KLIMA- OG FORURENSNINGS- DIREKTORATET

Statlig program for forurensningsovervåking

Rapportnr. 2726/2010

RIVERINE INPUTS AND DIRECT DISCHARGES TO NORWEGIAN COASTAL WATERS – 2009

TA 2726 2010

Utført av

NIVA Norsk institutt for vannforskning

Bioforsk

NVE

Riverine inputs and direct discharges to Norwegian coastal waters – 2009

Norwegian Institute for Water Research
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REPORT

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Title	Serial No.	Date
Riverine inputs and direct discharges to Norwegian coastal waters – 2009 (NIVA-Rapport 6053-2010)	6053-2010	November 2010
	Report No. Sub-No. TA-2726 /2010 SPFO – 1081/2010	Pages Price 75+ Appendices and Addendum
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	Geographical area Norway	Printed NIVA

Client(s)	Client ref.
Climate and Pollution Agency (Klif)	Christine Daae Olseng

Abstract

Riverine inputs and direct discharges to Norwegian seas in 2009 have been estimated in accordance with the requirements of the OSPAR Commission. Due to the general lower water discharges in 2009 than in 2008, there was a reduction in all nutrient fractions in riverine loads in 2009. Long-term (1990-2009) trends show that nutrient loads have decreased in some Norwegian rivers, although nitrogen *concentrations* have increased in others. Direct discharges of nutrients from fish farming continue to increase. The riverine loads of all metals except mercury were lower in 2009 than in 2008. The copper discharges from fish farming continue to increase. Analyses of long term trends (1990-2009) in metal inputs showed that zinc and copper loads have been reduced in several rivers. Inputs of PCBs and the pesticide lindane in 2009 were insignificant.

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

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ISBN 978-82-577-5788-5

Preface

This report presents the results of the 2009 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 contribution for 2009 has been administered by Christine Daae Olseng at Klif (the Climate and Pollution Agency; former SFT). Klif 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 organise and carry out the monitoring, undertake the analyses and report the results.

At NIVA, Øyvind Kaste has co-ordinated the RID programme in 2009. 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 chemical sampling/analyses) and Bente Lauritzen (contact person at NIVAlab).

At Bioforsk, Eva Skarbøvik has been the main responsible for the 2009 reporting. Per Stålnacke and Paul A. Aakerøy have carried out and reported the statistical trend analyses. All three have participated in the quality assurance of the 2009-data.

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

Overall quality assurance of the annual report has been carried out by Kari Austnes, NIVA.

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

Oslo, November 2010

Øyvind Kaste

Project co-ordinator

Content

Addendum

Summary

This report presents the 2009 results of the Riverine Inputs and Direct Discharges to Norwegian coastal waters (RID). The programme is part of the OSPAR Programme, which has been on-going since 1990. The four coastal areas included in Norway's reporting are Skagerrak, the North Sea, the Norwegian Sea and the Barents Sea. In 2008, 46 rivers have been monitored in Norway. Ten of these, labelled 'main' rivers, are monitored monthly or more often, whereas the remaining 36 are labelled 'tributary rivers' (although they drain directly to the sea) and are monitored four times a year. In addition, loads are estimated from the remaining land area draining into the Atlantic ocean including 201 unmonitored rivers, as well as areas located downstream of the sampling points.

Direct discharges are estimated from industry, sewage treatment plants and fish farming. Such estimates are only made for units that are not covered by the monitoring in the rivers and can therefore not be used to give a general overview of which sector causes the highest discharges of the substances.

In 2009, the programme monitored the same substances as in 2008, i.e. six fractions of nutrients (total phosphorus, ortho-phosphates, 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 general parameters (suspended particulate matter, pH, conductivity and total organic carbon).

Water discharge
In general, 2009 was characterised by few extreme weather events, apart from a pronounced flood in late autumn in many areas. At the end of the year, temperatures were lower than normal in most of the country, and in combination with low precipitation this gave low water discharges in many areas.

Nutrients and suspended particulate matter
Due to the generally lower water discharges in 2009 than in 2008, there was a reduction in all nutrient fractions, as well as organic carbon, silica and suspended solids, in riverine loads in 2009. However, direct discharges of nutrients increased considerably from 2008 to 2009, mainly due to emissions from the fish farming industry. The end result was a total increase in ammonium, ortho-phosphate and total phosphorus inputs to the sea compared to 2008, whereas inputs of nitrate, total nitrogen, suspended particulate matter, silica and organic carbon were reduced.

Long term trends (1990-2009) in nutrient inputs in nine of the main rivers include downward trends in nitrogen loads in rivers Skienselva and Vefsna and downward trends in phosphorus loads in River Vefsna. In River Orreelva the high loads of nutrients observed in 2004-2007 have decreased in the latter years.

In addition, the nutrient *concentrations* were analysed in data from 1990 to 2009 in order to detect trends. A downward statistically significant trend was detected for both total nitrogen and nitrate in rivers Skienselva, Vefsna and Altaelva, and for nitrate in River Otra. Rivers Glomma, Orkla, Vefsna and Altaelva had reduced concentrations of ammonium. There were also tendencies of upward trends in concentrations of total nitrogen in rivers Drammenselva and Numedalslågen.

For total phosphorus and orthophosphate concentrations, statistically significant downward trends were detected in rivers Otra, Orkla, Vefsna and Altaelva. For suspended particle concentrations, statistically significant downward trends were found in rivers Otra, Orkla and Vefsna.

Metals

Due to lower water discharges in 2009, the riverine loads of all metals except mercury were lower in 2009 than in 2008. In terms of the direct discharges, arsenic, cadmium, lead and chromium increased from industrial discharges, whereas chromium and lead increased from discharges from sewage treatment plants. The copper discharges from fish farming continue to increase, in line with other discharges from this sector. In total for all direct discharges of metals, there was a considerable increase from 2008 in terms of copper and arsenic, a smaller increase for lead, chromium and cadmium, whereas a decrease was observed for zinc, nickel and mercury. In terms of riverine inputs and direct discharges combined however, most metals decreased compared to 2008, except copper (due to fish farming discharges) and mercury (due to riverine inputs). In total, arsenic and cadmium had very small changes since 2008.

Analyses of long term trends (1990-2009) in metal inputs from nine of the ten main rivers showed statistically significant downward trends of copper in rivers Vefsna, Orkla, Skienselva and Altaelva; and of zinc in rivers Glomma, Orkla and Vefsna. There were also tendencies of downward trends of zinc in rivers Numedalslågen, Skienselva and Otra.

Data from 1990 to 2009 were also analysed for trends in metal *concentrations*, and statistically significant downward trends were detected for copper in rivers Orkla, Vefsna and Altaelva, in addition to tendencies of decreased concentrations in rivers Glomma, Skienselva and Numedalslågen. For zinc concentrations, seven out of nine rivers showed statistically significant downward trends.

Pesticides

In terms of PCB7 and lindane inputs, these are as in former years low in Norwegian waters, and can hardly be found in quantities above the detection limit of the analytical methods.

Sammendrag

Resultater fra Elvetilførselsprogrammet (RID) i 2009 er presentert i denne rapporten. Programmet er en del av OSPAR-programmet og har pågått siden 1990. Fire havområder inngår i Norges rapportering. Disse er Skagerrak, Nordsjøen, Norskehavet og Barentshavet. Til sammen 46 vassdrag er overvåket i 2009, i tillegg er tilførsler beregnet fra det resterende landområdet som drenerer til Atlanterhavet, herunder 201 vassdrag som ikke er overvåket i 2009 samt områder nedstrøms prøvetakingsstedene. Direkte utslipp fra industri, kloakkrenseanlegg og akvakulturanlegg er også beregnet.

I 2009 omfatter overvåkningen følgende parametre: Seks fraksjoner av næringssalter (totalfosfor, ortofosfat, total nitrogen, ammonium, nitrat og silikat); åtte tungmetaller (kobber, sink, kadmium, bly, krom, nikkel, kvikksølv og arsen); ett pesticid (lindan); sju PCB-stoffer (PCB7); og fire generelle parametre (suspendert partikulært materiale, pH, ledningsevne og totalt organisk karbon).

Et komplett norsk sammendrag er utgitt som et infoark (Klif nr. 2727/2010). En kort oppsummering av resultatene fra RID-programmet i 2009 er gitt under:

Elvetilførsler av næringsstoffer i 2009 var generelt lavere enn i 2008 pga. lavere vannføringer. Langtidstrender (1990-2009) viser at transporten av både fosfor og nitrogen har gått ned i flere elver, men samtidig viser langtidsanalysene av konsentrasjoner at nitrogen-konsentrasjonene har økt i andre elver. Direktetilførsler av næringsstoffer har økt. Dette skyldes hovedsakelig en økning i utslippene fra fiskeoppdrett langs med kysten.

Tilsvarende som for næringsstoffer gikk også metalltilførslene fra elver ned i 2009 i forhold til i 2008, pga. lavere vannføringer. Et unntak er tilførslene av kvikksølv som har økt siden foregående år. Langtidstrender (1990-2009) viser at særlig sink- og kobbertilførsler har blitt redusert. Imidlertid fortsetter kobbertilførslene fra fiskeoppdrettsanleggene å øke (disse utslippene skyldes at kobber frigjøres ved rensing av mærene).

Som for tidligere år er tilførslene av lindan og PCB ubetydelige, nesten alle prøver har verdier under deteksjonsgrensen for analysemetoden.

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 2009 results of the monitoring of 46 rivers in Norway, as well as estimated loads from the remaining land area draining into the Atlantic sea, including 201 unmonitored rivers and areas downstream sampling points (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 2009, 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 general 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*.

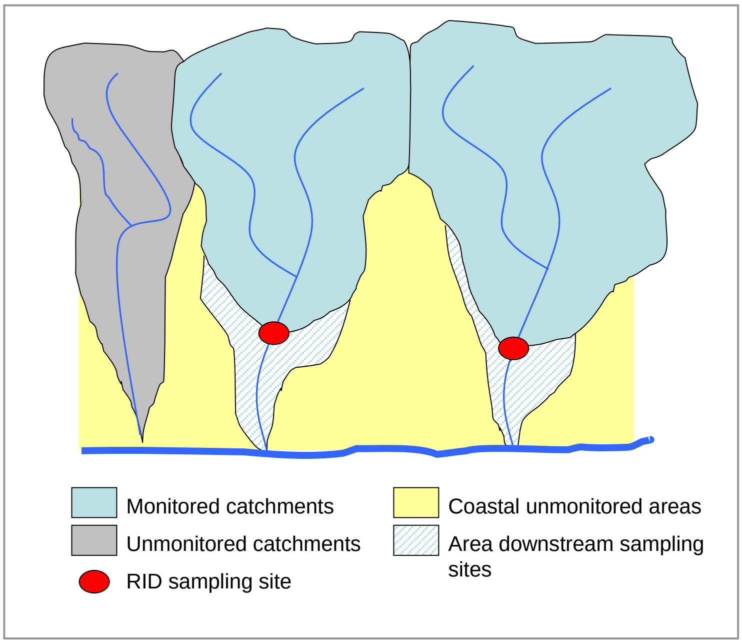


Figure 1. Illustration of RID areas. Areas covered by RID monitoring stations (blue; 46 rivers); areas downstream of the sampling sites (blue shaded); coastal areas between catchments (yellow); and unmonitored catchments (grey).

1.2 The RID Rivers

The Norwegian river basin register system "REGINE" (NVE; www.nve.no) classifies the Norwegian river basins into 262 main catchment areas, of which 247 drain into coastal areas. These rivers range from River Haldenvassdraget in the south east (river no. 001) to River Grense Jakobselv in the north east (river no. 247). A selection of these rivers has been done in order to fulfil the RID requirements, and in 2009, 10 '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 more seldom than the main rivers; they all drain directly into the sea. Whereas several changes were introduced in the 2008 monitoring programme, the programme in 2009 has not undergone any major alterations. Details on former changes of the RID monitoring programme are given in Appendix IV.

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

1.3 Unmonitored areas and direct discharges

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

Direct discharges have been estimated based on data from the Climate and Pollution Agency's Forurensning database (for industry); Statistics Norway's database KOSTRA (for municipal wastewater and wastewater from scattered dwellings); and the Directorate of Fisheries' ALTINN database (for information of discharges from aquaculture and fisheries).

1.4 Outline of the 2009 RID Report

The 2009 RID Report is organised as follows:

- Chapter 2: The methodology of the RID Programme;
- Chapter 3: The results, including concentrations and loads in 2009 as well as climatic and water discharge conditions this year;
- Chapter 4: Discussions, including comparisons with last year's results as well as long-term trend analyses of concentrations and loads since the programme started in 1990;
- Chapter 5: Conclusions.

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

An addendum to the report gives, as in former years, the three most important data tables of the programme, namely an overview of all concentrations and water discharge values in all rivers during sampling in 2009; the calculated annual loads of each river in 2009; as well as overview tables of all loads to the four coastal areas of Norway in 2009.

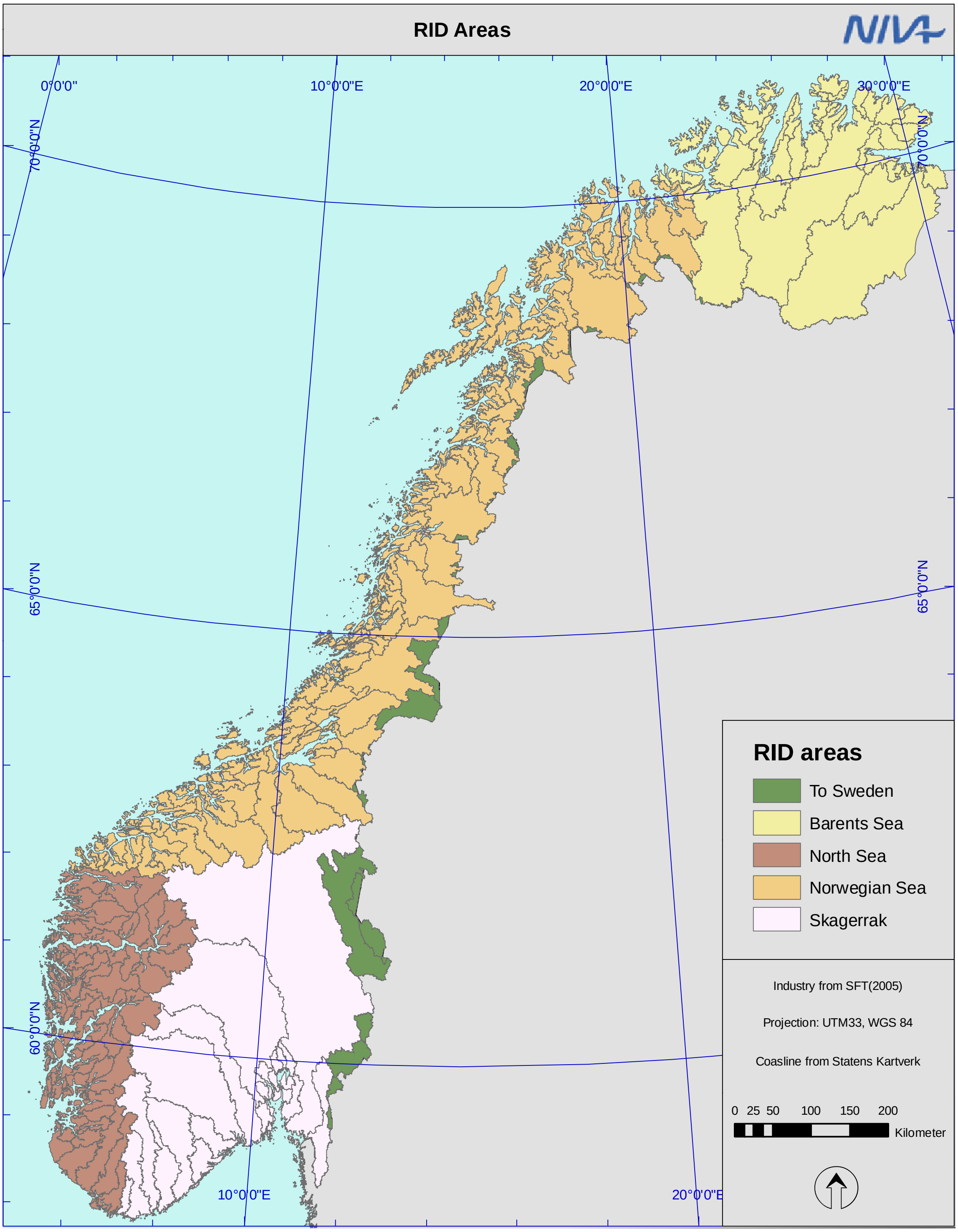


Figure 2. Norway has been divided into four Discharge Areas, i.e. Skagerrak, North Sea, Norwegian Sea and the Barents Sea. Minor parts of Norway drain to Sweden.

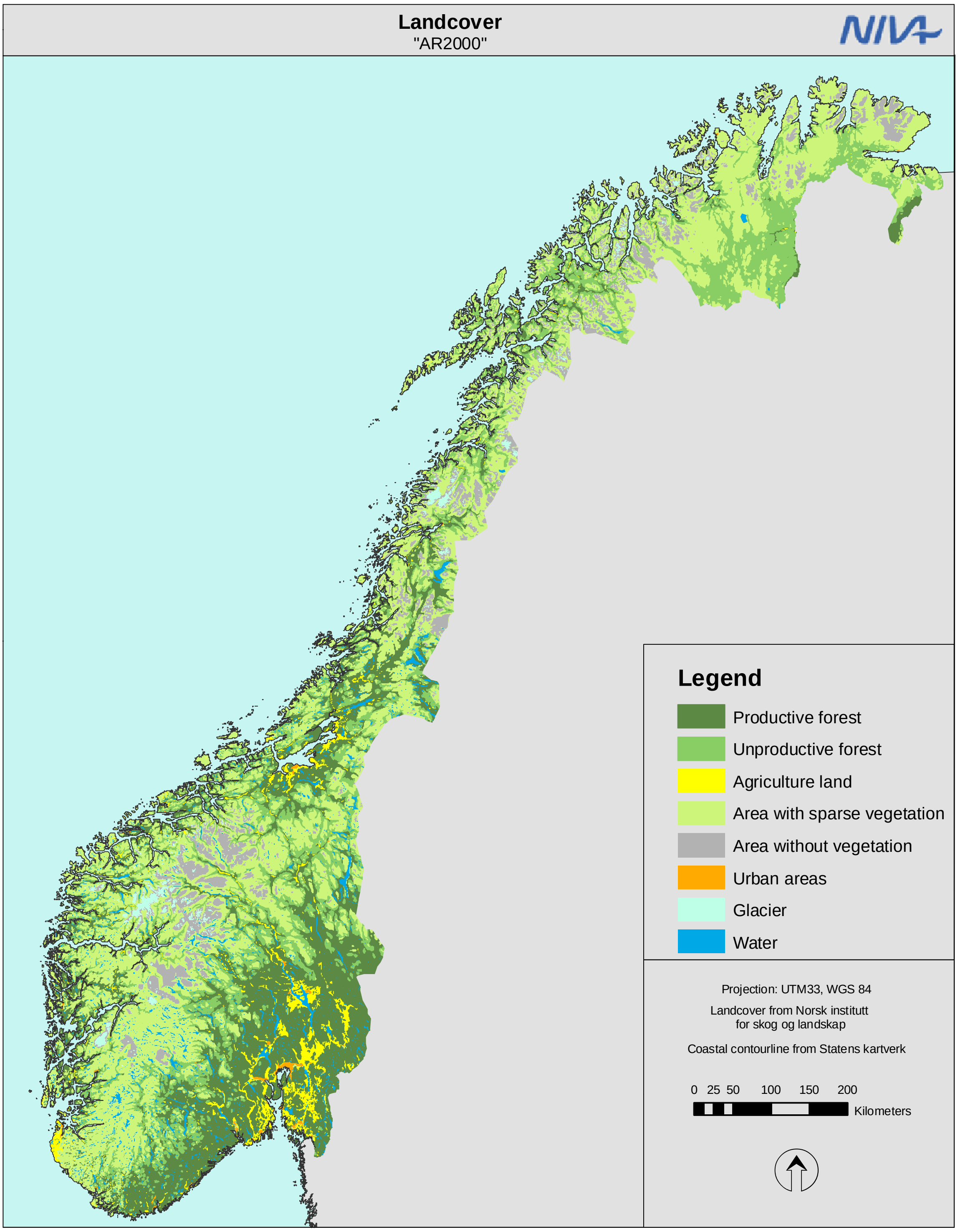


Figure 3. Land cover map of Norway. See also Figure 4 where the land use in the catchments of the 10 main RID rivers is shown.

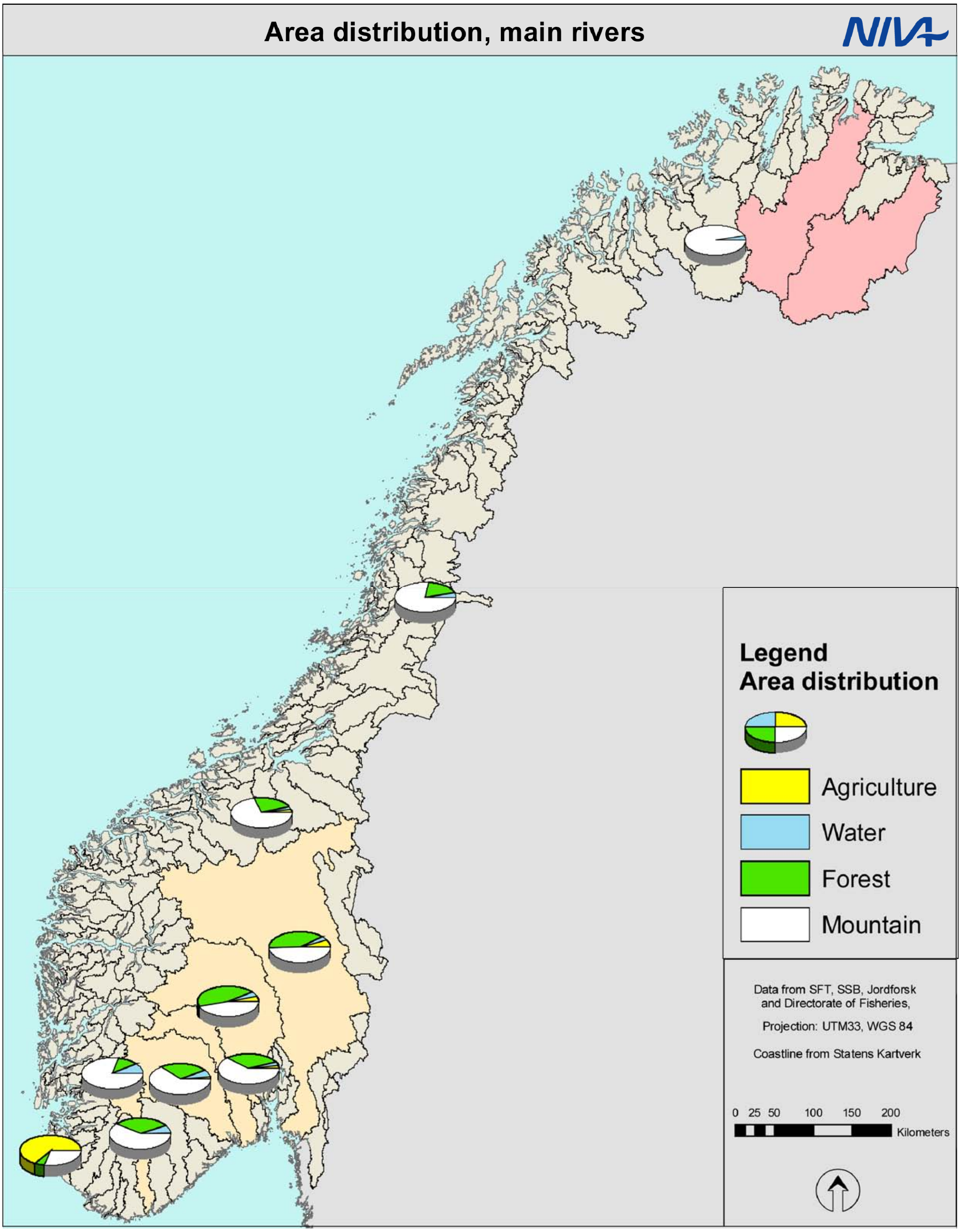


Figure 4. Land use in the catchment areas of the 10 main rivers. "Water" signifies proportion of lakes in the catchment; "Mountains" include moors and mountain plateaus not covered by forest. Based on data from The Norwegian Forest and Landscape Institute.

2. Materials and methods

This chapter presents the methodology used in the RID 2009 Programme, including selection of rivers for monitoring; water sampling and analysis methodology; water discharge and hydrological modelling; calculation formula for riverine loads and methods for estimating direct discharges; methods for estimating long-term trends in rivers . Appendix IV gives more details.

2.1 Selection of RID Rivers

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

- The 10 main rivers have been selected due to their size and loads. Eight of these were selected because they were assumed to be the most important load-bearing rivers; whereas two are relatively unpolluted rivers and included for comparison reasons.
- The 36 rivers sampled 4 times a year have been selected due to their size and loads, as well as presence of water discharge measurement stations.
- 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 spring 2008 onwards, River Vosso replaced River Suldalslågen as a main river, and from 2009 River Vosso is for the first time fully reported as one of the main rivers. This change will have some implications for the comparisons of main rivers with former years, and for the long-term database. For the long term trend analyses, rivers Vosso and Suldalslågen will be omitted until River Vosso again has a sufficient number of years of monthly observations. However, most year-to-year comparisons are done on all rivers or all inputs, and will therefore not be much affected by this change.

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

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

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

2.2 Water sampling methodology

The methodology for water sampling described in the Commission’s Document “Principles of the Comprehensive Study on Riverine Inputs” (PARCOM, 1988; 1993) has been followed. Sampling has been carried out in the same manner as the previous year (Skarbøvik et al., 2009).

The quarterly sampling has been designed to cover four main meteorological and hydrological conditions in the Norwegian climate, viz. winter season with low temperatures, snowmelt during spring, summer low flow season, and autumn floods/high discharges. In Glomma it has been decided to include data from a parallel monitoring programme carried out by the county administration, since the same laboratory is used and since the sampling sites are closely located. This programme analyses total organic carbon (TOC), total phosphorus, NO_3-N and total nitrogen only. An individual study was conducted in order to compare the data analyses from the RID programme with the analyses from the county administration. This study showed that there were no statistically significant differences between the two datasets and that, therefore, the additional data from Glomma could be included in the RID reporting.

Table 2 and Table 3 show the sampling frequency and dates of sampling for the 10 rivers monitored at least monthly, and the 36 rivers monitored quarterly, respectively. The sampling sites are indicated in Figure *5*.

Table 2. Sampling frequency and dates of sampling in 2009 in the 10 main rivers for all substances, except yellow dates which only are for TOC, total phosphorus (TP), NO_3-N and total nitrogen (TN). Dates for analyses of PCB7 and lindane below.

River	Glomma	Drammen	Numedals-lågen	Skienselva	Otra	Orre	Vosso[1]	Orkla	Vefsna	Altaelva
Date ddmm	05.01	08.01	12.01	14.01	13.01	12.01	12.01	08.01	09.01	13.01
	20.01									
	09.02	04.02	02.02	09.02	09.02	02.02	02.02	04.02	02.02	02.02
	16.02									
	09.03	04.03	03.03	06.03	05.03	02.03	02.03	04.03	03.03	06.03
	16.03									
	06.04	01.04	02.04	14.04	07.04	14.04	14.04	15.04	03.04	14.04
	14.04									
	04.05	06.05	07.05	04.05	06.05	11.05	04.05	07.05	08.05	06.05
	11.05									
	16.05	18.05								
	25.05	27.05								
	08.06	04.06	02.06	02.06	02.06	08.06	22.06	04.06	05.06	05.06
	18.06	16.06								
	29.06	23.06								
	06.07	08.07	07.07	07.07	08.07	06.07	06.07	06.07	03.07	07.07
	10.08	05.08	11.08	06.08	10.08	03.08	03.08	05.08	17.08	10.08
	07.09	07.09	07.09	02.09	09.09	07.09	07.09	08.09	04.09	08.09
	05.10	07.10	06.10	02.10	07.10	05.10	05.10	08.10	02.10	05.10
	09.11	04.11	04.11	02.11	04.11	02.11	02.11	05.11	02.11	02.11
	07.12	02.12	07.12	10.12	09.12	07.12	07.12	10.12	03.12	04.12
sum	21	16	12	12	12	12	12	12	12	12

River	Glomma	Drammen	Numedals-lågen	Skienselva	Otra	Orre	Vosso	Orkla	Vefsna	Altaelva
PCB7 and Lindane	09.02	04.02	02.04	09.02	09.02	14.04	14.04	04.02	02.02	02.02
	04.05	06.05	07.05	04.05	06.05	11.05	04.05	07.05	08.05	06.05
	10.08	05.08	11.08	06.08	10.08	03.08	03.08	05.08	17.08	10.08
	05.10	07.10	06.10	02.10	07.10		05.10	08.10	02.10	05.10
sum	4	4	4	4	4	3	4	4	4	4

[1] River Vosso is now being phased in as a main river.

