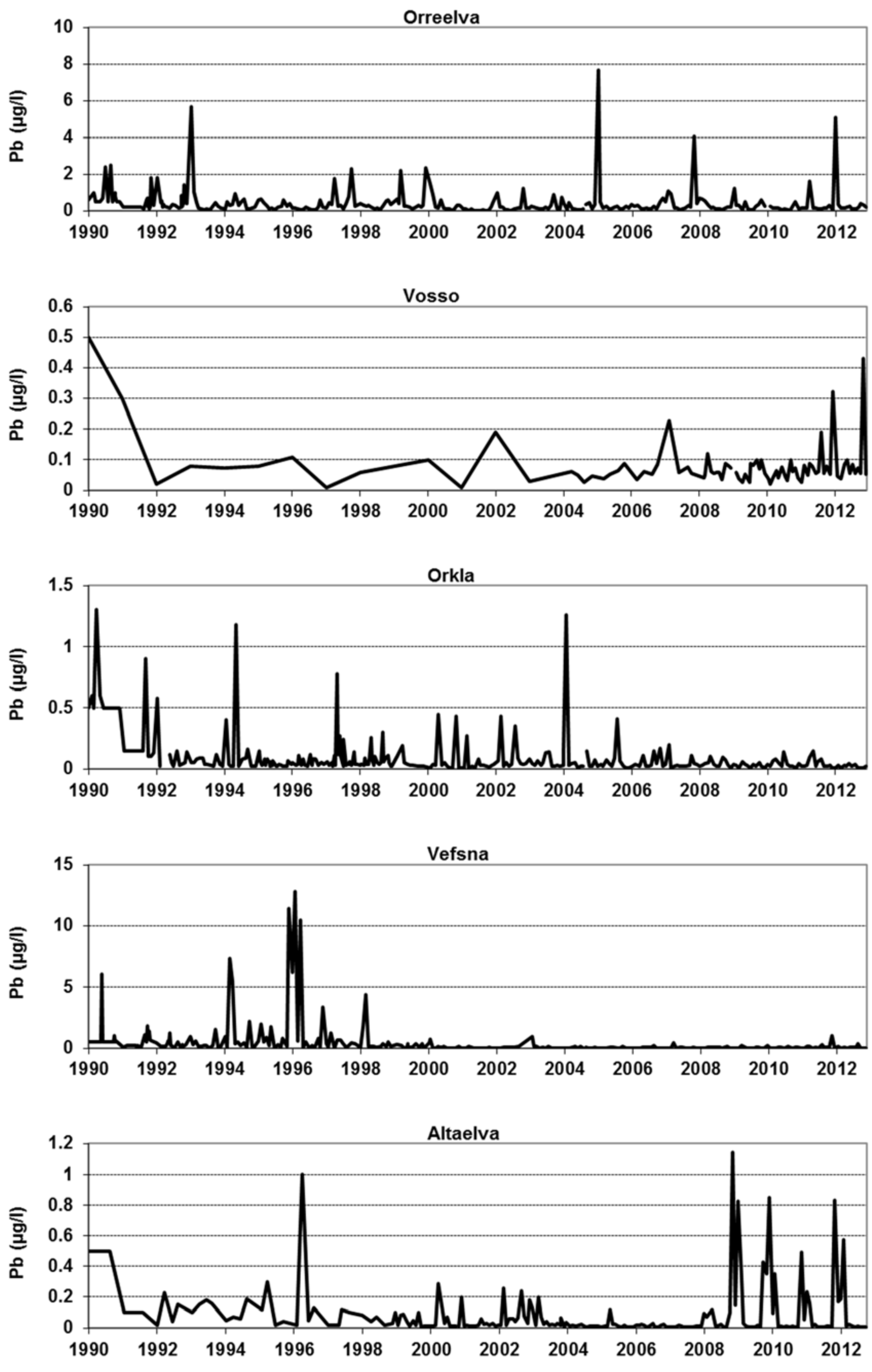

Figure A-VI-11b. Monthly concentrations of lead (Pb) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

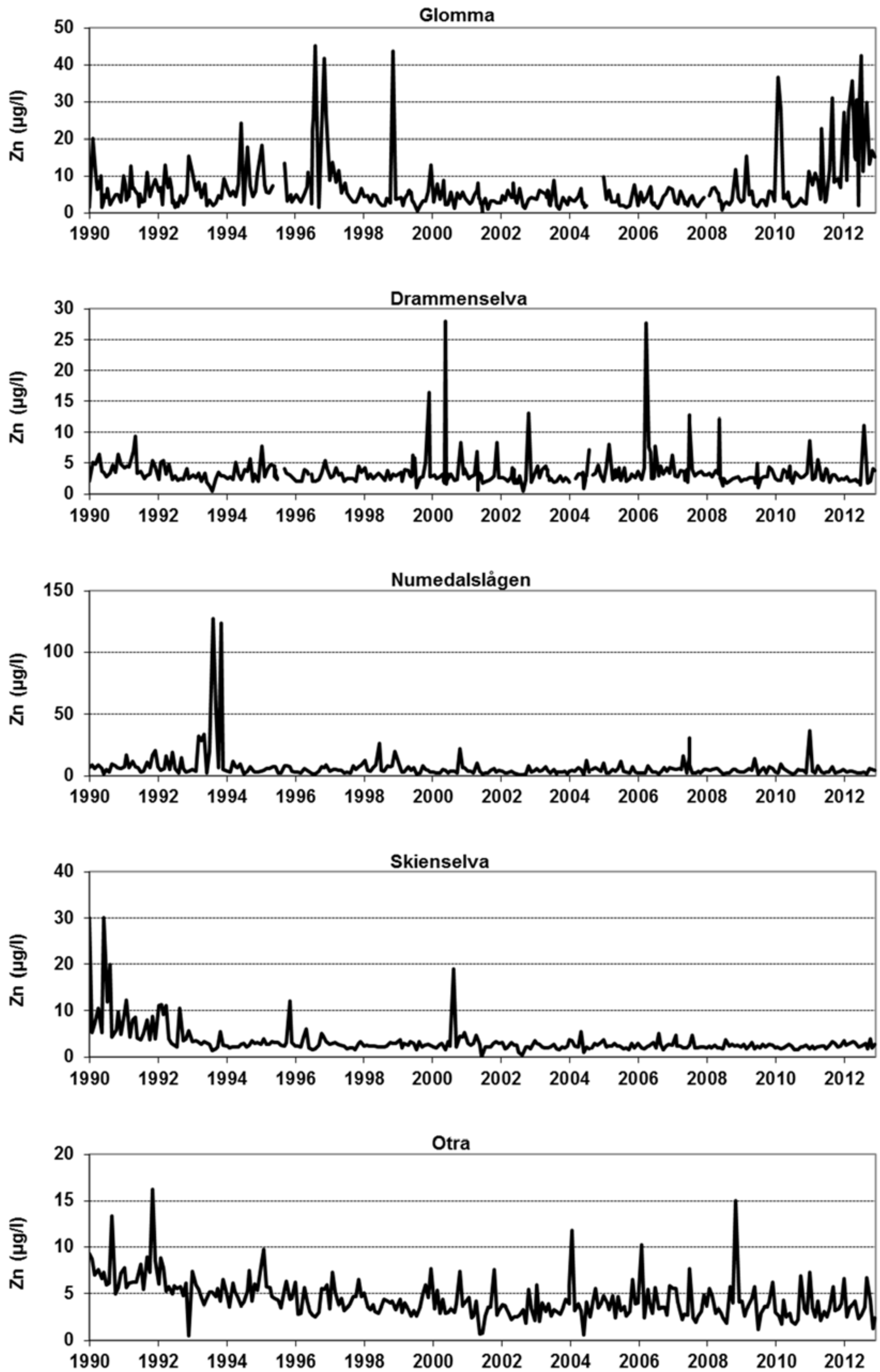

Figure A-VI-12a. Monthly concentrations of zinc (Zn) in the five main rivers draining to Skagerrak, Norway, 1990-2012.

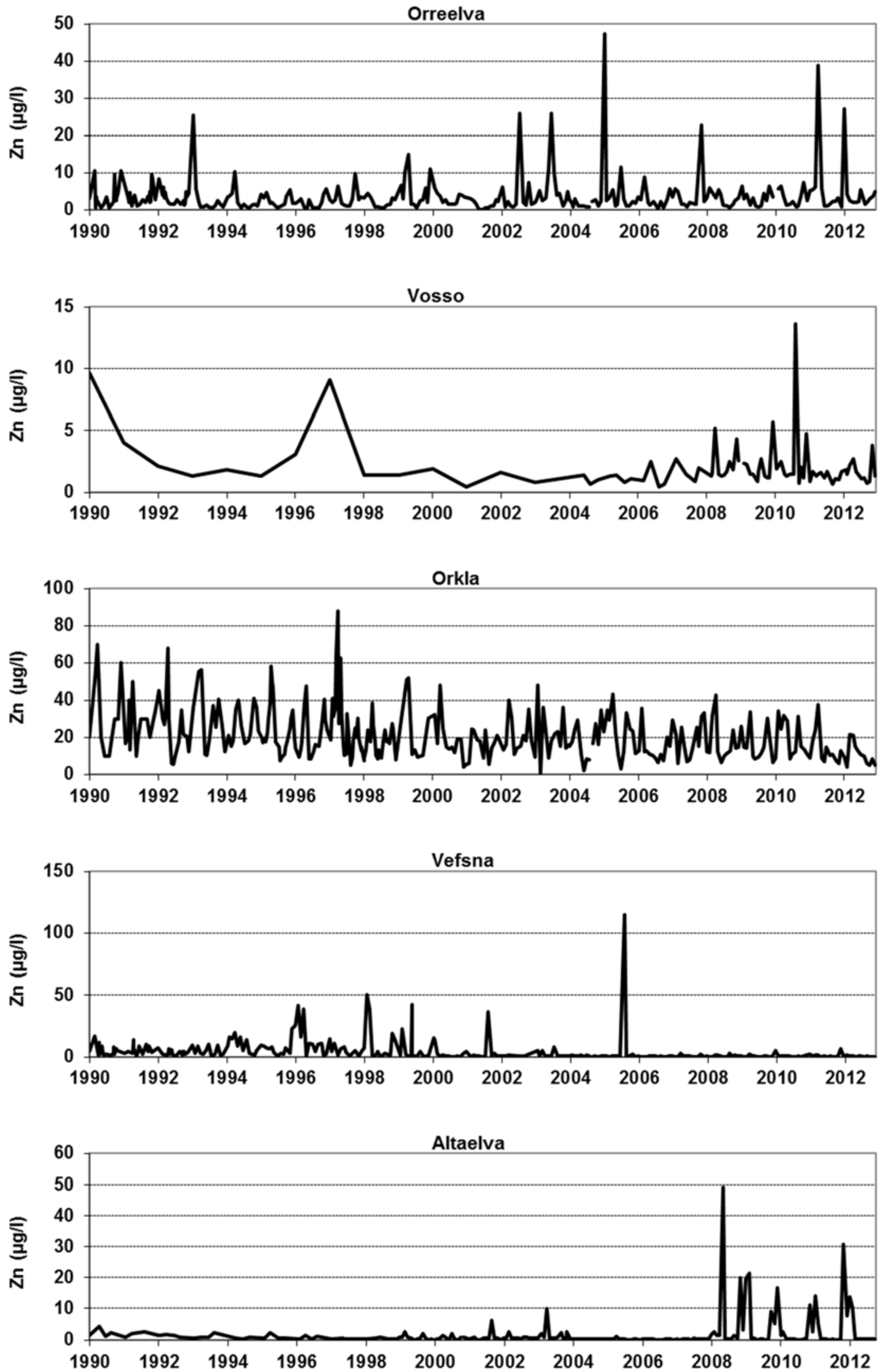

Figure A-VI-12b. Monthly concentrations of zinc (Zn) in the five main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2012. Note only 1-4 samples per year in River Vosso, 1990-2007.

Addendum: Data from the 2012 RID Programme

Table 1. Raw data and summary statistics for the 46 monitored rivers in 2012

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]
09.01.2012	532	6.89	5.33	10.80	5.20	9	20	480	19	725	4.41	0.20	0.31	0.01	1.43	27.20	0.75	0.42	4.00		
06.02.2012	531	6.92	4.69	1.18	3.50	3	3	370	23	545	3.85	0.10	0.10	0.01	0.99	8.85	0.52	0.60	2.00	<0.20	1.40
05.03.2012	496	7.32	5.11	3.22	3.70	6	8	395	17	600	4.26	0.20	0.12	0.01	1.15	27.30	0.60	0.40	7.00		
09.04.2012	651	6.93	5.03	5.08	4.30	5	14	370	17	1190	4.43	0.20	0.25	0.02	1.76	35.60	0.82	0.41	<1.00		
06.05.2012	860	7.21	4.47	5.65	5.00	7	15	280	12	525	4.04	0.10	0.19	0.02	1.07	15.20	0.60	0.20	1.00	<0.20	1.40
14.05.2012	991	7.15	4.59	19.60	4.80	15	25	475	17	745	4.00	0.21	0.34	0.02	1.79	14.40	0.77	0.20	2.00		
25.05.2012	1202	6.94	3.86	5.29	4.50	4	10	205	13	405	3.87	0.20	0.18	0.01	2.21	30.60	0.61	1.10	1.00		
04.06.2012	1238	7.07	3.39	6.60	3.10	8	31	155	7	335	2.80	0.10	0.22	0.01	1.65	22.90	0.67	0.30	<1.00		
14.06.2012	1094	7.22	4.25	2.85	2.70	<1	8	230	7	405	3.00	0.10	0.10	0.01	2.07	2.00	0.52	0.20	<1.00		
29.06.2012	1274	7.22	4.29	5.30	3.00	6	13	280	12	495	3.21	0.20	0.20	0.01	1.82	30.20	0.67	<0.10	1.00		
09.07.2012	1245	7.10	4.42	4.58	2.80	5	12	305	9	510	2.95	0.20	0.21	0.01	1.87	42.40	0.89	0.20	2.00		
06.08.2012	1561	6.99	4.08	11.40	5.20	10	20	265	13	510	3.62	0.20	0.22	0.01	1.68	11.20	0.74	0.36	2.00	<0.20	1.40
10.09.2012	756	7.19	4.05	2.37	4.50	3	8	205	8	475	3.25	0.20	0.13	0.01	1.68	29.70	0.50	0.20	<1.00		
08.10.2012	730	7.14	4.90	9.83	5.20	13	22	295	16	625	4.60	0.20	0.28	0.01	1.75	13.30	0.90	0.30	<1.00	<0.20	1.40
05.11.2012	875	7.14	4.81	19.50	7.10	20	35	300	17	605	5.20	0.32	0.57	0.01	1.93	16.90	1.30	1.20	<1.00		
10.12.2012	600	7.08	4.39	2.75	5.40	7	14	305	18	565	4.60	0.20	0.20	0.01	1.06	15.10	0.69	0.39	<1.00		
Lower avg.	915	7.09	4.48	7.25	4.38	8	16	307	14	579	3.88	0.18	0.23	0.01	1.62	21.43	0.72	0.40	1.38	0.00	1.40
Upper avg..	915	7.09	4.48	7.25	4.38	8	16	307	14	579	3.88	0.18	0.23	0.01	1.62	21.43	0.72	0.41	1.81	0.20	1.40
Minimum	496	6.89	3.39	1.18	2.70	1	3	155	7	335	2.80	0.10	0.10	0.01	0.99	2.00	0.50	0.10	1.00	0.20	1.40
Maximum	1561	7.32	5.33	19.60	7.10	20	35	480	23	1190	5.20	0.32	0.57	0.02	2.21	42.40	1.30	1.20	7.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes
n	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	4
St.dev	325	0.13	0.50	5.65	1.19	5	9	92	5	196	0.70	0.06	0.11	0.01	0.37	10.94	0.20	0.31	1.60	0.00	0.00

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]
03.01.2012	319	7.00	3.91	0.71	3.10	<1	5	295	<2	445	3.17	0.10	0.15	0.01	0.66	2.39	0.37	0.10	4.00		
02.02.2012	321	6.75	3.53	0.89	2.60	2	5	245	14	405	2.87	0.10	0.07	0.01	0.58	2.78	0.41	<0.10	5.00	<0.20	1.40
06.03.2012	306	6.97	3.67	0.69	2.70	1	2	250	10	395	2.87	0.10	0.05	0.01	0.63	2.04	0.37	0.10	2.00		
10.04.2012	343	6.92	3.37	1.22	2.80	<1	6	235	9	390	2.70	0.10	0.07	0.01	0.72	2.23	0.46	0.20	<1.00		
08.05.2012	341	7.01	3.42	1.03	3.50	1	7	235	5	430	2.85	0.10	0.07	0.01	0.55	2.29	0.44	<0.10	1.00	<0.20	1.40
15.05.2012	374	6.36	3.54	2.12	3.30	2	5	245	5	410	2.76	0.10	0.09	0.01	0.62	2.34	0.45	<0.10	<1.00		
24.05.2012	608	6.76	3.13	1.91	2.90	2	8	200	4	360	2.65	0.10	0.09	0.01	0.55	2.00	0.43	<0.10	<1.00		
05.06.2012	373	7.19	3.42	0.94	3.20	2	7	190	10	370	2.76	0.10	0.13	0.01	0.74	1.90	0.37	<0.10	<1.00		
15.06.2012	346	6.96	3.14	2.62	3.10	1	8	150	12	335	2.76	0.20	0.21	0.01	0.80	2.19	0.43	0.10	<1.00		
25.06.2012	385	7.16	3.46	1.23	3.10	1	6	180	7	350	2.67	0.10	0.09	<0.01	0.65	2.20	0.39	0.10	<1.00		
03.07.2012	406	7.15	3.23	0.94	3.20	3	6	175	7	350	2.63	0.10	0.06	0.01	0.64	1.50	0.34	<0.10	<1.00		
07.08.2012	402	6.90	5.61	230.00	10.60	226	308	455	15	1130	6.16	0.86	3.49	0.06	5.61	11.10	1.60	6.93	3.00	0.21	1.40
11.09.2012	281	7.25	3.76	0.90	3.30	1	6	190	12	425	2.67	0.20	0.04	0.01	0.60	1.70	0.41	<0.10	<1.00		
09.10.2012	255	7.12	3.60	1.20	3.30	2	4	200	11	405	2.97	0.10	0.08	0.01	0.64	2.00	0.34	<0.10	<1.00	<0.20	1.40
06.11.2012	409	7.08	4.61	2.90	4.10	3	5	320	9	530	3.47	0.20	0.14	0.02	1.05	4.12	0.64	0.10	<1.00		
04.12.2012	370	7.17	3.96	2.06	3.20	2	3	265	5	450	3.14	0.10	1.28	0.01	0.82	3.80	0.51	0.20	<1.00		
Lower avg.	365	6.98	3.71	15.71	3.62	16	24	239	8	449	3.07	0.17	0.38	0.01	0.99	2.91	0.50	0.49	0.94	0.05	1.40
Upper avg..	365	6.98	3.71	15.71	3.62	16	24	239	9	449	3.07	0.17	0.38	0.01	0.99	2.91	0.50	0.54	1.62	0.20	1.40
Minimum	255	6.36	3.13	0.69	2.60	1	2	150	2	335	2.63	0.10	0.04	0.01	0.55	1.50	0.34	0.10	1.00	0.20	1.40
Maximum	608	7.25	5.61	230.00	10.60	226	308	455	15	1130	6.16	0.86	3.49	0.06	5.61	11.10	1.60	6.93	5.00	0.21	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes
n	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	4
St.dev	79	0.22	0.62	57.15	1.89	56	76	73	4	188	0.86	0.19	0.88	0.01	1.24	2.29	0.30	1.71	1.26	0.01	0.00