*Table 3. Sampling frequency and dates in 2009 in the 36 tributary rivers. * not Hg ** only TOC and PO4-P.*

River	Tista	Tokkeelva	Nidelv (south)	Tovdalselva	Mandalselva	Lyngdalselva
Date ddmm	09.02	11.02	09.02	09.02	10.02	10.02
	04.05	06.05	05.05	06.05	11.05	12.05
	02.06**					
	10.08*	10.08	10.08	10.08	11.08	11.08
	05.10	14.10	14.10	07.10	08.10	08.10*
River	Kvina	Sira	Bjerkreimselva	Figgjoelva	Lyseelva	Årdalselva
Date ddmm	10.02	10.02	23.02	03.02	16.02	19.03
	12.05	12.05	18.05	04.05	10.05	13.05
	11.08	11.08	31.08	04.08	02.08	16.09*
	08.10	08.10	15.10	05.10	04.10	26.10
River	Ulla	Sauda	Vikedalselva	Suldalslågen	Jostedøla	Gaular
Date ddmm	15.03	10.03	10.03	03.03	05.02	17.02
	13.05*	12.05	12.05	15.05	12.05	14.05
	16.09*	16.09	07.09*	24.08	11.08	10.08*
	26.10	06.10	05.10	02.11	13.10	23.10
River	Jølstra	Nausta	Breimselva	Driva	Surna	Gaula
Date ddmm	17.02	17.02	17.03	03.03	09.02	17.02
	11.05	11.05	28.05	15.05	04.05	12.05
	12.08	12.08	26.08	04.08	04.08	05.08
	16.10	16.10	02.11	15.10	05.10	14.10
River	Nidelva	Stjørdalselva.	Verdalselva.	Snåsa	Namsen	Røssåga
Date ddmm	17.02	17.02	17.02	17.02*	12.03	02.02
	12.05	13.05	13.05	13.05	13.05	08.05
	05.08	06.08	06.08*	06.08	11.08	17.08
	15.10	15.10	15.10	15.10	14.10	21.10
River	Ranaelva	Beiarelva	Målselv	Barduelva	Tanaelva	Pasvikelva
Date ddmm	02.02	19.03	02.02	02.02	09.02	09.02
	08.05	03.06	18.05	18.05	08.05	10.05
	17.08	20.08	04.08	04.08	03.08*	04.08
	21.10	15.10	05.10	05.10	06.10	06.10

2.3 Chemical parameters – detection limits and analytical methods

The parameters monitored in 2009 are given in Chapter 1, Introduction. Information on methodology and limits of detection for all parameters included in the sampling programme are given in Appendix IV. There have been no changes in the analytical methods or in detection limits since the RID 2008-programme (Skarbøvik et al., 2009).

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:

- In the lower estimate, samples with concentrations below the detection limit have been given a value zero;
- In the upper estimate, 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. Moreover, for compounds that have a high number of samples below the detection limit, the highest and lowest estimates may vary considerably.

According to the RID Principles, and in particular the document “Principles of the Comprehensive Study of Riverine Inputs and Direct Discharges” (PARCOM, 1988), it is necessary to choose an analytical method which gives at least 70 % of positive findings (i.e. no more than 30% of the samples below the detection limit). As shown in Table 4, two metals (mercury and chromium) and one nutrient species (PO_4-P) did not achieve this requirement in 2009. This is the same as in 2008. Also as previously, PCB7 compounds and Lindane were 100% below the detection limit with one exception (PCB-CB118 in River Altaelva). As the analytical methods used have acceptably low detection limits, the number of samples below the detection limit reflect that the concentrations of these compounds were low in Norwegian river waters in 2009.

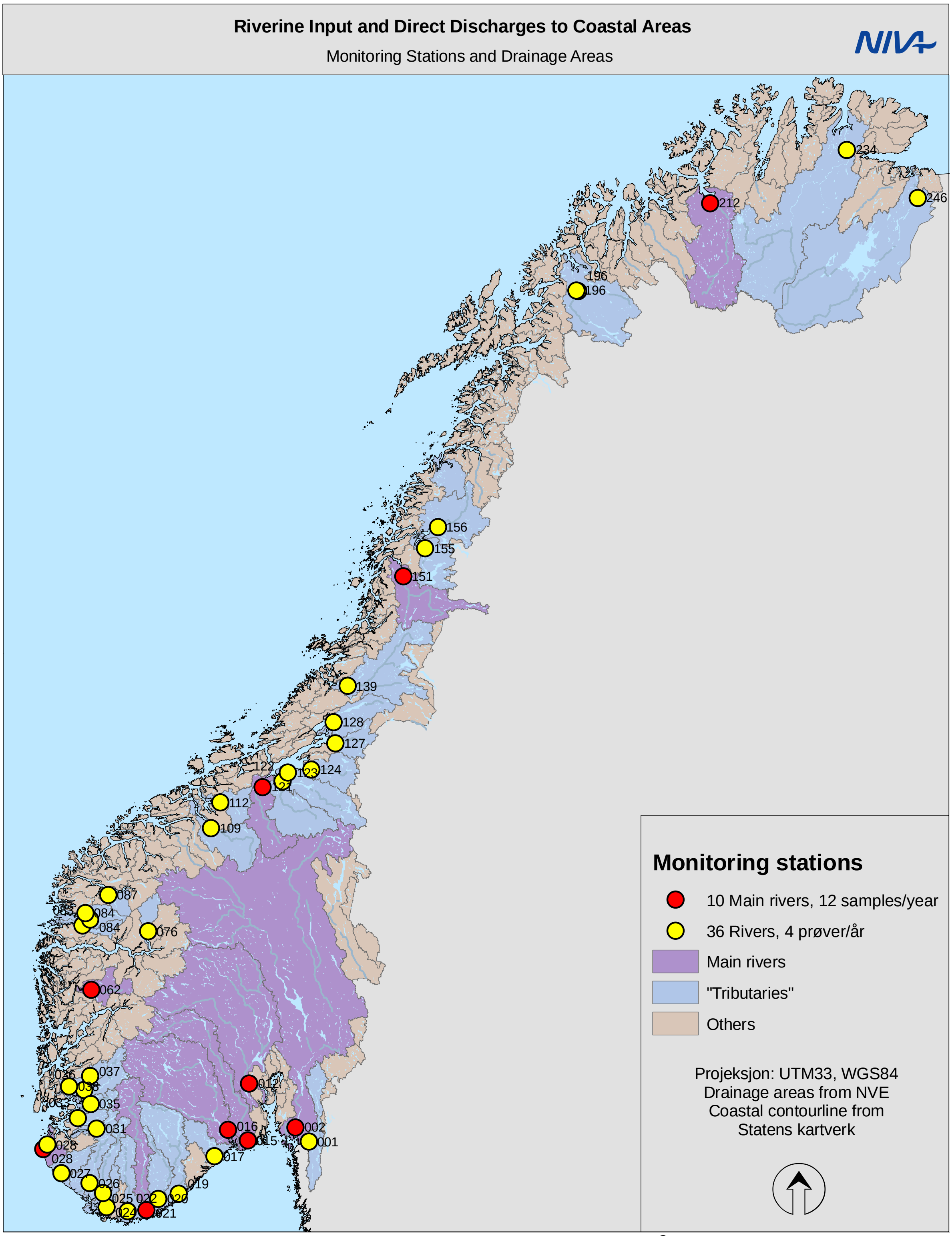


Figure 5. River sampling sites in the Norwegian RID programme[2]. Red dots represent the 10 main rivers. Yellow dots represent the 36 'tributary' rivers. Numbers next to the dots refer to the national river register (REGINE; www.nve.no).

[2] River Suldalslågen is here still regarded as a main river; in the 2009 reporting River Vosso (no. 62) will be replacing it.

Table 4. The proportion of analyses below the detection limit for all parameters included in the sampling programme in 2009. 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	0	276	0
TOC	mg C/l	0	278	0
TOT-P	µg P/l	1	277	4
PO4-P	µg P/l	43	273	118
TOT-N	µg N/l	0	277	0
NO3-N	µg N/l	1	277	4
NH4-N	µg N/l	23	272	62
SiO2	mg/l	0	271	1
Pb	µg/l	3	270	9
Cd	µg/l	23	270	62
Cu	µg/l	0	270	0
Zn	µg/l	1	270	3
As	µg/l	11	270	31
Hg	ng/l	46	257	118
Cr	µg/l	33	270	88
Ni	µg/l	2	270	5
Lindane(HCHG)	ng/l	100	39	39
PCB(CB101)	ng/l	100	39	39
PCB(CB118)	ng/l	97	39	38
PCB(CB138)	ng/l	100	39	39
PCB(CB153)	ng/l	100	39	39
PCB(CB180)	ng/l	100	39	39
PCB(CB28)	ng/l	100	39	39
PCB(CB52)	ng/l	100	39	39

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. Next, the data were transferred to NIVA's web pages, where an on-line system was established in 2004. The system allows authorised users to view values and graphs of each of the 46 monitored rivers. Data were uploaded continuously after each sampling.

2.5 Water discharge and hydrological modelling

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

For the 36 rivers monitored quarterly, as well as the remaining 109 rivers monitored once a year before 2004, water discharge has been simulated with a spatially distributed version of the HBV-model (Beldring et al., 2003). The use of this model was introduced in 2004. Appendix IV gives more information on the methodology. There have been no amendments or changes in the HBV-method since last year’s reporting (Skarbøvik et al. 2009). In addition, the total water discharge for unmonitored areas has been calculated by using the TEOTIL model. This includes the 92 unmonitored rivers and the areas downstream the sampling locations of the monitored rivers.

For each of the 46 rivers that have been monitored in 2009, as well as for the 109 rivers monitored earlier, the water discharge has been calculated at the location where the water samples are collected. This is the water discharge that is used to calculate riverine inputs.

2.6 Calculating riverine loads

As outlined in Stålnacke et al. (2009) and Skarbøvik 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:

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

where Qi represents the water discharge at the day of sampling (day i);
Ci the concentration at day i;
ti 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
Qr 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 average water discharge in 2009 was multiplied with average concentration for the period 1990-2003.
- For metals, the modelled average water discharge in 2009 was multiplied with average concentration for the period 2000-2003 (earlier data were not used due to high detection limits).

For the remaining area (the 92 rivers that drain to the sea but are not included in either this or former RID studies and areas downstream the sampling points), 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 based on national statistical information on population and effluent treatment, as well as industrial and agricultural point sources. Losses from agricultural fields and natural runoff from forest and mountain areas are modelled by an export coefficient approach (Tjomsland and Bratli, 1996).

Any direct discharges of metals in the unmonitored areas were considered covered by the estimates of the direct discharges to the sea.

2.7 Direct discharges to the sea

Data sources for direct discharges include:

- Municipal wastewater and scattered dwellings (Statistics Norway- SSB / KOSTRA);
- Agriculture (BIOFORSK)- *nutrients only*
- Aquaculture (The Directorate of Fisheries / ALTINN (altinn.no))- *nutrients only*
- Industry (The Climate and Pollution Agency - Klif/Forurensning)

The details on how these data are extracted are given in Appendix IV.

Estimated inputs of nutrients from fish farming followed the same procedure as in previous years. The sale statistics from SSB with regard to trout and salmon show that the there has been a general increase since 1995. 2007 and 2008 were quite similar but in 2009 the quantities increased, with 18.3 % since 2008 (see Figure 6). Increased production will lead to increased discharges of nutrients despite improvements in production procedures over the years.

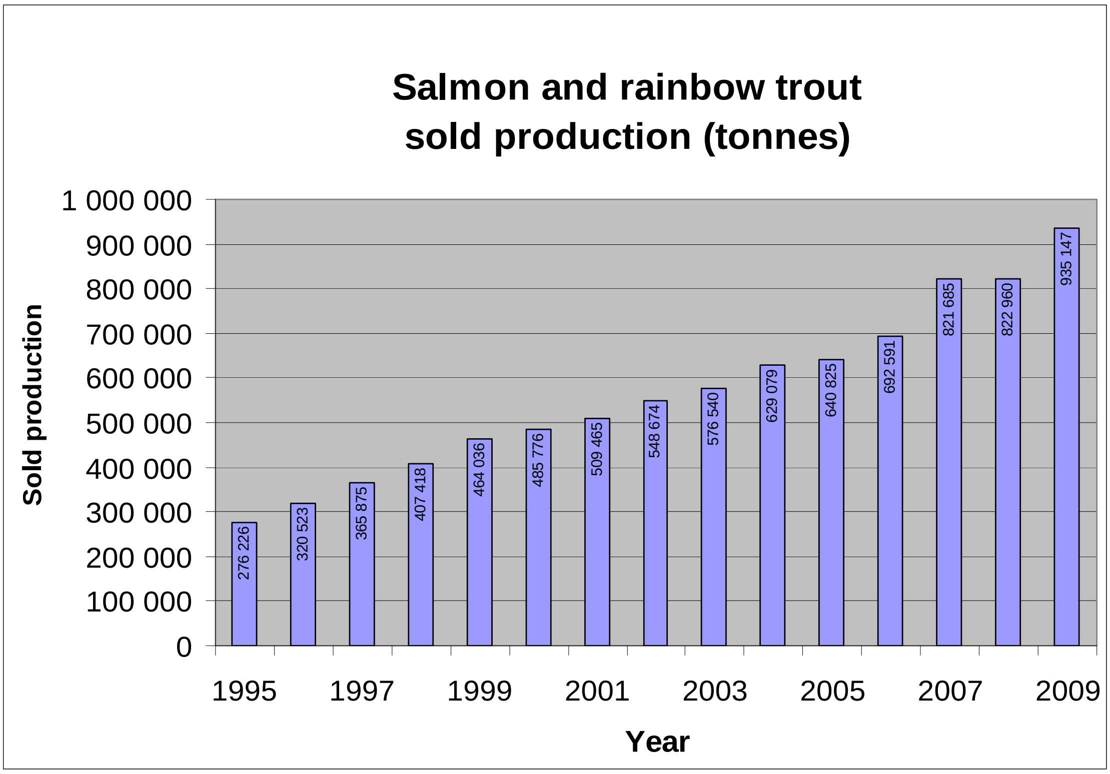


Figure 6. Quantities of sold trout and salmon for the period 1995-2009 (based on SSB data).

In terms of copper loads from fish farming, the quantification of discharges is based on sale statistics for a number of antifouling products in regular use (Figure 7). Klif assumes that 85%

of the copper content 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 was used. Since no new sale statistic of antifouling products were available for 2009, the copper discharges in 2009 have been estimated on the basis of a factor for the loss of copper per tonn nutrient discharge last year (2008). Copper from anti-fouling paint used on boats amounts to 250-300 tonnes per year, but this is presently not included in the RID reporting.

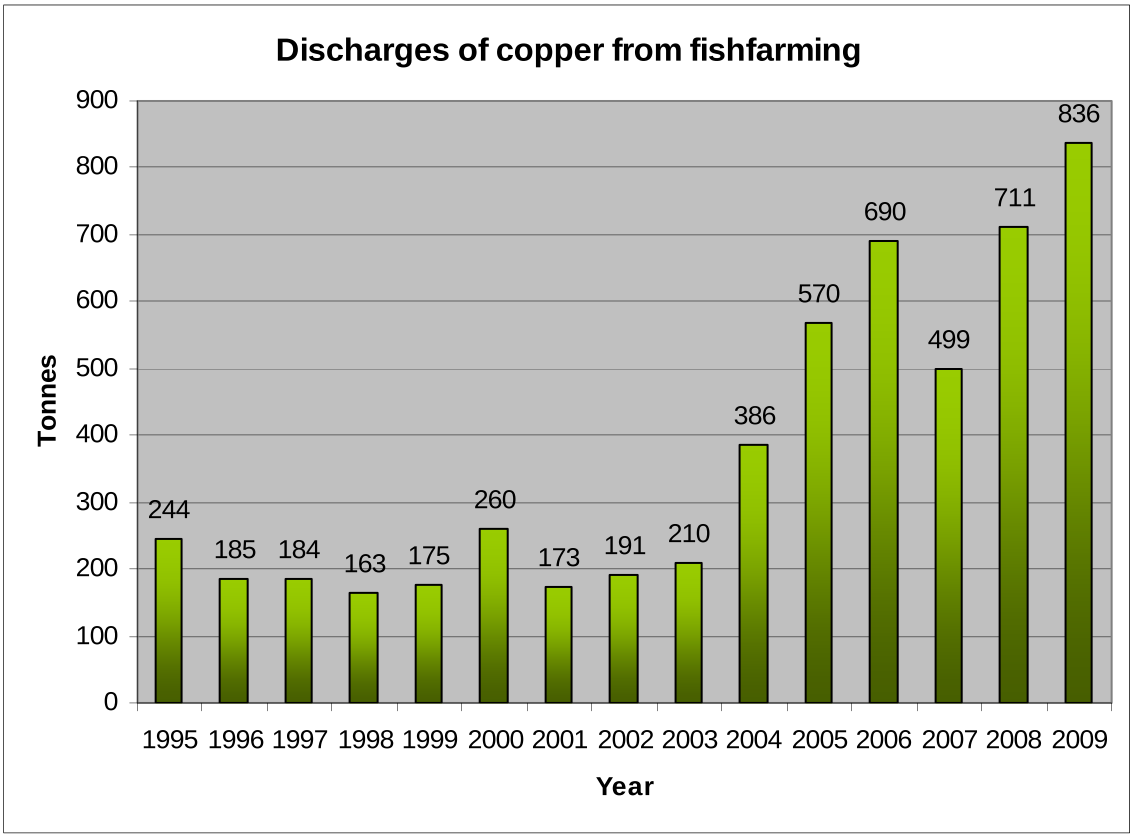


Figure 7. Discharge of copper from fish farming, caused by cleaning of net cages, in the period 1995-2009. Data for 2009 are estimated based on production data.

2.8 Statistical methodology for trends in pollutant concentrations

Long-term trends in the concentrations of pollutants are discussed in Chapter 4. Only main rivers are included in these trend analyses, due to the lower sampling frequency for the tributary rivers. The partial Mann-Kendall test (Libiseller and Grimvall, 2002) has been used to test for long-term changes in solute concentrations measured in nine of the ten main rivers[3]. The method has its methodological basis in the seasonal Mann-Kendall-test (SMK; Hirsch and Slack, 1984) with the difference that water discharge is included as explanatory variable. The trend analyses were performed on both the lower and upper estimates of the concentrations.

In addition, a multivariate test based on Loftis et al. (1991) and further developed by Wahlin and Grimwall (2009) has been applied for all the nine rivers. This implies that the trends for

[3] Neither River Suldalslågen nor River Vosso could be included in the long-term trend analyses due to incomplete datasets.

individual rivers are statistically weighted to determine the overall trend. Basically, it follows the same procedure as the seasonal Mann-Kendall test; each site is tested separately for trends before they are summed up to an overall test statistic.

These methods use tests for monotonic[4] trends (including linear trends), and each month is tested separately for trends before it is summed up to an overall test statistic.

The trends were regarded as statistically significant at the 5%-level (double-sided test)[5]. P-values between 5% and 10% were interpreted as a tendency or indication of a trend over time.

In addition to the formal statistical test, a visual inspection of all the time series was performed (cf. figures in Appendix V).

2.9 Method for analysing trends in riverine inputs

Long-term trends in riverine pollutant inputs are reported in Chapter 4, but the methodology is given here. Only main rivers[6] are included in these trend analyses, due to the lower sampling frequency for the tributary rivers. As described in section 2.5, daily water discharge data for the main rivers derive from the hydrological stations, and the water discharge at the sampling site is then spatially scaled up or down to fit to the catchment area upstream of the sampling site.

All annual loads were recalculated during the work of Stålnacke et al. (2009). As noted in the former section, some concentrations were removed from the riverine datasets prior to the concentration trend analyses (see Appendix VII for detailed overview). For the load trend analyses, the loads were estimated based on extrapolation or interpolation of the trend line wherever concentrations were missing. This was also done last year. The bars with estimated loads (extrapolated or interpolated) have been given different colours in the charts, to separate them from the loads based on measured concentration values.

The trend assessment for nutrients, sediments, zinc and copper was performed by comparing the estimated load with the flow-normalised loads. A trend-line given as a 'smoother' was also calculated according to the newly-developed method of Grimvall et al. (2008). More specifically, this smoother was obtained by statistical cross-validation that minimises the residuals in the statistical modelling. However, this 'smoother' should be interpreted with great caution and is only included to give a visual picture of the most likely long-term trend given the flow-normalised loads. In some cases, the flow normalisation and trend smoother were excluded due to bad model fit (mainly due to poor and inconsistent load and water discharge relationship). Some examples include total phosphorus and orthophosphate in River Altaelva; copper in River Vefsna; and suspended particulate matter in many rivers.

[4] 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.

[5] 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.

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

It should also be noted that flow normalisation and other statistical trend analyses were not conducted for metals (except for copper and zinc) given the problem with changed levels of detection (LOD) over time and/or a large number of samples reported at the LOD. The lower and upper estimates are, however, given in graphs supplemented with a qualitative assessment based on a visual inspection of these graphs and underlying data (Appendix VI).

3. Results

This chapter describes the climatic and water discharge conditions in 2009, and presents the main results of the 2009 monitoring and modelling of riverine inputs and direct discharges.

3.1 Climatic conditions in 2009

Mean annual temperature in Norway in 2009 was 1.0 °C above the long-term normal (1961-1990), and slightly lower than what has been reported for previous years (e.g. 2006, 2008; met.no 2010). The mean temperature was higher than normal in all parts of the country, with the largest deviation from normal temperature in parts of Northern and mid-Norway (Figure 8).

The highest temperatures were measured in the southern parts of Norway, in the areas draining to Skagerrak. The lowest temperatures were measured in the mountain areas in Southern Norway (which feed rivers that drain into Skagerrak, the North Sea and the Norwegian Sea) and at Finnmarksvidda (draining to the Barents Sea).

A mild winter with snowfall equal to or lower than normal, in combination with a warm summer in most of the country, resulted in a net decrease in most glaciers in 2009. However, a net increase was registered for a few glaciers in Southern Norway (NVE 2010).

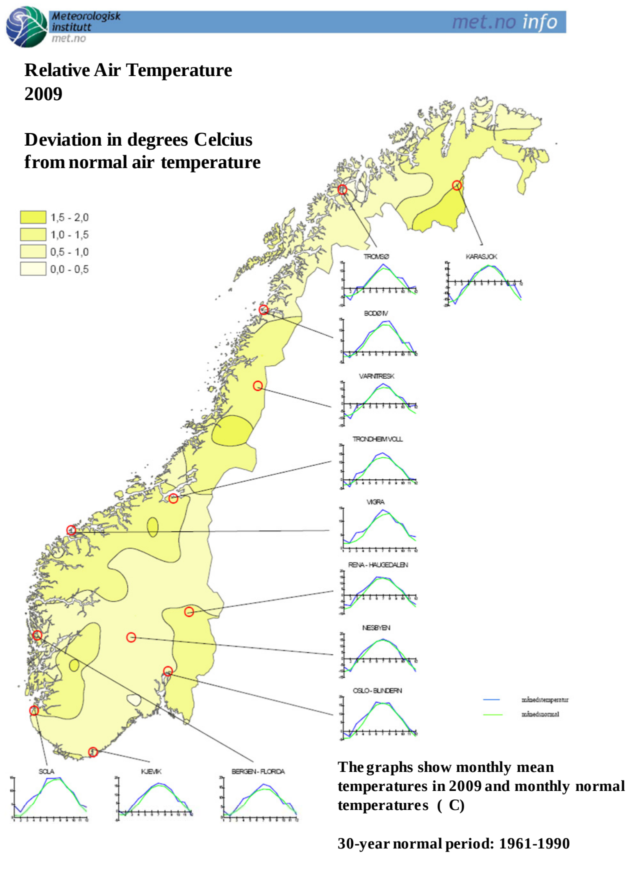


Figure 8. Air temperature in Norway in 2009 relative to the long-term normal of 1961-1990. Source: Norwegian Meteorological Institute (http://met.no/Klima/Klimastatistikk/Varet_i_Norge/).

River water temperatures in Southern Norway were slightly higher than the average for the last ten years in early summer and lower than average at the end of summer. The opposite trend was registered in the two northernmost counties, whereas water temperatures during summertime were close to average in mid-Norway (NVE 2010).

Total precipitation in Norway in 2009 was equal to the long-term normal (1961-1990), but parts of Eastern and Southern Norway (draining to Skagerrak) received up to 25-50 % more precipitation than normal (Figure 9). Large parts of the coastline in Western and Northern Norway received between 0-25 % less precipitation than normal. Total precipitation in the areas draining to the North Sea, the Norwegian Sea and the Barents Sea was approximately equal to normal precipitation.

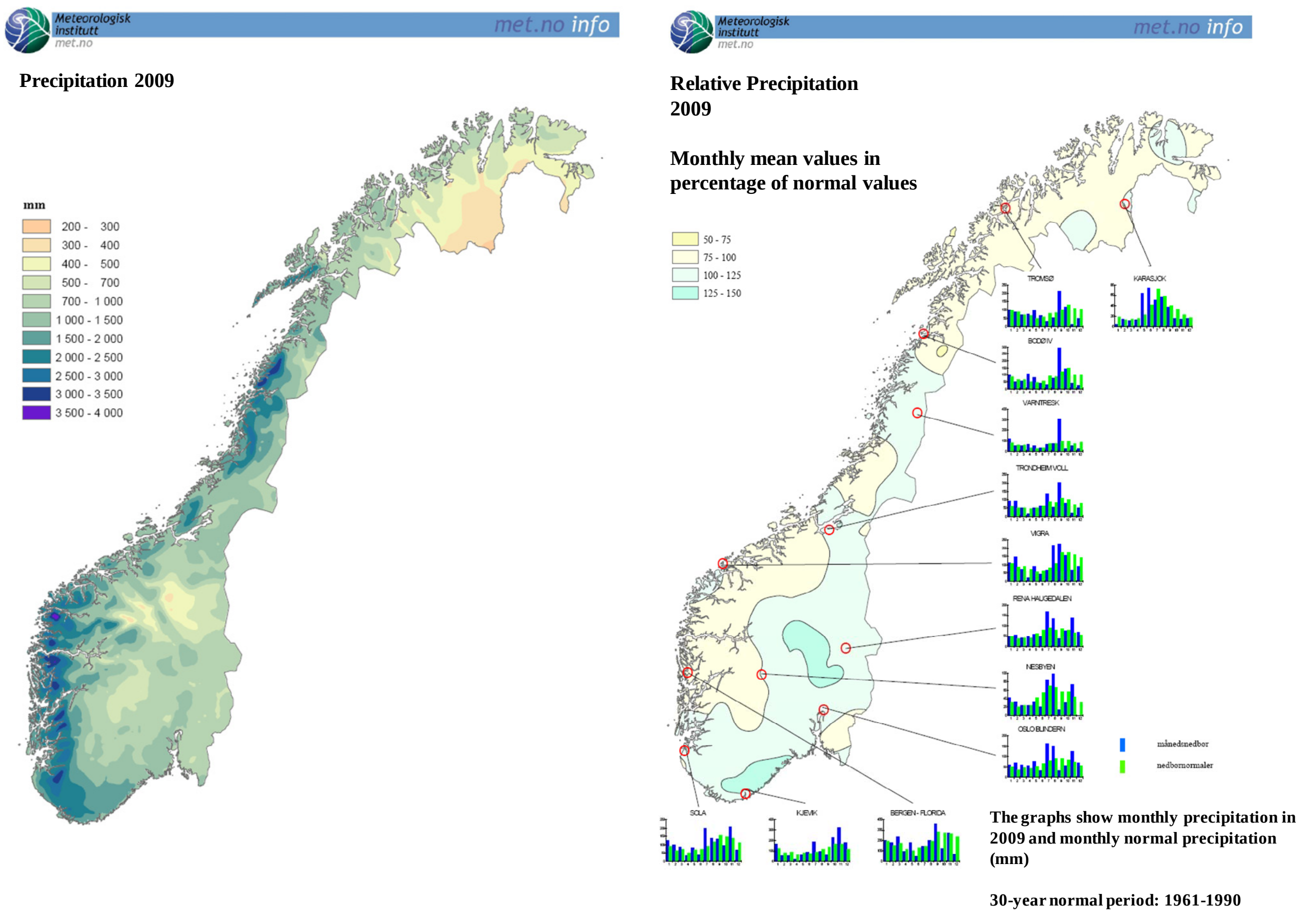


Figure 9. Total precipitation in 2009 (left panel) and precipitation in 2009 relative to the long-term normal of 1961-1990 (right panel). Source: The Norwegian Meteorological Institute (http://met.no/Klima/Klimastatistikk/Varet_i_Norge/).

3.2 Water discharges in 2009

The year of 2009 started with a relatively mild winter in most of the country. In combination with little snowfall, especially in the Northern parts of the country, this gave low water discharges in many catchments draining to the Barents Sea and the Norwegian Sea. Snowfall and water discharges in Southern Norway (draining to Skagerrak and the North Sea) were close to normal during winter. Spring flood came earlier than usual, with a lower peak than average. In general, 2009 was characterized by few extreme events, apart from a pronounced flood in late autumn in many areas. At the end of the year, temperatures were lower than normal in most of the country, and in combination with low precipitation this gave low water discharges in many areas (NVE 2010).

For eight of the ten main rivers the monthly mean water discharges in 2009 have been compared to mean water discharges in the 30-year period 1979-2008 (Figure 10), to the mean discharges in the 30-year normal (1971-2000) (Table 5), and to the discharges in 2008 (Table

5). Note that these water discharges derive directly from the hydrological stations and are not adjusted to the RID sampling sites.

In rivers draining to the Skagerrak area (rivers Glomma, Drammen, Numedalslågen, Skien and Otra), water discharges were lower in 2009 than in 2008 but still higher than for the two 30-year periods (1971-2000 and 1979-2008). Reductions since 2008 were most pronounced in rivers Drammenselva (21 %) and Otra (24 %). Spring floods were relatively average but came quite early, in April. Rivers Numedalslågen, Skien and Otra had relatively high water discharges in November; whereas rivers Glomma and Drammenselva had higher than normal autumn/late summer floods in August.

In the two rivers draining to the Norwegian Sea (rivers Orkla and Vefsna), water discharges were slightly higher than in 2008 (1 and 14 % respectively), but more or less at the same level as the thirty year averages. Spring floods started relatively early in both rivers and in River Orkla this flood was lower than usual. River Vefsna had higher flow than normal in September.

In the north of the country, the annual average flow in River Alta (Barents Sea) was about 26 % lower than in 2008, and about 15 % lower than the 30 year normal. Also here the spring flood came early, in May, but it was lower than usual. Autumn flow was also lower than usual.

Table 5. Average annual water discharges in the 30-year period 1971-2000, in 2008 and in 2009.

Station	30 year normal 1971-2000	2008	2009	Difference 2009-2008	Maritime area
	m^3/s	m^3/s	m^3/s	%	
Solbergfoss in Glomma	678.0	808.8	741.8	-9	Skagerrak
Døvikfoss in Drammenselva	281.3	372.7	308.6	-21	
Holmsfoss in Numedalslågen	104.7	126.8	109.4	-16	
Norsjø in Skienselva	259.5	324.7	281.2	-16	
Heisel in Otra	145.6	183.7	148.6	-24	
Syrstad in Orkla	48.5	42.0	42.6	1.4	Norwegian Sea
Laksfors in Vefsna	150.0	129.0	150.1	14	
Kista in Alta	75.4	82.0	65.2	-26	Barents Sea

Water discharges calculated as total input of water to the four different maritime areas are shown in Table 6 and reflect the above discussion. The total flow in 2009 was lower for all regions except for rivers draining to the Norwegian Sea, where the flow was 6 % higher than in 2008.

Table 6. River water discharges (1000 m^3/d) to the Norwegian coast in 2009 and 2008. The data is based on the main rivers (10) and tributary rivers (36+109).

	Total Norway	Skagerrak	North Sea	Norwegian Sea	Barents Sea
2009	534 539	183 365	137 940	169 659	43 574
2008	592 268	211 602	172 507	159 820	48 338
% change	-11	-15	-25	6	-11

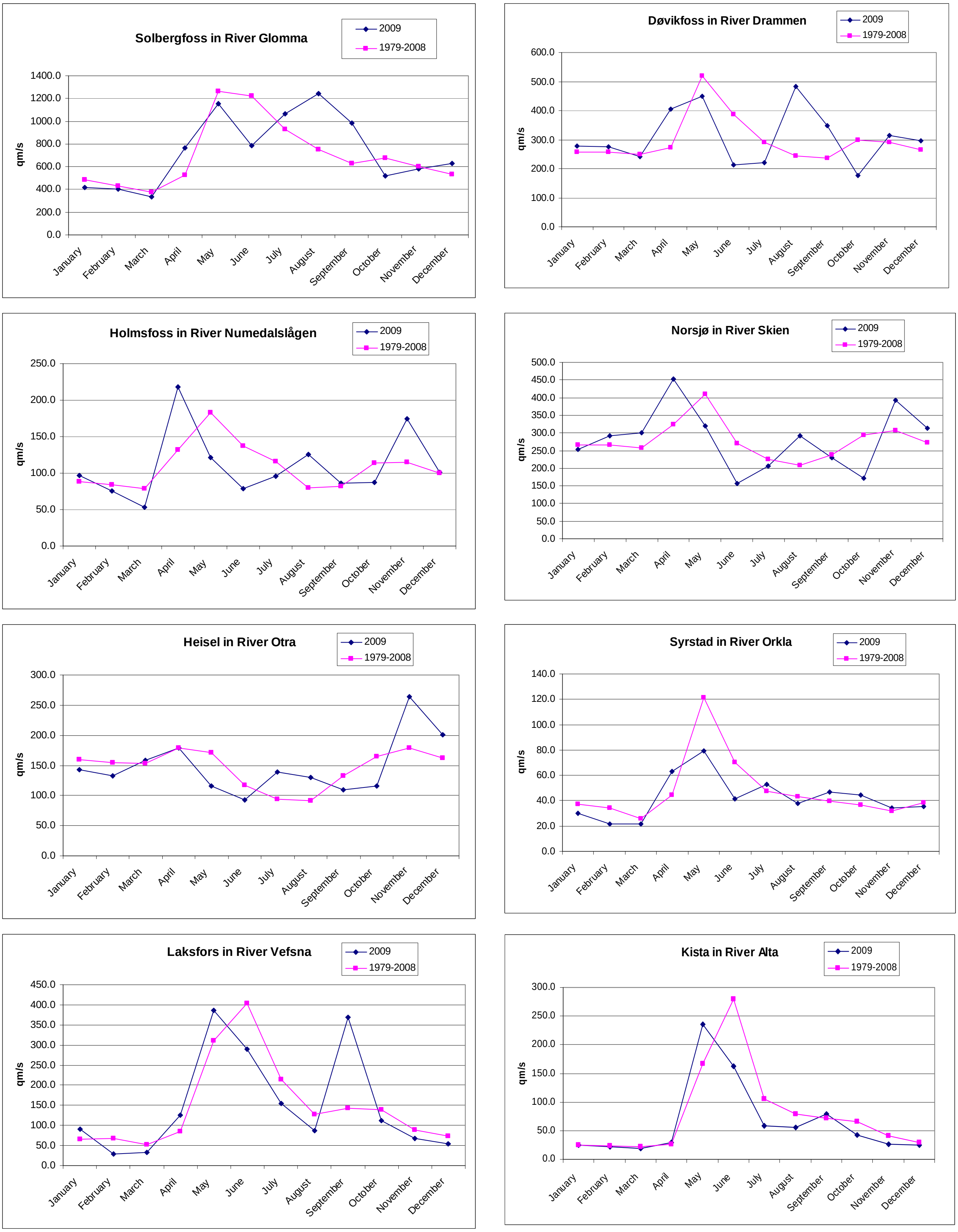


Figure 10. Monthly mean water discharge in 2009 and as a mean of 30 years (1979-2008), derived from hydrological stations (named) in 8 of the rivers monitored monthly (data from the Norwegian Water Resources and Energy Directorate, NVE).

3.3 Direct discharges and TEOTIL modelling results

Direct discharges have been calculated for point sources and diffuse sources. The point sources include industry (Figure 11); sewage treatment plants (Figure 12) and fish farming (Figure 13). Diffuse sources of nutrients have been calculated by using the TEOTIL model. The model also adjusts for retention of substances in the catchment area (i.e. between the point source and the sea).

Note that the direct discharges do not reflect all discharges from Norwegian industry and sewage treatment plants, since the calculation of direct discharges is only done for land areas that are *not* covered by the RID sampling programme. Direct discharges upstream of the sampling locations are covered by the monitoring programme. The relative proportion of especially industrial and sewage treatment discharges is therefore not necessarily reflecting the actual proportion of these discharges in Norway as a whole. Table 7 shows the direct discharges of nutrients, sediments and total organic carbon, whereas Table 8 shows the direct discharges for metals for the three point sources sewage effluents, industrial effluents and fish farming.

Table 7. Direct discharges of nutrients (TP and TN), sediments (SPM) and total organic carbon (TOC) in 2009.

	TN (tonnes)	TP (tonnes)	SPM (tonnes)	TOC (tonnes)
Sewage effluents	12 168	921	9 878	3 922
Industrial effluents	2 312	256	34 382	526
Fish farming	49 773	10 200	-	
Total	64 253	11 377	44 260	4 448

Table 8. Direct discharges of metals in 2009.

	As (tonnes)	Pb (tonnes)	Cd (tonnes)	Cu (tonnes)	Zn (tonnes)	Ni (tonnes)	Cr (tonnes)	Hg (kg)
Sewage effluents	0.23	0.61	0.02	4.87	14.38	1.92	1.12	8
Industrial effluents	1.94	2.94	0.17	8.53	15.78	8.05	1.05	10
Fish farming				836				
Total	2.17	3.54	0.19	849	30.16	9.97	2.18	17

Fish farming is the most important direct source of nutrients, especially along the coast in the North and Norwegian Sea regions. Fish farms contribute 77 % of total nitrogen and 90% of total phosphorus as compared with the two other direct discharge categories. Sewage treatment plants contribute about 8 % of total phosphorus and 19 % of total nitrogen of the direct discharges.

Fish farming is also the most important direct source for copper, due to losses when the net cages are cleansed. For the other metals, industrial effluents contribute most, with the exception of chromium where the sewage effluents are slightly higher.

Figure 14 and Figure 15 illustrate the relative importance of different sources for phosphorus and nitrogen, respectively. Note that in these maps all direct sources are shown, whether they are covered downstream by riverine monitoring or not.

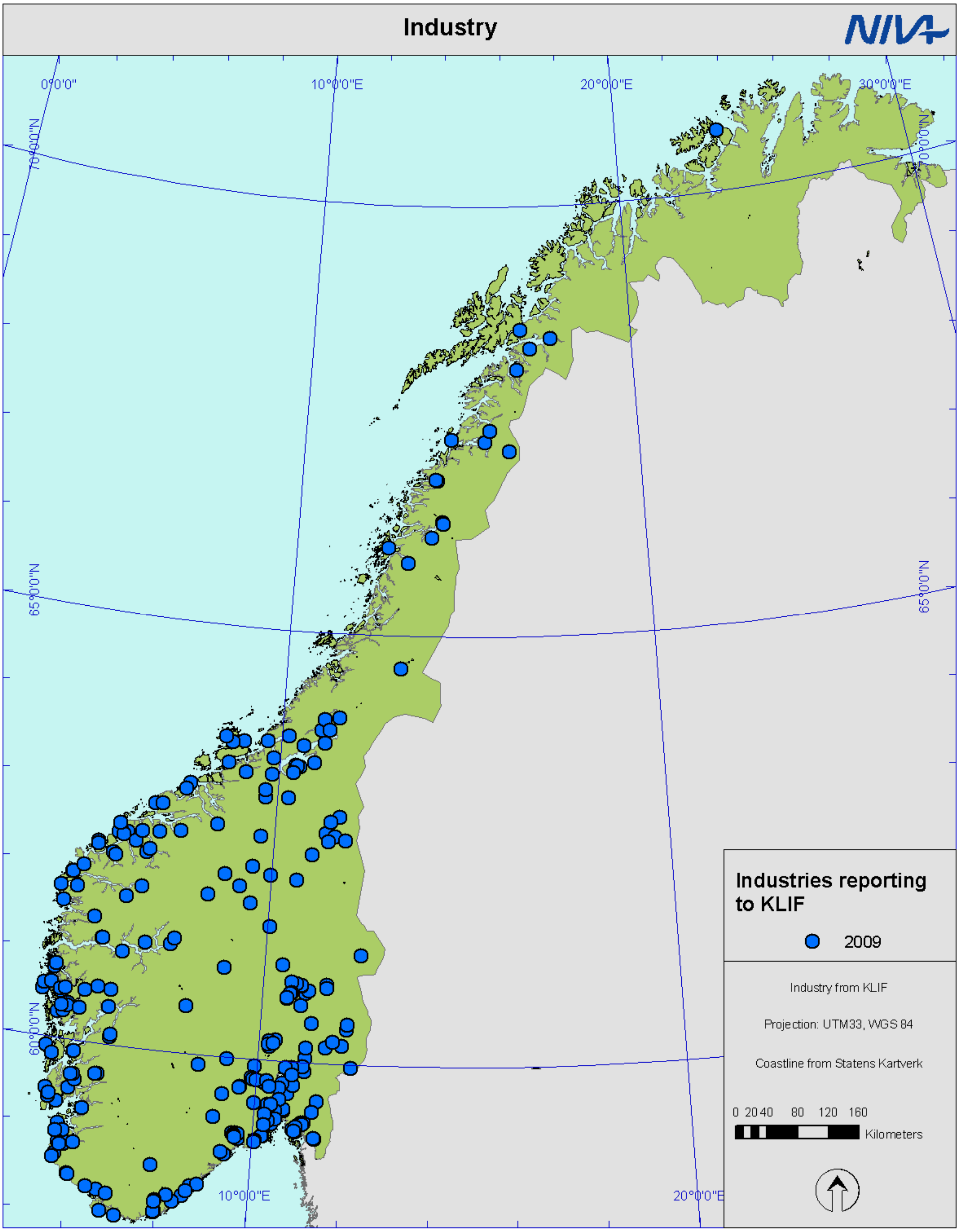


Figure 11. Industrial units reporting discharges of nitrogen and phosphorus to freshwater systems in 2009. Co-ordinates on industry from Klif (Forurensning).

Figure 12. Sewage treatment plants in Norway 2009 and nitrogen treatment efficiency. Co-ordinates from KOSTRA/SSB.

Figure 13. Fish farms for salmon and trout in Norway in 2009. Based on data from the Directorate of Fisheries/ALTINN.

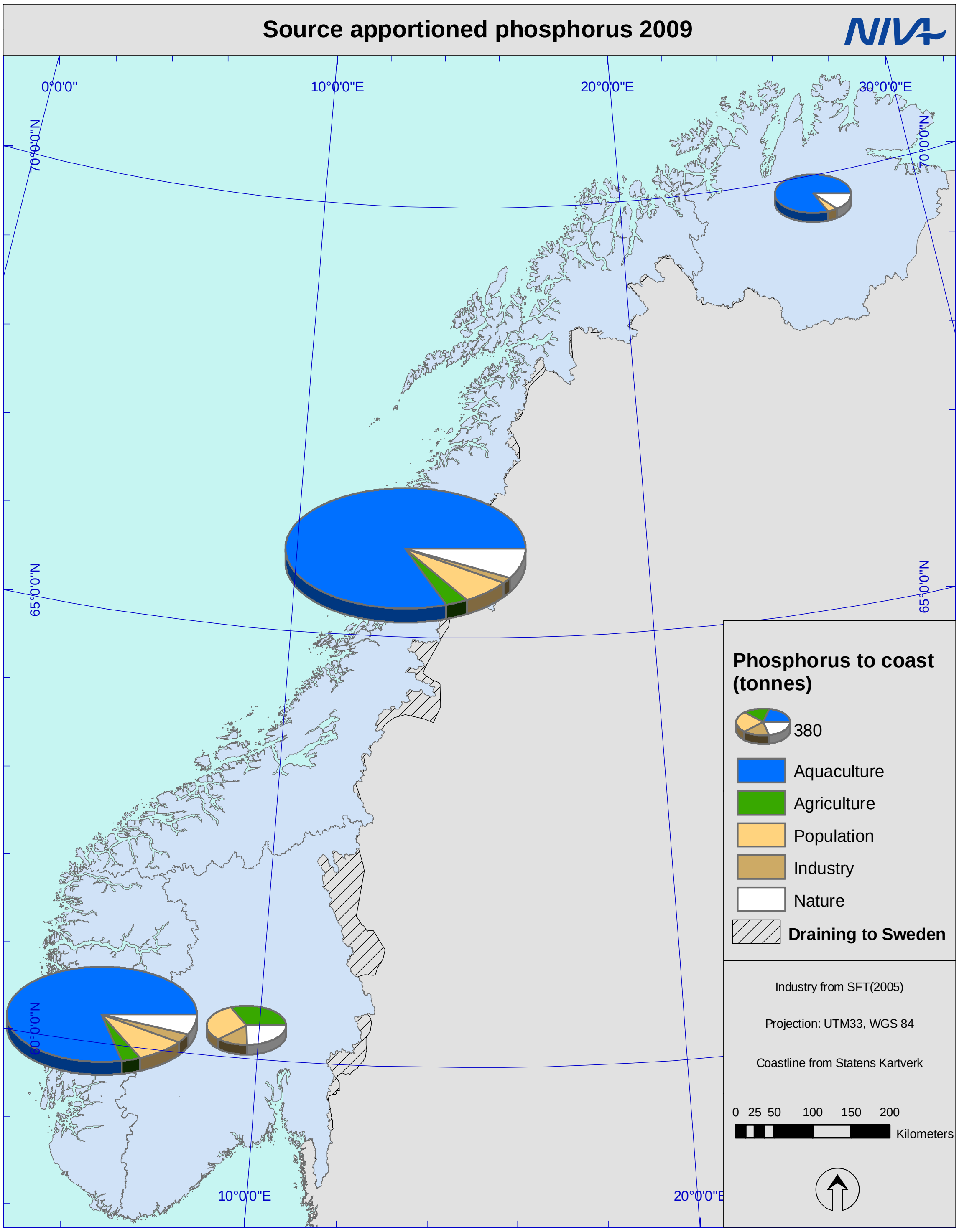


Figure 14. The relative importance of the five phosphorus sources to total inputs to the four coastal areas - (Source Orientated Approach, incl. marine salmon/trout farming). The size of the circles indicates the total amount (tonnes).

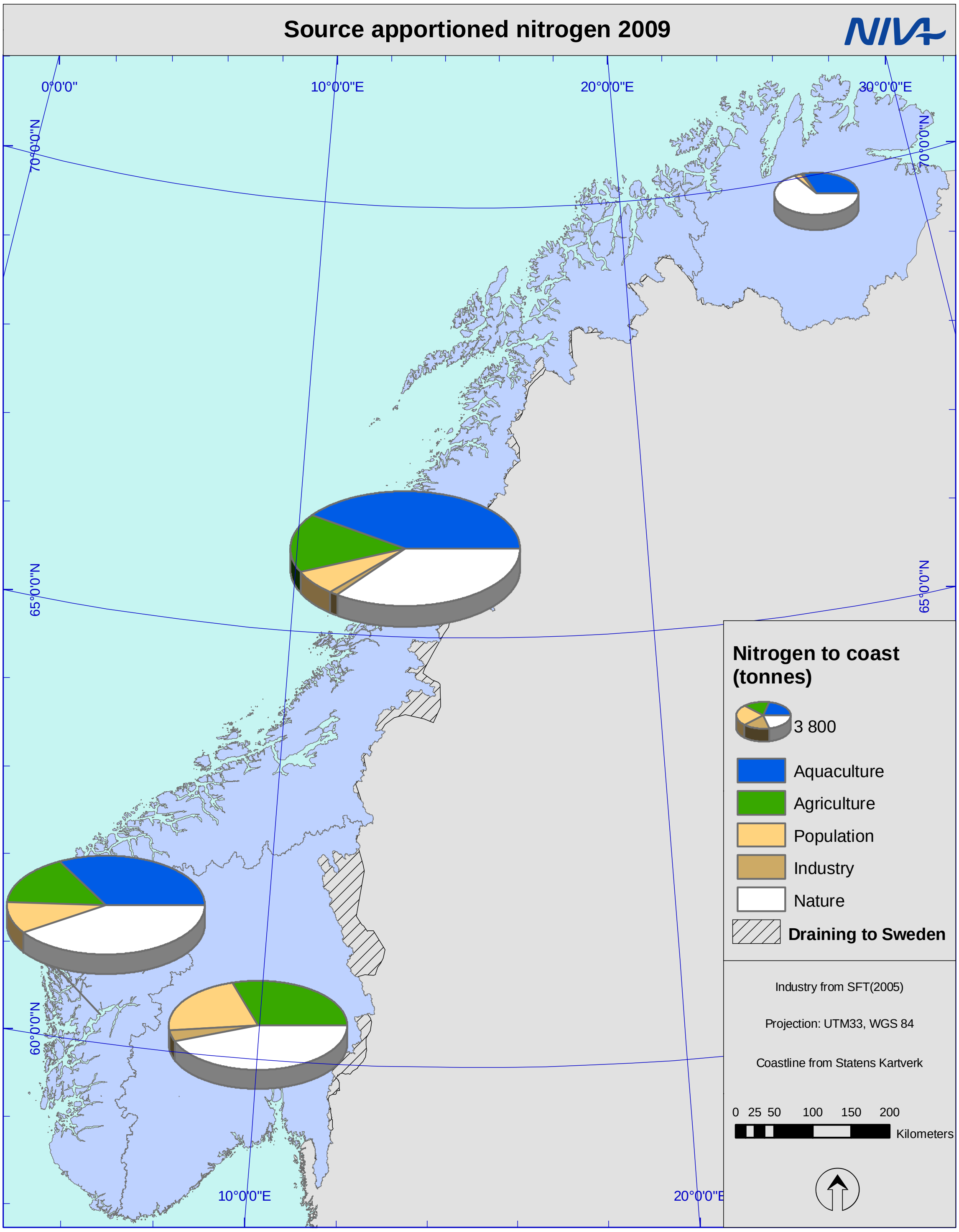


Figure 15. The relative importance of the five nitrogen sources to total inputs to the four coastal areas (Source Orientated Approach, incl. marine salmon/trout farming). The size of the circles indicates the total amount (tonnes).

3.4 Total nutrient and particle input in 2009

The total nutrient inputs[7] to coastal waters from land based sources in Norway in 2009 were estimated to about 13 000 tonnes of phosphorus and about 145 000 tonnes of nitrogen (Figure 16). Total silicate inputs were estimated to about 431 000 tonnes and total organic carbon (TOC) to about 516 000 tonnes. The input of suspended particulate matter amounted to about 607 000 tonnes.

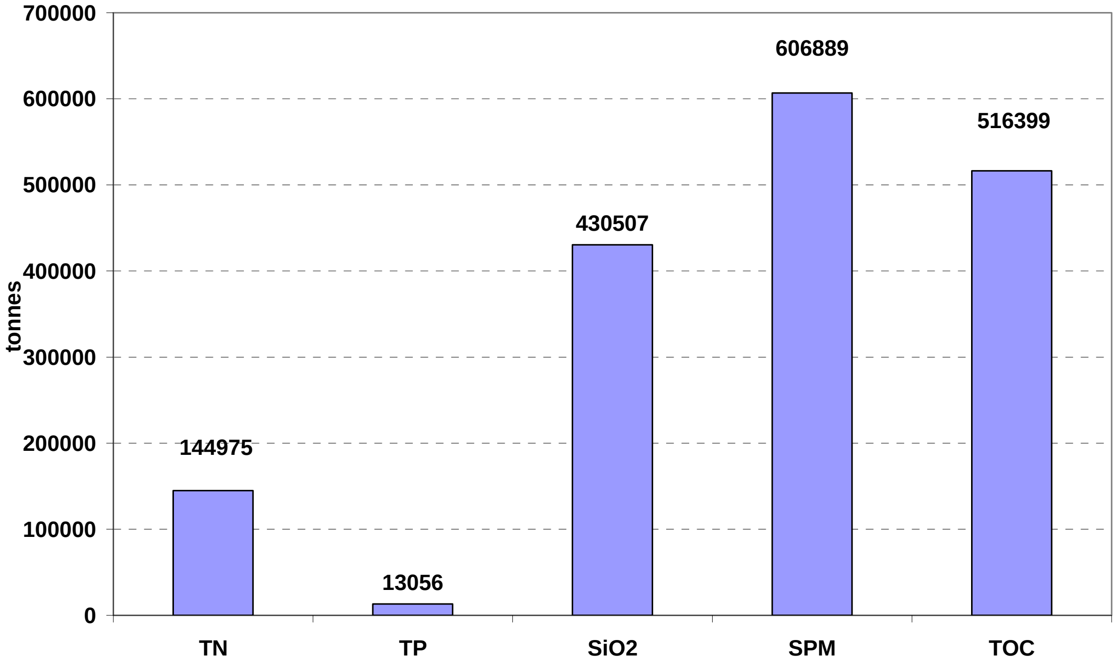


Figure 16. Total inputs (riverine and direct) of total nitrogen (TN), total phosphorus (TP), silicate (SiO_2), suspended particulate matter (SPM) and total organic carbon (TOC) to Norwegian coastal waters in 2009 (lower estimates).

An overview of the inputs of the different nitrogen and phosphorus fractions per coastal area is given in Figure 17. The relatively high ammonium and orthophosphate inputs to the North Sea and Norwegian Sea derive from fish farming. In the Barents Sea there is less fish farming, but this source of nutrients is still the most important of all nutrient sources, including riverine inputs, in this northern part of Norway. In the Skagerrak area, riverine inputs are the main source of nutrients, followed by sewage treatment plants. This area has very little contribution from fish farms. Overall, nutrient inputs were highest to the Norwegian Sea, and lowest to the Barents Sea.