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]
04.01.2012	158	6.94	3.99	28.40	4.20	27	41	360	13	590	4.73	0.21	0.54	0.02	0.84	4.92	0.42	0.20	3.00		
06.02.2012	112	6.67	3.36	3.84	2.40	6	7	295	38	575	3.42	0.10	0.17	0.01	0.50	2.99	0.33	0.36	2.00	<0.20	1.40
05.03.2012	63	6.93	4.05	2.16	3.40	27	51	320	45	540	4.58	0.10	0.15	0.02	0.50	3.60	0.30	0.20	<1.00		
02.04.2012	106	6.69	2.51	2.65	3.90	4	10	160	16	345	3.44	0.20	0.23	0.02	0.61	3.56	0.36	<0.10	<1.00		
07.05.2012	166	6.85	2.47	2.86	3.70	4	13	150	13	335	3.19	0.20	0.22	0.02	0.59	2.75	0.31	0.10	<1.00	<0.20	1.40
06.06.2012	93	6.90	2.53	0.98	2.80	1	4	110	20	275	2.70	0.09	0.10	0.01	0.57	1.90	0.28	<0.10	2.00		
04.07.2012	139	6.89	2.60	1.97	3.90	3	10	130	9	330	3.00	0.20	0.17	0.01	0.63	2.29	0.25	<0.10	<1.00		
07.08.2012	286	6.77	2.53	7.40	4.50	9	14	105	13	325	3.02	0.21	0.36	0.02	0.80	3.16	0.39	0.20	<1.00	<0.20	1.40
05.09.2012	117	6.79	2.30	1.39	3.70	2	5	77	17	285	2.65	0.20	0.15	0.01	0.42	1.80	0.30	<0.10	<1.00		
04.10.2012	189	7.00	3.16	18.00	7.40	18	28	205	18	550	4.49	0.30	0.66	0.03	1.05	6.04	0.51	0.20	2.00	<0.20	1.40
07.11.2012	147	6.76	3.62	6.10	5.30	6	11	285	19	545	4.49	0.20	0.26	0.02	0.82	4.95	0.44	0.20	1.00		
06.12.2012	182	6.82	3.05	5.27	3.30	2	8	180	29	415	3.62	0.10	0.21	0.01	0.61	4.81	0.35	0.20	<1.00		
Lower avg.	147	6.83	3.01	6.75	4.04	9	17	198	21	426	3.61	0.18	0.27	0.02	0.66	3.56	0.35	0.14	0.83	0.00	1.40
Upper avg..	147	6.83	3.01	6.75	4.04	9	17	198	21	426	3.61	0.18	0.27	0.02	0.66	3.56	0.35	0.17	1.42	0.20	1.40
Minimum	63	6.67	2.30	0.98	2.40	1	4	77	9	275	2.65	0.09	0.10	0.01	0.42	1.80	0.25	0.10	1.00	0.20	1.40
Maximum	286	7.00	4.05	28.40	7.40	27	51	360	45	590	4.73	0.30	0.66	0.03	1.05	6.04	0.51	0.36	3.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	58	0.10	0.62	8.23	1.30	10	15	94	11	124	0.77	0.06	0.17	0.01	0.18	1.35	0.08	0.08	0.67	0.00	0.00

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]
18.01.2012	60	6.37	2.02	0.67	2.60	2	4	165	10	315	2.33	0.07	1.55	0.01	0.53	3.50	0.20	<0.10	<1.00		
02.02.2012	91	6.33	1.91	0.50	2.50	2	3	160	9	290	2.29	0.06	0.25	0.01	0.32	2.59	0.20	<0.10	5.00	<0.20	1.40
13.03.2012	44	6.62	2.01	0.54	2.50	3	4	150	2	280	2.42	0.09	0.05	0.01	0.27	2.85	0.21	<0.10	2.00		
17.04.2012	93	6.78	2.14	0.49	2.40	1	5	170	10	280	2.22	0.06	0.04	0.01	0.41	3.31	0.20	0.20	<1.00		
06.05.2012	92	6.78	1.99	0.54	2.50	1	5	155	6	300	2.22	0.10	0.20	0.01	0.38	3.08	0.21	<0.10	<1.00	<0.20	1.40
20.06.2012	74	6.66	1.76	0.66	2.20	<1	5	110	6	235	2.00	0.08	0.06	0.01	0.16	2.09	0.20	<0.10	1.00		
17.07.2012	125	6.87	2.01	0.98	2.40	1	2	110	6	240	1.95	0.09	1.76	0.02	1.99	2.41	0.20	<0.10	<1.00		
31.08.2012	164	6.69	2.42	1.76	2.70	3	7	140	<2	325	2.06	0.10	0.17	0.01	0.46	2.87	0.25	0.10	<1.00	<0.20	1.40
20.09.2012	318	6.85	2.04	0.76	2.60	2	5	105	19	255	1.97	0.10	0.07	0.01	0.39	1.70	0.10	<0.10	<1.00		
23.10.2012	159	6.57	2.26	0.81	2.30	2	4	155	13	315	2.14	0.09	0.12	0.02	0.39	4.00	0.20	<0.10	<1.00	<0.20	1.40
06.11.2012	222	6.79	2.13	0.76	2.60	2	2	140	16	285	2.16	0.10	0.09	0.01	0.42	1.90	0.20	<0.10	<1.00		
11.12.2012	112	6.75	2.40	1.04	2.50	2	4	150	25	330	2.40	0.10	0.13	0.01	0.42	2.75	0.21	0.20	<1.00		
Lower avg.	129	6.67	2.09	0.79	2.48	2	4	143	10	288	2.18	0.09	0.37	0.01	0.51	2.75	0.20	0.04	0.67	0.00	1.40
Upper avg..	129	6.67	2.09	0.79	2.48	2	4	143	10	288	2.18	0.09	0.37	0.01	0.51	2.75	0.20	0.12	1.42	0.20	1.40
Minimum	44	6.33	1.76	0.49	2.20	1	2	105	2	235	1.95	0.06	0.04	0.01	0.16	1.70	0.10	0.10	1.00	0.20	1.40
Maximum	318	6.87	2.42	1.76	2.70	3	7	170	25	330	2.42	0.10	1.76	0.02	1.99	4.00	0.25	0.20	5.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	77	0.18	0.19	0.35	0.14	1	1	22	7	32	0.16	0.02	0.60	0.00	0.48	0.67	0.03	0.04	1.17	0.00	0.00

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]
04.01.2012	246	6.23	2.45	1.13	3.00	1	5	110	10	285	2.10	0.10	0.33	0.04	0.60	6.67	0.79	<0.10	<1.00		
06.02.2012	168	6.42	1.39	0.49	2.10	2	4	92	17	330	1.83	0.10	0.15	0.01	0.39	2.51	0.28	0.35	1.00	<0.20	1.40
05.03.2012	175	6.25	1.74	0.53	2.30	<1	2	97	12	225	1.89	0.10	0.17	0.02	1.00	3.54	0.49	0.20	2.00		
10.04.2012	134	6.44	2.02	2.80	2.30	2	9	125	9	280	1.81	0.10	0.32	0.02	0.70	3.92	0.50	0.30	<1.00		
02.05.2012	169	6.13	1.54	0.63	2.50	<1	5	92	9	220	1.69	0.10	0.21	0.02	0.35	4.16	0.58	0.10	1.00	<0.20	1.40
11.06.2012	71	6.24	1.47	0.72	2.00	<1	4	69	4	200	1.22	0.10	0.13	0.01	1.34	2.35	0.30	0.10	<1.00		
10.07.2012	124	6.29	1.46	0.90	2.70	1	5	57	4	200	1.22	0.10	0.21	0.01	0.40	2.75	0.49	<0.10	<1.00		
13.08.2012	88	6.22	1.21	0.76	1.90	1	5	53	3	165	1.05	0.08	0.14	0.01	2.83	3.59	0.30	<0.10	<1.00	<0.20	1.40
05.09.2012	139	6.42	1.31	0.90	2.80	<1	2	46	6	225	1.20	0.10	0.22	0.02	1.16	6.76	1.50	<0.10	<1.00		
08.10.2012	197	6.12	1.55	0.74	3.60	<1	2	61	5	225	1.72	0.10	0.30	0.02	0.93	4.27	0.67	<0.10	<1.00	<0.20	1.40
06.11.2012	204	6.08	1.73	0.83	4.00	2	4	82	18	275	1.92	0.07	0.05	0.01	0.39	1.30	0.29	<0.10	<1.00		
04.12.2012	188	6.16	1.44	0.35	2.60	1	3	77	12	280	1.81	0.09	0.19	0.01	0.35	2.46	0.52	0.10	<1.00		
Lower avg.	159	6.25	1.61	0.90	2.65	1	4	80	9	243	1.62	0.09	0.20	0.02	0.87	3.69	0.56	0.10	0.33	0.00	1.40
Upper avg..	159	6.25	1.61	0.90	2.65	1	4	80	9	243	1.62	0.09	0.20	0.02	0.87	3.69	0.56	0.15	1.08	0.20	1.40
Minimum	71	6.08	1.21	0.35	1.90	1	2	46	3	165	1.05	0.07	0.05	0.01	0.35	1.30	0.28	0.10	1.00	0.20	1.40
Maximum	246	6.44	2.45	2.80	4.00	2	9	125	18	330	2.10	0.10	0.33	0.04	2.83	6.76	1.50	0.35	2.00	0.20	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	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	50	0.12	0.34	0.63	0.64	0	2	24	5	47	0.35	0.01	0.09	0.01	0.71	1.66	0.34	0.09	0.29	0.00	0.00

Orreelva

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]
04.01.2012	21	7.25	18.50	120.00	8.00	263	409	1600	67	3310	6.23	0.63	5.09	0.19	5.15	27.20	2.84	0.78	14.00		
06.02.2012	5	7.20	18.70	5.94	5.50	38	60	1800	65	2420	5.71	0.29	0.36	0.01	1.82	4.12	1.10	0.72	7.00	<0.20	1.40
06.03.2012	3	7.56	17.90	3.75	4.90	27	46	1500	37	2170	4.56	0.20	0.17	0.01	1.51	2.53	0.98	0.40	5.00		
10.04.2012	7	7.20	18.50	5.60	4.60	30	50	1050	23	1675	2.13	0.20	0.17	0.02	1.53	1.90	0.85	0.20	2.00		
07.05.2012	1	7.80	19.15	6.12	4.60	12	47	460	20	1135	0.21	0.10	0.18	0.02	1.49	2.09	1.00	0.20	<1.00	<0.20	1.40
05.06.2012	1	7.74	20.10	9.81	6.10	9	53	<1	42	695	0.20	0.24	0.25	0.03	1.89	2.17	1.00	0.20	2.00		
03.07.2012	2	8.04	19.90	3.08	5.90	17	39	210	24	850	0.86	0.22	0.12	0.01	1.88	5.38	1.20	<0.10	2.00		
15.08.2012	1	7.74	20.10	4.49	5.40	9	39	<1	57	620	2.11	0.33	0.12	0.01	1.44	1.50	1.10	0.20	1.00	<0.20	1.40
10.09.2012	6	7.63	19.20	12.20	5.30	17	37	98	18	825	2.63	0.31	0.22	0.01	1.61	2.16	1.10	0.32	<1.00		
02.10.2012	15	7.91	18.30	9.22	5.90	24	51	490	35	1270	3.49	0.33	0.37	0.02	1.68	2.96	1.10	0.10	<5.00	<0.20	1.40
06.11.2012	8	7.54	18.60	5.95	6.10	23	51	520	42	1320	3.85	0.27	0.32	0.01	1.93	3.73	1.10	0.63	<1.00		
04.12.2012	3	7.51	16.50	4.62	6.10	31	60	1050	38	1720	3.96	0.26	0.21	0.01	2.14	4.87	1.10	0.55	<1.00		
Lower avg.	6	7.59	18.79	15.90	5.70	42	79	732	39	1501	2.99	0.28	0.63	0.03	2.01	5.05	1.21	0.36	2.75	0.00	1.40
Upper avg..	6	7.59	18.79	15.90	5.70	42	79	732	39	1501	2.99	0.28	0.63	0.03	2.01	5.05	1.21	0.37	3.50	0.20	1.40
Minimum	1	7.20	16.50	3.08	4.60	9	37	1	18	620	0.20	0.10	0.12	0.01	1.44	1.50	0.85	0.10	1.00	0.20	1.40
Maximum	21	8.04	20.10	120.00	8.00	263	409	1800	67	3310	6.23	0.63	5.09	0.19	5.15	27.20	2.84	0.78	14.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	6	0.27	1.02	32.89	0.92	70	104	647	17	807	2.00	0.13	1.41	0.05	1.01	7.08	0.52	0.24	3.87	0.00	0.00

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]
23.01.2012	21	6.23	2.81	0.49	0.74	2	4	155	7	255	1.18	<0.05	0.05	0.01	0.30	1.85	0.36	<0.10	<1.00		
07.02.2012	13	6.23	2.79	0.34	0.69	2	4	145	9	225	0.96	0.20	0.04	0.01	0.30	1.50	0.34	0.37	<1.00	<0.20	1.40
05.03.2012	71	6.42	3.01	0.31	0.87	1	4	190	8	255	1.20	0.05	0.04	0.01	0.35	2.23	0.48	<0.10	<1.00		
10.04.2012	25	6.58	2.73	0.49	1.00	2	4	190	3	290	1.20	0.10	0.09	0.02	0.73	2.70	0.41	0.10	1.00		
08.05.2012	60	6.55	2.47	1.72	0.93	2	6	160	3	270	1.11	<0.05	0.10	0.01	0.32	1.70	0.40	0.10	<1.00	<0.20	1.40
11.06.2012	242	6.41	1.64	0.60	0.73	<1	3	92	4	150	0.98	<0.05	0.06	0.01	0.88	1.40	0.26	0.10	<1.00		
03.07.2012	353	6.63	1.18	0.82	0.76	2	5	52	6	137	0.86	0.05	0.09	<0.01	0.31	1.10	0.21	<0.10	2.00		
06.08.2012	110	6.43	0.93	0.80	0.87	1	9	36	5	115	0.58	0.05	0.06	0.01	0.34	1.20	0.25	<0.10	<1.00	<0.20	1.40
04.09.2012	186	6.43	1.02	0.56	1.40	<1	3	38	7	180	0.73	0.08	0.07	0.01	0.37	0.75	0.23	<0.10	<1.00		
03.10.2012	251	6.55	1.20	0.59	1.10	1	4	66	13	145	0.94	0.08	0.06	<0.01	0.36	0.85	0.25	<0.10	<1.00	<0.20	1.40
05.11.2012	35	6.57	1.41	0.47	1.10	1	3	87	8	205	0.88	0.10	0.43	0.02	0.50	3.83	0.45	0.20	<1.00		
04.12.2012	16	6.59	1.56	0.41	1.30	<1	3	115	8	240	1.11	0.06	0.05	<0.01	0.35	1.30	0.34	0.10	<1.00		
Lower avg.	115	6.47	1.90	0.63	0.96	1	4	111	7	206	0.98	0.06	0.09	0.01	0.43	1.70	0.33	0.08	0.25	0.00	1.40
Upper avg..	115	6.47	1.90	0.63	0.96	1	4	111	7	206	0.98	0.08	0.09	0.01	0.43	1.70	0.33	0.13	1.08	0.20	1.40
Minimum	13	6.23	0.93	0.31	0.69	1	3	36	3	115	0.58	0.05	0.04	0.01	0.30	0.75	0.21	0.10	1.00	0.20	1.40
Maximum	353	6.63	3.01	1.72	1.40	2	9	190	13	290	1.20	0.20	0.43	0.02	0.88	3.83	0.48	0.37	2.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	115	0.14	0.80	0.38	0.23	1	2	57	3	59	0.20	0.04	0.11	0.01	0.19	0.87	0.09	0.08	0.29	0.00	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]
12.01.2012	53	6.98	6.19	1.49	2.00	<1	5	180	4	315	3.08	0.07	0.01	0.03	3.50	9.18	0.73	<0.10	1.00		
07.02.2012	25	7.30	6.31	2.36	1.90	3	7	170	10	330	3.04	0.10	0.03	0.01	2.65	4.14	0.74	0.41	3.00	<0.20	1.40
05.03.2012	60	7.26	7.23	0.64	3.20	3	7	250	5	400	3.42	0.09	0.01	0.07	5.23	21.40	0.68	0.30	<1.00		
10.04.2012	77	7.25	7.56	0.85	2.60	2	4	400	4	555	3.57	0.10	0.03	0.06	10.20	21.10	0.89	0.30	<1.00		
08.05.2012	77	7.24	6.06	0.63	3.40	<1	4	240	<2	420	3.47	0.10	0.02	0.05	8.18	15.40	0.95	0.20	<1.00	<0.20	1.40
06.06.2012	276	7.16	3.80	3.67	4.20	3	6	76	4	270	2.27	0.10	0.04	0.03	5.70	12.50	0.78	0.35	1.00		
04.07.2012	117	7.09	4.22	1.23	1.90	1	5	86	3	205	2.16	0.07	0.02	0.03	5.50	10.70	0.60	<0.10	<1.00		
06.08.2012	78	7.11	4.64	2.43	3.50	2	8	85	7	275	2.35	0.10	0.04	0.03	5.16	9.59	0.93	0.41	<1.00	<0.20	1.40
05.09.2012	51	7.45	5.91	0.78	2.60	<1	3	115	3	295	2.59	0.09	0.01	0.02	3.27	5.66	0.62	0.20	<1.00		
04.10.2012	37	7.59	7.03	0.44	1.80	<1	2	160	2	310	2.89	0.08	0.01	0.02	3.08	4.79	0.57	<0.10	<1.00	<0.20	1.40
07.11.2012	44	7.48	7.26	0.40	2.30	<1	3	190	3	345	3.12	0.09	0.01	0.03	3.87	8.10	0.65	0.10	<1.00		
06.12.2012	43	7.37	6.07	0.61	1.70	<1	2	110	6	220	2.78	0.06	0.02	0.02	2.45	5.08	0.64	0.20	<1.00		
Lower avg.	78	7.27	6.02	1.29	2.59	1	5	172	4	328	2.90	0.09	0.02	0.03	4.90	10.64	0.73	0.21	0.42	0.00	1.40
Upper avg..	78	7.27	6.02	1.29	2.59	2	5	172	4	328	2.90	0.09	0.02	0.03	4.90	10.64	0.73	0.23	1.17	0.20	1.40
Minimum	25	6.98	3.80	0.40	1.70	1	2	76	2	205	2.16	0.06	0.01	0.01	2.45	4.14	0.57	0.10	1.00	0.20	1.40
Maximum	276	7.59	7.56	3.67	4.20	3	8	400	10	555	3.57	0.10	0.04	0.07	10.20	21.40	0.95	0.41	3.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	67	0.18	1.23	1.02	0.81	1	2	93	2	95	0.48	0.01	0.01	0.02	2.34	5.98	0.13	0.12	0.58	0.00	0.00

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]
02.01.2012	67	7.07	9.01	0.17	1.40	<1	4	140	<2	275	2.18	0.10	0.02	<0.01	0.34	0.46	0.10	<0.10	7.00		
02.02.2012	45	7.38	15.25	13.40	1.20	6	16	240	2	365	3.27	0.26	0.17	0.01	0.88	1.60	0.32	1.10	2.00		
05.03.2012	88	7.29	8.51	0.49	1.60	<1	4	120	3	205	1.88	0.07	0.02	<0.01	0.30	0.58	0.20	0.20	1.00	<0.20	1.40
10.04.2012	74	7.52	9.22	0.45	1.50	<1	2	81	3	190	1.87	0.10	0.05	0.01	8.08	0.77	0.24	0.10	<1.00		
08.05.2012	90	7.40	8.22	1.03	1.80	<1	3	59	3	146	1.50	0.10	0.03	0.01	0.34	0.35	0.26	0.10	<1.00	<0.20	1.40
06.06.2012	505	7.28	4.58	2.01	1.30	<1	3	25	2	104	1.24	0.10	0.06	<0.01	0.33	0.71	0.33	0.10	<1.00		
04.07.2012	508	7.16	3.20	2.70	0.84	2	7	21	3	81	0.94	0.10	0.08	<0.01	0.27	0.49	0.26	<0.10	<1.00		
13.08.2012	105	7.41	3.40	0.96	0.63	<1	4	13	<2	72	0.77	0.10	0.04	<0.01	0.21	0.29	0.10	<0.10	<1.00	<0.20	1.40
06.09.2012	469	7.20	2.84	11.40	2.30	4	6	9	<2	140	0.94	0.24	0.34	0.01	0.47	0.86	0.33	0.20	<1.00		
05.10.2012	97	7.48	5.29	0.43	1.20	<1	2	25	<2	107	1.28	0.10	0.02	<0.01	0.27	0.31	0.20	<0.10	<1.00	<0.20	1.40
06.11.2012	60	7.49	7.94	0.17	1.90	<1	5	56	4	170	1.87	0.10	0.01	<0.01	0.37	0.25	0.25	0.10	<1.00		
05.12.2012	68	7.86	10.70	0.72	1.60	<1	2	115	2	250	2.18	0.10	0.02	<0.01	0.79	0.35	0.26	0.20	<1.00		
Lower avg.	181	7.38	7.35	2.83	1.44	1	5	75	2	175	1.66	0.12	0.07	0.00	1.05	0.59	0.24	0.18	0.83	0.00	1.40
Upper avg..	181	7.38	7.35	2.83	1.44	2	5	75	3	175	1.66	0.12	0.07	0.01	1.05	0.59	0.24	0.21	1.58	0.20	1.40
Minimum	45	7.07	2.84	0.17	0.63	1	2	9	2	72	0.77	0.07	0.01	0.01	0.21	0.25	0.10	0.10	1.00	0.20	1.40
Maximum	508	7.86	15.25	13.40	2.30	6	16	240	4	365	3.27	0.26	0.34	0.01	8.08	1.60	0.33	1.10	7.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	189	0.21	3.66	4.55	0.46	2	4	69	1	87	0.70	0.06	0.10	0.00	2.22	0.38	0.08	0.28	1.73	0.00	0.00