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

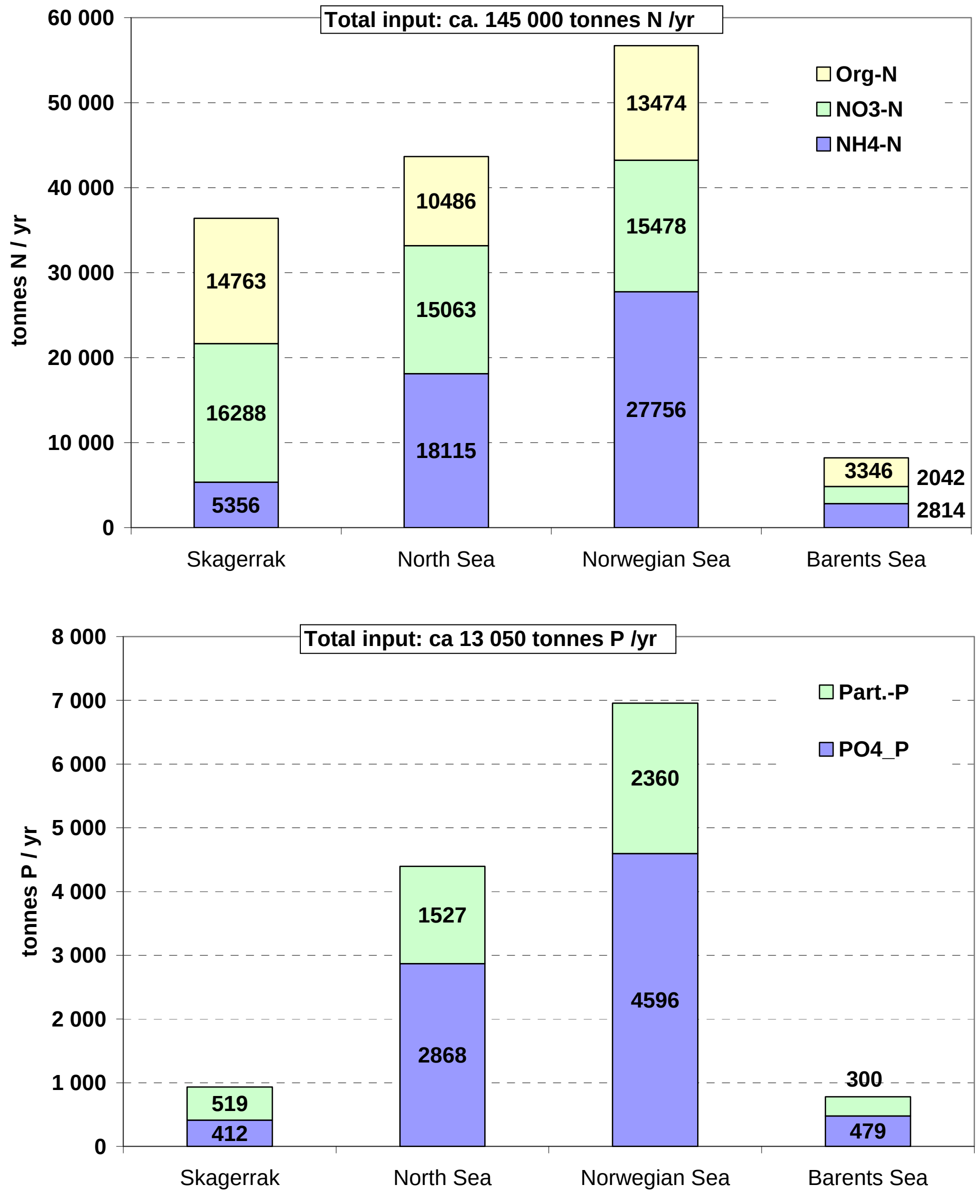


Figure 17. Inputs of total nitrogen (upper panel) and total phosphorus (lower panel) divided into different fractions for the four Norwegian maritime areas (lower estimates).

The sources of suspended particulate matter are shown in Figure 18. The inputs from rivers are the major source, with a total of about 560 000 tonnes, of which the main rivers contribute about 267 000 tonnes. Of the direct discharges, industrial effluents contribute most, with about 34 000 tonnes.

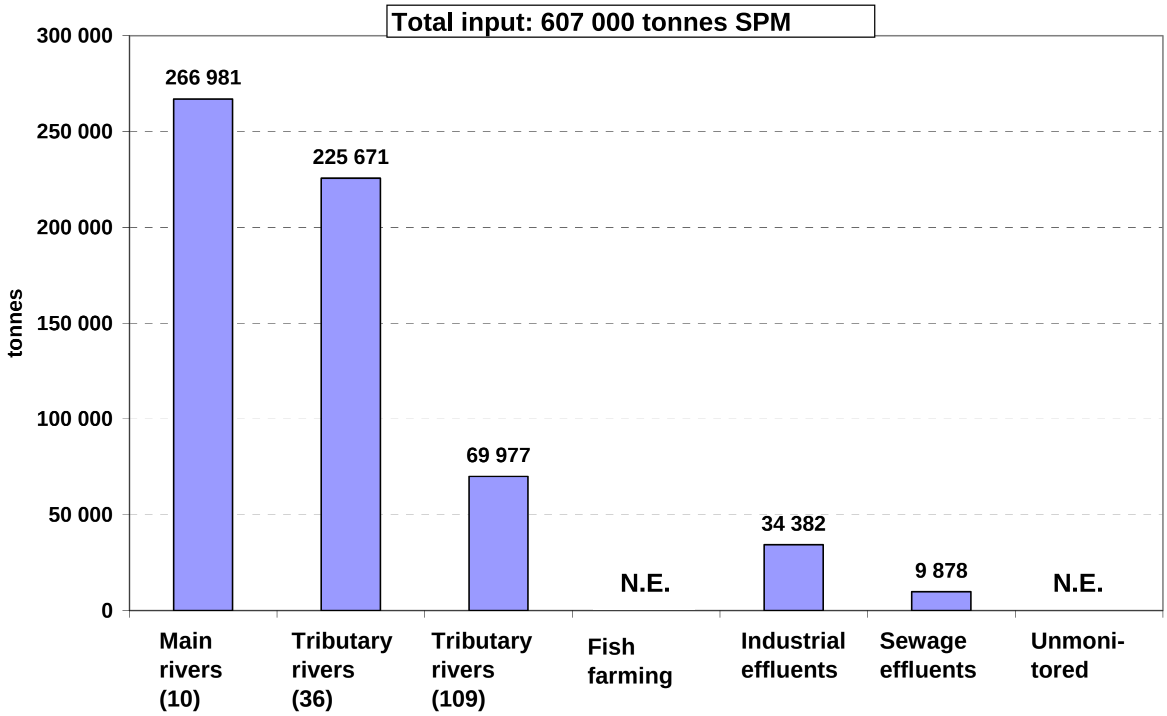
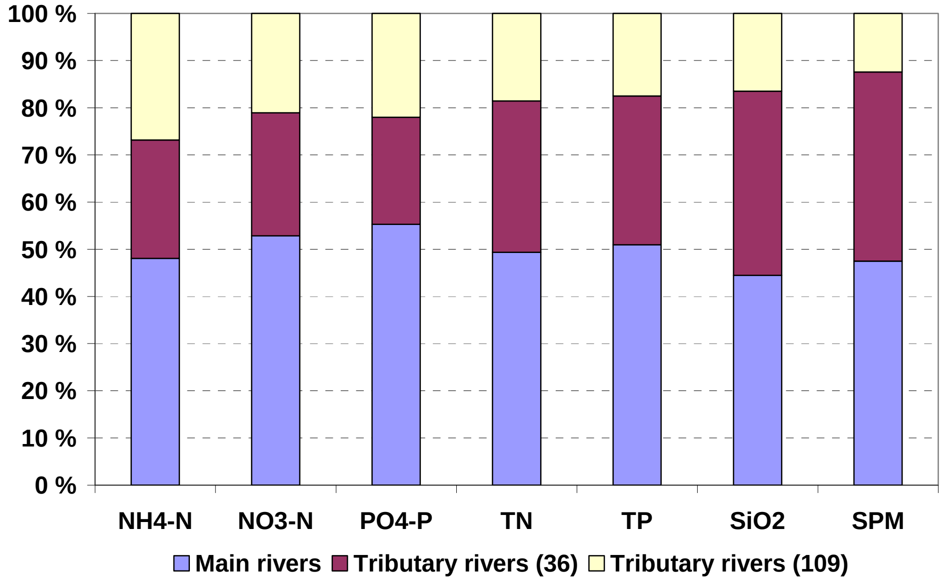


Figure 18. Inputs of particulate matter (SPM) from rivers and direct discharges in 2009 (lower estimates).

The proportion of sources of particulate matter and nutrients is further illustrated in Figure 19. In general, the 46 monitored rivers account for 70-90% of the total riverine inputs of nutrients. This reflects that the monitored rivers cover about 50% of the land draining to the coastal areas, and include most of the large land-based sources of nutrients.

Comparing riverine inputs with direct discharges (Figure 19, lower panel) shows that direct discharges are most important for phosphorus and ammonium, whereas the riverine sources are most important for loads of silicate and particulate matter, although the latter is not reported for fish farms and unmonitored areas.



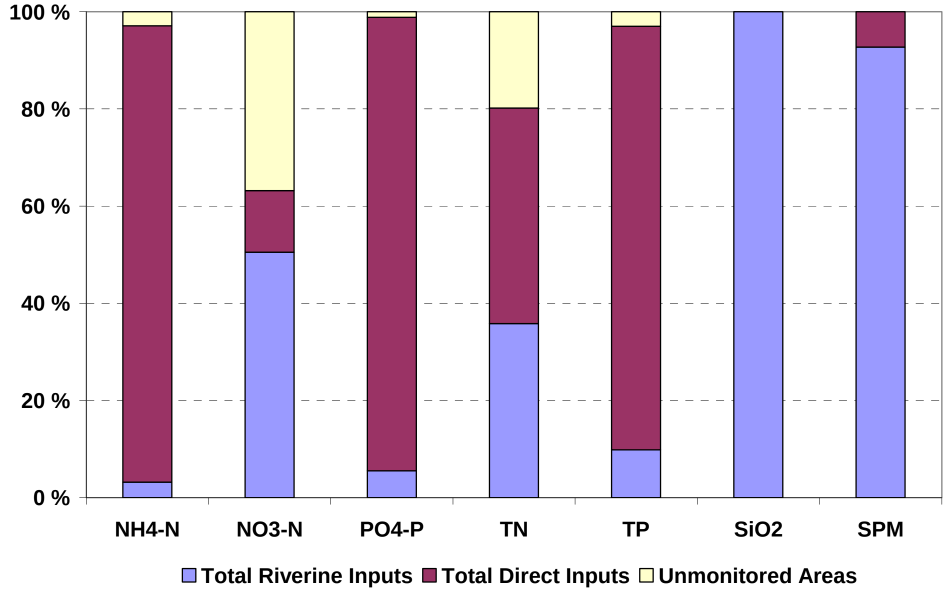


Figure 19. Main sources for nutrients, silicate and suspended particulate matter (SPM) divided into riverine contribution only (upper panel) and the proportion between riverine, direct inputs and unmonitored areas (lower panel). Note that for SPM there are no estimates of inputs from fish farming and unmonitored areas.

The relative share of inputs from fish farms to the total inputs of nutrients is shown in Figure 20 for the four coastal areas. Due to few fish farms in the Skagerrak area, this area has significantly lower inputs from this source than the other three coastal areas. Totally in Norway, the nutrient loading from fish farming contributes to 78 % of the total phosphorus inputs and 34 % of the total nitrogen inputs. In terms of nutrient fractions, 74 % of the ammonium and 84 % of orthophosphate derives from fish farming.

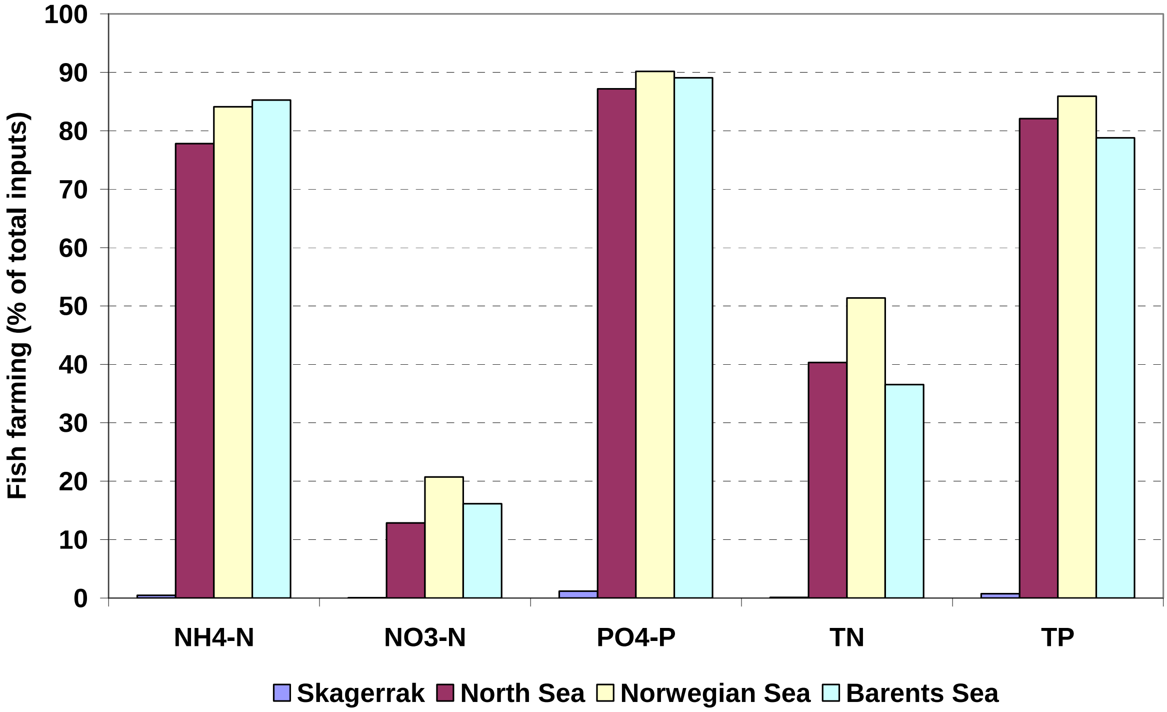


Figure 20. The relative share of nutrient inputs from fish-farming to the total inputs in 2009 for the 4 coastal areas.

3.5 Total metal inputs in 2009

In 2009, the total inputs of metals to Norwegian coastal areas ranged from 0.26 tonnes of mercury to 1036 tonnes of copper (lower estimates; Figure 21).

Inputs of cadmium were estimated to 2.3 tonnes, arsenic to about 26 tonnes, lead to about 34 tonnes, chromium to about 52 tonnes and nickel to about 104 tonnes. Copper and zinc comprised the largest inputs of heavy metals, which in 2009 amounted to about 1036 and 512 tonnes, respectively.

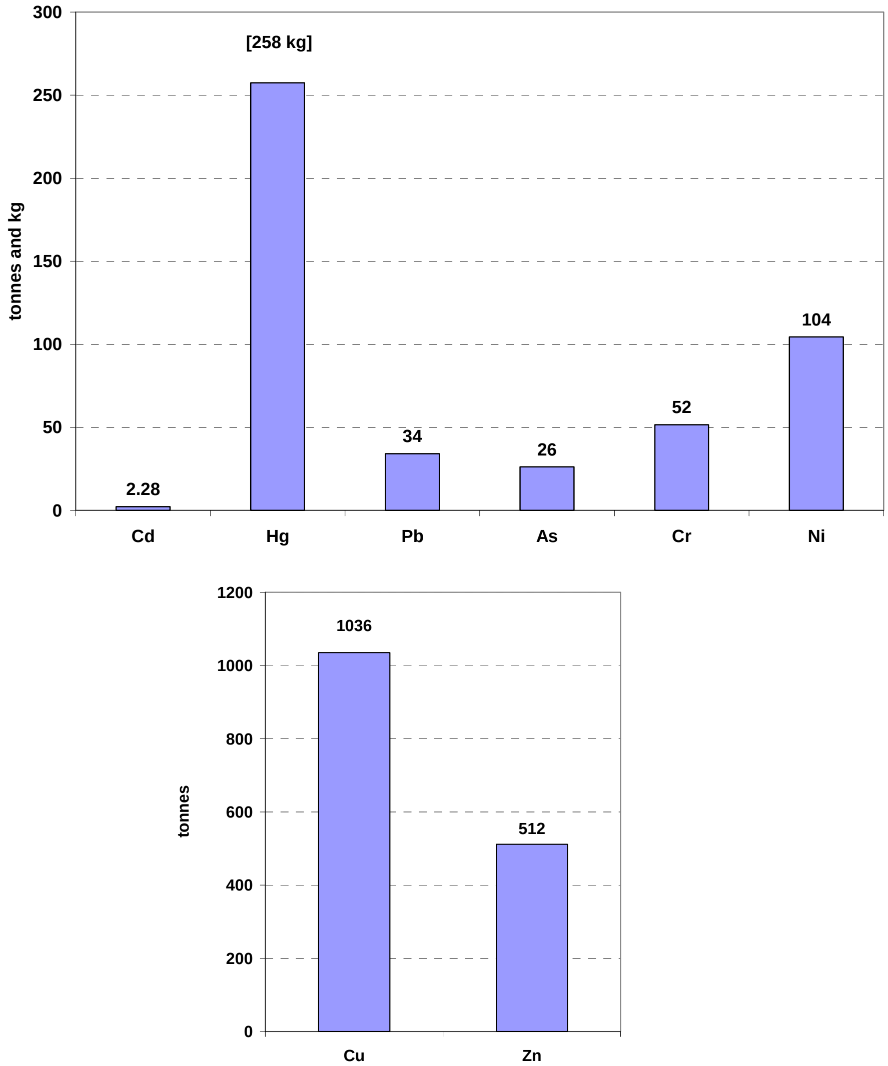


Figure 21 . Total inputs of metals in 2009 (lower estimates). Upper panel: Cadmium (Cd), mercury (Hg), lead (Pb), arsenic (As), chromium (Cr) and nickel (Ni). Note that mercury (Hg) is given in kg whereas the other metals are given in tonnes. Lower panel: Copper (Cu) and Zinc (Zn).

For all metals except copper the riverine loads account for about +/- 90% of the total input to Norwegian coastal waters (Figure 22). The high proportion of copper in the direct discharges is explained by fish farming (cleaning of net cages). The metal inputs per sub-region and other details are given in the Addendum (Table 3).

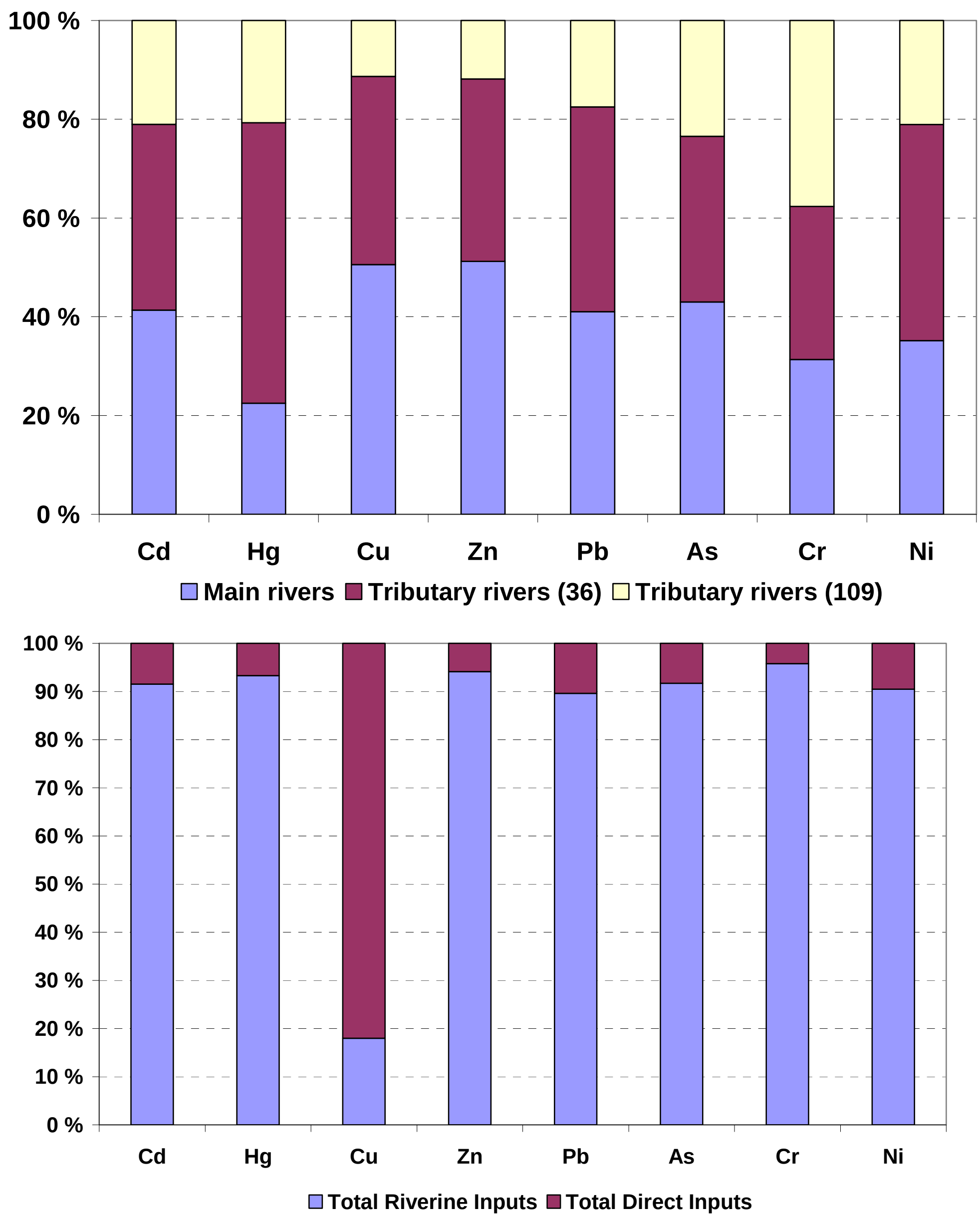


Figure 22. Relative share of riverine and direct discharges of the total inputs of metals to the Norwegian coastal waters in 2009 (lower estimates).

3.6 Total lindane and PCB7 inputs in 2009

For lindane and PCB7, only inputs from the main rivers have been estimated, since no measurements have been made in the other rivers. The results of the laboratory analyses are almost always below the LOD (level of detection).

In 2009, estimates of both lindane and PCB7 inputs reflect the detection limits, since all but one sample were below the detection limits. The one sample had a fraction of PCB7 which was exactly on the detection limit (0.2 ng/l), in River Alta in February. The lower estimate is therefore zero for lindane and 22 kg for PCB7, whereas the upper estimate is based on the concentration at the detection limit combined with the water flow in 2009, in accordance with the RID principles (Figure 23).

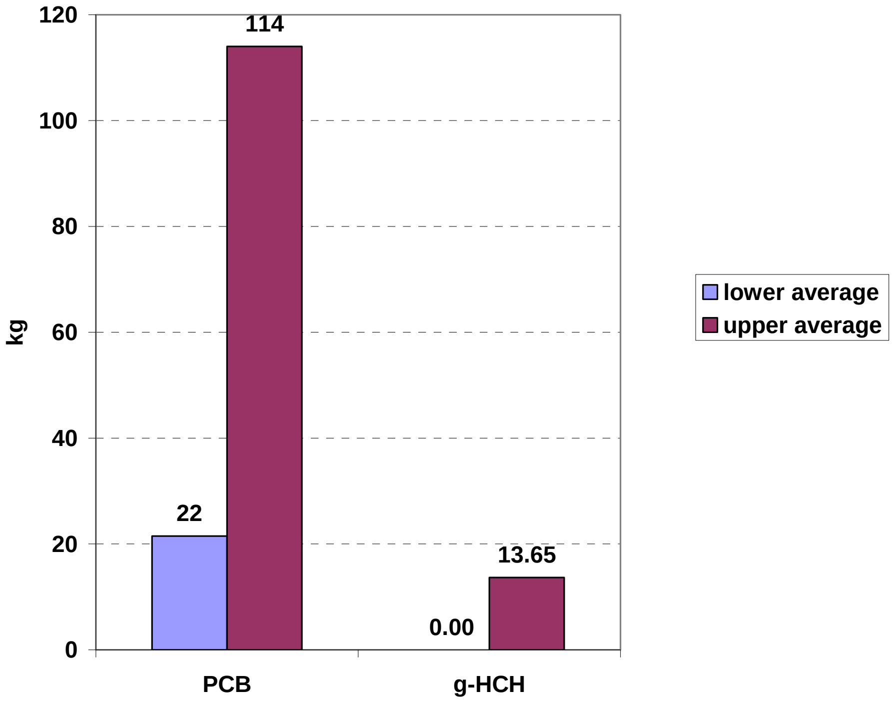


Figure 23. Riverine inputs (lower and upper averages) of PCB7 and lindane (g-HCH) in 2009.

4. Discussion

Riverine inputs and direct discharges in 2009 are compared with those in 2008. In addition, long term trends in pollutant concentrations and riverine inputs are discussed for the main rivers.

4.1 Comparison of riverine inputs in 2008 and 2009

This comparison of riverine inputs is based on the data for the 10 main rivers[8], the 36 tributary rivers monitored four times a year and the 109 previously monitored rivers. Inputs and estimated water discharges for unmonitored areas (92 rivers and areas below sampling points) are not included. Changes in the 109 tributary rivers not monitored since 2003 will mainly reflect between-year variations in annual water discharge, as the calculated concentrations have remained the same since 2003. Section 3.2 gave an overview of the water discharges in 2009, with comparisons to the average flows in 2008.

In the Skagerrak area, there was a decrease in water flow of 15 % (Table 6), which is reflected in a 15 % decrease in total nitrogen (TN), 22 % decrease in total phosphorus (TP) and as much as 47 % decrease in suspended particulate matter (SPM), (Table 9). The high spring floods in this area in 2008 obviously had effects on erosion and gave high particulate and phosphorus loads. In rivers draining to the North Sea, water discharge was reduced with as much as 25 % compared to 2008 (Table 6) and the subsequent reductions in TN, TP and SPM amounted to 27 %, 32 % and 17 %, respectively. In the area draining to the Norwegian Sea, however, the water discharges increased from 2008, with an average of 6 %. The nitrogen inputs also increased slightly from 2008 to 2009, whereas TP and SPM decreased, despite more water in the rivers. The reason for this is not clear, but can for instance be linked to the time of the year when the floods occurred, or to any mitigation measures that may have been implemented against erosion and nutrient losses. Investigations are needed before any conclusions can be drawn on this matter. In the Barents Sea, water flow decreased by 11 %, which also gave slight decreases in nutrient and sediment loads. For Norway in total, the decreases from 2008 to 2009 amounted to 11 % for total water flow, 13 % for TN, 14 % for TP and 26 % for SPM.

Table 9. Total riverine load of total nitrogen (TN), total phosphorus (TP) and suspended particulate matter (SPM) in 2008 and 2009. Decreases in loads shown in green; relatively small changes (<10 %) are not highlighted.

Maritime area	Nitrogen (tonnes)		Phosphorus (tonnes)		SPM (1000 tonnes)	
	2008	2009	2008	2009	2008	2009
Skagerrak	34 288	29181	919	725	541	290
North Sea	14 176	10488	330	225	98	82
Norwegian Sea	9 378	9527	315	244	252	158
Barents Sea	2 770	2743	96	93	41	32
Total Norway	59 359	51939	1 497	1287	764	563

The reduction in metal loads that was reported last year (then in a comparison between the period 2004-2007 and 2008; Skarbøvik et al. 2009), continued in the year 2009, again with

[8]River Vosso is from 2009 onwards a main river.

the exception of mercury (Figure 24). Variations in riverine loads of metals are often caused by variations in a few rivers with high metal concentrations; these often have point sources such as mines in their catchment area. River Pasvikelva and River Orkla are typical examples of this.

- The increase in mercury is among other factors caused by a sample with concentration 9.5 ng/l in River Orkla, and another with 7.5 ng/l in River Pasvikelva, but it should be noted that almost all rivers have some samples with concentrations above the detection limit in 2009. Fjeld and Rognerud (2009) analysed mercury in perch and brown trout in lakes in South Norway in 2008. None of the lakes had any known pollution point sources. Compared with data from 1991, the concentration in ten populations had increased by 63%. There is, therefore, other evidence that mercury may be increasing in Norwegian waters, but the reason is not clear.
- The decrease in chromium in 2009 is linked to the fact that chromium had a marked increase in 2008. This increase in 2008 was caused by one single sample with high concentration in River Glomma in November 2008. However, if compared with former years, the level in 2009 is 5 tonnes higher than for the average values in the period 2004-2007, in spite of lower water discharges in 2009. There seems, therefore, to be a slight increase in chromium which cannot solely be explained by water discharge variations.
- The total riverine load of arsenic has been relatively stable, both since 2008 and since the period 2004-2007, with a reduction in 2009 of one ton compared to 2008.
- Decreases in the other metals since 2008 occur both in the main and the tributary rivers. The substantial decrease in zinc is, for instance, caused by a 20 % decrease in the main rivers and 35 % decrease in the 36 tributary rivers. These decreases can to some extent be explained by lower water discharges in 2009, since not only the loads, but also the discharges were higher both in 2008 and in the period 2004-2007.

In terms of changes in PCB7 and lindane inputs, these are, as in all years, mainly a result of the detection limit of the analytical method used. This means, again, that the concentrations of these two substances remain low in Norwegian waters.