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]
07.01.2012	34	7.54	6.38	21.00	4.20	16	32	50	2	365	6.40	0.21	0.83	0.03	2.48	30.80	0.63	0.83	3.00		
10.02.2012	32	7.17	6.84	1.09	3.40	1	5	58	5	220	6.35	0.10	0.17	0.01	1.12	7.66	0.20	0.30	<1.00	<0.20	1.40
09.03.2012	27	7.57	7.61	1.70	3.30	<1	7	57	10	255	6.55	0.10	0.19	0.01	2.23	13.70	0.37	0.30	4.00		
10.04.2012	26	7.51	8.06	1.18	3.10	<1	7	44	7	225	5.67	0.08	0.57	0.02	2.88	10.30	0.31	0.49	<1.00		
10.05.2012	58	7.53	9.22	1.17	3.00	1	6	50	<2	180	6.40	0.10	0.01	<0.01	0.34	0.30	0.21	0.20	<1.00	<0.20	1.40
08.06.2012	294	7.18	3.86	1.51	3.30	2	9	19	4	175	3.32	0.10	0.02	<0.01	0.49	0.40	0.29	0.30	<1.00		
12.07.2012	100	6.72	4.17	0.68	3.10	1	7	2	7	160	2.91	0.10	0.01	<0.01	0.50	0.26	0.20	0.20	<1.00		
07.08.2012	120	7.14	4.85	0.90	2.90	<1	5	7	<2	147	2.97	0.10	<0.01	<0.01	0.24	0.20	0.21	<0.10	<1.00	<0.20	1.40
08.09.2012	115	7.50	5.32	0.71	2.80	1	6	8	2	180	3.21	0.20	0.01	<0.01	0.47	0.21	0.20	0.20	2.00		
10.10.2012	159	7.23	4.97	0.55	2.80	<1	4	13	3	165	3.51	0.10	<0.01	<0.01	0.44	0.25	0.22	0.10	<1.00	<0.20	1.40
16.11.2012	62	7.39	5.80	0.28	3.20	<1	2	23	2	175	4.36	0.08	<0.01	<0.01	0.44	0.27	0.20	0.20	<1.00		
07.12.2012	129	7.30	6.30	0.12	2.50	<1	3	56	2	205	4.69	0.08	0.01	<0.01	0.47	0.25	0.27	0.30	<1.00		
Lower avg.	96	7.32	6.11	2.57	3.13	2	8	32	4	204	4.69	0.11	0.15	0.01	1.01	5.38	0.28	0.29	0.75	0.00	1.40
Upper avg..	96	7.32	6.11	2.57	3.13	2	8	32	4	204	4.69	0.11	0.15	0.01	1.01	5.38	0.28	0.29	1.50	0.20	1.40
Minimum	26	6.72	3.86	0.12	2.50	1	2	2	2	147	2.91	0.08	0.01	0.01	0.24	0.20	0.20	0.10	1.00	0.20	1.40
Maximum	294	7.57	9.22	21.00	4.20	16	32	58	10	365	6.55	0.21	0.83	0.03	2.88	30.80	0.63	0.83	4.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	77	0.25	1.62	5.82	0.42	4	8	22	3	59	1.50	0.04	0.27	0.01	0.95	9.31	0.12	0.20	1.00	0.00	0.00

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]
06.02.2012	13	6.74	5.22	3.32	9.60	9	13	495	6	795	4.13	0.36	0.27	0.02	1.30	10.80	0.74	0.53	2.00		
06.05.2012	25	6.90	5.11	2.14	9.00	7	18	465	4	810	4.28	0.33	0.23	0.02	0.95	23.50	0.74	0.36	2.00		
06.08.2012	16	6.82	5.12	2.40	8.80	5	15	375	11	780	3.40	0.28	0.45	0.02	1.37	33.40	0.83	0.35	<1.00		
08.10.2012	27	6.81	5.11	5.02	9.30	5	11	425	4	800	3.70	0.31	0.27	0.02	1.43	33.60	0.71	0.20	<1.00		
Lower avg.	20	6.82	5.14	3.22	9.18	7	14	440	6	796	3.88	0.32	0.30	0.02	1.26	25.32	0.76	0.36	1.00		
Upper avg..	20	6.82	5.14	3.22	9.18	7	14	440	6	796	3.88	0.32	0.30	0.02	1.26	25.32	0.76	0.36	1.50		
Minimum	13	6.74	5.11	2.14	8.80	5	11	375	4	780	3.40	0.28	0.23	0.02	0.95	10.80	0.71	0.20	1.00		
Maximum	27	6.90	5.22	5.02	9.60	9	18	495	11	810	4.28	0.36	0.45	0.02	1.43	33.60	0.83	0.53	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	7	0.07	0.05	1.30	0.35	2	3	52	3	13	0.40	0.03	0.10	0.00	0.21	10.77	0.05	0.14	0.58		

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]
08.02.2012	10	6.17	2.24	1.37	7.20	2	7	145	2	380	3.19	0.20	0.26	0.04	0.79	7.75	0.57	0.20	6.00		
09.05.2012	30	6.35	2.06	0.83	5.10	<1	5	170	3	350	3.21	0.09	0.10	0.02	0.06	2.81	0.23	<0.10	2.00		
08.08.2012	51	6.38	2.32	1.79	5.50	2	8	96	<2	330	2.55	0.24	0.14	0.02	0.57	4.44	0.47	0.10	<1.00		
15.10.2012	29	6.51	2.03	1.11	5.40	1	3	130	4	355	2.74	0.20	0.13	0.02	0.43	4.36	0.38	<0.10	<1.00		
Lower avg.	30	6.35	2.16	1.28	5.80	1	6	135	2	354	2.92	0.18	0.16	0.03	0.46	4.84	0.41	0.08	2.00		
Upper avg..	30	6.35	2.16	1.28	5.80	2	6	135	3	354	2.92	0.18	0.16	0.03	0.46	4.84	0.41	0.12	2.50		
Minimum	10	6.17	2.03	0.83	5.10	1	3	96	2	330	2.55	0.09	0.10	0.02	0.06	2.81	0.23	0.10	1.00		
Maximum	51	6.51	2.32	1.79	7.20	2	8	170	4	380	3.21	0.24	0.26	0.04	0.79	7.75	0.57	0.20	6.00		
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	17	0.14	0.14	0.41	0.95	1	2	31	1	21	0.33	0.06	0.07	0.01	0.30	2.08	0.14	0.05	2.38		

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]
08.02.2012	60	6.26	2.05	0.85	3.00	2	5	180	13	345	2.57	0.10	0.19	0.02	1.17	4.41	0.34	<0.10	1.00		
14.05.2012	132	6.32	1.65	1.09	3.30	<1	3	135	8	275	2.20	0.10	0.24	0.02	0.52	4.09	0.26	0.10	<1.00		
08.08.2012	120	6.37	1.55	0.89	3.10	2	5	105	6	270	1.56	0.20	0.15	0.02	0.73	3.11	0.24	0.10	<1.00		
15.10.2012	100	6.61	2.73	1.61	4.50	3	8	145	8	365	2.10	0.23	0.27	0.03	0.73	4.14	0.28	<0.10	<1.00		
Lower avg.	103	6.39	2.00	1.11	3.48	2	5	141	9	314	2.11	0.16	0.21	0.02	0.79	3.94	0.28	0.05	0.25		
Upper avg..	103	6.39	2.00	1.11	3.48	2	5	141	9	314	2.11	0.16	0.21	0.02	0.79	3.94	0.28	0.10	1.00		
Minimum	60	6.26	1.55	0.85	3.00	1	3	105	6	270	1.56	0.10	0.15	0.02	0.52	3.11	0.24	0.10	1.00		
Maximum	132	6.61	2.73	1.61	4.50	3	8	180	13	365	2.57	0.23	0.27	0.03	1.17	4.41	0.34	0.10	1.00		
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	32	0.15	0.54	0.35	0.70	1	2	31	3	48	0.42	0.07	0.06	0.00	0.27	0.57	0.04	0.00	0.00		

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]
06.02.2012	36	6.47	2.97	3.36	3.90	12	13	205	20	410	3.04	0.20	0.54	0.05	0.53	8.06	0.43	0.39	<1.00		
02.05.2012	67	6.34	2.26	1.90	4.30	<1	6	125	16	380	2.27	0.20	0.40	0.04	1.37	5.61	0.34	0.20	2.00		
13.08.2012	32	7.51	3.32	1.25	4.80	2	7	45	15	300	1.03	0.26	0.34	0.03	0.33	4.33	0.39	0.10	1.00		
08.10.2012	57	6.42	2.07	1.16	5.80	<1	5	59	13	315	1.87	0.27	0.63	0.04	1.62	5.42	0.41	<0.10	2.00		
Lower avg.	48	6.68	2.66	1.92	4.70	4	8	109	16	351	2.05	0.23	0.48	0.04	0.96	5.86	0.39	0.17	1.25		
Upper avg..	48	6.68	2.66	1.92	4.70	4	8	109	16	351	2.05	0.23	0.48	0.04	0.96	5.86	0.39	0.20	1.50		
Minimum	32	6.34	2.07	1.16	3.90	1	5	45	13	300	1.03	0.20	0.34	0.03	0.33	4.33	0.34	0.10	1.00		
Maximum	67	7.51	3.32	3.36	5.80	12	13	205	20	410	3.04	0.27	0.63	0.05	1.62	8.06	0.43	0.39	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	17	0.55	0.59	1.02	0.82	5	4	73	3	52	0.84	0.04	0.13	0.01	0.63	1.57	0.04	0.14	0.58		

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]
08.02.2012	43	6.25	2.16	1.06	3.60	9	12	120	14	300	1.48	0.10	0.52	0.03	0.33	5.39	0.20	<0.10	10.00		
03.05.2012	119	6.51	2.26	1.52	3.50	2	6	120	9	280	1.43	0.10	0.45	0.03	0.53	3.92	0.20	0.10	2.00		
15.08.2012	38	6.38	1.60	1.10	3.10	1	7	88	7	265	0.90	0.10	0.41	0.02	0.41	3.63	0.23	<0.10	<1.00		
04.10.2012	140	6.20	1.93	2.61	5.90	2	5	81	9	340	1.76	0.20	0.72	0.04	0.50	4.97	0.27	0.10	1.00		
Lower avg.	85	6.34	1.99	1.57	4.03	4	8	102	10	296	1.39	0.12	0.53	0.03	0.44	4.48	0.22	0.05	3.25		
Upper avg..	85	6.34	1.99	1.57	4.03	4	8	102	10	296	1.39	0.12	0.53	0.03	0.44	4.48	0.22	0.10	3.50		
Minimum	38	6.20	1.60	1.06	3.10	1	5	81	7	265	0.90	0.10	0.41	0.02	0.33	3.63	0.20	0.10	1.00		
Maximum	140	6.51	2.26	2.61	5.90	9	12	120	14	340	1.77	0.20	0.72	0.04	0.53	5.39	0.27	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	52	0.14	0.29	0.72	1.27	4	3	21	3	33	0.36	0.05	0.14	0.01	0.09	0.84	0.03	0.00	4.36		

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]
07.02.2012	20	6.60	3.79	0.91	2.30	2	6	265	13	425	2.63	0.10	0.27	0.06	0.61	6.96	0.20	0.20	<1.00		
03.05.2012	35	6.62	2.91	8.30	3.00	4	7	160	5	310	1.33	0.10	0.45	0.03	0.25	4.68	0.10	0.10	1.00		
15.08.2012	18	6.59	2.45	0.90	3.70	2	9	145	<2	355	1.20	0.20	0.34	0.03	0.30	3.76	0.10	<0.10	1.00		
04.10.2012	67	6.64	2.43	2.10	5.60	2	7	98	9	335	1.57	0.25	0.72	0.03	0.31	4.44	0.08	<0.10	2.00		
Lower avg.	35	6.61	2.90	3.05	3.65	3	7	167	7	356	1.68	0.16	0.44	0.04	0.37	4.96	0.12	0.08	1.00		
Upper avg..	35	6.61	2.90	3.05	3.65	3	7	167	7	356	1.68	0.16	0.44	0.04	0.37	4.96	0.12	0.12	1.25		
Minimum	18	6.59	2.43	0.90	2.30	2	6	98	2	310	1.20	0.10	0.27	0.03	0.25	3.76	0.08	0.10	1.00		
Maximum	67	6.64	3.79	8.30	5.60	4	9	265	13	425	2.63	0.25	0.72	0.06	0.61	6.96	0.20	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	no	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	22	0.02	0.64	3.54	1.42	1	1	70	5	49	0.65	0.08	0.20	0.02	0.16	1.39	0.05	0.05	0.50		

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]
07.02.2012	40	6.49	4.01	0.78	2.20	2	3	260	22	440	2.33	0.10	0.35	0.05	1.49	6.83	0.27	0.37	3.00		
03.05.2012	72	6.35	2.72	0.87	3.30	2	7	160	3	325	0.71	0.10	0.39	0.03	0.37	4.41	0.30	<0.10	1.00		
15.08.2012	42	6.24	2.16	0.89	6.70	3	13	57	3	385	0.90	0.30	0.75	0.03	2.32	4.49	0.36	0.20	2.00		
04.10.2012	150	6.14	2.08	3.30	7.40	3	9	74	8	360	1.67	0.33	1.53	0.03	0.63	5.66	0.20	<0.10	3.00		
Lower avg.	76	6.30	2.74	1.46	4.90	3	8	138	9	378	1.40	0.21	0.75	0.04	1.20	5.35	0.28	0.14	2.25		
Upper avg..	76	6.30	2.74	1.46	4.90	3	8	138	9	378	1.40	0.21	0.75	0.04	1.20	5.35	0.28	0.19	2.25		
Minimum	40	6.14	2.08	0.78	2.20	2	3	57	3	325	0.71	0.10	0.35	0.03	0.37	4.41	0.20	0.10	1.00		
Maximum	150	6.49	4.01	3.30	7.40	3	13	260	22	440	2.33	0.33	1.53	0.05	2.32	6.83	0.36	0.37	3.00		
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	51	0.15	0.89	1.23	2.54	1	4	93	9	48	0.75	0.13	0.55	0.01	0.89	1.14	0.07	0.13	0.96		

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]
07.02.2012	80	5.78	1.75	0.78	2.00	2	3	105	25	275	0.98	0.10	0.38	0.04	0.76	3.98	0.20	0.20	2.00		
03.05.2012	119	5.72	1.73	0.94	1.70	<1	4	91	17	195	0.96	0.07	0.27	0.02	0.96	2.68	0.10	0.10	2.00		
15.08.2012	103	5.66	1.46	0.78	2.70	1	5	80	11	255	0.79	0.10	0.35	0.02	0.29	2.51	0.20	0.10	<1.00		
04.10.2012	289	5.63	1.41	0.55	2.40	<1	3	73	17	210	0.88	0.08	0.31	0.01	0.26	2.21	0.10	<0.10	1.00		
Lower avg.	148	5.70	1.59	0.76	2.20	1	4	87	18	234	0.90	0.09	0.33	0.02	0.57	2.84	0.15	0.10	1.25		
Upper avg..	148	5.70	1.59	0.76	2.20	1	4	87	18	234	0.90	0.09	0.33	0.02	0.57	2.84	0.15	0.12	1.50		
Minimum	80	5.63	1.41	0.55	1.70	1	3	73	11	195	0.79	0.07	0.27	0.01	0.26	2.21	0.10	0.10	1.00		
Maximum	289	5.78	1.75	0.94	2.70	2	5	105	25	275	0.98	0.10	0.38	0.04	0.96	3.98	0.20	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	yes	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	95	0.07	0.18	0.16	0.44	1	1	14	6	38	0.09	0.02	0.05	0.01	0.35	0.78	0.06	0.05	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]
07.02.2012	30	6.47	3.93	0.32	1.20	2	<1	465	12	600	1.94	0.10	0.15	0.04	0.20	3.03	0.20	0.30	<1.00		
08.05.2012	30	6.58	3.21	0.39	1.20	1	6	285	4	380	1.41	0.07	0.16	0.02	0.27	2.32	0.10	0.10	1.00		
07.08.2012	44	6.56	3.37	0.68	1.70	2	7	250	4	430	1.11	0.08	0.16	0.02	0.25	3.35	0.20	<0.10	<1.00		
08.10.2012	86	6.46	3.17	0.63	1.60	2	4	183	7	390	1.35	0.07	0.17	0.02	0.22	2.47	0.10	<0.10	<1.00		
Lower avg.	48	6.52	3.42	0.50	1.42	2	4	296	7	450	1.45	0.08	0.16	0.03	0.24	2.79	0.15	0.10	0.25		
Upper avg..	48	6.52	3.42	0.50	1.42	2	5	296	7	450	1.45	0.08	0.16	0.03	0.24	2.79	0.15	0.15	1.00		
Minimum	30	6.46	3.17	0.32	1.20	1	1	183	4	380	1.11	0.07	0.15	0.02	0.20	2.32	0.10	0.10	1.00		
Maximum	86	6.58	3.93	0.68	1.70	2	7	465	12	600	1.95	0.10	0.17	0.04	0.27	3.35	0.20	0.30	1.00		
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	27	0.06	0.35	0.18	0.26	1	3	121	4	102	0.35	0.01	0.01	0.01	0.03	0.48	0.06	0.10	0.00		

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]
07.02.2012	4	6.99	18.30	5.68	3.60	52	68	1700	295	2150	4.75	0.22	0.39	0.03	1.90	11.50	0.71	0.59	6.00		
07.05.2012	4	7.30	11.97	1.39	2.30	7	15	885	10	1130	1.72	0.09	0.13	0.01	0.70	3.15	0.43	0.10	<1.00		
15.08.2012	4	7.09	10.90	1.84	2.60	6	15	505	23	880	1.80	0.10	0.15	0.01	0.70	2.32	0.37	0.20	<1.00		
02.10.2012	11	7.00	7.53	2.18	3.50	10	18	560	18	1000	2.33	0.10	0.31	0.02	1.00	3.82	0.45	0.10	<1.00		
Lower avg.	6	7.10	12.18	2.77	3.00	19	29	913	87	1290	2.65	0.13	0.25	0.02	1.08	5.20	0.49	0.25	1.50		
Upper avg..	6	7.10	12.18	2.77	3.00	19	29	913	87	1290	2.65	0.13	0.25	0.02	1.08	5.20	0.49	0.25	2.25		
Minimum	4	6.99	7.53	1.39	2.30	6	15	505	10	880	1.72	0.09	0.13	0.01	0.70	2.32	0.37	0.10	1.00		
Maximum	11	7.30	18.30	5.68	3.60	52	68	1700	295	2150	4.75	0.22	0.39	0.03	1.90	11.50	0.71	0.59	6.00		
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	4	0.14	4.50	1.97	0.65	22	26	551	139	582	1.43	0.06	0.13	0.01	0.57	4.25	0.15	0.23	2.50		

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]
12.02.2012	8	6.29	2.79	<0.10	0.44	<1	2	180	<2	225	2.61	0.06	0.05	0.01	0.20	1.90	<0.05	0.10	<1.00		
06.05.2012	11	6.94	2.47	0.23	0.73	<1	3	100	<2	160	1.22	<0.05	0.12	0.02	0.30	2.39	0.06	0.10	<1.00		
19.08.2012	6	6.81	1.39	0.52	1.10	<1	2	120	2	225	1.05	0.07	0.15	0.01	0.49	3.94	0.08	0.20	1.00		
15.10.2012	15	6.82	1.85	<0.10	0.72	<1	<1	99	2	175	1.96	0.05	0.08	0.01	0.21	1.70	<0.05	0.10	<1.00		
Lower avg.	10	6.72	2.12	0.19	0.75	0	2	125	1	196	1.71	0.04	0.10	0.01	0.30	2.48	0.04	0.12	0.25		
Upper avg..	10	6.72	2.12	0.24	0.75	1	2	125	2	196	1.71	0.06	0.10	0.01	0.30	2.48	0.06	0.12	1.00		
Minimum	6	6.29	1.39	0.10	0.44	1	1	99	2	160	1.05	0.05	0.05	0.01	0.20	1.70	0.05	0.10	1.00		
Maximum	15	6.94	2.79	0.52	1.10	1	3	180	2	225	2.61	0.07	0.15	0.02	0.49	3.94	0.08	0.20	1.00		
More than 70%LOD	yes	yes	yes	no	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	4	0.29	0.63	0.20	0.27	0	1	38	0	34	0.72	0.01	0.05	0.01	0.14	1.01	0.01	0.05	0.00		

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]
14.02.2012	21	6.23	3.24	0.12	0.70	1	2	305	3	370	2.20	0.06	0.08	0.01	0.82	4.66	0.20	0.10	1.00		
14.05.2012	62	6.00	1.90	6.96	3.30	13	23	27	4	240	1.09	0.10	0.63	0.01	0.31	2.82	0.10	0.10	2.00		
14.08.2012	32	6.49	1.99	0.51	1.50	1	6	145	2	270	0.81	0.05	0.11	0.01	0.19	0.82	0.07	<0.10	<1.00		
15.10.2012	40	6.37	1.86	0.21	1.10	1	1	120	4	205	1.24	0.05	0.09	<0.01	0.17	1.40	0.05	<0.10	<1.00		
Lower avg.	39	6.27	2.25	1.95	1.65	4	8	149	3	271	1.34	0.06	0.23	0.01	0.37	2.43	0.11	0.05	0.75		
Upper avg..	39	6.27	2.25	1.95	1.65	4	8	149	3	271	1.34	0.06	0.23	0.01	0.37	2.43	0.11	0.10	1.25		
Minimum	21	6.00	1.86	0.12	0.70	1	1	27	2	205	0.81	0.05	0.08	0.01	0.17	0.82	0.05	0.10	1.00		
Maximum	62	6.49	3.24	6.96	3.30	13	23	305	4	370	2.20	0.10	0.63	0.01	0.82	4.66	0.20	0.10	2.00		
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	17	0.21	0.66	3.34	1.15	6	10	116	1	71	0.60	0.02	0.27	0.00	0.30	1.71	0.07	0.00	0.50		

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]
14.02.2012	18	6.58	2.89	<0.10	0.40	<1	3	100	<2	135	2.20	<0.05	0.03	0.01	0.13	1.20	<0.05	0.20	1.00		
14.05.2012	41	6.33	1.41	0.60	3.30	2	8	29	<2	155	1.07	0.10	0.32	0.01	0.96	2.94	0.26	0.10	2.00		
14.08.2012	43	6.92	2.30	0.28	1.40	<1	3	59	<2	170	1.72	0.10	0.37	0.01	1.14	4.70	0.47	0.30	<1.00		
15.10.2012	27	6.82	1.90	<0.10	0.93	<1	<1	43	3	139	1.76	0.07	0.05	<0.01	0.36	1.30	0.09	<0.10	<1.00		
Lower avg.	32	6.66	2.12	0.22	1.51	1	4	58	1	150	1.69	0.07	0.19	0.01	0.65	2.54	0.20	0.15	0.75		
Upper avg..	32	6.66	2.12	0.27	1.51	1	4	58	2	150	1.69	0.08	0.19	0.01	0.65	2.54	0.22	0.18	1.25		
Minimum	18	6.33	1.41	0.10	0.40	1	1	29	2	135	1.07	0.05	0.03	0.01	0.13	1.20	0.05	0.10	1.00		
Maximum	43	6.92	2.89	0.60	3.30	2	8	100	3	170	2.20	0.10	0.37	0.01	1.14	4.70	0.47	0.30	2.00		
More than 70%LOD	yes	yes	yes	no	yes	no	yes	yes	no	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	12	0.26	0.63	0.24	1.26	1	3	31	1	16	0.47	0.02	0.18	0.00	0.48	1.65	0.19	0.10	0.50		

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]
13.02.2012	52	6.25	2.19	3.54	0.78	1	3	645	5	730	1.35	<0.05	0.13	0.01	0.31	2.55	0.20	<0.10	2.00		
07.05.2012	81	6.61	1.74	0.23	0.66	<1	2	140	<2	195	0.92	0.06	0.03	0.01	0.24	1.60	0.20	<0.10	<1.00		
06.08.2012	144	6.51	1.34	0.45	0.74	1	3	88	2	160	0.71	0.05	0.06	0.01	0.23	1.20	0.20	0.10	<1.00		
08.10.2012	159	6.45	1.82	0.54	1.30	<1	2	205	5	290	1.05	0.08	0.08	0.01	0.55	5.67	0.20	<0.10	<1.00		
Lower avg.	109	6.45	1.77	1.19	0.87	1	3	270	3	344	1.01	0.05	0.08	0.01	0.33	2.76	0.20	0.02	0.50		
Upper avg..	109	6.45	1.77	1.19	0.87	1	3	270	4	344	1.01	0.06	0.08	0.01	0.33	2.76	0.20	0.10	1.25		
Minimum	52	6.25	1.34	0.23	0.66	1	2	88	2	160	0.71	0.05	0.03	0.01	0.23	1.20	0.20	0.10	1.00		
Maximum	159	6.61	2.19	3.54	1.30	1	3	645	5	730	1.35	0.08	0.13	0.01	0.55	5.67	0.20	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	51	0.15	0.35	1.57	0.29	0	1	255	2	263	0.27	0.01	0.04	0.00	0.15	2.02	0.00	0.00	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]
13.02.2012	16	6.24	3.15	0.44	0.52	2	3	370	5	450	1.67	<0.05	0.07	0.02	0.68	3.41	0.26	0.10	1.00		
08.05.2012	24	6.34	2.11	0.33	0.73	<1	3	120	<2	240	1.03	<0.05	0.08	0.02	0.28	1.90	0.20	0.10	<1.00		
14.08.2012	20	6.44	0.84	0.21	0.50	1	3	30	<2	87	0.41	0.06	0.03	<0.01	0.24	0.51	0.07	<0.10	<1.00		
09.10.2012	61	6.22	1.20	0.18	1.00	1	2	67	<2	150	0.81	0.06	0.08	0.01	0.26	1.30	0.09	<0.10	<1.00		
Lower avg.	30	6.31	1.82	0.29	0.69	1	3	147	1	232	0.98	0.03	0.07	0.01	0.36	1.78	0.16	0.05	0.25		
Upper avg..	30	6.31	1.82	0.29	0.69	1	3	147	3	232	0.98	0.06	0.07	0.01	0.36	1.78	0.16	0.10	1.00		
Minimum	16	6.22	0.84	0.18	0.50	1	2	30	2	87	0.41	0.05	0.03	0.01	0.24	0.51	0.07	0.10	1.00		
Maximum	61	6.44	3.15	0.44	1.00	2	3	370	5	450	1.67	0.06	0.08	0.02	0.68	3.41	0.26	0.10	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	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	21	0.10	1.03	0.12	0.23	1	1	153	2	158	0.53	0.01	0.02	0.01	0.21	1.23	0.09	0.00	0.00		

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]
07.02.2012	6	6.54	3.58	0.46	0.84	2	2	335	19	475	1.48	0.26	0.08	0.02	0.34	2.30	0.38	<0.10	<1.00		
08.05.2012	5	6.60	3.00	0.51	0.89	<1	3	140	4	215	0.92	0.20	0.08	0.01	0.30	1.70	0.25	0.10	<1.00		
14.08.2012	4	6.66	2.95	0.59	1.20	2	6	210	9	365	0.88	0.35	0.05	0.01	0.30	1.10	0.26	<0.10	<1.00		
08.10.2012	22	6.54	2.56	0.98	1.80	2	4	170	10	315	1.11	0.20	0.23	0.02	1.10	4.86	0.48	<0.10	<1.00		
Lower avg.	9	6.58	3.02	0.64	1.18	2	4	214	11	343	1.10	0.25	0.11	0.02	0.51	2.49	0.34	0.02	0.00		
Upper avg..	9	6.58	3.02	0.64	1.18	2	4	214	11	343	1.10	0.25	0.11	0.02	0.51	2.49	0.34	0.10	1.00		
Minimum	4	6.54	2.56	0.46	0.84	1	2	140	4	215	0.88	0.20	0.05	0.01	0.30	1.10	0.25	0.10	1.00		
Maximum	22	6.66	3.58	0.98	1.80	2	6	335	19	475	1.48	0.35	0.23	0.02	1.10	4.86	0.48	0.10	1.00		
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	9	0.06	0.42	0.24	0.44	1	2	86	6	108	0.27	0.07	0.08	0.01	0.39	1.65	0.11	0.00	0.00		

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]
06.02.2012	21	6.76	11.70	31.60	0.54	2	5	295	10	405	4.69	<0.05	0.11	<0.01	0.88	3.34	0.25	<0.10	<1.00		
08.05.2012	26	6.75	3.23	0.33	1.50	1	3	155	24	320	3.10	<0.05	0.06	0.01	1.00	2.38	0.22	0.10	<1.00		
07.08.2012	122	6.53	0.94	5.62	0.19	8	10	24	<2	60	1.35	<0.05	0.16	<0.01	0.44	1.80	0.33	0.33	<1.00		
09.10.2012	43	6.65	2.59	1.13	0.87	1	5	93	<2	170	2.87	<0.05	0.03	0.01	0.49	0.74	0.09	<0.10	<1.00		
Lower avg.	53	6.67	4.62	9.67	0.78	3	6	142	9	239	3.00	0.00	0.09	0.00	0.70	2.06	0.22	0.11	0.00		
Upper avg..	53	6.67	4.62	9.67	0.78	3	6	142	10	239	3.00	0.05	0.09	0.01	0.70	2.06	0.22	0.16	1.00		
Minimum	21	6.53	0.94	0.33	0.19	1	3	24	2	60	1.35	0.05	0.03	0.01	0.44	0.74	0.09	0.10	1.00		
Maximum	122	6.76	11.70	31.60	1.50	8	10	295	24	405	4.69	0.05	0.16	0.01	1.00	3.34	0.33	0.33	1.00		
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	47	0.11	4.82	14.80	0.56	3	3	115	10	154	1.37	0.00	0.06	0.00	0.28	1.09	0.10	0.12	0.00		

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]
03.02.2012	33	6.09	2.34	0.35	1.10	2	5	155	3	265	1.41	<0.05	0.04	0.01	0.43	2.30	0.20	<0.10	6.00		
15.05.2012	129	6.15	2.35	1.17	2.50	7	18	77	5	250	0.77	<0.05	0.09	0.01	0.38	1.90	0.21	<0.10	1.00		
17.08.2012	56	6.24	1.36	0.55	0.82	1	4	38	5	120	0.56	<0.05	0.03	<0.01	0.22	1.10	0.09	<0.10	<1.00		
19.10.2012	43	6.26	1.66	0.75	2.70	3	7	7	<2	220	1.18	<0.05	0.08	<0.01	0.29	1.40	0.20	<0.10	<1.00		
Lower avg.	65	6.18	1.93	0.70	1.78	3	9	69	3	214	0.98	0.00	0.06	0.00	0.33	1.67	0.18	0.00	1.75		
Upper avg..	65	6.18	1.93	0.70	1.78	3	9	69	4	214	0.98	0.05	0.06	0.01	0.33	1.67	0.18	0.10	2.25		
Minimum	33	6.09	1.36	0.35	0.82	1	4	7	2	120	0.56	0.05	0.03	0.01	0.22	1.10	0.09	0.10	1.00		
Maximum	129	6.26	2.35	1.17	2.70	7	18	155	5	265	1.41	0.05	0.09	0.01	0.43	2.30	0.21	0.10	6.00		
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	43	0.08	0.50	0.35	0.96	3	6	64	2	65	0.39	0.00	0.03	0.00	0.09	0.53	0.06	0.00	2.50		

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]
03.02.2012	39	6.44	2.22	0.77	0.82	2	7	170	6	265	1.22	<0.05	0.03	0.01	0.23	1.90	0.08	0.20	4.00		
15.05.2012	149	6.21	1.90	1.08	1.50	3	12	110	2	220	0.75	<0.05	0.05	0.01	0.27	1.50	0.10	<0.10	<1.00		
17.08.2012	43	6.58	1.60	0.74	0.89	1	4	62	5	185	0.73	<0.05	0.01	<0.01	0.22	1.00	0.09	<0.10	<1.00		
19.10.2012	43	6.30	1.73	0.65	1.40	2	6	60	4	235	1.01	<0.05	0.04	<0.01	0.28	1.60	0.10	<0.10	<1.00		
Lower avg.	68	6.38	1.86	0.81	1.15	2	7	101	4	226	0.93	0.00	0.03	0.00	0.25	1.50	0.09	0.05	1.00		
Upper avg..	68	6.38	1.86	0.81	1.15	2	7	101	4	226	0.93	0.05	0.03	0.01	0.25	1.50	0.09	0.12	1.75		
Minimum	39	6.21	1.60	0.65	0.82	1	4	60	2	185	0.73	0.05	0.01	0.01	0.22	1.00	0.08	0.10	1.00		
Maximum	149	6.58	2.22	1.08	1.50	3	12	170	6	265	1.22	0.05	0.05	0.01	0.28	1.90	0.10	0.20	4.00		
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	54	0.16	0.27	0.19	0.35	1	3	52	2	33	0.23	0.00	0.02	0.00	0.03	0.37	0.01	0.05	1.50		

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]
03.02.2012	15	6.21	4.11	0.34	0.79	2	3	160	8	265	2.12	<0.05	0.02	0.01	0.47	2.65	0.20	<0.10	2.00		
15.05.2012	57	6.11	1.83	1.27	1.80	4	9	52	3	165	0.86	<0.05	0.10	0.01	0.22	1.40	0.10	<0.10	<1.00		
17.08.2012	16	6.68	1.06	0.58	1.10	2	5	<1	4	93	0.19	0.06	0.04	<0.01	0.13	0.46	<0.05	<0.10	<1.00		
19.10.2012	17	6.42	1.66	0.51	2.70	2	6	38	<2	195	1.37	<0.05	0.07	<0.01	0.25	1.30	0.10	0.10	<1.00		
Lower avg.	26	6.36	2.16	0.68	1.60	3	6	63	4	180	1.13	0.02	0.06	0.00	0.27	1.45	0.10	0.02	0.50		
Upper avg..	26	6.36	2.16	0.68	1.60	3	6	63	4	180	1.13	0.05	0.06	0.01	0.27	1.45	0.11	0.10	1.25		
Minimum	15	6.11	1.06	0.34	0.79	2	3	1	2	93	0.19	0.05	0.02	0.01	0.13	0.46	0.05	0.10	1.00		
Maximum	57	6.68	4.11	1.27	2.70	4	9	160	8	265	2.12	0.06	0.10	0.01	0.47	2.65	0.20	0.10	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	21	0.25	1.34	0.41	0.85	1	3	68	3	71	0.82	0.01	0.03	0.00	0.14	0.90	0.06	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]
11.02.2012	21	6.46	2.11	<0.10	0.82	2	3	195	<2	305	1.43	<0.05	0.01	<0.01	0.24	0.88	0.10	<0.10	2.00		
06.06.2012	50	6.41	4.40	0.88	0.87	<1	4	175	3	235	1.30	<0.05	0.04	<0.01	4.00	1.70	0.10	<0.10	<1.00		
15.08.2012	59	6.54	1.83	0.72	0.64	1	6	86	3	170	1.01	<0.05	0.02	<0.01	0.22	0.62	0.10	<0.10	<1.00		
10.10.2012	37	6.63	1.83	0.40	0.82	1	3	145	4	235	1.33	<0.05	0.02	<0.01	0.22	0.70	0.08	<0.10	<1.00		
Lower avg.	42	6.51	2.54	0.50	0.79	1	4	150	3	236	1.27	0.00	0.02	0.00	1.17	0.98	0.10	0.00	0.50		
Upper avg..	42	6.51	2.54	0.52	0.79	1	4	150	3	236	1.27	0.05	0.02	0.00	1.17	0.98	0.10	0.10	1.25		
Minimum	21	6.41	1.83	0.10	0.64	1	3	86	2	170	1.01	0.05	0.01	0.01	0.22	0.62	0.08	0.10	1.00		
Maximum	59	6.63	4.40	0.88	0.87	2	6	195	4	305	1.43	0.05	0.04	0.01	4.00	1.70	0.10	0.10	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	17	0.10	1.25	0.35	0.10	1	1	48	1	55	0.18	0.00	0.01	0.00	1.89	0.50	0.01	0.00	0.50		

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]
13.02.2012	32	6.89	3.22	0.22	0.96	1	2	185	2	300	2.61	0.05	<0.01	<0.01	0.40	0.85	0.10	0.20	1.00		
30.05.2012	289	6.64	2.69	10.50	1.60	<1	13	100	3	220	2.65	<0.05	0.10	<0.01	1.15	3.17	0.49	0.70	<1.00		
22.08.2012	88	7.13	2.32	1.08	0.83	2	5	40	<2	125	2.13	<0.05	0.02	<0.01	0.36	0.74	0.10	0.10	1.00		
18.10.2012	45	6.44	4.12	0.40	0.79	<1	1	150	3	285	2.87	<0.05	0.04	<0.01	0.48	0.65	0.10	0.10	<1.00		
Lower avg.	114	6.78	3.09	3.05	1.04	1	5	119	2	233	2.57	0.01	0.04	0.00	0.60	1.35	0.20	0.27	0.50		
Upper avg..	114	6.78	3.09	3.05	1.04	1	5	119	3	233	2.57	0.05	0.04	0.00	0.60	1.35	0.20	0.27	1.00		
Minimum	32	6.44	2.32	0.22	0.79	1	1	40	2	125	2.13	0.05	0.01	0.01	0.36	0.65	0.10	0.10	1.00		
Maximum	289	7.13	4.12	10.50	1.60	2	13	185	3	300	2.87	0.05	0.10	0.01	1.15	3.17	0.49	0.70	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	120	0.30	0.78	4.98	0.38	1	5	63	1	80	0.31	0.00	0.04	0.00	0.37	1.21	0.20	0.29	0.00		

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]
07.02.2012	20	6.85	2.08	0.44	1.60	2	6	68	5	170	1.89	<0.05	0.01	0.01	0.29	0.29	0.10	<0.10	1.00		
23.05.2012	124	6.72	2.04	3.09	1.90	2	5	27	4	113	1.41	0.06	0.04	<0.01	0.55	0.56	0.25	0.85	<1.00		
22.08.2012	33	6.87	2.23	0.81	2.40	<1	3	30	<2	155	1.33	<0.05	0.02	<0.01	0.38	0.42	0.27	0.20	<1.00		
03.10.2012	27	6.83	2.08	0.52	1.20	<1	2	42	4	125	1.24	<0.05	0.02	<0.01	0.36	0.30	0.10	<0.10	<1.00		
Lower avg.	51	6.82	2.11	1.21	1.78	1	4	42	3	141	1.47	0.02	0.02	0.00	0.40	0.39	0.18	0.26	0.25		
Upper avg..	51	6.82	2.11	1.21	1.78	2	4	42	4	141	1.47	0.05	0.02	0.01	0.40	0.39	0.18	0.31	1.00		
Minimum	20	6.72	2.04	0.44	1.20	1	2	27	2	113	1.24	0.05	0.01	0.01	0.29	0.29	0.10	0.10	1.00		
Maximum	124	6.87	2.23	3.09	2.40	2	6	68	5	170	1.89	0.06	0.04	0.01	0.55	0.56	0.27	0.85	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	49	0.07	0.08	1.26	0.51	1	2	19	1	26	0.29	0.01	0.01	0.00	0.11	0.13	0.09	0.36	0.00		

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]
07.02.2012	31	7.21	6.91	4.42	2.60	5	9	220	29	440	3.59	0.08	0.08	0.02	1.79	2.48	1.30	0.81	<1.00		
10.05.2012	167	7.06	6.31	5.25	4.10	8	15	80	7	245	3.12	0.10	0.14	0.01	2.06	3.06	1.70	0.75	1.00		
09.08.2012	113	7.24	6.17	6.02	5.30	3	8	18	3	235	2.42	0.20	0.13	0.01	2.05	2.85	1.80	0.51	<1.00		
08.10.2012	131	6.91	4.61	59.10	8.30	48	65	47	5	380	5.61	0.34	0.70	0.03	2.62	8.98	4.72	3.34	1.00		
Lower avg.	111	7.10	6.00	18.70	5.08	16	24	91	11	325	3.69	0.18	0.26	0.02	2.13	4.34	2.38	1.35	0.50		
Upper avg..	111	7.10	6.00	18.70	5.08	16	24	91	11	325	3.69	0.18	0.26	0.02	2.13	4.34	2.38	1.35	1.00		
Minimum	31	6.91	4.61	4.42	2.60	3	8	18	3	235	2.42	0.08	0.08	0.01	1.79	2.48	1.30	0.51	1.00		
Maximum	167	7.24	6.91	59.10	8.30	48	65	220	29	440	5.61	0.34	0.70	0.03	2.62	8.98	4.72	3.34	1.00		
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	58	0.15	0.98	26.94	2.42	21	27	89	12	101	1.37	0.12	0.29	0.01	0.35	3.10	1.58	1.33	0.00		