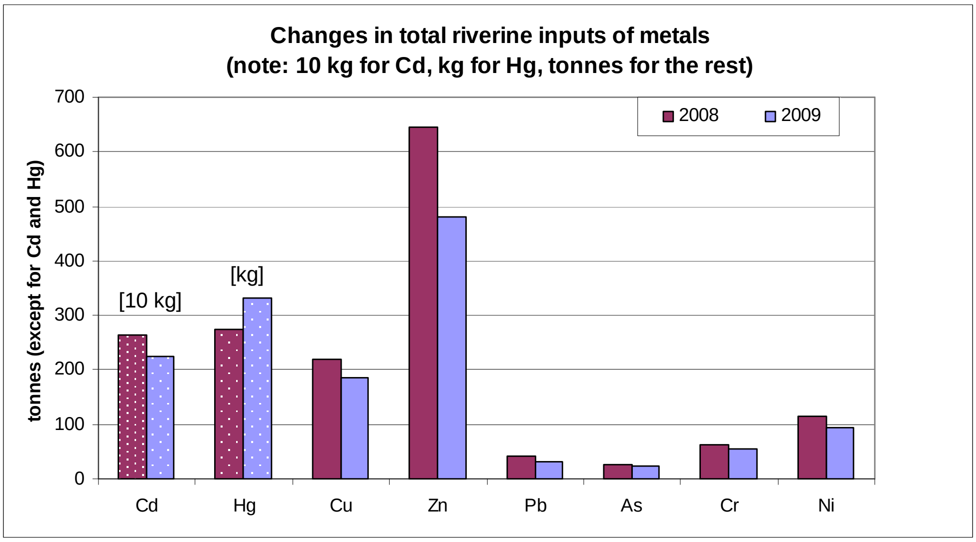


Figure 24. Changes in riverine inputs of metals from 2008 to 2009, for all of Norway. Note that Hg is given in kg and Cd in 10 kg, the rest of the metals are given in tonnes).

4.2 Comparison of direct discharges in 2008 and 2009

The increase in nutrient discharges from fish farming from 2008 to 2009 was about 20 %. The trend with increasing nutrient discharges from this sector therefore continues in 2009. The industrial discharges, however, decreased somewhat, whereas there was only a small increase from the sewage treatment plants.

Table 10. Nutrient discharges from three sectors to the Norwegian coast in 2008 and 2009. Totals for all four maritime areas. Orange colour indicates an increase in nutrient discharges, green a reduction; relatively small changes (<10 %) are not highlighted. (STP: Sewage treatment plants).

Sector	2008	2009	% difference	Actual difference
Total nitrogen (Tonnes)				
Fish farming	41 428	49773	20	8345
Industry	2 610	2312	-11	-298
STP	11 534	12168	6	634
Total phosphorus (Tonnes)				
Fish farming	8 581	10200	19	1619
Industry	338	256	-24	-82
STP	912	921	1	9

After the revision of the RID data in 2009 (Stålnacke et al. 2009), a new routine was introduced where direct discharges are compared from year to year between the same industries and sewage treatment plants. This is done in order to detect errors in reporting (e.g. use of wrong units). However, each year is likely to bring new challenges as to whether or not the reported data from direct discharges are correct. As a general rule, only data that are obviously wrong are removed from the dataset, other anomalies are included in the reporting since accident spills can have occurred. In 2009, this issue only concerned high reported discharges of arsenic from one industrial unit. The unit has not reported discharges of arsenic before, but the discharges were nevertheless included in the reporting from 2009 as an accident can have occurred. This implied an increase of 336 % in arsenic from direct discharges since 2008, or from 0.45 to 1.94 tonnes (Figure 25). The increase is probably mainly linked to organic arsenic since the produce of this unit is alginate. The total loads to the sea of arsenic are, however, almost equal to 2008 since the riverine inputs were reduced with about one ton.

For industrial units, therefore, discharges of arsenic increased considerably since 2008. For the other metals there was a small increase in cadmium (0.02 tonnes or 14%) and chromium (0.25 tonnes or 32%), otherwise the discharges were equal to or lower than in 2008. Mercury and zinc discharges from industry were reduced by more than 20 %.

Copper discharges from fish farming continue to increase, in line with other discharges from this sector. The small decreases in the other two sources of direct discharges in copper (about 5 tonnes) can by no means outweigh the increase by more than 100 tonnes from the fish farming industry.

Metal discharges from sewage treatment plants generally decreased, for mercury by as much as 62 %. Exceptions are chromium (increase of 32 %) and lead (increase of 6 %).

Overall, the metal discharges from industry, sewage treatment plants and fish farming in 2009 increased considerably in terms of copper and arsenic, has smaller increases of lead, chromium and cadmium, and decreased in terms of zinc, nickel and mercury.

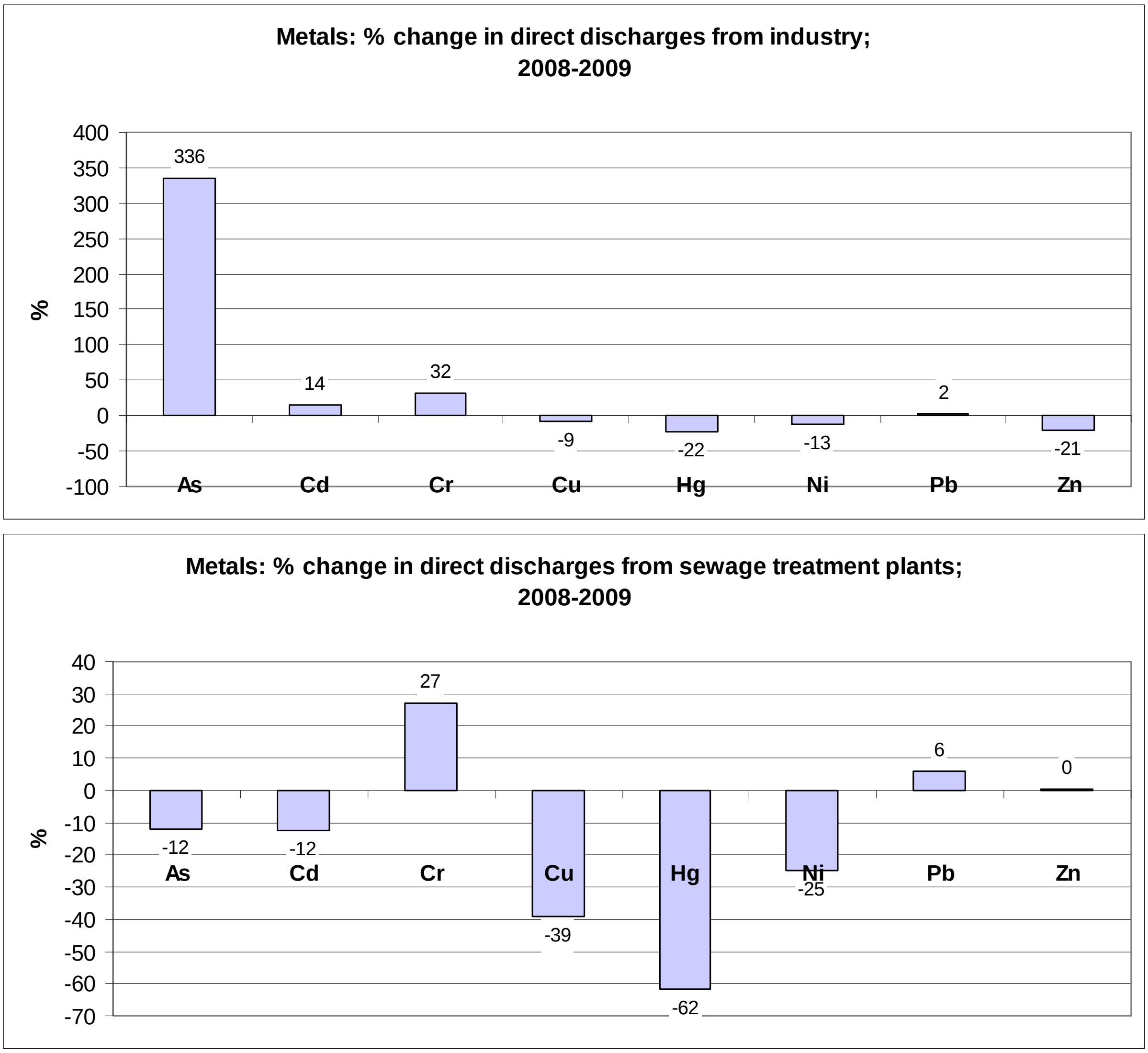


Figure 25. Differences in direct discharges of metals to the Norwegian coast from 2008 to 2009; Upper panel: industry; Lower panel: sewage treatment plants.

4.3 Long-term riverine trends in concentrations 1990-2009

Trend analyses are only performed on data from the main rivers. The methodology for this section can be found in Section 2.8. Additional charts with trends in pollutant concentrations are presented in Appendix V.

4.3.1 Data selection

The analysis has been based on raw data observations in nine of the ten main rivers for the period 1990-2009. River Vosso was not included due to varying sampling frequencies; i.e., one sample per year during 1990-2003, four samples a year 2004-2007 and monthly sampling since 2008.

Chemical variables analysed for trends include cadmium (Cd), copper (Cu), nickel (Ni), lead (Pb), zinc (Zn), ammonium nitrogen (NH_4-N), nitrate nitrogen (NO_3-N), total nitrogen (TN), orthophosphate (PO_4-P), total phosphorus (TP) and suspended particulate matter (SPM). No trend analyses were performed for mercury (Hg) 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). Other parameters not analysed for trends due to too short time series, gaps in the series and/or a majority of the observations at LOD, include arsenic (As), chromium (Cr), total organic carbon (TOC), Silica (SiO_2), PCB7 and lindane (g-HCH).

Some important facts include:

- River Alta was sampled less than 12 times a year during the period 1990-1998.
- Some rivers have increased sampling frequency 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 Appendix VII. 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 data-sets, which includes several rivers with low contamination levels. Particularly noteworthy is the high number of below LOD observations for many metals in Norwegian rivers (see Skarbøvik et al., 2007 for the 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 laboratories (see Skarbøvik and Borgvang, 2007.)

4.3.2 Trends in nutrients and suspended particulate matter

Table 11 summarises long-term trends in nutrient and particle (SPM) concentrations in nine of the main Norwegian RID rivers. Charts showing the development in nutrient and SPM concentrations for all rivers are given in Appendix V. The trends for the different substances are discussed below.

Table 11. Long-term trends in water discharge (Q; estimated at the day of water quality sampling) and nutrient and particle concentrations (upper estimates; upper and lower estimates given for orthophosphate) in nine Norwegian main rivers 1990- 2009. The table shows the p-values. The colours indicate the degree of statistical significance (see legend).

River	**Q**	**NH_4-N**	**NO_3-N**	**Tot-N**	**PO_4-P (1)**	**PO_4-P (2)**	**Tot-P**	**SPM**
Glomma	0.349	0.006	0.755	0.248	0,264	0,272	0,859	0,573
Drammenselva	0.026	0.337	0.357	0.084	0,530	0,415	0,762	0,719
Numedalslågen	0.195	0.275	0.098	0.042	0,586	0,485	0,077	0,401
Skienselva	0.071	0.175	0.000	0.000	0,072	0,542	0,674	0,474
Otra	0.747	0.532	0.014	0.078	0,148	0,011	0,004	0,003
Orreelva	0.182	0.101	0.181	0.575	0,603	0,598	0,348	0,253
Orkla	0.662	0.024	0.966	0.883	0,424	0,007	0,020	0,021
Vefsna	0.964	0.000	0.000	0.005	0,079	0,001	0,014	0,012
Altaelva	0.992	0.001	0.005	0.007	0,010	0,004	0,012	0,220
All rivers	0.143	0.009	0.004	0.100	0,557	0,020	0,148	0,160

Legend:

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

PO_4-P(1) – upper estimates

PO_4-P(2) – lower estimates

Water discharges

Trends in water discharges in the nine main rivers were assessed for the specific sampling dates for chemical analyses, and not as time trends in general hydrological conditions.

As shown in Figure 26 and Table 11, a significant upward trend was found for River Drammenselva ($p<0.05$). In addition, an upward, but not significant trend was found for River Skienselva ($p<0.07$), and in River Orreelva there is a tendency of elevated water discharges since 2004 (Appendix V).

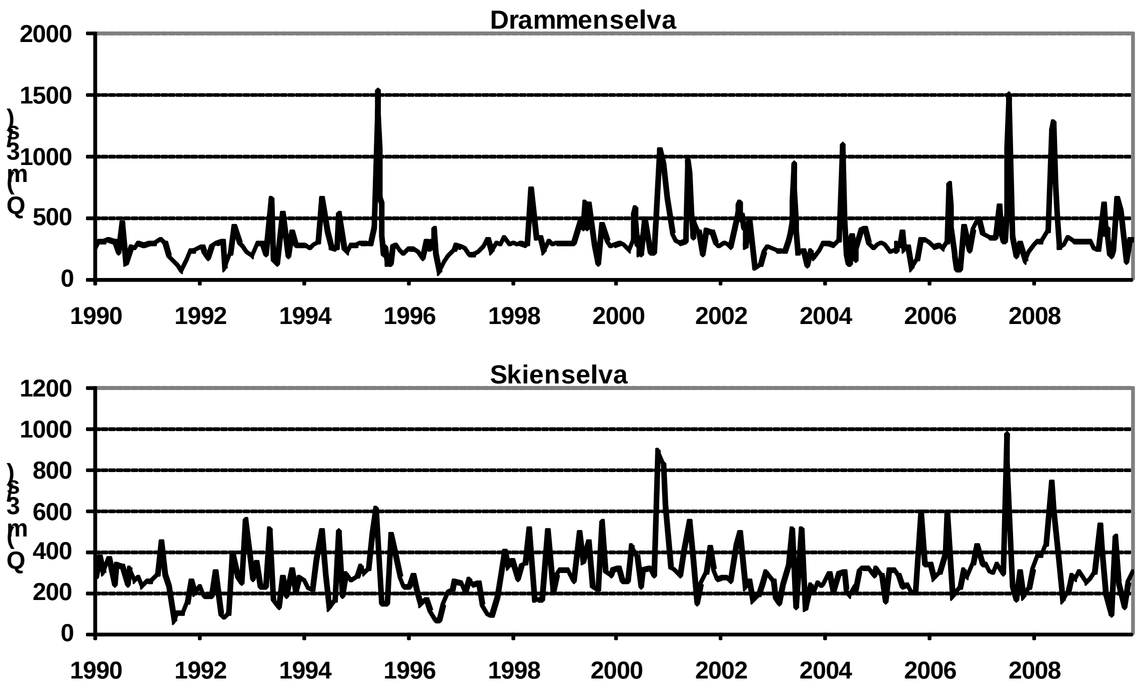


Figure 26. Water discharge (based only on data at the day of water quality sampling) in River Drammenselva (upper panel) and River Skienselva (lower panel), 1990-2009.

Nitrogen

Statistically significant downward trends ($p<0.05$) were detected for total nitrogen and nitrate in the three rivers Skienselva, Vefsna and Alta (Figure 27 for rivers Vefsna and Altaelva, and Appendix V for River Skienselva). A significant downward trend in nitrate was also detected in River Otra. Ammonium showed statistically downward trends in four rivers (Glomma, Orkla, Vefsna and Altaelva; $p<0.05$).

A statistically significant upward trend was found for total nitrogen in River Numedalslågen, whereas River Drammenselva shows a tendency of increased concentrations ($0.05<p<0.1$; Table 11 and Figure 28).

The multivariate test for all rivers combined showed a statistically significant downward trend for nitrate and ammonium ($p<0.05$).

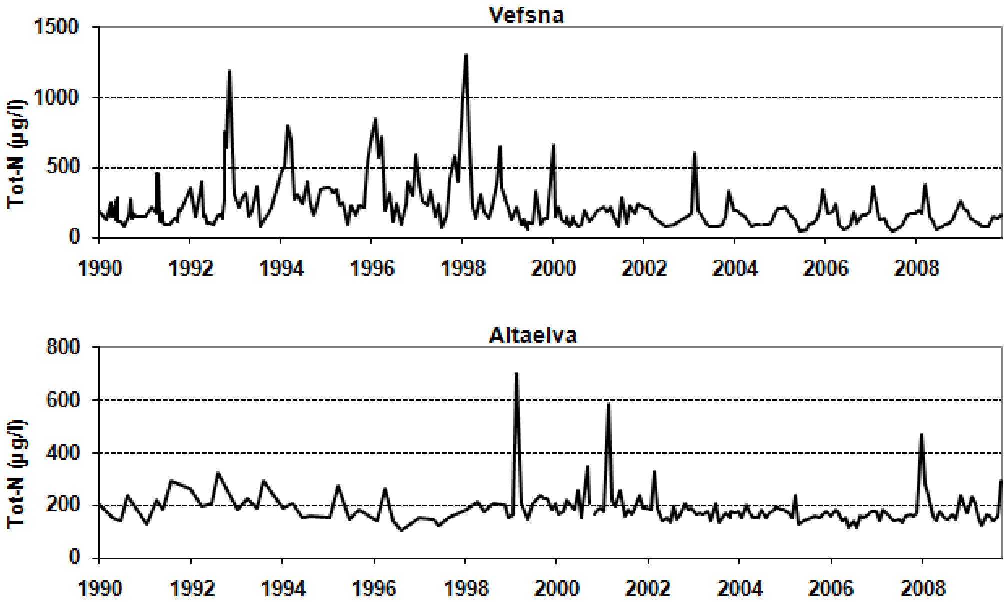


Figure 27. Total nitrogen concentrations in River Vefsna (upper panel) and River Altaelva (lower panel), 1990-2009.

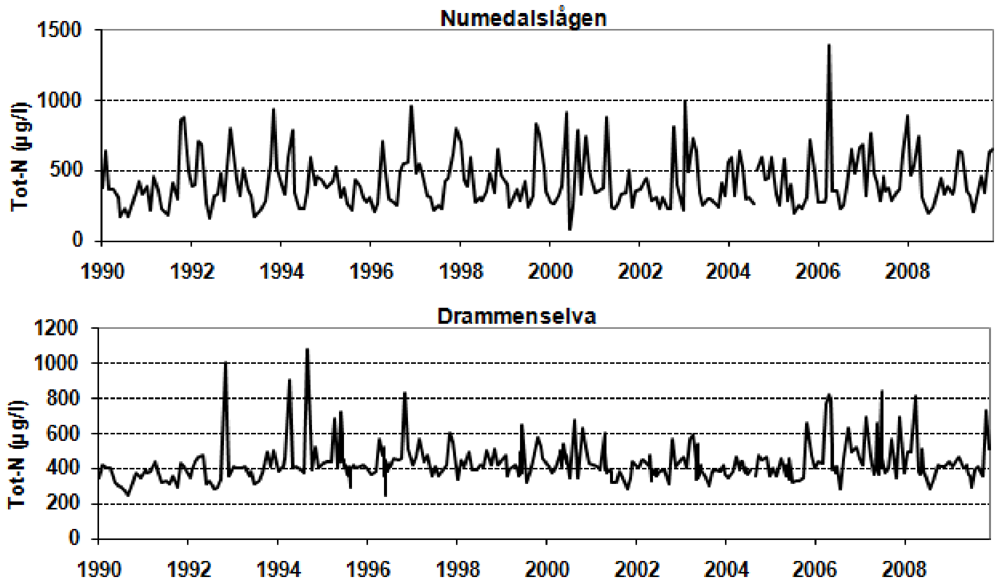


Figure 28: Total nitrogen concentrations in River Numedalslågen (upper panel) and River Drammenselva (lower panel), 1990-2009.

Phosphorus and particulate matter

Statistically significant downward trends ($p<0.05$) for total phosphorous were detected in four rivers (Otra, Orkla, Vefsna and Altaelva). In the previous trend analyses for 1990-2008 (Skarbøvik et al. 2008) only River Altaelva showed a statistically significant downward trend. This change in trends is therefore most likely an effect of the exclusion of the 1999 to 2003 data in the present trend analysis.

Detecting trends in orthophosphate is a challenge due to the fact that many samples are at or below the LOD value; hence there is a large difference in concentrations between the lower and upper estimates. If upper estimates are used, River Altaelva is the only river with a significant downward trend for orthophosphate (Figure 29). However, if the lower estimates are used, rivers Otra, Orkla, Vefsna and Altaelva had statistically significant downward trends (Table 11). This illustrates the challenges involved in performing trend analyses for substances with concentrations close to the LOD value, and/or where LOD values have changed during the course of the monitoring programme.

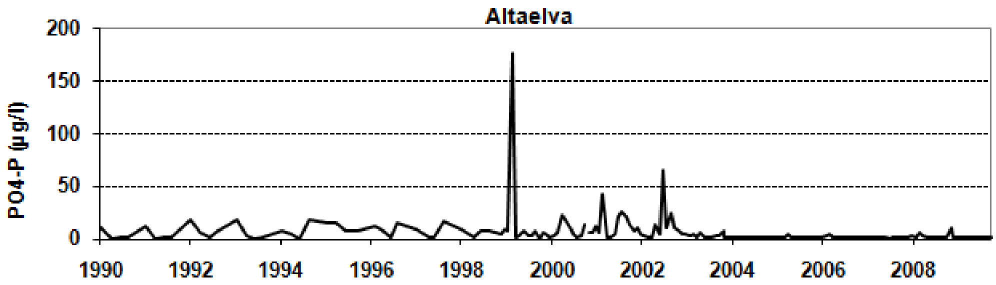


Figure 29. Monthly orthophosphate concentrations in River Altaelva, 1990-2009.

Suspended particulate matter (SPM) showed downward trends in rivers Otra, Orkla and Vefsna. In addition, the more detailed exploratory analysis revealed that there have been few SPM values above 40 mg/l in River Glomma after 2000, apart from some peaks in early 2005 and 2008. Particularly low SPM levels were observed in the rivers during 2002. This might indicate a tendency of decreasing concentrations from 2001 and onwards in River Glomma. The peak values in 2007 in rivers Drammenselva and Numedalslågen are explained by increased and additional monitoring during a summer flood situation.

The multivariate test for all the rivers combined, did not reveal a statistically significant downward trend for SPM ($p>0.05$).

4.3.3 Trends in concentrations of metals

Table 12 gives an overview of trends in five selected metals (cf. Section 4.3.1 on the basis for the selection of substances for which trend analyses could be carried out). The trends in concentrations of these metals are discussed below. More detailed figures for all rivers and substances are given in Appendix V.

Table 12. Long-term trends for metal concentrations in nine Norwegian main rivers 1990-2009. The table shows the p-values. The colours indicate the degree of statistical significance (see legend).

Upper estimates:

River	Q	Cd	Cu	Ni	Pb	Zn
Glomma	0.349	0.001	0.064	0.003	0.002	0.002
Drammenselva	0.026	0.000	0.488	0.342	0.062	0.223
Numedalslågen	0.195	0.001	0.057	0.006	0.025	0.012
Skienselva	0.071	0.000	0.058	0.001	0.007	0.001
Otra	0.747	0.002	0.264	0.015	0.002	0.000
Orreelva	0.182	0.000	0.289	0.000	0.011	0.572
Orkla	0.662	0.009	0.010	0.000	0.001	0.001
Vefsna	0.964	0.000	0.000	0.000	0.000	0.000
Altaelva	0.992	0.000	0.003	0.000	0.000	0.010
All rivers	0.143	0.000	0.016	0.000	0.001	0.000

Legend:

Significant downward ($p<0.05$)

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

Significant upward ($p<0.05$)

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

Lower estimates:

River	Q	Cd	Cu	Ni	Pb	Zn
Glomma	0.349	0.373	0.064	0.003	0.124	0.002
Drammenselva	0.026	0.070	0.488	0.538	0.537	0.221
Numedalslågen	0.195	0.401	0.057	0.194	0.082	0.012
Skienselva	0.071	0.043	0.058	0.365	0.178	0.001
Otra	0.747	0.638	0.264	0.025	0.135	0.000
Orreelva	0.182	0.716	0.289	0.000	0.039	0.527
Orkla	0.662	0.376	0.010	0.000	0.128	0.001
Vefsna	0.964	0.001	0.000	0.000	0.003	0.000
Altaelva	0.992	0.013	0.004	0.001	0.255	0.024
All rivers	0.143	0.104	0.017	0.000	0.040	0.000

Legend:

Significant downward ($p<0.05$)

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

Significant upward ($p<0.05$)

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

A majority of the five analysed metals (Cd, Cu, Ni, Pb and Zn) showed statistically downward trends in most of the nine studied rivers. More precisely, 35 of 45 metal trend tests revealed a statistically significant downward trend ($p<0.05$) for the upper estimates. When the lower estimates were used, 21 of 45 metal trends revealed a statistically significant downward trend ($p<0.05$). The trend test for the lower estimates might be regarded as a more conservative estimate.

Relatively few of the copper and zinc analyses were below the detection limits. For copper, statistically significant downward trends could be detected in three out of nine rivers, as well as tendencies of decreased concentrations in three more rivers, i.e., rivers Glomma, Numedalslågen and Skienselva. For zinc, statistically downward trends were found in seven rivers. This is illustrated in Figure 30 for rivers Otra and Vefsna.

The trend test for the metals cadmium, nickel and lead must be interpreted with caution given the changes in LOD-values during the course of the 20 years with monitoring.

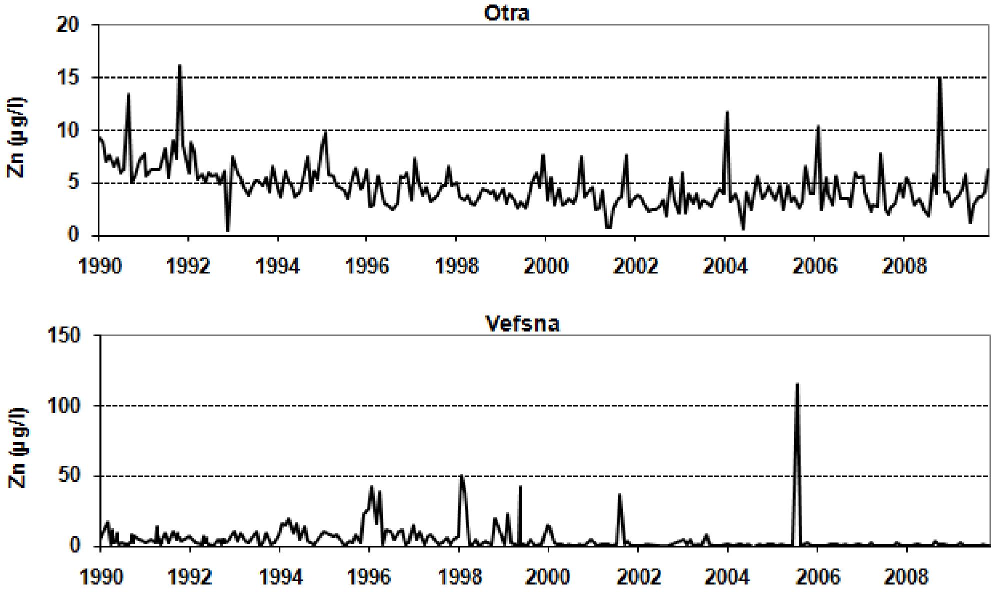


Figure 30: Monthly zinc concentrations in River Otra (upper panel) and River Vefsna (lower panel), 1990-2009.

4.3.4 Overview of long-term trends for pollutant concentrations

In this section, a statistical assessment has been made on the long-term trends for the period 1990-2009 in monthly water discharge (only data at day of water quality sampling), concentrations of nutrients (NH_4-N, NO_3-N, Total-N; PO_4-P and Total-P), suspended particulate matter (SPM) and metals (Cd, Cu, Ni, Pb, and Zn) in nine main rivers. The main findings are:

- For nitrogen the following statistically significant downward trends ($p<0.05$) were detected:
  - In rivers Skienselva, Vefsna and Altaelva, for both total nitrogen and nitrate nitrogen;
  - In rivers Glomma, Orkla, Vefsna and Altaelva, for ammonium nitrogen;
  - In River Otra,for nitrate nitrogen.
- Tendencies ($0.05<p<0.1$) of upward trends in total nitrogen could be noted in rivers Drammenselva and Numedalslågen.
- For total phosphorus and orthophosphate concentrations, statistically significant downward trends were detected in rivers Otra, Orkla, Vefsna and Altaelva.