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]
08.02.2012	32	7.09	3.23	1.18	2.50	2	4	105	5	230	1.86	0.07	0.03	<0.01	0.89	1.00	0.71	0.20	2.00		
10.05.2012	148	7.00	3.16	1.18	2.50	1	5	98	5	195	1.94	<0.05	0.01	<0.01	0.54	0.57	0.37	<0.10	<1.00		
09.08.2012	90	7.10	3.14	0.64	2.20	1	4	43	10	200	1.56	0.08	0.02	<0.01	0.47	0.72	0.63	0.10	<1.00		
08.10.2012	115	7.01	3.68	6.40	3.30	5	9	96	5	285	2.67	0.10	0.16	0.01	1.17	1.80	1.30	0.73	<1.00		
Lower avg.	96	7.05	3.30	2.35	2.62	2	6	86	6	228	2.01	0.06	0.05	0.00	0.77	1.02	0.75	0.26	0.50		
Upper avg..	96	7.05	3.30	2.35	2.62	2	6	86	6	228	2.01	0.08	0.05	0.01	0.77	1.02	0.75	0.28	1.25		
Minimum	32	7.00	3.14	0.64	2.20	1	4	43	5	195	1.56	0.05	0.01	0.01	0.47	0.57	0.37	0.10	1.00		
Maximum	148	7.10	3.68	6.40	3.30	5	9	105	10	285	2.67	0.10	0.16	0.01	1.17	1.80	1.30	0.73	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	49	0.05	0.26	2.71	0.47	2	2	29	3	41	0.47	0.02	0.07	0.00	0.33	0.55	0.39	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]
08.02.2012	24	6.94	3.37	13.80	2.90	9	11	89	16	260	3.36	0.21	0.59	0.02	2.47	12.10	2.34	2.40	3.00		
10.05.2012	100	6.67	2.41	10.80	3.20	7	16	14	3	137	1.64	<0.05	0.08	0.01	0.79	1.60	0.37	0.20	1.00		
09.08.2012	56	6.96	2.94	3.66	6.40	2	7	27	<2	255	1.28	0.20	0.11	0.01	2.99	4.67	0.83	0.30	1.00		
08.10.2012	76	6.78	2.86	21.40	7.00	9	18	45	7	300	2.67	0.20	0.34	0.02	2.70	6.07	1.30	0.87	1.00		
Lower avg.	64	6.84	2.90	12.42	4.88	7	13	44	7	238	2.24	0.15	0.28	0.01	2.24	6.11	1.21	0.94	1.50		
Upper avg..	64	6.84	2.90	12.42	4.88	7	13	44	7	238	2.24	0.16	0.28	0.01	2.24	6.11	1.21	0.94	1.50		
Minimum	24	6.67	2.41	3.66	2.90	2	7	14	2	137	1.28	0.05	0.08	0.01	0.79	1.60	0.37	0.20	1.00		
Maximum	100	6.96	3.37	21.40	7.00	9	18	89	16	300	3.36	0.21	0.59	0.02	2.99	12.10	2.34	2.40	3.00		
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	32	0.14	0.39	7.35	2.13	3	5	33	6	70	0.95	0.08	0.24	0.01	0.99	4.41	0.84	1.02	1.00		

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]
08.02.2012	16	7.37	9.46	2.67	3.20	4	6	370	30	595	2.97	0.10	0.19	0.01	2.23	19.40	0.77	0.36	4.00		
10.05.2012	76	6.86	2.70	4.55	3.30	3	9	31	3	146	1.48	0.09	0.09	0.01	1.01	1.20	0.51	0.20	2.00		
09.08.2012	35	7.24	4.63	1.76	5.10	2	7	34	6	250	1.30	0.20	0.06	<0.01	0.61	1.00	0.66	0.20	<1.00		
09.10.2012	50	7.14	4.00	4.45	6.30	4	8	80	2	300	2.07	0.10	0.12	<0.01	0.89	1.30	0.79	0.30	1.00		
Lower avg.	44	7.15	5.20	3.36	4.47	3	8	129	10	323	1.96	0.12	0.12	0.00	1.18	5.72	0.68	0.26	1.75		
Upper avg..	44	7.15	5.20	3.36	4.47	3	8	129	10	323	1.96	0.12	0.12	0.01	1.18	5.72	0.68	0.26	2.00		
Minimum	16	6.86	2.70	1.76	3.20	2	6	31	2	146	1.31	0.09	0.06	0.01	0.61	1.00	0.51	0.20	1.00		
Maximum	76	7.37	9.46	4.55	6.30	4	9	370	30	595	2.97	0.20	0.19	0.01	2.23	19.40	0.79	0.36	4.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	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	26	0.22	2.95	1.37	1.50	1	1	162	13	193	0.75	0.05	0.06	0.00	0.72	9.12	0.13	0.08	1.41		

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]
08.02.2012	13	7.09	5.08	1.97	4.40	3	4	190	3	380	1.72	0.08	0.04	<0.01	0.96	0.94	0.45	0.10	2.00		
10.05.2012	59	7.11	4.58	1.27	3.90	1	7	165	4	320	1.47	0.07	0.04	0.01	0.78	1.10	0.47	0.10	<1.00		
09.08.2012	22	6.92	4.43	0.87	4.00	2	6	90	9	270	1.07	0.20	0.04	0.01	0.46	0.64	0.44	<0.10	2.00		
11.10.2012	23	7.12	4.45	0.81	4.00	1	3	125	<2	310	1.20	0.10	0.03	<0.01	0.53	0.81	0.40	0.20	<1.00		
Lower avg.	29	7.06	4.64	1.23	4.08	2	5	143	4	320	1.36	0.11	0.03	0.00	0.68	0.87	0.44	0.10	1.00		
Upper avg..	29	7.06	4.64	1.23	4.08	2	5	143	5	320	1.36	0.11	0.03	0.01	0.68	0.87	0.44	0.12	1.50		
Minimum	13	6.92	4.43	0.81	3.90	1	3	90	2	270	1.07	0.07	0.03	0.01	0.46	0.64	0.40	0.10	1.00		
Maximum	59	7.12	5.08	1.97	4.40	3	7	190	9	380	1.72	0.20	0.04	0.01	0.96	1.10	0.47	0.20	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	20	0.09	0.30	0.53	0.22	1	2	44	3	45	0.29	0.06	0.01	0.00	0.23	0.20	0.03	0.05	0.58		

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]
13.02.2012	14	6.69	1.82	10.40	2.50	13	15	385	150	900	2.48	0.09	0.21	0.01	2.09	15.90	1.10	29.30	4.00		
14.05.2012	68	6.97	3.16	8.50	2.70	6	9	42	<2	150	1.72	0.08	0.10	0.01	0.59	1.50	0.59	0.20	<1.00		
07.08.2012	30	6.87	4.29	2.77	2.00	3	5	22	5	147	1.05	0.09	0.06	<0.01	0.66	0.97	0.39	<0.10	<1.00		
09.10.2012	36	6.80	2.62	4.41	5.10	3	7	23	<2	190	1.98	0.09	0.13	<0.01	0.86	1.70	0.57	0.34	1.00		
Lower avg.	37	6.83	2.97	6.52	3.08	6	9	118	39	347	1.81	0.09	0.13	0.00	1.05	5.02	0.66	7.46	1.25		
Upper avg..	37	6.83	2.97	6.52	3.08	6	9	118	40	347	1.81	0.09	0.13	0.01	1.05	5.02	0.66	7.48	1.75		
Minimum	14	6.69	1.82	2.77	2.00	3	5	22	2	147	1.05	0.08	0.06	0.01	0.59	0.97	0.39	0.10	1.00		
Maximum	68	6.97	4.29	10.40	5.10	13	15	385	150	900	2.48	0.09	0.21	0.01	2.09	15.90	1.10	29.30	4.00		
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	23	0.12	1.04	3.54	1.38	5	4	178	74	369	0.60	0.01	0.06	0.00	0.70	7.26	0.31	14.54	1.50		

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]
03.02.2012	43	7.31	7.00	4.87	1.50	5	5	69	3	170	1.60	0.20	0.11	0.01	0.56	1.50	0.56	0.42	<1.00		
08.05.2012	66	7.13	4.09	0.60	0.84	<1	4	1	3	110	0.92	<0.05	0.01	0.01	0.34	0.72	0.24	<0.10	<1.00		
09.08.2012	95	7.33	3.97	0.30	0.83	<1	2	23	5	100	0.66	0.09	0.01	<0.01	0.30	0.84	0.34	<0.10	<1.00		
05.10.2012	52	7.35	3.74	0.57	0.73	<1	<1	29	<2	106	0.79	0.08	0.02	<0.01	0.29	0.91	0.37	<0.10	<1.00		
Lower avg.	64	7.28	4.70	1.58	0.98	1	3	31	3	122	0.99	0.09	0.04	0.00	0.38	0.99	0.38	0.10	0.00		
Upper avg..	64	7.28	4.70	1.58	0.98	2	3	31	3	122	0.99	0.10	0.04	0.01	0.38	0.99	0.38	0.18	1.00		
Minimum	43	7.13	3.74	0.30	0.73	1	1	1	2	100	0.66	0.05	0.01	0.01	0.29	0.72	0.24	0.10	1.00		
Maximum	95	7.35	7.00	4.87	1.50	5	5	69	5	170	1.61	0.20	0.11	0.01	0.56	1.50	0.56	0.42	1.00		
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	23	0.10	1.54	2.19	0.35	2	2	28	1	33	0.42	0.07	0.05	0.00	0.13	0.35	0.13	0.16	0.00		

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]
03.02.2012	66	7.04	4.09	0.70	0.79	2	3	67	13	146	1.30	0.10	0.04	0.02	0.39	1.20	0.32	0.32	<1.00		
08.05.2012	106	7.38	5.78	4.68	1.10	<1	6	72	3	146	1.28	0.07	0.02	0.01	0.20	0.60	0.29	0.10	2.00		
09.08.2012	263	7.34	4.61	0.35	0.76	<1	4	28	3	114	0.98	0.08	0.01	<0.01	0.30	0.42	0.21	<0.10	2.00		
05.10.2012	97	7.41	4.20	0.53	0.64	<1	1	26	3	106	1.09	0.06	0.01	<0.01	0.29	0.33	0.29	<0.10	<1.00		
Lower avg.	133	7.29	4.67	1.56	0.82	1	4	48	6	128	1.17	0.08	0.02	0.01	0.30	0.64	0.28	0.11	1.00		
Upper avg..	133	7.29	4.67	1.56	0.82	1	4	48	6	128	1.17	0.08	0.02	0.01	0.30	0.64	0.28	0.16	1.50		
Minimum	66	7.04	4.09	0.35	0.64	1	1	26	3	106	0.98	0.06	0.01	0.01	0.20	0.33	0.21	0.10	1.00		
Maximum	263	7.41	5.78	4.68	1.10	2	6	72	13	146	1.31	0.10	0.04	0.02	0.39	1.20	0.32	0.32	2.00		
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	88	0.17	0.77	2.08	0.20	1	2	25	5	21	0.16	0.02	0.02	0.01	0.08	0.39	0.05	0.11	0.58		

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]
27.02.2012	12	7.33	9.43	0.23	1.20	<1	5	130	52	330	4.75	0.10	0.03	<0.01	0.67	1.10	0.45	0.30	1.00		
23.05.2012	48	7.24	6.61	2.00	1.60	2	4	91	4	190	2.18	0.06	0.04	0.01	0.78	1.80	0.67	0.67	<1.00		
26.08.2012	32	7.36	3.64	1.18	0.38	<1	2	7	<2	58	1.59	0.10	0.03	0.02	0.36	0.99	0.41	0.10	<1.00		
11.10.2012	20	7.45	5.14	1.27	1.70	2	2	15	<2	114	2.50	0.09	0.02	<0.01	0.33	0.97	0.47	<0.10	<1.00		
Lower avg.	28	7.34	6.20	1.17	1.22	1	3	61	14	173	2.76	0.09	0.03	0.01	0.53	1.22	0.50	0.27	0.25		
Upper avg..	28	7.34	6.20	1.17	1.22	2	3	61	15	173	2.76	0.09	0.03	0.01	0.53	1.22	0.50	0.29	1.00		
Minimum	12	7.24	3.64	0.23	0.38	1	2	7	2	58	1.59	0.06	0.02	0.01	0.33	0.97	0.41	0.10	1.00		
Maximum	48	7.45	9.43	2.00	1.70	2	5	130	52	330	4.75	0.10	0.04	0.02	0.78	1.80	0.67	0.67	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	16	0.09	2.47	0.73	0.60	1	2	60	25	118	1.38	0.02	0.01	0.01	0.22	0.39	0.12	0.27	0.00		

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]
08.02.2012	22	7.54	9.52	0.25	0.82	<1	3	90	3	190	3.08	<0.05	0.01	<0.01	0.50	0.34	0.10	0.10	<1.00		
07.05.2012	38	7.55	8.75	0.88	1.80	2	6	53	<2	165	2.80	<0.05	0.01	<0.01	0.43	0.36	0.20	<0.10	<1.00		
13.08.2012	75	7.58	7.22	2.22	0.77	2	4	19	2	94	2.25	0.10	0.06	0.01	0.46	0.47	0.35	0.20	<1.00		
14.10.2012	49	7.73	8.19	1.41	0.89	<1	2	33	3	126	2.50	<0.05	0.02	<0.01	0.40	0.33	0.26	0.20	<1.00		
Lower avg.	46	7.60	8.42	1.19	1.07	1	4	49	2	144	2.66	0.02	0.02	0.00	0.45	0.38	0.23	0.12	0.00		
Upper avg..	46	7.60	8.42	1.19	1.07	2	4	49	3	144	2.66	0.06	0.02	0.01	0.45	0.38	0.23	0.15	1.00		
Minimum	22	7.54	7.22	0.25	0.77	1	2	19	2	94	2.25	0.05	0.01	0.01	0.40	0.33	0.10	0.10	1.00		
Maximum	75	7.73	9.52	2.22	1.80	2	6	90	3	190	3.08	0.10	0.06	0.01	0.50	0.47	0.35	0.20	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	22	0.09	0.97	0.83	0.49	1	2	31	1	42	0.36	0.03	0.02	0.00	0.05	0.07	0.11	0.06	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]
08.02.2012	20	7.41	5.61	1.70	1.10	1	4	73	2	180	2.22	<0.05	0.06	<0.01	1.42	0.91	0.26	0.20	<1.00		
07.05.2012	35	7.42	7.02	2.28	1.40	3	5	70	4	175	2.35	<0.05	0.02	0.01	0.11	0.45	0.22	<0.10	<1.00		
13.08.2012	68	7.55	6.17	2.99	0.66	2	3	20	5	96	1.75	0.06	0.05	<0.01	0.38	0.43	0.36	0.20	<1.00		
14.10.2012	45	7.68	6.10	1.97	0.85	2	3	26	3	114	1.98	<0.05	0.02	<0.01	0.39	0.27	0.33	0.20	<1.00		
Lower avg.	42	7.52	6.22	2.24	1.00	2	4	47	4	141	2.08	0.02	0.04	0.00	0.57	0.52	0.29	0.15	0.00		
Upper avg..	42	7.52	6.22	2.24	1.00	2	4	47	4	141	2.08	0.05	0.04	0.00	0.57	0.52	0.29	0.18	1.00		
Minimum	20	7.41	5.61	1.70	0.66	1	3	20	2	96	1.75	0.05	0.02	0.01	0.11	0.27	0.22	0.10	1.00		
Maximum	68	7.68	7.02	2.99	1.40	3	5	73	5	180	2.35	0.06	0.06	0.01	1.42	0.91	0.36	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	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	20	0.13	0.59	0.56	0.32	1	1	28	1	43	0.27	0.01	0.02	0.00	0.58	0.28	0.06	0.05	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]
07.02.2012	51	7.25	6.72	0.49	2.00	<1	5	130	18	325	10.50	<0.05	0.03	<0.01	0.43	1.70	0.24	0.52	<1.00		
03.05.2012	88	6.89	3.20	3.00	0.98	4	11	75	185	600	3.17	0.09	0.24	0.02	1.84	7.13	0.61	0.36	<1.00		
07.08.2012	260	7.27	4.25	0.91	3.00	2	8	1	5	155	5.18	0.07	0.01	<0.01	0.32	0.50	0.26	0.20	<1.00		
09.10.2012	227	7.07	3.97	0.97	3.20	1	5	9	32	245	6.50	0.09	0.02	<0.01	0.34	1.10	0.34	0.31	1.00		
Lower avg.	157	7.12	4.54	1.34	2.30	2	7	54	60	331	6.34	0.06	0.07	0.00	0.73	2.61	0.36	0.35	0.25		
Upper avg..	157	7.12	4.54	1.34	2.30	2	7	54	60	331	6.34	0.08	0.07	0.01	0.73	2.61	0.36	0.35	1.00		
Minimum	51	6.89	3.20	0.49	0.98	1	5	1	5	155	3.17	0.05	0.01	0.01	0.32	0.50	0.24	0.20	1.00		
Maximum	260	7.27	6.72	3.00	3.20	4	11	130	185	600	10.50	0.09	0.24	0.02	1.84	7.13	0.61	0.52	1.00		
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	102	0.18	1.52	1.13	1.02	1	3	61	84	192	3.10	0.02	0.11	0.01	0.74	3.06	0.17	0.13	0.00		

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]
07.02.2012	45	6.91	3.51	0.37	2.70	<1	5	505	15	890	5.39	<0.05	0.03	0.01	0.41	2.04	0.82	1.00	<1.00		
03.05.2012	248	6.87	2.68	1.24	2.20	1	8	38	115	500	3.96	0.29	0.27	0.02	4.03	6.72	3.58	0.20	<1.00		
07.08.2012	236	7.06	3.49	1.03	3.30	3	9	2	3	170	4.04	0.20	0.03	0.01	1.13	0.70	4.97	<0.10	<1.00		
09.10.2012	157	7.09	3.55	2.11	3.00	2	5	205	10	410	4.39	0.20	0.04	0.01	1.95	1.80	6.14	0.10	<1.00		
Lower avg.	171	6.98	3.31	1.19	2.80	2	7	188	36	493	4.44	0.17	0.09	0.01	1.88	2.82	3.88	0.32	0.00		
Upper avg..	171	6.98	3.31	1.19	2.80	2	7	188	36	493	4.44	0.18	0.09	0.01	1.88	2.82	3.88	0.35	1.00		
Minimum	45	6.87	2.68	0.37	2.20	1	5	2	3	170	3.96	0.05	0.03	0.01	0.41	0.70	0.82	0.10	1.00		
Maximum	248	7.09	3.55	2.11	3.30	3	9	505	115	890	5.39	0.29	0.27	0.02	4.03	6.72	6.14	1.00	1.00		
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	94	0.11	0.42	0.72	0.47	1	2	229	53	299	0.66	0.10	0.12	0.01	1.57	2.67	2.29	0.44	0.00		

Table 2. Riverine inputs from 155 rivers in Norway in 2012

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 ved Sarpsfossen	*lower avg.*	75 791	212 158	126 861	224	464	8 261	387	16 021	108 362	5.351	6.479	0.305	45.181	581.758	20.813	11.572	35.373	0.000	0.000
	upper avg.	75 791	212 158	126 861	225	464	8 261	387	16 021	108 362	5.351	6.479	0.305	45.181	581.758	20.813	11.715	48.041	5.548	38.835
Drammenselva	*lower avg.*	30 861	297 928	44 848	295	431	2 925	101	5 563	36 850	2.274	6.779	0.173	13.993	39.202	6.380	9.301	12.433	0.622	0.000
	upper avg.	30 861	297 928	44 848	296	431	2 925	102	5 563	36 850	2.274	6.779	0.175	13.993	39.202	6.380	9.777	19.685	2.289	15.813
Numedalslågen	*lower avg.*	12 095	31 553	18 781	36	67	812	85	1 843	15 776	0.818	1.290	0.073	3.078	16.481	1.617	0.662	3.117	0.000	0.000
	upper avg.	12 095	31 553	18 781	36	67	812	85	1 843	15 776	0.818	1.290	0.073	3.078	16.481	1.617	0.774	5.925	0.885	6.198
Skienselva	*lower avg.*	9 855	3 134	9 045	7	15	490	42	1 029	7 692	0.329	1.169	0.041	1.964	9.269	0.683	0.150	1.464	0.000	0.000
	upper avg.	9 855	3 134	9 045	7	15	490	43	1 029	7 692	0.329	1.169	0.041	1.964	9.269	0.683	0.414	4.530	0.721	5.050
Otra	*lower avg.*	13 260	4 067	13 314	4	19	396	48	1 213	8 228	0.460	0.986	0.082	3.582	17.566	2.723	0.477	1.827	0.000	0.000
	upper avg.	13 260	4 067	13 314	6	19	396	48	1 213	8 228	0.460	0.986	0.082	3.582	17.566	2.723	0.707	5.328	0.971	6.795
Orreelva	*lower avg.*	600	6 820	1 338	17	28	201	9	404	867	0.077	0.285	0.011	0.540	1.809	0.316	0.095	0.896	0.000	0.000
	upper avg.	600	6 820	1 338	17	28	201	9	404	867	0.077	0.285	0.011	0.540	1.809	0.316	0.095	1.188	0.044	0.308
Vosso(Bolstadelvi)	*lower avg.*	9 272	2 329	3 220	3	15	263	24	563	3 055	0.176	0.260	0.015	1.497	4.326	0.919	0.111	1.710	0.000	0.000
	upper avg.	9 272	2 329	3 220	5	15	263	24	563	3 055	0.214	0.260	0.023	1.497	4.326	0.919	0.355	4.216	0.679	4.751
Orkla	*lower avg.*	7 937	5 226	8 690	5	15	439	12	914	7 897	0.261	0.076	0.104	15.935	34.558	2.182	0.676	1.149	0.000	0.000
	upper avg.	7 937	5 226	8 690	6	15	439	12	914	7 897	0.261	0.076	0.104	15.935	34.558	2.182	0.739	3.042	0.581	4.067
Vefsna	*lower avg.*	14 130	19 604	7 236	7	26	203	9	669	6 529	0.665	0.581	0.010	3.334	3.153	1.409	0.577	1.089	0.000	0.000
	upper avg.	14 130	19 604	7 236	10	26	203	13	669	6 529	0.665	0.581	0.029	3.334	3.153	1.409	0.772	5.823	1.034	7.240
Altaelva	*lower avg.*	10 053	4 875	11 107	4	24	88	12	671	14 386	0.400	0.181	0.006	2.205	6.199	0.926	0.843	1.315	0.000	0.000
	upper avg.	10 053	4 875	11 107	6	24	88	13	671	14 386	0.400	0.187	0.023	2.205	6.199	0.926	0.878	4.459	0.736	5.151
TRIBUTARY RIVERS (36)																				
Tista utløp Femsjøen	*lower avg.*	2 179	2 812	7 313	5	11	349	4	637	3 091	0.253	0.229	0.016	1.008	21.985	0.592	0.252	0.676		
	upper avg.	2 179	2 812	7 313	5	11	349	4	637	3 091	0.253	0.229	0.016	1.008	21.985	0.592	0.252	1.136		
Tokkeelva	*lower avg.*	2 293	1 102	4 617	1	5	108	2	291	2 368	0.157	0.115	0.020	0.351	3.575	0.328	0.044	0.819		
	upper avg.	2 293	1 102	4 617	1	5	108	2	291	2 368	0.157	0.115	0.020	0.351	3.575	0.328	0.090	1.379		
Nidelva(Rykene)	*lower avg.*	9 899	4 210	12 917	6	19	495	30	1 123	7 483	0.591	0.802	0.086	2.618	14.156	0.985	0.205	0.497		
	upper avg.	9 899	4 210	12 917	7	19	495	30	1 123	7 483	0.591	0.802	0.086	2.618	14.156	0.985	0.362	3.623		
Tovdalselva	*lower avg.*	5 250	3 417	9 289	4	13	198	30	674	3 989	0.448	0.954	0.075	2.267	11.047	0.741	0.280	2.969		
	upper avg.	5 250	3 417	9 289	6	13	198	30	674	3 989	0.448	0.954	0.075	2.267	11.047	0.741	0.347	3.271		

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.*	7 247	5 177	12 235	7	17	262	25	820	4 107	0.391	1.548	0.084	1.281	12.059	0.625	0.214	5.811		
	upper avg.	7 247	5 177	12 235	7	17	262	25	820	4 107	0.391	1.548	0.084	1.281	12.059	0.625	0.265	6.041		
Lyngdalselva	*lower avg.*	2 826	3 422	4 554	3	7	142	8	353	1 657	0.198	0.584	0.035	0.344	4.889	0.104	0.049	1.475		
	upper avg.	2 826	3 422	4 554	3	7	142	8	353	1 657	0.198	0.584	0.035	0.344	4.889	0.104	0.116	1.598		
Kvina	*lower avg.*	6 305	5 137	13 490	6	19	257	18	838	3 320	0.578	2.450	0.080	1.938	12.406	0.570	0.139	5.631		
	upper avg.	6 305	5 137	13 490	6	19	257	18	838	3 320	0.578	2.450	0.080	1.938	12.406	0.570	0.321	5.631		
Sira	*lower avg.*	12 789	3 193	10 583	2	16	379	80	1 032	4 184	0.388	1.472	0.076	2.126	11.876	0.583	0.257	5.471		
	upper avg.	12 789	3 193	10 583	5	16	379	80	1 032	4 184	0.388	1.472	0.076	2.126	11.876	0.583	0.520	6.104		
Bjerkreimselva	*lower avg.*	4 782	984	2 636	3	8	434	12	742	2 439	0.133	0.287	0.041	0.403	4.699	0.231	0.096	0.256		
	upper avg.	4 782	984	2 636	3	8	434	12	742	2 439	0.133	0.287	0.041	0.403	4.699	0.231	0.222	1.750		
Figgjoelva	*lower avg.*	653	603	765	4	6	186	14	281	603	0.028	0.066	0.004	0.250	1.113	0.114	0.044	0.213		
	upper avg.	653	603	765	4	6	186	14	281	603	0.028	0.066	0.004	0.250	1.113	0.114	0.044	0.416		
Lyseelva	*lower avg.*	1 511	72	399	0	1	65	1	103	972	0.023	0.053	0.007	0.149	1.227	0.015	0.063	0.073		
	upper avg.	1 511	105	399	1	1	65	1	103	972	0.030	0.053	0.007	0.149	1.227	0.031	0.063	0.553		
Årdalselva	*lower avg.*	4 392	4 661	3 182	9	17	180	6	404	1 986	0.114	0.490	0.009	0.501	3.675	0.149	0.084	1.473		
	upper avg.	4 392	4 661	3 182	9	17	180	6	404	1 986	0.114	0.490	0.012	0.501	3.675	0.149	0.161	2.238		
Ulladalsåna (Ulla)	*lower avg.*	3 381	337	2 163	1	5	63	1	189	1 971	0.097	0.278	0.009	0.919	3.447	0.298	0.181	0.969		
	upper avg.	3 381	386	2 163	2	5	63	3	189	1 971	0.106	0.278	0.011	0.919	3.447	0.306	0.212	1.634		
Suldalslågen	*lower avg.*	11 244	3 234	4 041	2	10	863	14	1 177	3 974	0.246	0.295	0.035	1.589	14.079	0.823	0.111	0.888		
	upper avg.	11 244	3 234	4 041	4	10	863	15	1 177	3 974	0.268	0.295	0.035	1.589	14.079	0.823	0.412	4.559		
Saudaelva	*lower avg.*	3 534	312	1 073	1	3	137	1	249	1 159	0.054	0.093	0.013	0.399	1.999	0.164	0.039	0.146		
	upper avg.	3 534	312	1 073	1	3	137	3	249	1 159	0.074	0.093	0.014	0.399	1.999	0.164	0.129	1.294		
Vikedalselva	*lower avg.*	997	300	551	1	1	70	4	120	408	0.080	0.064	0.007	0.305	1.397	0.153	0.005	0.000		
	upper avg.	997	300	551	1	1	70	4	120	408	0.080	0.064	0.007	0.305	1.397	0.153	0.036	0.365		
Jostedøla	*lower avg.*	4 991	11 221	1 050	8	13	155	7	283	4 192	0.000	0.196	0.004	1.033	3.160	0.445	0.329	0.000		
	upper avg.	4 991	11 221	1 050	8	13	155	10	283	4 192	0.091	0.196	0.009	1.033	3.160	0.445	0.396	1.827		
Gaular	*lower avg.*	5 657	1 835	4 291	10	25	137	8	461	1 822	0.000	0.147	0.010	0.708	3.538	0.384	0.000	2.500		
	upper avg.	5 657	1 835	4 291	10	25	137	9	461	1 822	0.104	0.147	0.014	0.708	3.538	0.384	0.207	3.257		
Jølstra	*lower avg.*	6 030	2 033	2 907	5	20	226	7	494	1 877	0.000	0.083	0.015	0.574	3.318	0.212	0.056	1.119		
	upper avg.	6 030	2 033	2 907	5	20	226	7	494	1 877	0.110	0.083	0.019	0.574	3.318	0.212	0.249	3.046		
Nausta	*lower avg.*	2 322	790	1 478	3	6	48	3	148	866	0.007	0.063	0.005	0.208	1.206	0.085	0.015	0.215		

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.	2 322	790	1 478	3	6	48	3	148	866	0.044	0.063	0.006	0.208	1.206	0.090	0.085	0.957		
Gloppenelva(Breimselva)	*lower avg.*	4 258	899	1 231	1	6	228	4	356	1 951	0.000	0.037	0.000	2.219	1.594	0.147	0.000	0.446		
	upper avg.	4 258	922	1 231	2	6	228	5	356	1 951	0.078	0.037	0.008	2.219	1.594	0.147	0.156	1.781		
Driva	*lower avg.*	8 442	22 247	4 162	1	30	318	8	677	8 020	0.012	0.221	0.000	2.781	7.271	1.110	1.564	0.695		
	upper avg.	8 442	22 247	4 162	4	30	318	9	677	8 020	0.154	0.222	0.015	2.781	7.271	1.110	1.564	3.090		
Surna	*lower avg.*	4 842	3 878	3 228	3	8	59	6	221	2 518	0.068	0.050	0.002	0.846	0.849	0.381	1.003	0.166		
	upper avg.	4 842	3 878	3 228	3	8	59	7	221	2 518	0.100	0.050	0.010	0.846	0.849	0.381	1.047	1.772		
Gaula	*lower avg.*	9 934	90 354	20 992	77	114	233	25	1 105	14 201	0.750	1.218	0.067	8.158	18.629	10.140	5.970	2.661		
	upper avg.	9 934	90 354	20 992	77	114	233	25	1 105	14 201	0.750	1.218	0.067	8.158	18.629	10.140	5.970	3.636		
Nidelva(Tr.heim)	*lower avg.*	9 328	10 143	9 333	9	21	299	20	789	7 265	0.193	0.231	0.010	2.663	3.675	2.668	1.019	0.515		
	upper avg.	9 328	10 143	9 333	9	21	299	20	789	7 265	0.257	0.231	0.021	2.663	3.675	2.668	1.147	3.671		
Stjørdalselva	*lower avg.*	6 081	30 268	11 352	16	33	75	11	505	4 665	0.278	0.493	0.029	4.461	10.325	2.120	1.437	2.605		
	upper avg.	6 081	30 268	11 352	16	33	75	12	505	4 665	0.320	0.493	0.029	4.461	10.325	2.120	1.437	2.605		
Verdalselva	*lower avg.*	3 754	5 393	6 330	4	11	104	7	346	2 441	0.153	0.143	0.005	1.378	3.671	0.894	0.340	2.065		
	upper avg.	3 754	5 393	6 330	4	11	104	7	346	2 441	0.153	0.143	0.008	1.378	3.671	0.894	0.340	2.281		
Snåsavassdraget	*lower avg.*	2 633	1 126	3 846	1	5	141	4	304	1 316	0.095	0.033	0.004	0.663	0.907	0.430	0.104	0.505		
	upper avg.	2 633	1 126	3 846	1	5	141	4	304	1 316	0.095	0.033	0.006	0.663	0.907	0.430	0.119	1.216		
Namsen	*lower avg.*	3 925	9 312	4 744	8	12	92	21	330	2 526	0.123	0.162	0.007	1.177	3.985	0.858	4.075	0.959		
	upper avg.	3 925	9 312	4 744	8	12	92	23	330	2 526	0.123	0.162	0.010	1.177	3.985	0.858	4.099	1.825		
Røssåga	*lower avg.*	7 985	3 339	2 652	2	7	75	8	336	2 657	0.232	0.079	0.009	1.024	2.704	1.034	0.185	0.000		
	upper avg.	7 985	3 339	2 652	5	8	75	10	336	2 657	0.272	0.079	0.018	1.024	2.704	1.034	0.433	2.922		
Ranaelva	*lower avg.*	15 095	7 542	4 460	1	20	229	23	677	6 141	0.416	0.083	0.021	1.583	2.911	1.433	0.323	7.084		
	upper avg.	15 095	7 542	4 460	6	20	229	23	677	6 141	0.416	0.083	0.040	1.583	2.911	1.433	0.693	9.067		
Beiarelva	*lower avg.*	2 472	1 309	1 168	1	3	55	7	145	2 190	0.073	0.030	0.007	0.519	1.227	0.490	0.321	0.108		
	upper avg.	2 472	1 309	1 168	1	3	55	8	145	2 190	0.073	0.030	0.008	0.519	1.227	0.490	0.340	0.905		
Målselv	*lower avg.*	6 768	3 623	2 561	3	9	95	5	321	6 284	0.089	0.077	0.005	1.085	0.960	0.650	0.363	0.000		
	upper avg.	6 768	3 623	2 561	4	9	95	6	321	6 284	0.168	0.077	0.013	1.085	0.960	0.650	0.416	2.477		
Barduelva	*lower avg.*	6 146	5 336	2 083	5	8	86	9	287	4 505	0.048	0.079	0.002	0.981	0.976	0.697	0.354	0.000		
	upper avg.	6 146	5 336	2 083	5	8	86	9	287	4 505	0.121	0.079	0.011	0.981	0.976	0.697	0.402	2.250		
Tanaelva	*lower avg.*	16 358	7 140	16 419	10	41	142	254	1 602	35 112	0.459	0.278	0.016	3.266	10.512	2.047	1.755	2.652		
	upper avg.	16 358	7 140	16 419	11	41	142	254	1 602	35 112	0.480	0.278	0.042	3.266	10.512	2.047	1.755	5.987		

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.*	13 299	6 700	13 557	9	35	495	223	1 938	20 384	1.075	0.580	0.061	11.503	15.822	22.236	0.767	0.000		
	upper avg.	13 299	6 700	13 557	9	35	495	223	1 938	20 384	1.089	0.580	0.061	11.503	15.822	22.236	0.912	4.867		
TRIBUTARY RIVERS(109)																				
Mosselva	*lower avg.*	865	2 131	2 444	1	9	138	5	289	133	0.119	0.082	0.001	0.475	0.472	0.323	0.000	0.475		
	upper avg.	865	2 131	2 444	1	9	138	5	289	133	0.119	0.082	0.001	0.475	0.472	0.323	0.003	0.475		
Hølenelva	*lower avg.*	123	299	447	2	4	63	2	87	397	0.030	0.024	0.000	0.109	0.194	0.127	0.000	0.112		
	upper avg.	123	299	447	2	4	63	2	87	397	0.030	0.024	0.000	0.109	0.194	0.127	0.000	0.112		
Årungelva	*lower avg.*	56	58	119	0	1	57	0	70	50	0.004	0.002	0.000	0.039	0.020	0.024	0.000	0.031		
	upper avg.	56	58	119	0	1	57	0	70	50	0.004	0.002	0.000	0.039	0.020	0.024	0.000	0.031		
Gjersjøelva	*lower avg.*	95	29	249	0	0	40	1	53	173	0.009	0.002	0.000	0.053	0.014	0.073	0.000	0.079		
	upper avg.	95	29	249	0	0	40	1	53	173	0.009	0.002	0.000	0.053	0.014	0.073	0.000	0.079		
Ljanselva	*lower avg.*	62	136	121	1	2	21	1	28	144	0.012	0.005	0.000	0.055	0.000	0.057	0.011	0.068		
	upper avg.	62	136	121	1	2	21	1	28	144	0.012	0.005	0.000	0.055	0.000	0.057	0.011	0.068		
Loelva	*lower avg.*	104	607	224	2	5	43	8	68	274	0.021	0.037	0.001	0.166	0.356	0.066	0.030	0.000		
	upper avg.	104	607	224	2	5	43	8	68	274	0.021	0.037	0.001	0.166	0.356	0.066	0.030	0.038		
Akerselva	*lower avg.*	339	144	508	0	2	27	4	52	441	0.031	0.078	0.002	0.171	0.620	0.040	0.008	0.528		
	upper avg.	339	144	508	0	2	27	4	52	441	0.031	0.078	0.002	0.171	0.620	0.040	0.008	0.528		
Frognerelva	*lower avg.*	30	34	48	0	1	13	1	18	67	0.005	0.000	0.000	0.052	0.020	0.017	0.002	0.039		
	upper avg.	30	34	48	0	1	13	1	18	67	0.005	0.000	0.000	0.052	0.020	0.017	0.002	0.039		
Lysakerelva	*lower avg.*	284	108	581	0	0	19	1	31	241	0.034	0.010	0.000	0.000	0.049	0.005	0.011	0.208		
	upper avg.	284	108	581	0	0	19	1	31	241	0.034	0.010	0.000	0.001	0.049	0.005	0.011	0.208		
Sandvikselva	*lower avg.*	293	126	558	1	2	19	2	34	499	0.038	0.000	0.000	0.063	0.000	0.036	0.051	0.000		
	upper avg.	293	126	558	1	2	19	2	34	499	0.038	0.001	0.000	0.063	0.001	0.036	0.051	0.000		
Åroselva	*lower avg.*	173	798	448	1	2	100	2	114	425	0.041	0.061	0.003	0.140	0.234	0.069	0.075	0.111		
	upper avg.	173	798	448	1	2	100	2	114	425	0.041	0.061	0.003	0.140	0.234	0.069	0.075	0.111		
Lierelva	*lower avg.*	387	5 249	1 030	2	7	112	0	130	1 010	0.116	0.198	0.006	0.350	1.911	0.174	0.269	0.505		
	upper avg.	387	5 249	1 030	2	7	112	0	130	1 010	0.116	0.198	0.006	0.350	1.911	0.174	0.269	0.505		
Sandeelva	*lower avg.*	274	836	448	0	1	42	2	65	369	0.077	0.137	0.012	0.331	3.635	0.125	0.071	0.150		
	upper avg.	274	836	448	0	1	42	2	65	369	0.077	0.137	0.012	0.331	3.635	0.125	0.071	0.150		
Aulielva	*lower avg.*	491	2 511	1 134	8	30	262	20	311	1 528	0.167	0.092	0.010	0.487	0.905	0.490	0.132	0.787		
	upper avg.	491	2 511	1 134	8	30	262	20	311	1 528	0.167	0.092	0.010	0.487	0.905	0.490	0.132	0.787		

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.*	1 130	286	1 971	1	1	139	2	205	1 564	0.062	0.000	0.018	0.000	4.215	0.035	0.009	0.000		
	upper avg.	1 130	286	1 971	1	1	139	2	205	1 564	0.062	0.002	0.018	0.003	4.215	0.035	0.009	0.414		
Gjerstadelva	*lower avg.*	975	430	1 951	0	2	63	10	125	607	0.086	0.167	0.004	0.180	1.684	0.212	0.021	0.535		
	upper avg.	975	430	1 951	0	2	63	10	125	607	0.086	0.167	0.004	0.180	1.684	0.212	0.021	0.535		
Vegårdselva	*lower avg.*	1 011	479	2 008	1	2	51	4	116	363	0.101	0.104	0.008	0.222	0.081	0.201	0.037	0.370		
	upper avg.	1 011	479	2 008	1	2	51	4	116	363	0.101	0.104	0.008	0.222	0.081	0.201	0.037	0.370		
Søgneelva-Songdalselva	*lower avg.*	773	274	1 245	1	3	111	6	166	181	0.074	0.111	0.015	0.153	1.513	0.148	0.000	0.283		
	upper avg.	773	274	1 245	1	3	111	6	166	181	0.074	0.111	0.015	0.153	1.513	0.148	0.002	0.283		
Audnedalselva	*lower avg.*	1 273	443	1 701	0	2	141	6	225	426	0.091	0.200	0.013	0.142	2.671	0.158	0.000	0.582		
	upper avg.	1 273	443	1 701	0	2	141	6	225	426	0.091	0.200	0.013	0.142	2.671	0.158	0.004	0.582		
Soknedalselva	*lower avg.*	2 002	923	1 370	2	6	184	12	260	865	0.117	0.211	0.017	0.366	2.349	1.762	0.053	0.916		
	upper avg.	2 002	923	1 370	2	6	184	12	260	865	0.117	0.211	0.017	0.366	2.349	1.762	0.053	0.916		
Hellelandselva	*lower avg.*	1 630	643	1 393	2	4	175	9	256	621	0.089	0.233	0.013	0.220	1.983	0.189	0.046	0.746		
	upper avg.	1 630	643	1 393	2	4	175	9	256	621	0.089	0.233	0.013	0.220	1.983	0.189	0.046	0.746		
Håelva	*lower avg.*	479	469	831	2	6	172	12	300	451	0.078	0.029	0.002	0.154	0.706	0.095	0.000	0.263		
	upper avg.	479	469	831	2	6	172	12	300	451	0.078	0.029	0.002	0.154	0.706	0.095	0.001	0.263		
Imselva	*lower avg.*	401	138	499	0	1	79	2	107	5	0.015	0.013	0.001	0.076	0.280	0.070	0.000	0.147		
	upper avg.	401	138	499	0	1	79	2	107	5	0.015	0.013	0.001	0.076	0.280	0.070	0.001	0.147		
Oltedalselva,utløp Ragsvatnet	*lower avg.*	888	221	538	0	0	92	4	110	665	0.022	0.049	0.006	0.130	0.963	0.134	0.036	0.000		
	upper avg.	888	221	538	0	0	92	4	110	665	0.022	0.049	0.006	0.130	0.963	0.134	0.036	0.325		
Dirdalsåna	*lower avg.*	1 389	197	838	0	1	127	1	170	504	0.054	0.093	0.003	0.135	0.650	0.374	0.000	0.635		
	upper avg.	1 389	197	838	0	1	127	1	170	504	0.054	0.093	0.003	0.135	0.650	0.374	0.004	0.635		
Frafjordelva	*lower avg.*	1 564	282	905	0	2	111	6	143	530	0.041	0.130	0.006	0.178	0.548	0.029	0.053	0.573		
	upper avg.	1 564	282	905	0	2	111	6	143	530	0.041	0.130	0.006	0.178	0.548	0.029	0.053	0.573		
Espedalselva	*lower avg.*	1 213	240	617	1	2	78	2	124	634	0.023	0.057	0.003	0.026	0.300	0.078	0.087	0.444		
	upper avg.	1 213	240	617	1	2	78	2	124	634	0.023	0.057	0.003	0.026	0.300	0.078	0.087	0.444		
Førrelva	*lower avg.*	1 402	257	902	1	2	32	1	47	828	0.031	0.074	0.003	0.056	0.219	0.118	0.044	0.000		
	upper avg.	1 402	257	902	1	2	32	1	47	828	0.031	0.074	0.003	0.056	0.219	0.118	0.044	1.026		
Åbøelva	*lower avg.*	821	128	270	0	1	27	0	38	99	0.022	0.020	0.001	0.040	0.282	0.058	0.081	0.376		
	upper avg.	821	128	270	0	1	27	0	38	99	0.022	0.020	0.001	0.040	0.282	0.058	0.081	0.376		
Etneelva	*lower avg.*	1 609	446	687	1	2	183	3	234	406	0.102	0.045	0.008	0.228	0.645	0.484	0.677	1.031		