- For suspended particle concentrations, statistically significant downward long-term trends were detected in rivers Otra, Orkla and Vefsna.
- For copper statistically significant downward trends were detected in rivers Orkla, Vefsna and Altaelva, and tendencies of decreased concentrations also in Glomma, Skienselva and Numedalslågen.
- For zinc, seven out of nine rivers showed statistically significant downward trends.
- No firm conclusions can be drawn on trends in concentrations of the three other metals (Cd, Ni and Pb), due to many values at or below LOD value. Also, major changes in LOD values have occurred over the monitoring period. The statistically significant downward trends in 11 out of 27 cases for lower estimates (i.e., 9 rivers and 3 metals) are therefore not necessarily 'real' changes in concentrations. Thus, results and interpretations should be treated with great caution and it is advised that the analysis is used mainly as an indication of the magnitude of concentration variations.

4.4 Long-term trends in loads in main rivers 1990-2009

The methodology for this work is given in Section 2.9. Complementary figures are given in Appendix VI.

4.4.1 Characteristics of and trends in water discharge

The riverine loads of nutrients and particles have considerable inter-annually variability as shown in previous reporting of the Norwegian RID-programme (e.g. Skarbøvik et al., 2008; 2009). This is mainly due to variations in runoff from year to year.

Time series of actual[9] annual water discharges are presented in Appendix VI. In Chapter 3.2 water discharges in the main rivers and in the areas draining to the four different marine areas are discussed. In addition to the discussion in Chapter 3.2, some interesting observations in the water discharge series include:

- In the five Skagerrak rivers, the water discharge was particularly high in the year 2000, due to heavy and long-lasting rainfall during autumn 2000.
- For the two rivers in northern Norway, Vefsna and Altaelva, the highest annual water discharges were registered in 2005.
- The year 1996 was characterised by low water discharges in all Skagerrak rivers.
- There is a tendency of increased water discharges in Drammenselva.
- No other obvious upward or downward trends in annual water discharges could be detected in the visual inspection of the data.

4.4.2 Trends in nutrient loads

Nitrogen

For all the five Skagerrak rivers the observed total nitrogen loads were particularly high in 2000. However, a substantial fraction of the inter-annual variation in nitrogen loads was removed when load data were flow normalised, especially in years with very high or low flows.

Flow-normalised nitrogen loads were relatively low in 2001 in all five Skagerrak rivers. This might be an effect of intensive leaching of nutrients and increased soil erosion during the precipitation-rich autumn in 2000, and thus, less available material for river transport in 2001.

A slight tendency of an upward trend in River Drammenselva ("trend smoother") is mainly due to relatively lower concentrations and loads during the period 1990-1993 than in latter years.

After flow-normalisation, a clear downward trend in nitrogen can be seen in River Skienselva. This trend may be caused by a number of different changes and measures in the river basin, but no concrete explanation has yet been found.

As reported last year (Skarbøvik et al. 2009) River Vefsna shows a rather abrupt change in loads of some substances before and after 1999, including nitrogen (Figure 31). This was also found for concentrations in the formal trend analysis (cf. Section 4.3). In this river also loads of lead and copper, and to some extent ammonium, dropped after 1999. The river has relative high

[9] With 'actual' water discharge is meant the total water discharge as measured continuously, as opposed to the water discharge measured only at sampling dates (as reported in the previous chapter).

concentration levels of these substances (cf. Section 4.3), 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).

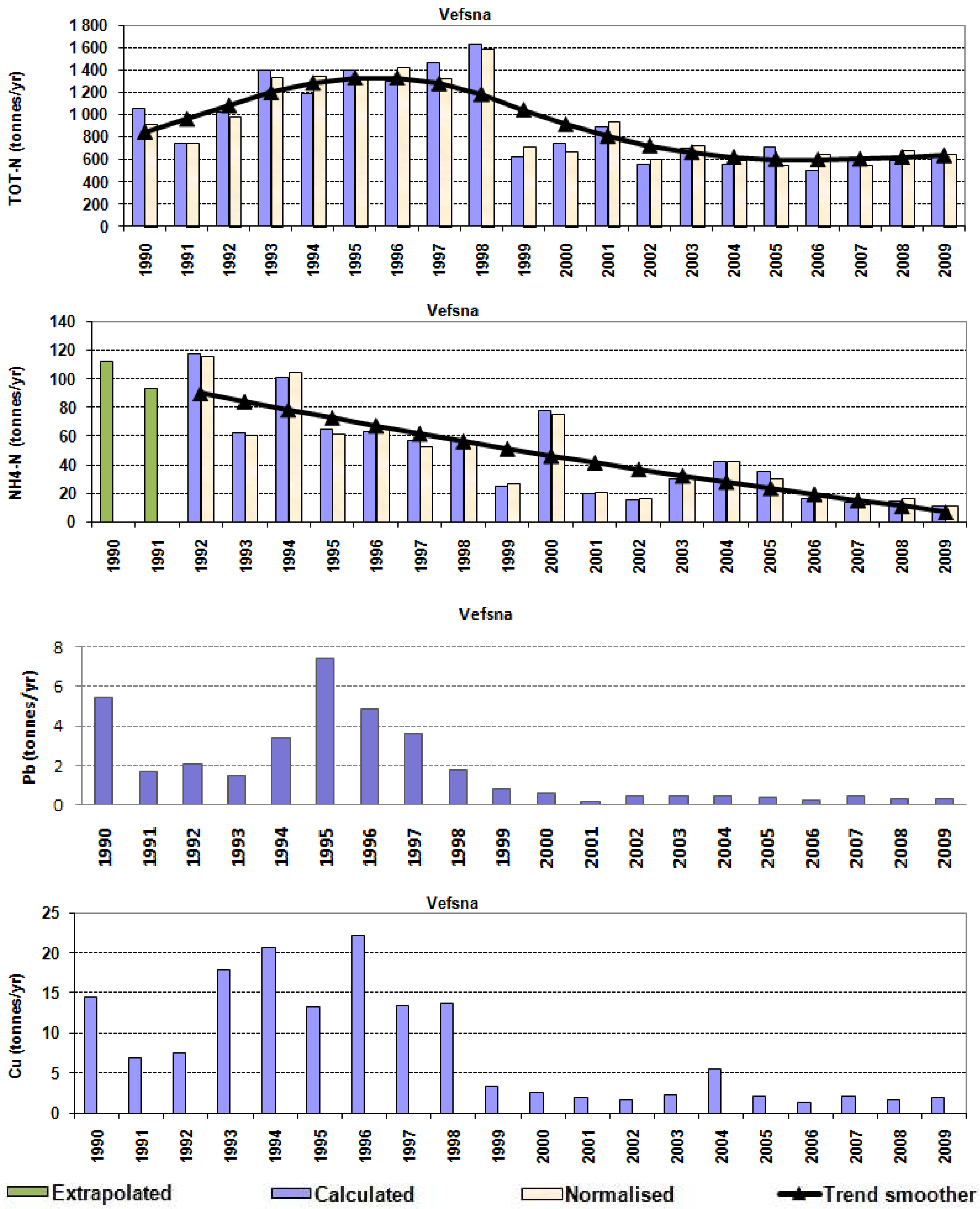


Figure 31. Annual riverine loads in River Vefsna of total nitrogen, ammonium, lead and copper in 1990-2009. Loads shown are the upper estimates.

In River Orreelva, elevated loads for total nitrogen in the period 2004-2007, with the highest load ever observed in 2007 (Figure 32), have resulted in a trend smoother line pointing upwards in the years 2003-2007 followed by a downward trend 2007-2009. The high loads in 2006 and 2007 were examined in more detail in Skarbøvik et al. (2007; 2008).

Also phosphorus loads were higher in River Orreelva during the years 2004-2006, especially for the orthophosphate fraction (cf. next section). The similar pattern for nitrogen (nitrate-N) and orthophosphate in River Orreelva (see Appendix VI) is probably explained by hydrological conditions, in combination with changes in emissions from agricultural sources. A study on phosphorus losses by Molversmyr et al. (2008) in Orreelva based on various statistics on land use, agricultural management practices and waste water treatment, indicated decreased phosphorous emissions between 1995 and 2007. It may, however, take time before the nutrient level in the ground is reduced and the measures are detected in the rivers. The reduction in nutrient loads the latter years may therefore finally be a result of former years' efforts to reduce nutrient inputs, but more detailed studies are needed in order to confirm this.

A visible downward trend in River Otra for nitrate loads was noted. The reason for this is not known.

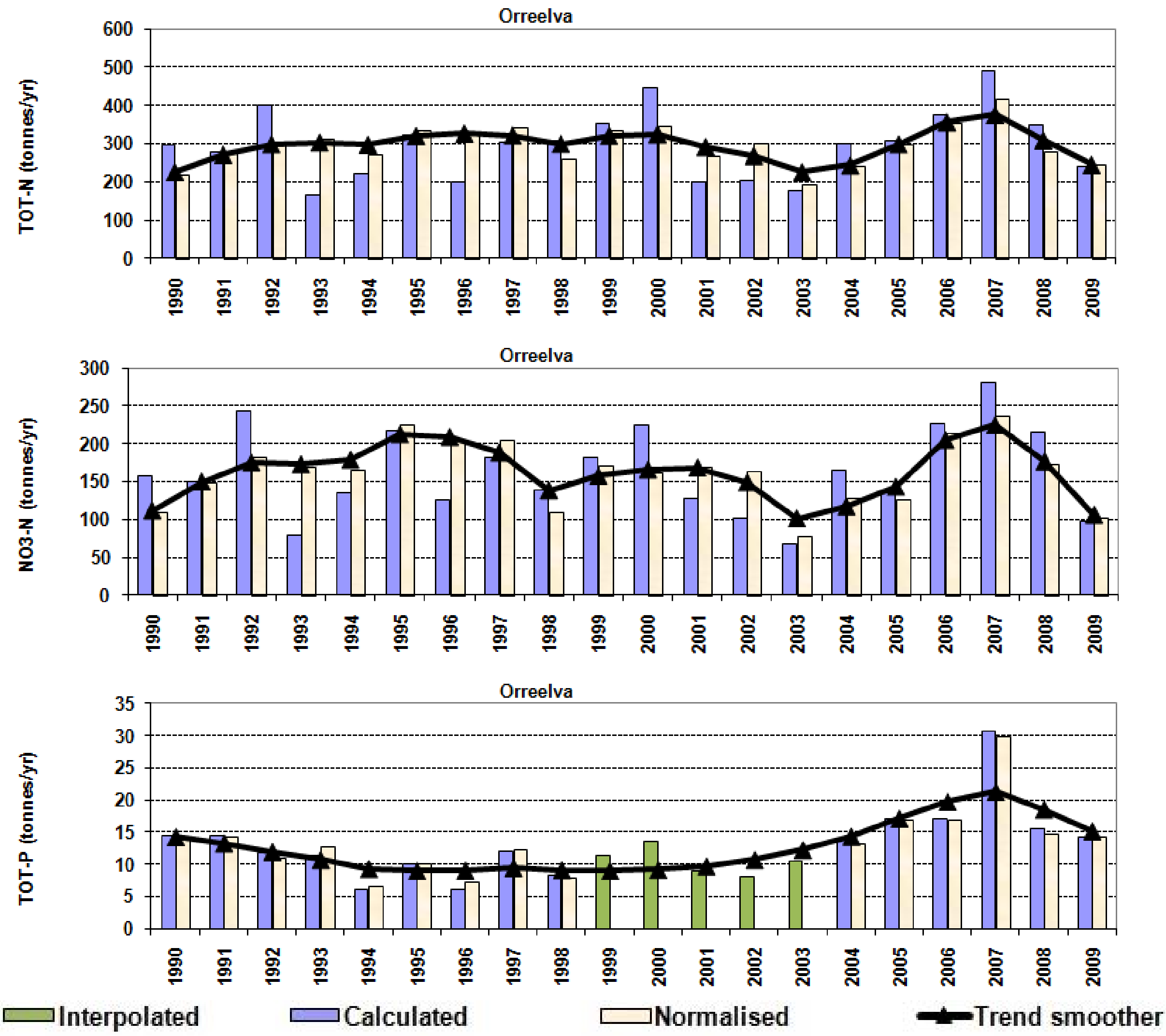


Figure 32. Annual riverine loads in River Orreelva of total nitrogen, nitrate nitrogen and total phosphorus, 1990-2009.

Changes in ammonium loads are shown in figures in Appendix VI. Ammonium loads in most rivers only account for 1-5% of the total nitrogen loads. In addition, ammonium is normally quickly converted to nitrate in river water (via nitrification processes) and is thus a less informative parameter for long-term trend assessments.

Phosphorus

The total phosphorus loads generally show large inter-annual variability, varying by a factor of three or more in a majority of the nine rivers (e.g., rivers Numedalslågen, Skienselva, Otra, Vefsna and Altaelva; blue bars in figures in Appendix VI). Apart from some wetter periods with increased water flow, the high observed and flow-normalised loads cannot be explained. Given this and especially the high inter-annual variability, it is difficult to detect long-term trends. The only exception is in River Vefsna, where the phosphorus loads have declined, primarily during the years 2004-2007. Apparently this is the joint effect of low orthophosphate (PO_4) and particle (SPM) loads in the same years (Figure 33).

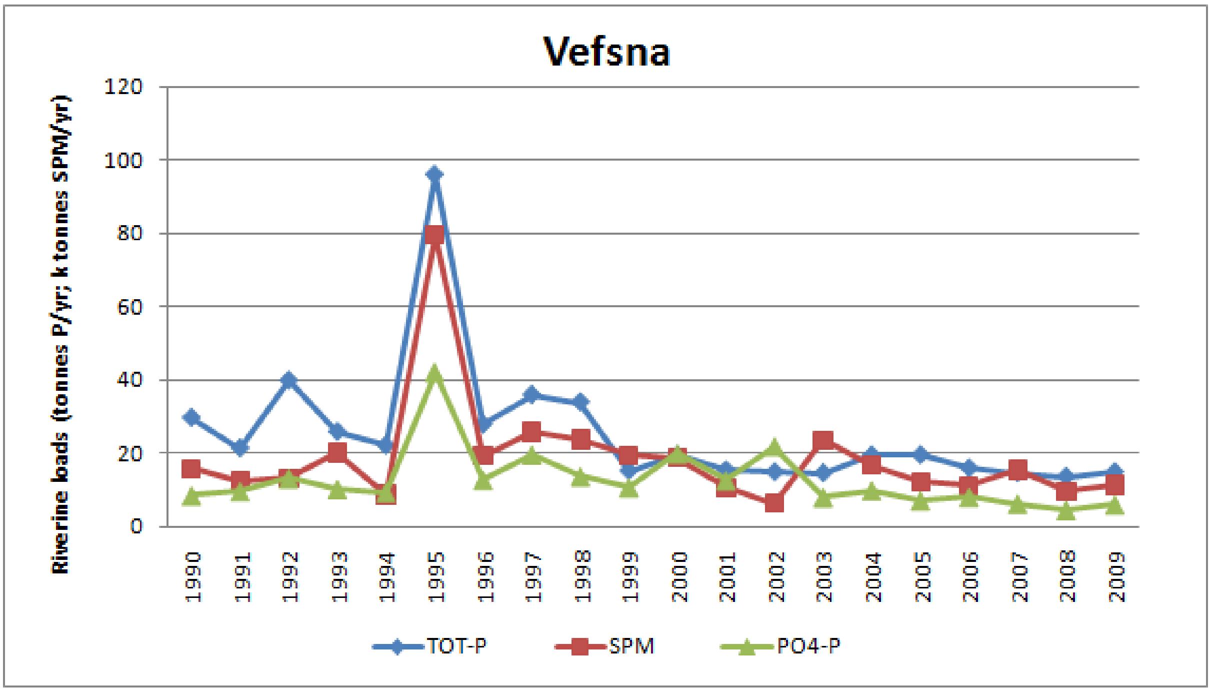


Figure 33. Riverine loads of total phosphorus (tot-P), orthophosphate (PO_4-P) and suspended particulate matter (SPM) in Vefsna 1990-2009. It should be noted that total phosphorus loads in 1999-2003 are calculated and not monitored (cf. Stålnacke et al. 2009).

The tendency of upward trends in phosphorus in River Orreelva has been discussed in the previous section, since the same trend was also found for nitrogen. The high loads in 2007 in rivers Drammenselva and Numedalslågen are coupled to SPM and increased sampling frequency which is further discussed in the next section. The highest load of total phosphorus during the monitoring period in River Glomma in 2008 corresponds with high SPM and orthophosphate loads, and the second highest water runoff registered since 1990. Skienselva also had high phosphorus loads and high runoff in 2008 but this is not seen in the SPM and orthophosphate loads. The high total phosphorus loads in 2008 are due to high concentrations in the sampling conducted in September, October and December (3-4 times higher concentrations compared to average values).

Orthophosphate concentrations are in most samples at very low levels (1-2 µg/l) or at LOD, which in turn have changed during the course of the monitoring period. This implies that interpretation of orthophosphate trends should be made with great caution.

Particulate matter

Similar as for total phosphorus, there has been major inter-annual variability in suspended particulate matter (SPM). The fact that the flow-normalised method was not capable of removing the inter-annual variability in observed load to any particular degree is due to a rather poor relationship between loads and water discharge and/or single outliers in such relationships (Figure 34).

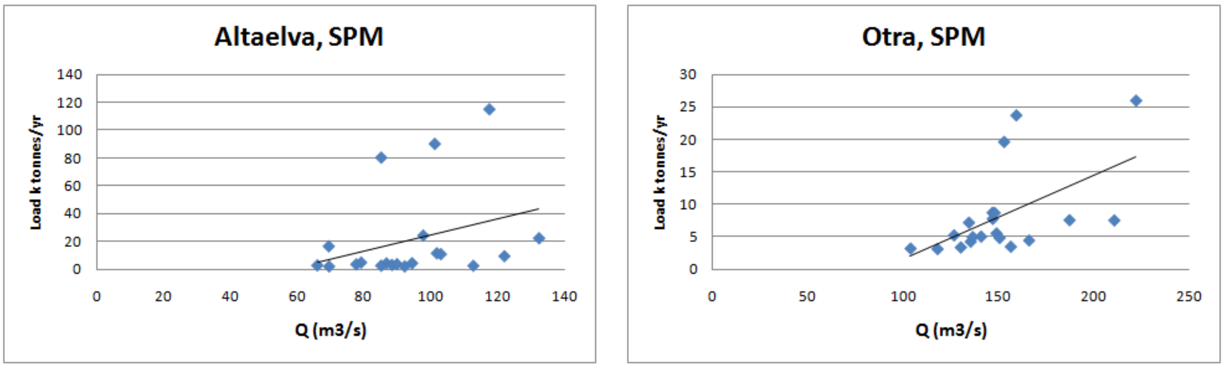


Figure 34. Scatter-plot of the relationship between annual load of suspended particulate matter and annual water discharge in River Altaelva (left panel) and River Otra (right panel) for the monitoring period 1990-2009.

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 this year. High runoff also explains the high SPM loads for River Glomma in 2008.

The high loads of SPM in 2007 in rivers Drammenselva and Numedalslågen were due to increased sampling frequency during the summer flooding. This specific event and other examples of the influence of single observations for annual loads are given in Skarbøvik et al. (2007; 2008). A more general discussion concerning the sampling frequency in RID on particulate material can be found in Borgvang et al (2006).

4.4.3 Trends in metal loads

In this section the annual riverine loads of six metals in the nine main rivers during the period 1990-2009 are assessed. All figures are given in Appendix VI for both upper and lower estimates. The metals include:

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

Nickel and chromium have not been included in this study, since these substances have not been reported for all years of the monitoring period.

It should be stressed that no firm conclusions can be drawn about long-term changes in metal loads, except for copper and zinc. Possible visual trends in the data and figures shown in this section (and in Appendix VI) are not necessarily explained by 'real' changes in loads. Thus, results and interpretations should in most rivers be used with great caution and should solely be used as an indication of the magnitude in loads and the uncertainty.

Copper (Cu)
Copper was together with zinc the only metals with few values below LOD and few changes in LOD over the monitoring period 1990-2009. Long-term trends have, in general, been difficult to identify in a majority of the rivers. However, as noted above, 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 (1999-2009) they dropped to 2-5 tonnes (Figure 31).

A decline in copper loads in rivers Altaelva (Figure 35), Skienselva and Orkla can also be noted. In River Altaelva, the loads have declined from 4-7 tonnes in the early to mid 1990's to 1-3 tonnes in the 2000s; except for the year 2002 with a load of almost 4 tonnes.

A relatively steep increase since 2004 can be noted in River Otra (Figure 35, lower panel). The reason for this is not known.

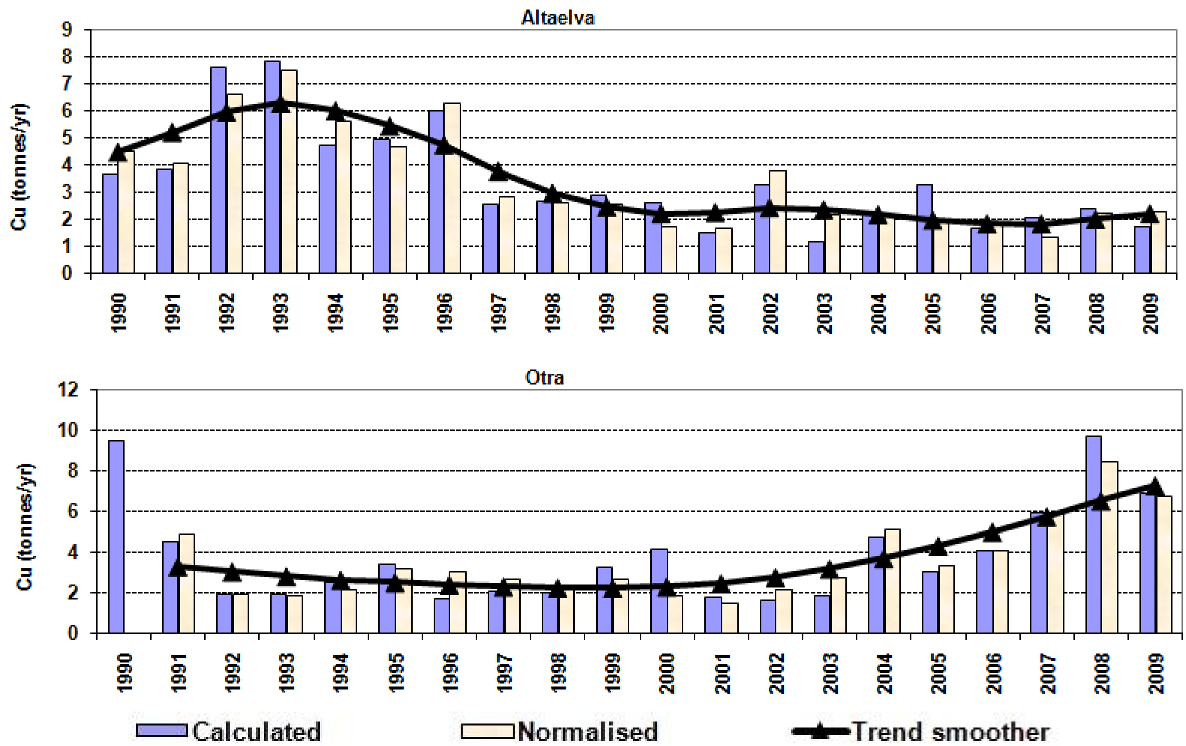


Figure 35. Annual riverine loads of copper in River Altaelva and River Otra, 1990-2009. The value for Otra in 1990 was removed before estimating the normalised loads and the trend smoother.

Single years of anomalies also occur, such as 1993 in River Numedalslågen, and 1990 in rivers Skienselva and Otra (these values have been removed before estimating the normalised values and trend smoother). The high copper load in River Numedalslågen in 1993 (Figure 36) is explained by generally high values 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 has only occurred at one sampling occasion (in 2007) in the entire time period 2000-2009.

The high load in River Skienselva in 1990 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. The high load in River Otra in 1990 is explained by one single sample with high concentration (6 µg/l) in combination with several observations around or above 1 µg/l.

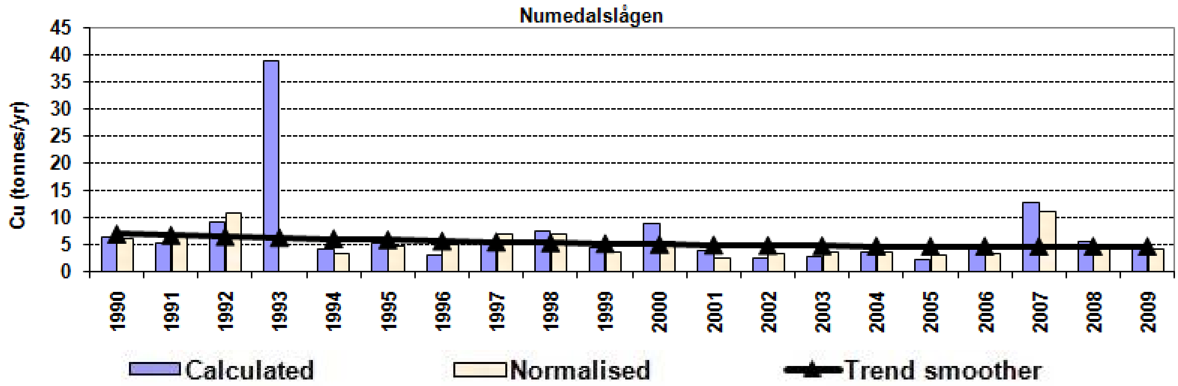


Figure 36. Annual riverine loads of copper in River Numedalslågen, 1990-2009. Data for 1993 were removed before estimating the normalised loads and the trend smoother.

Zinc (Zn)

The zinc loads show relatively low inter-annual variability as compared to those of many of the other metals. A downward trend could be detected in Glomma, Orkla and Vefsna (Figure 37). However, also rivers Numedalslågen, Skienselva and Otra show tendencies of decreased loads. 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).

Lead (Pb)

The inter-annual variability and trends in inputs of lead are mainly due to changes in LOD. Table 13 shows that the LOD for lead has changed by a factor of 100 during the monitoring period (1990-2009). This means that no reliable trend assessment of the annual inputs of lead can be carried out.

Table 13. Changes in detection limits (LOD) for lead (µg/l).

Year	1990	1991	1992 -1998	1999	2000	2001	2002-2003	2004-2009
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.

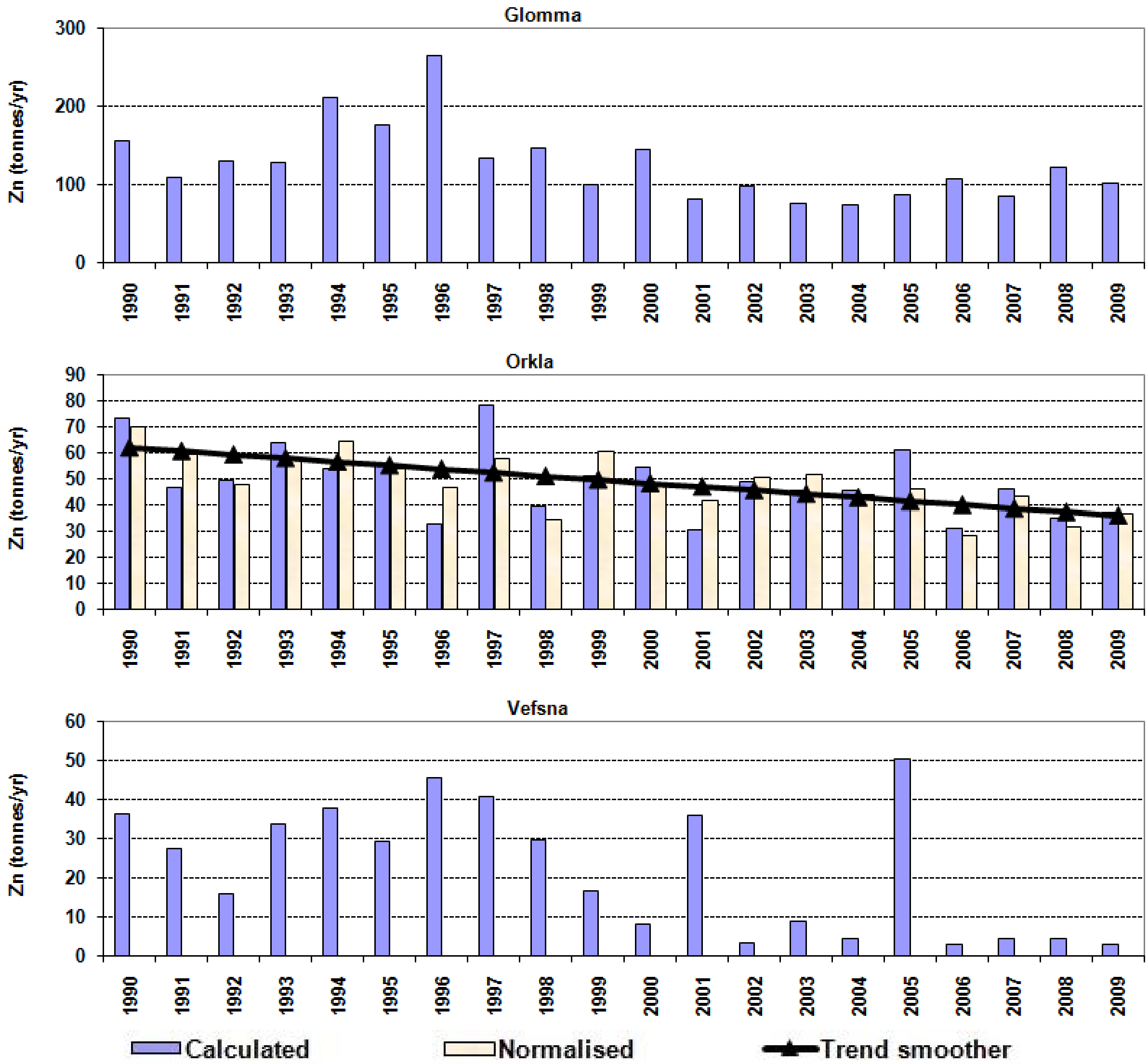


Figure 37. Annual riverine loads of zinc in River Glomma, River Orkla and River Vefsna, 1990-2009.