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.	1 609	446	687	1	2	183	3	234	406	0.102	0.045	0.008	0.228	0.645	0.484	0.677	1.031		
Opo	*lower avg.*	4 255	4 413	1 297	5	4	146	16	247	1 851	0.314	0.623	0.000	0.391	2.484	0.532	0.000	0.000		
	upper avg.	4 255	4 413	1 297	5	4	146	16	247	1 851	0.314	0.623	0.000	0.391	2.484	0.532	0.012	1.557		
Tysso	*lower avg.*	2 931	407	1 748	2	0	160	5	216	787	0.120	0.055	0.006	0.908	3.695	0.708	0.137	1.609		
	upper avg.	2 931	407	1 748	2	1	160	5	216	787	0.120	0.055	0.006	0.908	3.695	0.708	0.137	1.609		
Kinso	*lower avg.*	1 477	535	307	2	0	14	6	48	105	0.054	0.027	0.000	0.000	0.040	0.059	0.148	0.540		
	upper avg.	1 477	535	307	2	0	14	6	48	105	0.054	0.027	0.000	0.000	0.040	0.059	0.148	0.540		
Veig	*lower avg.*	2 606	572	940	2	2	27	3	86	1 276	0.044	0.044	0.002	0.078	0.000	0.405	0.220	0.954		
	upper avg.	2 606	572	940	2	2	27	3	86	1 276	0.044	0.044	0.002	0.078	0.010	0.405	0.220	0.954		
Bjoreio	*lower avg.*	3 111	814	2 397	1	3	48	6	120	1 171	0.104	0.083	0.000	0.401	0.265	0.683	0.000	1.138		
	upper avg.	3 111	814	2 397	1	3	48	6	120	1 171	0.104	0.083	0.000	0.401	0.265	0.683	0.009	1.138		
Sima	*lower avg.*	762	213	118	0	1	24	1	37	628	0.020	0.008	0.000	0.028	0.201	0.084	0.012	0.279		
	upper avg.	762	213	118	0	1	24	1	37	628	0.020	0.008	0.000	0.028	0.201	0.084	0.012	0.279		
Austdøla	*lower avg.*	700	164	81	1	0	20	2	29	78	0.015	0.015	0.002	0.031	0.116	0.028	0.011	0.320		
	upper avg.	700	164	81	1	0	20	2	29	78	0.015	0.015	0.002	0.031	0.116	0.028	0.011	0.320		
Nordøla /Austdøla	*lower avg.*	210	76	15	0	0	8	0	11	93	0.007	0.004	0.000	0.009	0.001	0.038	0.005	0.000		
	upper avg.	210	76	15	0	0	8	0	11	93	0.007	0.004	0.000	0.009	0.001	0.038	0.005	0.077		
Tysselvi Samnangervassdraget	*lower avg.*	2 140	486	1 325	1	3	66	6	138	187	0.072	0.128	0.011	0.227	1.096	0.188	0.000	0.783		
	upper avg.	2 140	486	1 325	1	3	66	6	138	187	0.072	0.128	0.011	0.227	1.096	0.188	0.006	0.783		
Oselva	*lower avg.*	963	377	1 154	2	4	50	3	114	334	0.054	0.091	0.007	0.352	0.000	0.187	0.000	0.000		
	upper avg.	963	377	1 154	2	4	50	3	114	334	0.054	0.091	0.007	0.352	0.004	0.187	0.003	0.352		
DaleelviBergsdalsvassdraget	*lower avg.*	1 973	500	812	1	1	59	5	126	370	0.059	0.137	0.008	0.245	1.199	0.177	0.000	0.000		
	upper avg.	1 973	500	812	1	1	59	5	126	370	0.059	0.137	0.008	0.245	1.199	0.177	0.006	0.722		
Ekso -Storelvi	*lower avg.*	4 117	1 055	2 241	3	6	81	11	240	290	0.051	0.188	0.015	0.000	0.000	0.256	0.098	0.000		
	upper avg.	4 117	1 055	2 241	3	6	81	11	240	290	0.051	0.188	0.015	0.011	0.015	0.256	0.098	1.507		
Modalselva -Moelvi	*lower avg.*	3 727	682	1 167	1	5	119	6	177	753	0.041	0.177	0.014	0.000	0.322	0.284	0.249	0.000		
	upper avg.	3 727	682	1 167	1	5	119	6	177	753	0.041	0.177	0.014	0.010	0.322	0.284	0.249	1.364		
Nærøydalselvi	*lower avg.*	1 894	557	421	1	2	51	4	104	1 662	0.035	0.000	0.000	0.159	0.598	0.061	0.149	0.693		
	upper avg.	1 894	557	421	1	2	51	4	104	1 662	0.035	0.003	0.000	0.159	0.598	0.061	0.149	0.693		
Flåmselvi	*lower avg.*	1 069	483	167	1	1	22	3	40	241	0.038	0.010	0.000	0.042	0.243	0.110	0.074	0.000		
	upper avg.	1 069	483	167	1	1	22	3	40	241	0.038	0.010	0.000	0.042	0.243	0.110	0.074	0.391		

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.*	3 106	1 097	682	2	1	100	5	148	1 211	0.091	0.171	0.000	0.377	0.964	0.274	0.056	0.000		
	upper avg.	3 106	1 097	682	2	1	100	5	148	1 211	0.091	0.171	0.000	0.377	0.964	0.274	0.056	1.137		
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	0.163		
Lærdalselva /Mjeldo	*lower avg.*	3 772	863	1 091	2	3	117	6	231	1 525	0.093	0.083	0.000	0.442	0.556	0.299	0.226	0.000		
	upper avg.	3 772	863	1 091	2	3	117	6	231	1 525	0.093	0.083	0.000	0.442	0.556	0.299	0.226	1.381		
Årdalselvi	*lower avg.*	3 434	855	880	1	3	84	7	143	2 080	0.050	0.024	0.006	1.257	0.440	0.331	0.000	3.770		
	upper avg.	3 434	855	880	1	3	84	7	143	2 080	0.050	0.024	0.006	1.257	0.440	0.331	0.000	3.770		
Fortundalselva	*lower avg.*	2 252	2 243	374	1	2	74	3	104	1 181	0.126	0.050	0.010	0.711	0.944	0.218	0.115	1.649		
	upper avg.	2 252	2 243	374	1	2	74	3	104	1 181	0.126	0.050	0.010	0.711	0.944	0.218	0.115	1.649		
Mørkrisdalselvi	*lower avg.*	1 250	1 985	196	1	1	27	2	48	846	0.032	0.059	0.000	0.251	0.796	0.231	0.162	0.000		
	upper avg.	1 250	1 985	196	1	1	27	2	48	846	0.032	0.059	0.000	0.251	0.796	0.231	0.162	0.458		
Årøyelva	*lower avg.*	2 584	1 166	719	1	3	64	6	123	1 362	0.053	0.072	0.000	0.063	0.673	0.126	0.161	0.000		
	upper avg.	2 584	1 166	719	1	3	64	6	123	1 362	0.053	0.072	0.000	0.063	0.673	0.126	0.161	0.946		
Sogndalselva	*lower avg.*	996	244	440	2	2	30	3	58	149	0.033	0.037	0.005	0.072	0.594	0.022	0.139	0.000		
	upper avg.	996	244	440	2	2	30	3	58	149	0.033	0.037	0.005	0.072	0.594	0.022	0.139	0.365		
Oselva	*lower avg.*	2 591	645	2 371	1	4	50	14	146	560	0.157	0.092	0.000	0.303	1.612	0.298	0.000	1.422		
	upper avg.	2 591	645	2 371	1	4	50	14	146	560	0.157	0.092	0.000	0.303	1.612	0.298	0.008	1.422		
Hopselva	*lower avg.*	726	200	186	0	1	24	1	35	64	0.014	0.023	0.003	0.008	0.275	0.019	0.109	0.266		
	upper avg.	726	200	186	0	1	24	1	35	64	0.014	0.023	0.003	0.008	0.275	0.019	0.109	0.266		
Ååelva (Gjengedalselva)	*lower avg.*	1 671	484	911	1	2	37	3	74	187	0.051	0.038	0.000	0.112	0.478	0.057	0.116	1.193		
	upper avg.	1 671	484	911	1	2	37	3	74	187	0.051	0.038	0.000	0.112	0.478	0.057	0.116	1.193		
Oldenelva	*lower avg.*	1 230	653	349	0	2	58	5	90	515	0.095	0.047	0.005	0.135	0.293	0.064	0.049	0.000		
	upper avg.	1 230	653	349	0	2	58	5	90	515	0.095	0.047	0.005	0.135	0.293	0.064	0.049	0.450		
Loelvi	*lower avg.*	1 422	807	260	0	2	45	2	72	716	0.114	0.037	0.005	0.149	0.076	0.042	0.127	0.000		
	upper avg.	1 422	807	260	0	2	45	2	72	716	0.114	0.037	0.005	0.149	0.076	0.042	0.127	0.520		
Stryneelva	*lower avg.*	2 898	1 360	530	1	4	102	7	187	1 247	0.117	0.063	0.006	0.642	0.955	0.206	0.185	1.061		
	upper avg.	2 898	1 360	530	1	4	102	7	187	1 247	0.117	0.063	0.006	0.642	0.955	0.206	0.185	1.061		
Hornindalselva(Horndøla)	*lower avg.*	2 807	771	1 233	1	5	124	8	182	1 193	0.117	0.030	0.006	0.294	0.826	0.315	0.000	1.027		
	upper avg.	2 807	771	1 233	1	5	124	8	182	1 193	0.117	0.030	0.006	0.294	0.826	0.315	0.008	1.027		
Ørstaelva	*lower avg.*	971	295	556	3	8	35	5	74	595	0.033	0.006	0.000	0.114	0.335	0.100	0.000	0.356		

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.	971	295	556	3	8	35	5	74	595	0.033	0.006	0.000	0.114	0.335	0.100	0.003	0.356		
Valldøla	*lower avg.*	2 177	478	410	0	2	0	4	0	580	0.041	0.005	0.002	0.151	0.560	0.072	0.044	0.000		
	upper avg.	2 177	478	410	0	2	1	4	8	580	0.041	0.005	0.002	0.151	0.560	0.072	0.044	0.797		
Rauma	*lower avg.*	6 623	1 382	1 467	1	5	41	12	134	1 852	0.138	0.081	0.000	0.737	1.224	0.410	0.000	0.000		
	upper avg.	6 623	1 382	1 467	1	5	41	12	134	1 852	0.138	0.081	0.000	0.737	1.224	0.410	0.019	2.424		
Isa	*lower avg.*	974	284	194	0	1	5	2	6	558	0.019	0.000	0.000	0.111	0.013	0.079	0.087	0.356		
	upper avg.	974	284	194	0	1	5	2	6	558	0.019	0.002	0.000	0.111	0.013	0.079	0.087	0.356		
Eira	*lower avg.*	5 875	0	1 263	1	3	226	10	319	4 285	0.215	0.027	0.000	0.614	0.570	0.258	0.538	3.225		
	upper avg.	5 875	108	1 263	1	3	226	10	319	4 285	0.215	0.027	0.000	0.614	0.570	0.258	0.538	3.225		
Litledalselva	*lower avg.*	1 144	239	251	0	1	58	1	66	1 500	0.023	0.000	0.000	0.015	0.020	0.276	0.117	0.000		
	upper avg.	1 144	239	251	0	1	58	1	66	1 500	0.023	0.002	0.000	0.015	0.020	0.276	0.117	0.419		
Ålvunda	*lower avg.*	878	467	567	0	2	42	2	74	620	0.013	0.025	0.000	0.269	0.241	0.064	0.017	0.402		
	upper avg.	878	467	567	0	2	42	2	74	620	0.013	0.025	0.000	0.269	0.241	0.064	0.017	0.402		
Toåa	*lower avg.*	1 108	235	509	0	1	7	2	39	437	0.012	0.019	0.000	0.181	0.089	0.018	0.000	0.000		
	upper avg.	1 108	235	509	0	1	7	2	39	437	0.012	0.019	0.000	0.181	0.089	0.018	0.003	0.405		
Bøvra	*lower avg.*	981	269	915	0	0	45	3	93	484	0.029	0.009	0.002	0.085	0.083	0.063	0.015	0.000		
	upper avg.	981	269	915	0	0	45	3	93	484	0.029	0.009	0.002	0.085	0.083	0.063	0.015	0.359		
Børselva	*lower avg.*	272	438	553	1	1	32	3	60	134	0.021	0.005	0.000	0.139	0.000	0.139	0.015	0.349		
	upper avg.	272	438	553	1	1	32	3	60	134	0.021	0.005	0.000	0.139	0.001	0.139	0.015	0.349		
Vigda	*lower avg.*	408	1 572	557	1	1	28	1	54	298	0.027	0.009	0.000	0.138	0.000	0.000	0.000	0.336		
	upper avg.	408	1 572	557	1	1	28	1	54	298	0.027	0.009	0.000	0.138	0.001	0.001	0.001	0.336		
Homla	*lower avg.*	472	118	1 158	0	1	7	3	37	276	0.084	0.003	0.002	0.112	0.000	0.086	0.000	0.346		
	upper avg.	472	118	1 158	0	1	7	3	37	276	0.084	0.003	0.002	0.112	0.002	0.086	0.001	0.346		
Gråe	*lower avg.*	267	222	536	1	1	43	2	70	19	0.032	0.000	0.000	0.106	0.000	0.038	0.025	0.000		
	upper avg.	267	222	536	1	1	43	2	70	19	0.032	0.000	0.000	0.106	0.001	0.038	0.025	0.098		
Figgja	*lower avg.*	682	1 584	1 907	1	4	93	2	116	374	0.071	0.041	0.001	0.275	0.163	0.212	0.092	0.000		
	upper avg.	682	1 584	1 907	1	4	93	2	116	374	0.071	0.041	0.001	0.275	0.163	0.212	0.092	0.250		
Årgårdselva	*lower avg.*	1 716	1 753	4 187	1	11	62	11	233	954	0.027	0.060	0.000	0.427	0.198	0.281	0.000	1.994		
	upper avg.	1 716	1 753	4 187	1	11	62	11	233	954	0.027	0.060	0.000	0.427	0.198	0.281	0.005	1.994		
Moelva(Salsvatenelva)	*lower avg.*	1 898	358	1 380	1	0	40	4	85	695	0.070	0.014	0.004	0.000	0.712	0.087	0.000	0.000		
	upper avg.	1 898	358	1 380	1	1	40	4	85	695	0.070	0.014	0.004	0.005	0.712	0.087	0.006	0.695		

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.*	2 522	689	948	1	2	28	8	86	372	0.069	0.042	0.000	0.148	0.600	0.224	0.093	0.000		
	upper avg.	2 522	689	948	1	2	28	8	86	372	0.069	0.042	0.000	0.148	0.600	0.224	0.093	0.923		
Skjerva	*lower avg.*	406	275	498	1	3	14	10	65	195	0.036	0.046	0.003	0.157	0.299	0.222	0.008	0.297		
	upper avg.	406	275	498	1	3	14	10	65	195	0.036	0.046	0.003	0.157	0.299	0.222	0.008	0.297		
Fusta	*lower avg.*	2 485	805	807	1	4	12	19	104	413	0.117	0.016	0.018	0.124	0.628	0.205	0.000	0.909		
	upper avg.	2 485	805	807	1	4	12	19	104	413	0.117	0.016	0.018	0.124	0.628	0.205	0.007	0.909		
Drevja	*lower avg.*	805	441	220	1	1	5	2	25	91	0.008	0.000	0.004	0.068	0.110	0.017	0.000	0.000		
	upper avg.	805	441	220	1	1	5	2	25	91	0.008	0.001	0.004	0.068	0.110	0.017	0.002	0.295		
Bjerkaelva	*lower avg.*	1 473	509	1 027	1	0	13	5	55	442	0.023	0.045	0.001	0.271	0.367	0.341	0.019	1.348		
	upper avg.	1 473	509	1 027	1	0	13	5	55	442	0.023	0.045	0.001	0.271	0.367	0.341	0.019	1.348		
Dalselva	*lower avg.*	828	193	474	0	1	2	2	21	244	0.000	0.011	0.000	0.114	0.003	0.146	0.024	0.834		
	upper avg.	828	193	474	0	1	2	2	21	244	0.003	0.011	0.000	0.114	0.003	0.146	0.024	0.834		
Fykanåga	*lower avg.*	1 265	859	231	1	1	16	3	37	161	0.088	0.000	0.000	0.053	0.238	0.053	0.000	0.000		
	upper avg.	1 265	859	231	1	1	16	3	37	161	0.088	0.002	0.000	0.053	0.238	0.053	0.004	0.463		
Saltelva	*lower avg.*	2 421	3 642	432	1	0	20	4	74	1 661	0.086	0.000	0.000	0.207	1.029	0.248	2.029	0.000		
	upper avg.	2 421	3 642	432	1	1	20	4	74	1 661	0.086	0.004	0.000	0.207	1.029	0.248	2.029	0.886		
SulitjelmavassdragetUtl Øvrevt	*lower avg.*	2 277	0	875	1	0	9	7	50	537	0.000	0.000	0.000	0.000	0.000	0.130	5.287	1.875		
	upper avg.	2 277	42	875	1	0	9	7	50	537	0.008	0.004	0.000	0.006	0.008	0.130	5.287	1.875		
Kobbelva	*lower avg.*	1 446	394	212	1	0	15	2	37	573	0.048	0.003	0.008	0.026	0.006	0.082	0.000	0.000		
	upper avg.	1 446	394	212	1	0	15	2	37	573	0.048	0.003	0.008	0.026	0.006	0.082	0.004	0.529		
Elvegårdselva	*lower avg.*	2 838	2 304	1 153	1	4	10	8	66	1 866	0.075	0.131	0.015	0.441	0.945	0.649	0.701	1.818		
	upper avg.	2 838	2 304	1 153	1	4	10	8	66	1 866	0.075	0.131	0.015	0.441	0.945	0.649	0.701	1.818		
Spanselva	*lower avg.*	439	100	90	0	0	5	1	14	235	0.008	0.011	0.002	0.075	0.079	0.161	0.000	0.000		
	upper avg.	439	100	90	0	0	5	1	14	235	0.008	0.011	0.002	0.075	0.079	0.161	0.001	0.161		
Salangselva	*lower avg.*	1 685	322	654	1	1	10	5	38	483	0.000	0.022	0.012	0.154	0.185	0.280	0.395	0.000		
	upper avg.	1 685	322	654	1	1	10	5	38	483	0.006	0.022	0.012	0.154	0.185	0.280	0.395	0.617		
Lakselva(Rossfjordelva)	*lower avg.*	402	128	256	0	0	0	1	15	89	0.008	0.006	0.001	0.022	0.027	0.060	0.000	0.294		
	upper avg.	402	128	256	0	0	0	1	15	89	0.008	0.006	0.001	0.022	0.027	0.060	0.001	0.294		
Nordkjoselva	*lower avg.*	415	124	175	0	0	3	1	11	309	0.018	0.006	0.002	0.039	0.064	0.000	0.114	0.000		
	upper avg.	415	124	175	0	0	3	1	11	309	0.018	0.006	0.002	0.039	0.064	0.002	0.114	0.152		
Signaldalselva	*lower avg.*	1 067	376	722	1	1	7	3	24	808	0.034	0.000	0.004	0.203	0.006	0.160	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.	1 067	376	722	1	1	7	3	24	808	0.034	0.002	0.004	0.203	0.006	0.160	0.003	0.390		
Skibotnelva	*lower avg.*	1 337	344	807	0	0	11	2	30	788	0.030	0.007	0.007	0.212	0.000	0.507	0.342	1.223		
	upper avg.	1 337	344	807	0	0	11	2	30	788	0.030	0.007	0.007	0.212	0.005	0.507	0.342	1.223		
Kåfjordelva	*lower avg.*	794	116	203	0	0	17	1	33	436	0.008	0.015	0.004	0.283	0.025	0.189	0.060	0.000		
	upper avg.	794	116	203	0	0	17	1	33	436	0.008	0.015	0.004	0.283	0.025	0.189	0.060	0.290		
Reisaelva	*lower avg.*	4 402	1 335	2 775	3	3	58	10	165	3 899	0.122	0.124	0.018	1.165	1.229	1.116	0.000	5.639		
	upper avg.	4 402	1 335	2 775	3	3	58	10	165	3 899	0.122	0.124	0.018	1.165	1.229	1.116	0.013	5.639		
Mattiselva	*lower avg.*	352	82	461	0	0	1	0	13	189	0.015	0.000	0.003	0.085	0.025	0.039	0.155	0.000		
	upper avg.	352	82	461	0	0	1	0	13	189	0.015	0.001	0.003	0.085	0.025	0.039	0.155	0.129		
Tverrelva	*lower avg.*	252	92	532	0	0	4	1	19	198	0.008	0.001	0.001	0.071	0.045	0.033	0.013	0.000		
	upper avg.	252	92	532	0	0	4	1	19	198	0.008	0.001	0.001	0.071	0.045	0.033	0.013	0.092		
Repparfjordelva	*lower avg.*	2 078	449	3 846	1	1	12	8	92	880	0.051	0.000	0.008	1.004	0.241	0.228	0.044	1.521		
	upper avg.	2 078	449	3 846	1	1	12	8	92	880	0.051	0.004	0.008	1.004	0.241	0.228	0.044	1.521		
Stabburselva	*lower avg.*	1 377	116	1 209	1	1	9	3	32	1 080	0.027	0.004	0.003	0.057	0.285	0.050	0.209	0.000		
	upper avg.	1 377	116	1 209	1	1	9	3	32	1 080	0.027	0.004	0.003	0.057	0.285	0.050	0.209	0.504		
Lakseelv	*lower avg.*	1 445	1 486	1 534	1	3	6	4	54	1 091	0.029	0.020	0.005	0.291	0.000	0.314	0.289	0.000		
	upper avg.	1 445	1 486	1 534	1	3	6	4	54	1 091	0.029	0.020	0.005	0.291	0.005	0.314	0.289	0.529		
Børselva	*lower avg.*	1 264	463	463	0	0	2	6	36	1 314	0.002	0.051	0.003	0.093	0.244	0.100	0.292	0.000		
	upper avg.	1 264	463	463	0	0	2	6	36	1 314	0.002	0.051	0.003	0.093	0.244	0.100	0.292	0.463		
Mattusjåkka	*lower avg.*	146	26	69	0	0	3	0	4	64	0.003	0.022	0.002	0.022	0.205	0.043	0.129	0.000		
	upper avg.	146	26	69	0	0	3	0	4	64	0.003	0.022	0.002	0.022	0.205	0.043	0.129	0.053		
Stuorrajåkka	*lower avg.*	996	0	255	0	0	9	1	33	859	0.033	0.080	0.009	0.000	0.310	0.060	0.158	0.000		
	upper avg.	996	18	255	0	0	9	1	33	859	0.033	0.080	0.009	0.003	0.310	0.060	0.158	0.364		
Soussjåkka	*lower avg.*	133	0	63	0	0	1	0	4	133	0.001	0.004	0.001	0.004	0.020	0.002	0.035	0.000		
	upper avg.	133	2	63	0	0	1	0	4	133	0.001	0.004	0.001	0.004	0.020	0.002	0.035	0.049		
Adamselva	*lower avg.*	1 056	25	618	0	0	1	3	36	865	0.048	0.015	0.008	0.041	0.317	0.000	0.000	1.159		
	upper avg.	1 056	25	618	0	0	1	3	36	865	0.048	0.015	0.008	0.041	0.317	0.004	0.003	1.159		
Syltefjordelva(Vesterelva)	*lower avg.*	789	0	231	1	1	2	3	17	634	0.047	0.000	0.005	0.017	0.052	0.000	0.508	0.577		
	upper avg.	789	14	231	1	1	2	3	17	634	0.047	0.001	0.005	0.017	0.052	0.003	0.508	0.577		
Jakobselv	*lower avg.*	864	115	886	1	1	0	2	39	1 122	0.024	0.000	0.003	0.024	0.000	0.003	0.011	0.000		
	upper avg.	864	115	886	1	1	0	2	39	1 122	0.024	0.002	0.003	0.024	0.003	0.003	0.011	0.316		

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.*	2 834	1 193	4 975	2	2	19	12	197	2 075	0.068	0.000	0.021	0.539	0.000	0.233	0.602	0.000		
	upper avg.	2 834	1 193	4 975	2	2	19	12	197	2 075	0.068	0.005	0.021	0.539	0.010	0.233	0.602	1.037		
Grense Jakobselv	*lower avg.*	262	73	347	0	0	0	1	13	286	0.017	0.006	0.002	0.216	0.182	0.746	0.285	0.288		
	upper avg.	262	73	347	0	0	0	1	13	286	0.017	0.006	0.002	0.216	0.182	0.746	0.285	0.288		

Table 3. Total inputs from Norway 2012

TOTAL INPUTS																				
Discharge region	Estimate	Flow rate (km³/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.	183 855	587 695	244 440	601	1 103	14 078	730	28 889	209 641	10.81	18.09	0.82	91.31	714.32	37.97	24.46	60	1	0
	upp avg.		587 695	244 440	613	1 103	14 078	736	28 889	209 641	10.85	18.09	0.87	91.31	714.32	37.97	26.23	102	13	94
Tributary Rivers (36)	low avg.	219 601	263 462	207 655	231	586	7 480	908	20 359	174 644	7.85	14.06	0.88	63.28	220.87	54.94	22.04	52		
	upp avg.		263 566	207 655	254	587	7 480	927	20 359	174 644	8.83	14.06	1.02	63.28	220.87	54.97	25.32	101		
Tributary Rivers (109)	low avg.	154 855	70 481	95 115	104	237	5 641	483	10 358	75 308	5.90	5.68	0.45	22.20	59.25	20.91	17.14	52		
	upp avg.		70 665	95 115	105	241	5 642	483	10 366	75 308	5.92	5.72	0.45	22.24	59.31	20.92	17.29	79		
Total Riverine Inputs	**low avg.**	558 311	921 638	547 210	937	1 926	27 199	2 121	59 606	459 594	24.56	37.83	2.15	176.79	994.44	113.81	63.65	164	1	0
	upp avg.		921 926	547 210	972	1 931	27 200	2 147	59 614	459 594	25.60	37.87	2.34	176.82	994.50	113.85	68.83	282	13	94
Sewage Effluents	low avg.		3 058		546	910	607	9 105	12 140		0.19	0.29	0.01	5.28	11.51	1.36	0.60	9		47
	upp avg.		3 058		546	910	607	9 105	12 140		0.19	0.29	0.01	5.28	11.51	1.36	0.60	9		47
Industrial Effluents	low avg.		13 306	2 668	155	258	113	1 701	2 268		2.08	4.38	0.16	5.77	15.90	9.01	0.01	8		
	upp avg.		13 306	2 668	155	258	113	1 701	2 268		2.08	4.38	0.16	5.77	15.90	9.01	0.01	8		
Fish Farming	low avg.				6 287	9 112	5 938	43 185	53 981					677.03						
	upp avg.				6 287	9 112	5 938	43 185	53 981					677.03						
Total Direct Inputs	**low avg.**		16 364	2 668	6 989	10 281	6 658	53 991	68 390		2.27	4.68	0.17	688.08	27.41	10.37	0.60	17		47
	upp avg.		16 364	2 668	6 989	10 281	6 658	53 991	68 390		2.27	4.68	0.17	688.08	27.41	10.37	0.60	17		47
Unmonitored Areas	low avg.	397 992			185	752	25 786	2 269	41 257											
	upp avg.				185	752	25 786	2 269	41 257											
REGION TOTAL	**low avg.**	956 303	938 003	549 878	8 110	12 958	59 643	58 381	169 252	459 594	27	43	2	865	1 022	124	64	181	1	47
	upp avg.		938 291	549 878	8 145	12 963	59 644	58 407	169 260	459 594	28	43	3	865	1 022	124	69	299	13	141

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: Skagerrak																				
RIVERINE INPUTS																				
Main Rivers	low avg.	141 862	548 841	212 849	565	996	12 885	664	25 668	176 907	9.23	16.70	0.67	67.80	664.28	32.22	22.16	54	1	0
	upp avg.		548 841	212 849	570	996	12 885	665	25 668	176 907	9.23	16.70	0.68	67.80	664.28	32.22	23.39	84	10	73
Tributary Rivers (36)	low avg.	26 867	16 718	46 372	23	65	1 413	90	3 545	21 038	1.84	3.65	0.28	7.52	62.82	3.27	1.00	11		
	upp avg.		16 718	46 372	26	65	1 413	91	3 545	21 038	1.84	3.65	0.28	7.52	62.82	3.27	1.32	15		
Tributary Rivers (109)	low avg.	8 740	14 977	17 236	22	76	1 460	76	2 186	8 890	1.12	1.31	0.09	3.19	18.59	2.38	0.73	5		
	upp avg.		14 977	17 236	22	76	1 460	76	2 186	8 890	1.12	1.31	0.09	3.19	18.60	2.38	0.74	5		
Total Riverine Inputs	**low avg.**	177 469	580 536	276 457	610	1 137	15 758	830	31 400	206 835	12.19	21.66	1.05	78.51	745.69	37.87	23.88	70	1	0
	upp avg.		580 536	276 457	618	1 137	15 758	832	31 400	206 835	12.19	21.66	1.05	78.51	745.69	37.87	25.44	104	10	73
Sewage Effluents	low avg.		363		60	100	238	3 571	4 761		0.14	0.19	0.01	3.93	9.71	1.08	0.24	7		47
	upp avg.		363		60	100	238	3 571	4 761		0.14	0.19	0.01	3.93	9.71	1.08	0.24	7		47
Industrial Effluents	low avg.		1 227	1 982	40	66	47	701	935		0.17	0.23	0.04	4.90	5.49	3.07		5		
	upp avg.		1 227	1 982	40	66	47	701	935		0.17	0.23	0.04	4.90	5.49	3.07		5		
Fish Farming	low avg.				3	4	3	18	23					0.29						
	upp avg.				3	4	3	18	23					0.29						
Total Direct Inputs	**low avg.**		1 590	1 982	102	170	287	4 291	5 719		0.32	0.42	0.04	9.12	15.20	4.15	0.24	12		47
	upp avg.		1 590	1 982	102	170	287	4 291	5 719		0.32	0.42	0.04	9.12	15.20	4.15	0.24	12		47
Unmonitored Areas	low avg.	7 984			19	77	1 975	174	3 161											
	upp avg.				19	77	1 975	174	3 161											
REGION TOTAL	**low avg.**	185 454	582 125	278 439	731	1 384	18 020	5 294	40 279	206 835	13	22	1	88	761	42	24	82	1	47
	upp avg.		582 125	278 439	739	1 384	18 020	5 296	40 279	206 835	13	22	1	88	761	42	26	116	10	120

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																				
Main Rivers	low avg.	9 872	9 149	4 558	20	43	464	33	967	3 922	0.25	0.55	0.03	2.04	6.14	1.24	0.21	3	0	0
	upp avg.		9 149	4 558	21	43	464	33	967	3 922	0.29	0.55	0.03	2.04	6.14	1.24	0.45	5	1	5
Tributary Rivers (36)	low avg.	75 671	39 034	54 393	58	164	3 569	187	7 229	33 382	1.95	6.66	0.35	13.67	73.62	4.48	1.47	21		
	upp avg.		39 138	54 393	66	165	3 569	197	7 229	33 382	2.42	6.66	0.38	13.67	73.62	4.51	3.33	37		
Tributary Rivers (109)	low avg.	76 517	28 735	33 420	47	91	3 091	201	5 174	28 363	2.77	3.38	0.17	9.31	28.68	9.70	3.66	22		
	upp avg.		28 735	33 420	47	92	3 091	201	5 174	28 363	2.77	3.38	0.17	9.33	28.71	9.70	3.72	35		
Total Riverine Inputs	**low avg.**	162 060	76 919	92 371	125	298	7 124	421	13 370	65 667	4.97	10.58	0.55	25.01	108.44	15.42	5.34	45	0	0
	upp avg.		77 023	92 371	135	300	7 124	432	13 370	65 667	5.49	10.58	0.59	25.03	108.47	15.45	7.50	77	1	5
Sewage Effluents	low avg.		107		208	347	180	2 696	3 595		0.01	0.04	0.00	0.39	1.13	0.07	0.04	1		0
	upp avg.		107		208	347	180	2 696	3 595		0.01	0.04	0.00	0.39	1.13	0.07	0.04	1		0
Industrial Effluents	low avg.		6 005	300	58	97	22	328	438		1.85	0.96	0.07	0.57	9.21	4.00	0.01	3		
	upp avg.		6 005	300	58	97	22	328	438		1.85	0.96	0.07	0.57	9.21	4.00	0.01	3		
Fish Farming	low avg.				2 155	3 123	2 046	14 882	18 602					232.50						
	upp avg.				2 155	3 123	2 046	14 882	18 602					232.50						
Total Direct Inputs	**low avg.**		6 112	300	2 421	3 567	2 248	17 906	22 635		1.86	1.00	0.07	233.47	10.34	4.07	0.05	3		0
	upp avg.		6 112	300	2 421	3 567	2 248	17 906	22 635		1.86	1.00	0.07	233.47	10.34	4.07	0.05	3		0
Unmonitored Areas	low avg.	145 799			62	254	10 804	951	17 286											
	upp avg.				62	254	10 804	951	17 286											
REGION TOTAL	**low avg.**	307 859	83 031	92 671	2 609	4 119	20 175	19 278	53 291	65 667	7	12	1	258	119	19	5	48	0	0
	upp avg.		83 135	92 671	2 618	4 121	20 176	19 289	53 291	65 667	7	12	1	259	119	20	8	80	1	5

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.	22 067	24 830	15 926	12	40	642	21	1 583	14 426	0.93	0.66	0.11	19.27	37.71	3.59	1.25	2	0	0
	upp avg.		24 830	15 926	16	40	642	25	1 583	14 426	0.93	0.66	0.13	19.27	37.71	3.59	1.51	9	2	11
Tributary Rivers (36)	low avg.	87 405	193 870	76 914	131	281	1 860	154	6 044	64 729	2.53	2.90	0.17	27.32	58.09	22.91	17.06	17		
	upp avg.		193 870	76 914	142	281	1 860	162	6 044	64 729	3.00	2.90	0.26	27.32	58.09	22.91	18.01	38		
Tributary Rivers (109)	low avg.	55 750	22 649	28 970	29	62	1 021	162	2 407	27 265	1.63	0.79	0.11	7.24	10.05	6.97	10.02	22		
	upp avg.		22 798	28 970	29	64	1 022	162	2 415	27 265	1.65	0.81	0.11	7.25	10.06	6.98	10.10	32		
Total Riverine Inputs	**low avg.**	165 222	241 350	121 810	172	383	3 524	337	10 034	106 421	5.09	4.34	0.39	53.83	105.85	33.47	28.34	41	0	0
	upp avg.		241 499	121 810	187	386	3 524	348	10 042	106 421	5.58	4.36	0.50	53.84	105.87	33.47	29.62	78	2	11
Sewage Effluents	low avg.		2 571		258	430	177	2 648	3 530		0.04	0.06	0.00	0.96	0.67	0.21	0.31	1		0
	upp avg.		2 571		258	430	177	2 648	3 530		0.04	0.06	0.00	0.96	0.67	0.21	0.31	1		0
Industrial Effluents	low avg.		6 074	309	56	93	42	633	844		0.06	3.20	0.05	0.29	1.20	1.93	0.00	0		
	upp avg.		6 074	309	56	93	42	633	844		0.06	3.20	0.05	0.29	1.20	1.93	0.00	0		
Fish Farming	low avg.				3 683	5 338	3 471	25 241	31 551					396.34						
	upp avg.				3 683	5 338	3 471	25 241	31 551					396.34						
Total Direct Inputs	**low avg.**		8 645	309	3 997	5 861	3 689	28 521	35 925		0.10	3.26	0.06	397.59	1.87	2.14	0.31	2		0
	upp avg.		8 645	309	3 997	5 861	3 689	28 521	35 925		0.10	3.26	0.06	397.59	1.87	2.14	0.31	2		0
Unmonitored Areas	low avg.	208 225			95	384	11 696	1 029	18 714											
	upp avg.				95	384	11 696	1 029	18 714											
REGION TOTAL	**low avg.**	373 447	249 995	122 119	4 263	6 628	18 909	29 887	64 672	106 421	5	8	0	451	108	36	29	43	0	0
	upp avg.		250 144	122 119	4 278	6 630	18 910	29 899	64 680	106 421	6	8	1	451	108	36	30	80	2	11

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.	10 053	4 875	11 107	4	24	88	12	671	14 386	0.40	0.18	0.01	2.20	6.20	0.93	0.84	1	0	0
	upp avg.		4 875	11 107	6	24	88	13	671	14 386	0.40	0.19	0.02	2.20	6.20	0.93	0.88	4	1	5
Tributary Rivers (36)	low avg.	29 657	13 839	29 976	19	77	637	477	3 541	55 495	1.53	0.86	0.08	14.77	26.33	24.28	2.52	3		
	upp avg.		13 839	29 976	20	77	637	477	3 541	55 495	1.57	0.86	0.10	14.77	26.33	24.28	2.67	11		
Tributary Rivers (109)	low avg.	13 849	4 120	15 488	7	7	69	44	590	10 790	0.37	0.20	0.07	2.46	1.93	1.85	2.73	4		
	upp avg.		4 155	15 488	7	8	69	44	590	10 790	0.37	0.22	0.07	2.47	1.94	1.86	2.73	7		
Total Riverine Inputs	**low avg.**	53 559	22 834	56 572	30	108	794	533	4 802	80 671	2.31	1.24	0.16	19.44	34.46	27.06	6.09	8	0	0
	upp avg.		22 869	56 572	32	109	794	534	4 802	80 671	2.34	1.26	0.20	19.44	34.48	27.07	6.28	22	1	5
Sewage Effluents	low avg.		17		20	33	13	190	254											
	upp avg.		17		20	33	13	190	254											
Industrial Effluents	low avg.			77	2	3	3	39	52		0.00	0.00				0.00		0		
	upp avg.			77	2	3	3	39	52		0.00	0.00				0.00		0		
Fish Farming	low avg.				446	647	419	3 044	3 805					47.89						
	upp avg.				446	647	419	3 044	3 805					47.89						
Total Direct Inputs	**low avg.**		17	77	468	683	434	3 273	4 111		0.00	0.00		47.89		0.00		0		
	upp avg.		17	77	468	683	434	3 273	4 111		0.00	0.00		47.89		0.00		0		
Unmonitored Areas	low avg.	35 985			9	37	1 311	115	2 097											
	upp avg.				9	37	1 311	115	2 097											
REGION TOTAL	**low avg.**	89 544	22 852	56 649	507	828	2 538	3 922	11 010	80 671	2	1	0	67	34	27	6	8	0	0
	upp avg.		22 887	56 649	509	829	2 539	3 923	11 010	80 671	2	1	0	67	34	27	6	23	1	5

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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. Miljødirektoratet er ansvarlig for gjennomføringen av overvåkingsprogrammet.