Cadmium (Cd)

More than 25% of the observations of cadmium in the ten 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 2004-2009. For this reason, no meaningful trend assessment of the annual loads is possible. The lower and upper load estimates given in Appendix VI should therefore solely be used as an indication of the magnitude of the loads.

Mercury (Hg)

For mercury, 50% of the observations in the ten 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 (cf Appendix VII).

Arsenic (As)

Lower and upper load estimates (shown in Appendix VI) should only be used as an indication of the magnitude in loads. Arsenic was not monitored in the period 1990-1993.

4.4.4 Trends in loads of PCB7 and total 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. This obviously poses limitations to assess long-term trends with sufficient accuracy. PCB7 was not monitored in the period 1999-2003

In the period 1990-1998, no values above LOD were observed for lindane. In this period, the actual values were reported, despite the fact that they were below LOD. In the period 1999-2003, values below LOD for the upper estimates were set equal to a LOD of 0.1 ng/l; whereas in the period 2004-2006, the LOD increased to 0.2 ng/l, and upper estimates were therefore given as 0.2 ng/l. Apparent trends, therefore, mainly reflect the changes in LOD. The lower and upper load estimates can therefore only be used as an indication of the magnitude of the loads.

4.4.5 Overview of trends in riverine loads

The main conclusions of the trend analysis on loads are the following:

- For nutrients:
  - In rivers Skienselva and Vefsna, a downward trend in nitrogen loads;
  - In River Orreelva, no overall long-term trends but high loads of both nitrogen, phosphorus and to some extent suspended particles were observed in the period 2004-2007 followed by a decrease in 2007-2009.
  - In River Vefsna, somewhat reduced loads of phosphorus during the 2000s compared to a period with higher loads in 1992-1998.
- For suspended particles, no long-term trends can be observed due to a very high inter-annual variability. This is most likely due to too low sampling frequency related to the fact that SPM concentrations normally show high peaks during high water discharge.
- For copper there was a downward trend in rivers Vefsna, Orkla, Skienselva and Altaelva.
- For zinc, visible downward trends could be detected in rivers Glomma, Orkla and Vefsna, whereas tendencies of decreased loads were seen in rivers Numedalslågen, Skienselva and Otra.
- For the other metal loads, no firm conclusions can be drawn about long-term changes since any visual downward trends are not necessarily due to ‘real’ changes in loads. Changes in LOD values over the monitoring period and many samples with concentrations at or below LOD means that the interpretations should be made with great caution.
- For lindane and PCB, no conclusion about trends can be drawn due to the very low concentrations. A majority of analyses were below LOD, and there have also been changes in the LOD during the monitoring period.

5. Conclusions

The total estimated inputs of nutrients, suspended solids, metals, lindane and PCB7s to Norwegian coastal waters in 2009 are presented in Table 14. More detailed tables are given in the Addendum to this report.

Table 14. Overview of total inputs of RID determinants from mainland Norway in 2009; lower estimates. In tonnes for all parameters, except mercury (Hg), PCB7 and lindane (g-HCH) which are given in kg; flow rate is given in km^3/d.

	Flow rate	Cd	Hg	Cu	Zn	Pb	As	Cr	Ni
Main Rivers	180 324	0.862	54	94	247	13	10	16	33
Tributary Rivers (36)	209 130	0.784	136	71	178	13	8	15	41
Tributary Rivers (109)	145 085	0.438	50	21	57	5	6	19	20
Total Riverine Inputs	534 539	2.084	240	186	481	31	24	49	94
Sewage Effluents		0.021	7.6	4.9	14.4	0.6	0.2	1.1	1.9
Industrial Effluents		0.172	9.7	8.5	15.8	2.9	1.9	1.1	8.0
Fish Farming		0.000	0.0	836.0	0.0	0.0	0.0	0.0	0.0
Total Direct Inputs		0.193	17.3	849.4	30.2	3.5	2.2	2.2	10.0
Unmonitored Areas	284 531								
Total Norway	819 070	2.28	257	1036	512	34	26	52	104

	NH_4-N	NO_3-N	PO_4-P	TN	TP	SiO_2	SPM	TOC	PCB	g-HCH
Main Rivers	826	13 043	254	25 628	655	191 280	266 981	227 353	0.00	0.00
Tributary Rivers (36)	432	6 438	104	16 669	406	168 323	225 671	194 443		
Tributary Rivers (109)	462	5 200	101	9 641	225	70 905	69 977	90 155		
Total Riverine Inputs	1 720	24 680	459	51 938	1 286	430 507	562 628	511 951		
Sewage Effluents	9 126	608	552	12 168	921		9 878	3 922	21	
Industrial Effluents	1 734	116	154	2 312	256		34 382	526		
Fish Farming	39 818	5 475	7 038	49 773	10 200			0		
Total Direct Inputs	50 678	6 199	7 744	64 253	11 377		44 260	4 448	21	
Unmonitored Areas	1 583	17 990	97	28 784	393					
REGION TOTAL	53981	48870	8300	144975	13056	430507	606889	516399	21	0.00

Water discharge

Water discharges decreased from 2008 to 2009 for all regions except in rivers draining to the Norwegian Sea, where the flow was on average 6 % higher than in 2008. However, the two RID rivers in this area, Orkla and Vefsna, had discharges close to the 30-year average. In rivers draining to the Skagerrak area, water discharges were lower than in 2008 but still higher than for the 30-year average. In general, 2009 was characterised by few extreme weather events, apart from a pronounced flood in late autumn in many areas. At the end of the year, temperatures were lower than normal in most of the country, and in combination with low precipitation this gave low water discharges in many areas.

Nutrients and suspended particulate matter

Due to the generally lower water discharges in 2009 than in 2008, there was a reduction in all nutrient fractions, as well as organic carbon, silica and suspended solids in riverine loads in 2009. However, the direct discharges of nutrients increased considerably from 2008 to 2009. This was mainly caused by increased discharges from the fish farming industry, and does therefore not include the Skagerrak area. Increases in direct discharges in the latter area were mainly due to a slight increase in discharges from sewage treatment plants. The end result was a total increase in inputs and discharges to the sea of ammonium, ortho-phosphate and total phosphorus compared to 2008, whereas total losses of nitrate, total nitrogen, suspended particulate matter, silica and organic carbon were reduced.

Long term trends (1990-2009) in nutrient inputs in nine of the ten main rivers include

- Downward trends in nitrogen loads in rivers Skienselva and Vefsna;
- In River Orreelva, high loads of both nitrogen, phosphorus and to some extent suspended particles were observed in the period 2004-2007, followed by a decrease in the years 2007-2009.
- In River Vefsna the phosphorus loads declined somewhat during the 2000s compared to a period of higher loads in the nineties (1992-1998).

In addition, the nutrient *concentrations* were analysed in data from 1990 to 2009 in order to detect trends, with the following results:

- For nitrogen the following downward statistically significant trends ($p<0.05$) were detected:
  - In rivers Skienselva, Vefsna and Altaelva, for both total nitrogen and nitrate;
  - In River Otra for nitrate;
  - In rivers Glomma, Orkla, Vefsna and Altaelva, for ammonium;
- Tendencies ($0.05<p<0.1$) of upward trends in concentrations of total nitrogen could be noted in rivers Drammenselva and Numedalslågen.
- For total phosphorus and orthophosphate concentrations, statistically significant downward trends were detected in rivers Otra, Orkla, Vefsna and Altaelva.
- For suspended particle concentrations, statistically significant downward trends were detected in rivers Otra, Orkla and Vefsna.

Metals

Due to lower water discharges in 2009, the riverine loads of all metals except mercury were lower in 2009 than in 2008. In terms of the direct discharges, arsenic, cadmium, lead and chromium increased from industrial discharges, whereas chromium and lead increased from discharges from sewage treatment plants. The copper discharges from fish farming continue to increase, in line with other discharges from this sector. In total for all direct discharges of metals, there was a considerable increase from 2008 in terms of copper and arsenic, a smaller increase for lead, chromium and cadmium, whereas a decrease was found for zinc, nickel and mercury. In terms of riverine and direct loads combined, however, most metals decreased compared to 2008 except for copper (due to fish farming discharges) and mercury (due to riverine inputs). Arsenic and cadmium had very small changes in total inputs from 2008.

Long term trends (1990-2009) in metal inputs from nine of the ten main rivers were analysed:

- Downward trends in copper in rivers Vefsna, Orkla, Skienselva and Altaelva.
- Downward trends in zinc in rivers Glomma, Orkla and Vefsna; and tendencies of downwards trends in zinc in rivers Numedalslågen, Skienselva and Otra.

Data from 1990 to 2009 were also analysed for trends in metal *concentrations*, with the following results:

- For copper, statistically significant downward trends were detected in rivers Orkla, Vefsna and Altaelva, and tendencies of decreased concentrations also in rivers Glomma, Skienselva and Numedalslågen.
- For zinc, seven out of nine rivers showed statistically significant downward trends.

Pesticides
In terms of PCB7 and lindane inputs, these are, as in former years, low in Norwegian waters, and can hardly be found in quantities above the detection limit of the analytical methods.

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Appendices

Appendix I The RID Principles and 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 Trend analyses – pollutant concentrations
Appendix VI Long-term trends in riverine loads
Appendix VII Overview of data that have been estimated.

Appendix I
The RID principles and objectives

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

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

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

Appendix II
Water sampling personnel

An overview of the personnel for water sampling in 2009 is given below:

Personnel for water sampling in the 10 main rivers:

Nils Haakensen (Glomma)
Vibeke Svenne (Drammen)
Vebjørn Opdahl (Vefsna)
Anders Bjordal (Alta)
Joar Skauge (Orkla)
Geir Ove Henden (Vosso)
Eskild Henning Larsen (Skien)
Sverre Holm (Numedalen)
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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 has all the time been heavily modified by hydropower developments, and large parts of the river have been transferred to another watershed. 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 population density of only 2.4 persons/km^2. There are no industrial units reporting discharges of nitrogen or phosphorus from the catchment. The pressures are, thus, mainly linked to the aforementioned hydropower.

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

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

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

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

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

The ten watercourses represent river systems typical for different parts of the country. As such they are very useful when estimating loads of comparable rivers with less data than the main rivers. All rivers except Orreelva are to varying degrees regulated 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[10] 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[11] and 12%, respectively), whereas some of the rivers have none or insignificant agricultural activities in their drainage basins (e.g. Ulla, Røssåga, Målselv, Tana and Pasvik). Some catchments, like Lyseelv,

[10] Note that River Vosso is still included in this figure.
[11] Note that statistics for Figgjo also include values from Orre, as these rivers are adjacent.

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

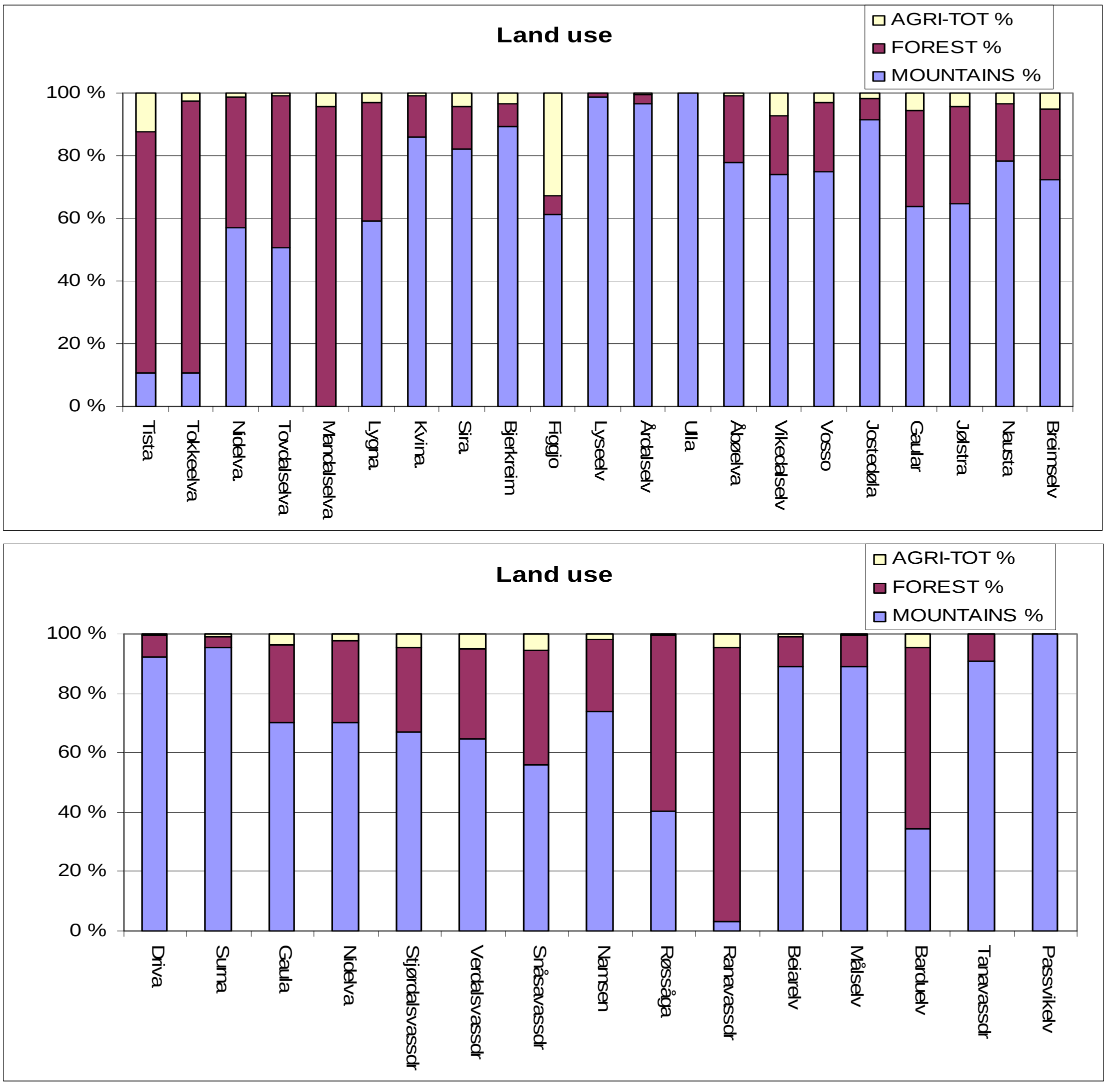

Figure A-III-1. Land use distribution in the catchment areas of the 36 rivers monitored quarterly. "Agri-tot" means total agricultural land. "Mountains" include moors and mountain plateaus not covered by forest.

There is also considerable variation in population density, from rivers in the west and north with less than one inhabitant per km^2, to rivers with larger towns and villages with up to 100 or more inhabitants per km^2. Population density decreases in general from south to north in Norway. The average population density of the 36 rivers amounts to about 14 inhabitants per km^2, whereas the average density in the main rivers 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 comprise Rivers Glomma, Drammenselva, Numedalslågen, Skienselva, Otra, Orreelva, Orkla and Vefsna. In addition, two relatively “unpolluted” rivers were included for comparison purposes; these now comprise River Vosso and River Alta, and are monitored at the same frequency. In these 10 rivers a number of studies have been carried out since 1990 (www.klif.no). However, River Vosso only became a ‘main river’ in 2008/2009, when it replaced River Suldalslågen (see below for justification of this change).

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

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

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

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

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

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

Sampling methodology and sampling sites

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

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

Table A-IV-2 gives the coordinates of the sampling stations. For quality assurance reasons, the sampling sites have been documented by use of photographs. This, together with the coordinates, will ensure continuity if staff needs to be changed.

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	62.98000	8.72600	
122.A24	103	Gaula	63.28600	10.27000	
123.A2	104	Nidelva(Tr.heim)	63.43300	10.40700	
124.A21	106	Stjørdalselva	63.44900	10.99300	
127.A0	108	Verdalselva	63.79200	11.47800	
128.A1	110	Snåsavassdraget	64.01900	11.50700	
139.A50	112	Namsen	64.44100	11.81900	
155.A0	119	Røssåga	66.10900	13.80700	
156.A0	122	Ranaelva	66.32300	14.17700	
161.B4	124	Beiarelva	66.99100	14.75000	
196.B2	132	Målselv	69.03600	18.66600	
196.AA3	133	Barduelva	69.04300	18.59500	
234.B41	150	Tanaelva	70.23000	28.17400	Barents Sea
246.A5	153	Pasvikelva	69.50100	30.11600	

Analytical methods and detection limits

Table A-IV-3. Analytical methods and obtainable detection limits for all parameters included in the sampling programme in 2009.

Parameter	Detection limit	Analytical Methods (NS: Norwegian Standard)
pH	0.01	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	EPA number 415.1 and 9060A STD.
Total phosphorus (µg P/L)	1.0	NS 4725 – Peroxidisulphate oxidation method
Orthophosphate (PO4-P) (µg P/L)	1.0	NS 4724 – Automated molybdate method
Total nitrogen (µg N/L)	10	NS 4743 – Peroxidisulphate oxidation method
Nitrate (NO_3-N) (µgN/L)	1	NS-EN ISO 10304-1
Ammonium (NH_4-N) (µg N/L)	5	NS-EN ISO 14911
Silicate (SiO_2) (Si/ICD; mg/L)	0.02	ICP-AES and ISO 11885 + NIVA's accredited method E9-5
Lead (Pb) (µg Pb/L)	0.005	ICP-MS; NIVA's accredited method E8-3
Cadmium (Cd) (µg Cd/L)	0.005	ICP-MS; NIVA's accredited method E8-3
Copper (Cu) (µg Cu/L)	0.01	ICP-MS; NIVA's accredited method E8-3
Zinc (Zn) (µg Zn/L)	0.05	ICP-MS; NIVA's accredited method E8-3
Arsenic (As) (µg As/L)	0.05	ICP-MS; NIVA's accredited method E8-3
Chromium (Cr) (µg Cr/L)	0.1	ICP-MS; NIVA's accredited method E8-3
Nickel (Ni) (µg Ni/L)	0.05	ICP-MS; NIVA's accredited method E8-3
Mercury (Hg) (ng Hg/L)	1.0	NS-EN 1483 and NIVA's accredited method E4-3
Lindane (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,4,4'-trichlorobiphenyl (CB28) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',5,5'-tetrachlorobiphenyl (CB52) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',4,5,5'-pentachlorobiphenyl (CB101) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,3',4,4',5-pentachlorobiphenyl (CB118) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',3,4,4',5'-hexachlorobiphenyl (CB138) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',4,4',5,5'-hexachlorobiphenyl (CB153) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180) (ng/L)	0.2	NIVA's accredited method H3-2 (PCB)

Water discharge and hydrological modelling

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

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

The gridded HBV-model model performs water balance calculations for square grid-cell landscape elements characterised by their altitude and land use. Each grid cell may be divided into two land-use zones with different vegetation cover, a lake area and a glacier area. The model is run with daily time steps, using precipitation and air temperature data as input. 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 since every model element has unique characteristics that determine its parameters, input data are distributed, water balance computations are performed separately for each model element, and finally, only those parts of the model structure which are necessary are used for each element. When watershed boundaries are defined, runoff from the individual model grid cells is sent to the respective basin outlets.

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

A regionally applicable set of parameters was determined by calibrating the model with the restriction that the same parameter values are used for all computational elements of the model that fall into the same class for land surface properties. This calibration procedure rests on the hypothesis that model elements with identical landscape characteristics have similar hydrological behaviour, and should consequently be assigned the same parameter values. The grid cells should represent the significant and systematic variations in the properties of the land surface, and representative (typical) parameter values must be applied for different classes of soil and vegetation types, lakes and glaciers (Gottschalk et al., 2001). The model was calibrated using available information about climate and hydrological processes from all gauged basins in Norway with reliable observations, and parameter values were transferred to other basins based on the classification of landscape characteristics. Several automatic calibration procedures, which use an optimisation algorithm to find those values of model parameters that minimise or maximise, as appropriate, an objective function or statistic of the residuals between model simulated outputs and observed watershed output, have been developed. The nonlinear parameter estimation method PEST (Doherty et al., 1998) was used in this study. 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 streamflow 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 extratropical 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.

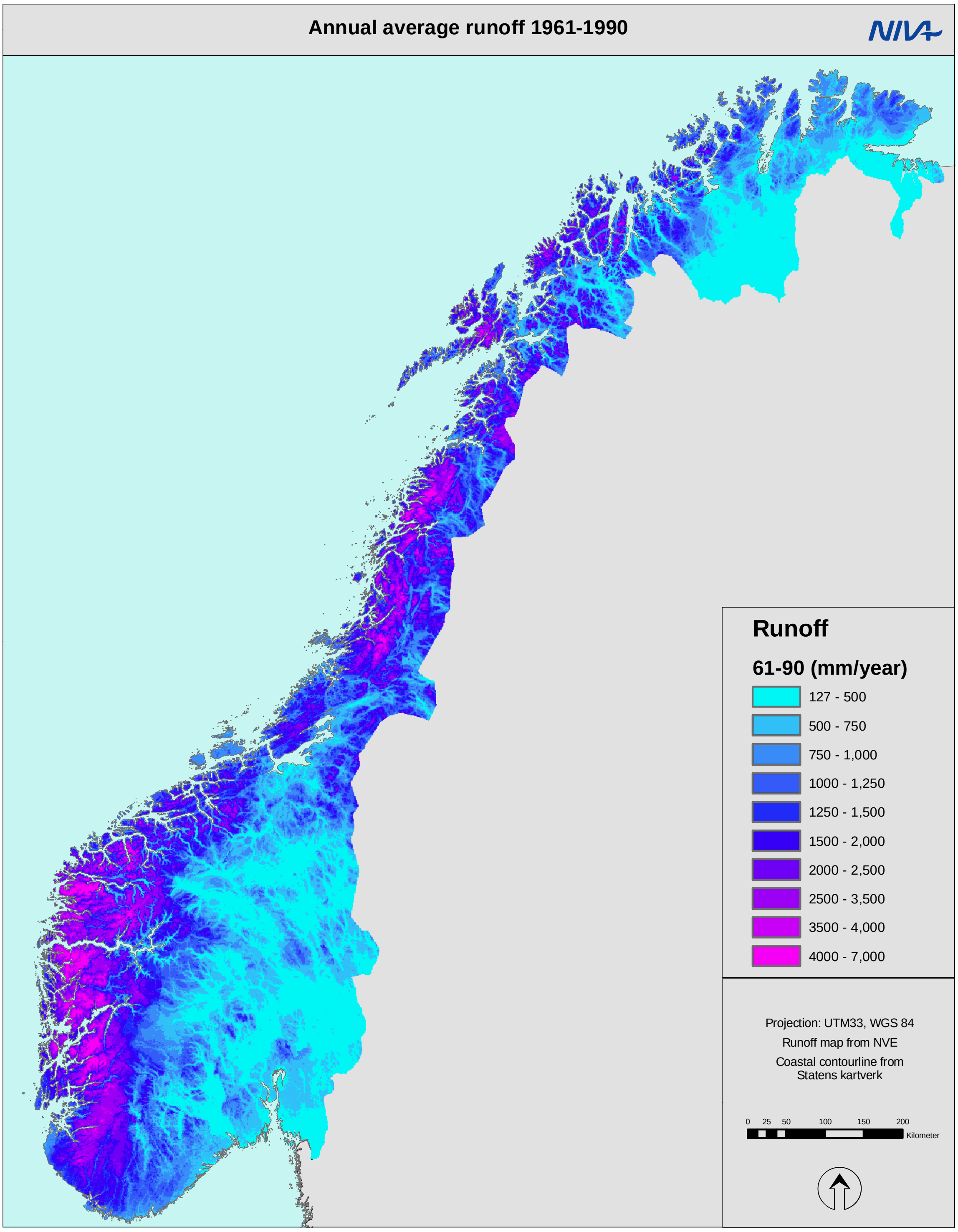

Figure A-IV-1. Annual average runoff (mm/year) for Norway for the period 1961-1990.

Direct discharges to the sea

Data sources:

- Municipal wastewater and scattered dwellings (Statistics Norway- SSB / KOSTRA);
- Agriculture (BIOFORSK)- *nutrients only*
- Aquaculture (The Directorate of Fisheries / ALTINN (altinn.no))- *nutrients only*
- Industry (The Climate and Pollution Agency - Klif/Forurensning)

Wastewater

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

The annual discharge of nutrients from municipal wastewater effluents have mostly been estimated as the product of annual flow and flow-weighted concentrations. For the plants with no reporting requirements, the discharge was estimated by multiplying the number of people with standard Norwegian per capita load figures and then adjusting the estimate according to the removal efficiency of the treatment plants. “Principles of the Comprehensive Study of Riverine Inputs and Direct Discharges” (PARCOM, 1988), recommends the derived per capita loads listed in Table A-IV-4 to be used. The Norwegian per capita loads are based on studies of Norwegian sewerage districts (Farestveit et al., 1995).

Discharges from the population not connected to public treatment plants are estimated by the same approach as for unmonitored plants.

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

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

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

Metals from wastewater
The metal loads from wastewater treatment plants reflect the *reported* load from wastewater treatment plants. No assumptions on metal loads from other plants than those reporting have been considered. The metal loads from industrial effluents were calculated based on data from Klif's database Forurensning.

Nutrients from wastewater
Statistics Norway (SSB) and the Climate and Pollution Agency (Klif) jointly initiated 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. Discharge figures from KOSTRA are used in the transport model "TEOTIL" to calculate the total discharges of total phosphorus and total nitrogen from population (wastewater treatment plants and scattered dwellings not connected to wastewater treatment plants), industry, agriculture and aquaculture sources to Norwegian coastal waters. The Norwegian Institute for Water Research (NIVA) performs this modelling. The figures take account of retention of nutrients in lakes.

Industrial effluents
Sampling frequency for industrial wastewater varies from weekly composite samples to random grab samples. Sampling is performed at least twice a year. Measured and estimated loads from industrial activities in the different areas are shown in Appendix III, Report B. NIVA has used TEOTIL for estimating the total nitrogen and total phosphorus loads from industry not connected to municipal treatment plants. The metal data were collected from Klif's data base Forurensning.

Fish farming effluents
Fish farmers report monthly data about e.g. fish fodder, biomass, slaughtered fish and slaughter offal down to net cage level. The basis for the report from The Directorate of Fisheries is data available at altinn.no.

The sale statistics of SSB with regard to trout and salmon show the increase in fish farming activities since 1995, which has a bearing on the discharges from fish farming although there has been improvements in treatment yield and production procedures.

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

The produced volume has increased compared to previous years and the corresponding discharges of nitrogen and phosphorus will normally increase correspondingly. Some factors may influence sold volume, biomass produced and discharges of nitrogen and phosphorus, a few is listed here:

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

For more information about details in data reporting and availability see Selvik et al. (2007).

The loads from fish farming have been included in the grand total values as from 2000, i.e. these loads were not included in the input figures for the period 1990-1999.

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 an aquaculture source are organic matter, nitrogen and phosphorus (Cho and Bureau, 1997).

After deducting N and P harvested with the fish and the proportion of feed not consumed by fish, the remaining N and P is excreted in particulate (faecal) and soluble form.

Changes in the Norwegian RID programme over the years

Since the Norwegian RID Programme started in 1990, several smaller and larger changes have been introduced. For this reason, a major work was carried out in 2009, where 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, e.g., the changes in LOD values over time). Below is therefore 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 due to 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 a parallel sampling programme was included in the database for River Glomma, and the number of samples in this river therefore increased. This parallel dataset only contains data for some nutrients and TOC.

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

It is important to note that the name 'tributary' is only used to signify that these rivers are monitored more seldom 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. Since 2004, the number of 'tributary rivers' was reduced to 36 rivers that were monitored 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 one, 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 steps and in some cases also monthly data are missing. Thus, it was decided that it would be better to weight each sample not only to 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.

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

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 reporting is missing 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).

A couple of 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.

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Appendix V
Trend Analyses – Pollutant Concentrations. Complementary figures to Chapter 4.3.

The figures 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 figures in this Appendix are complementary to Chapter 4.3.

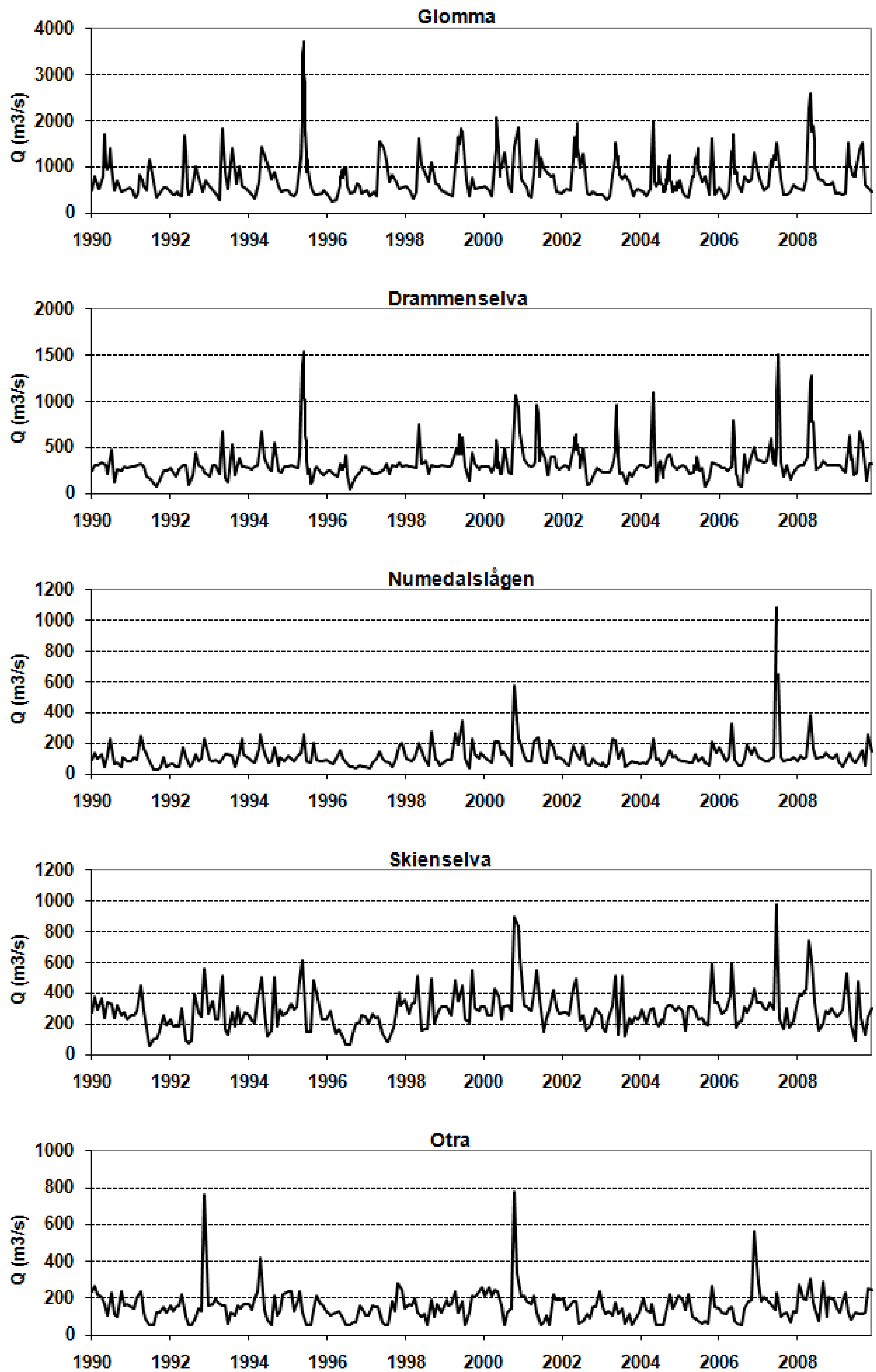


Figure A-V-1a. Monthly <u>water discharge</u> (based only on data at the day of water quality sampling) for the five main rivers draining to Skagerrak, Norway, 1990-2009.

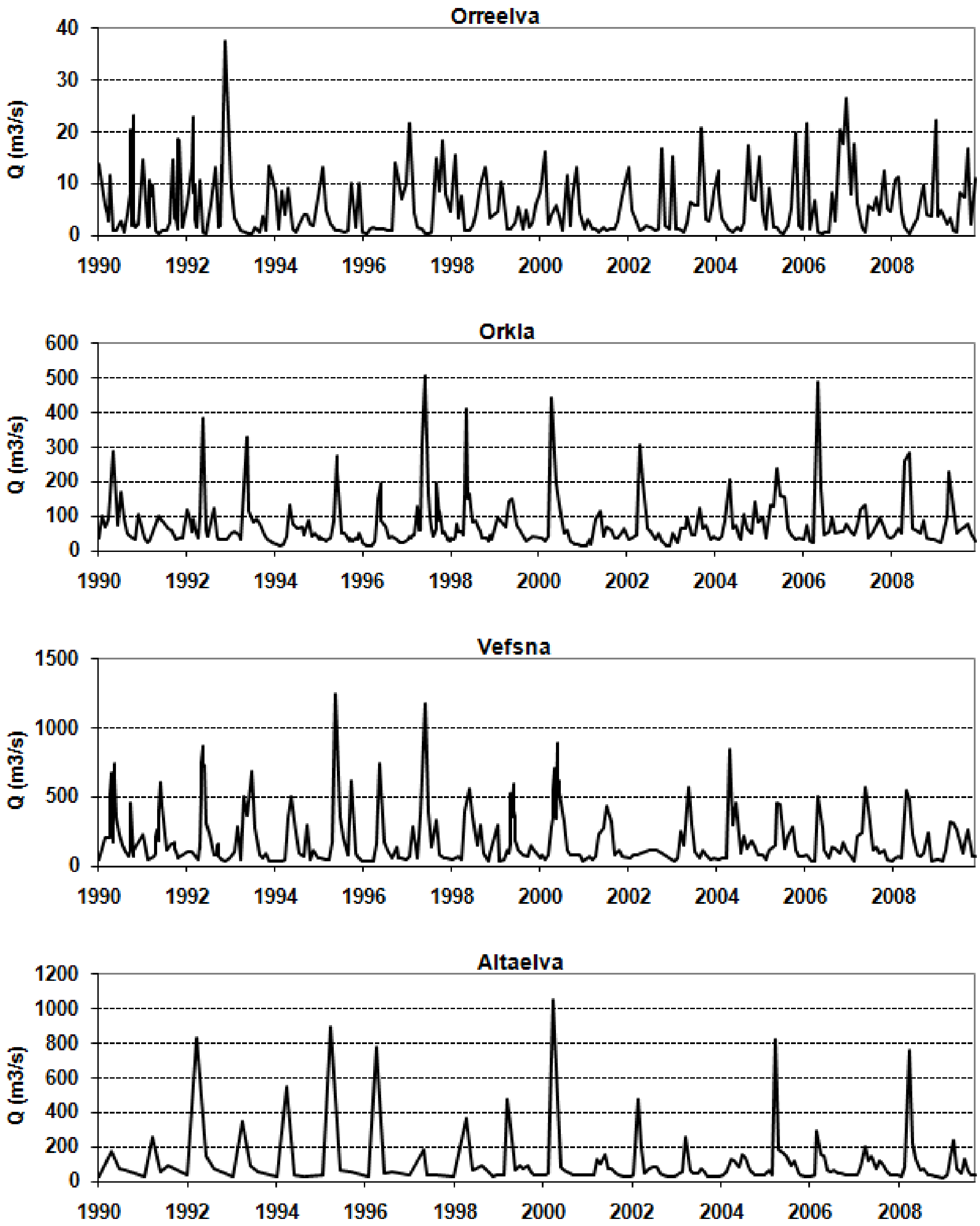


Figure A-V-1b. Monthly water discharge (based only on data at the day of water quality sampling) for the four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2009.

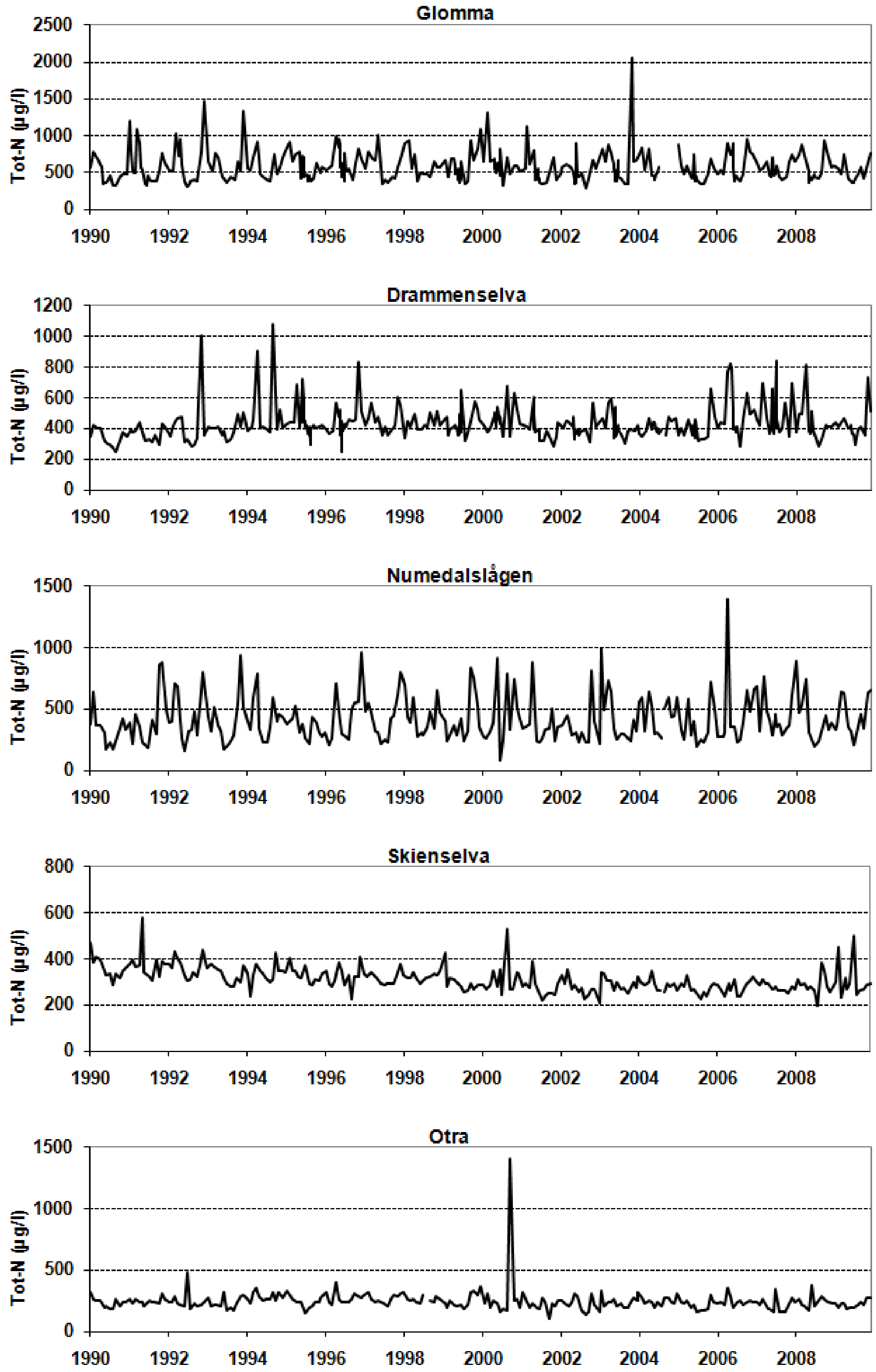


Figure A-V-2a. Monthly concentrations of total nitrogen in the five main Norwegian Skagerrak rivers, 1990-2009.

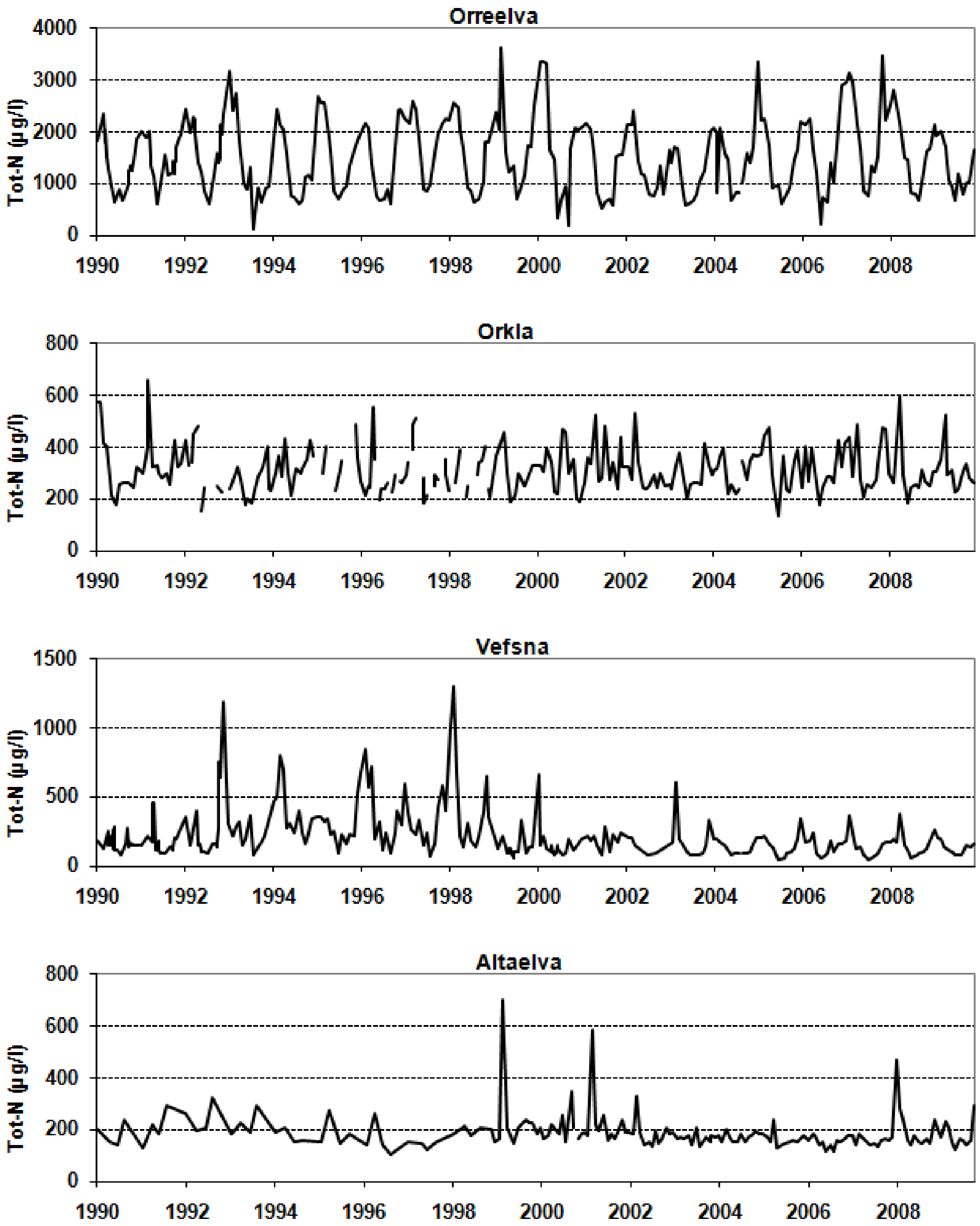


Figure A-V-2b. Monthly concentrations of <u>*total nitrogen*</u> *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

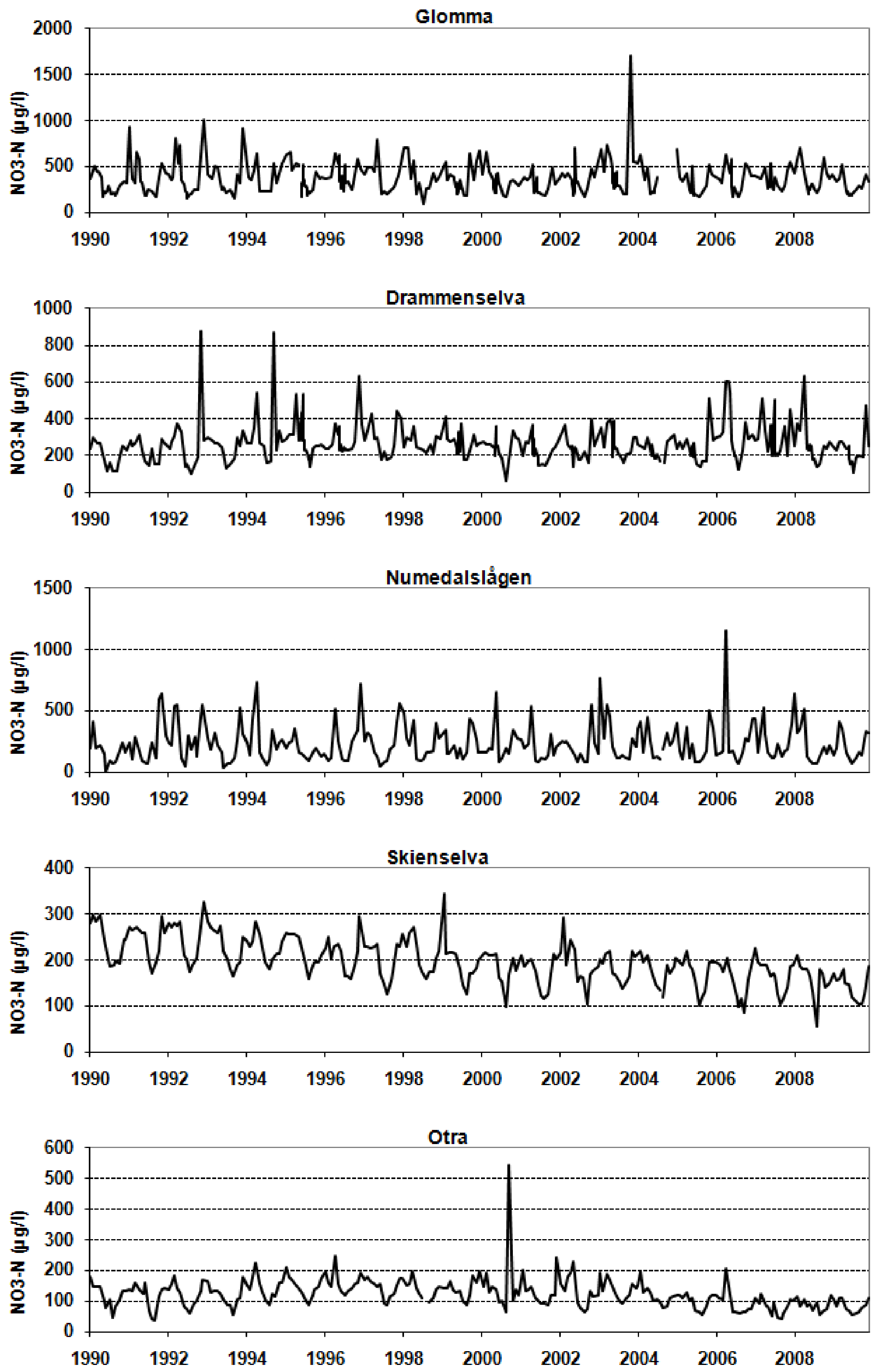


Figure A-V-3a. Monthly concentrations of *__nitrate nitrogen__* *in the five main Norwegian Skagerrak rivers, 1990-2009.*

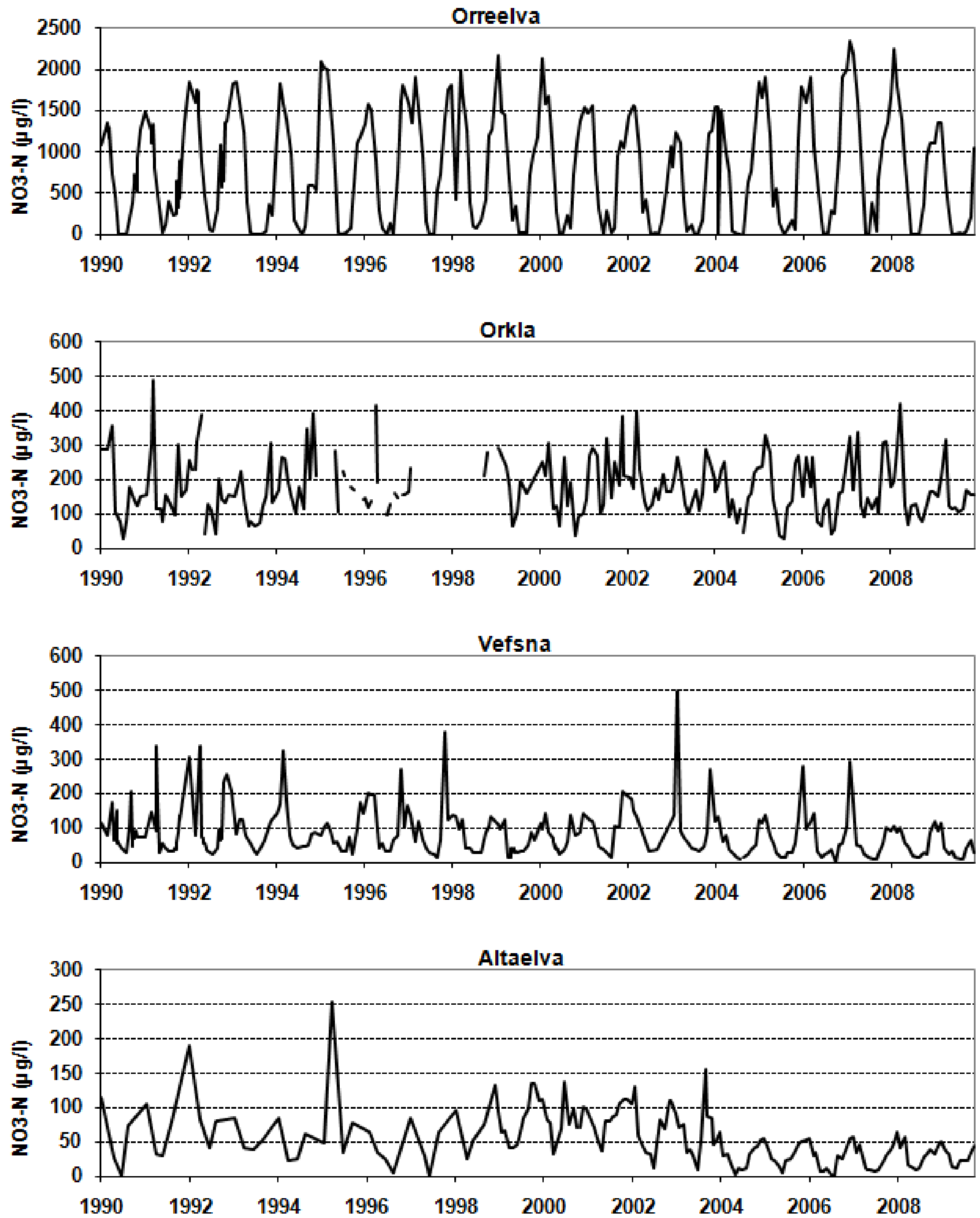


Figure A-V-3b. Monthly concentrations of <u>nitrate nitrogen</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

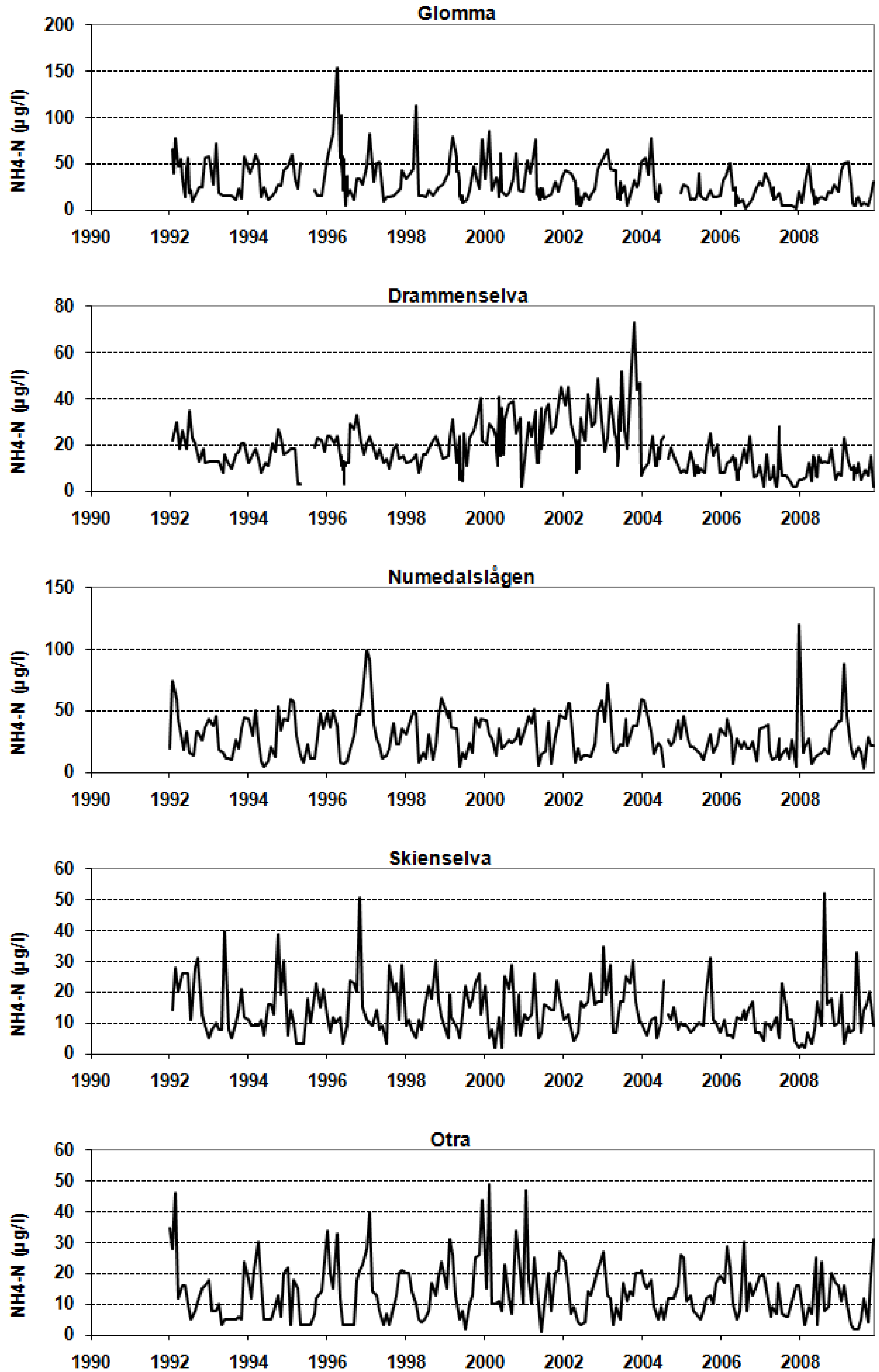


Figure A-V-4a. Monthly concentrations of ***NH_4-N*** *in the five main Norwegian Skagerrak rivers, 1990-2009.*

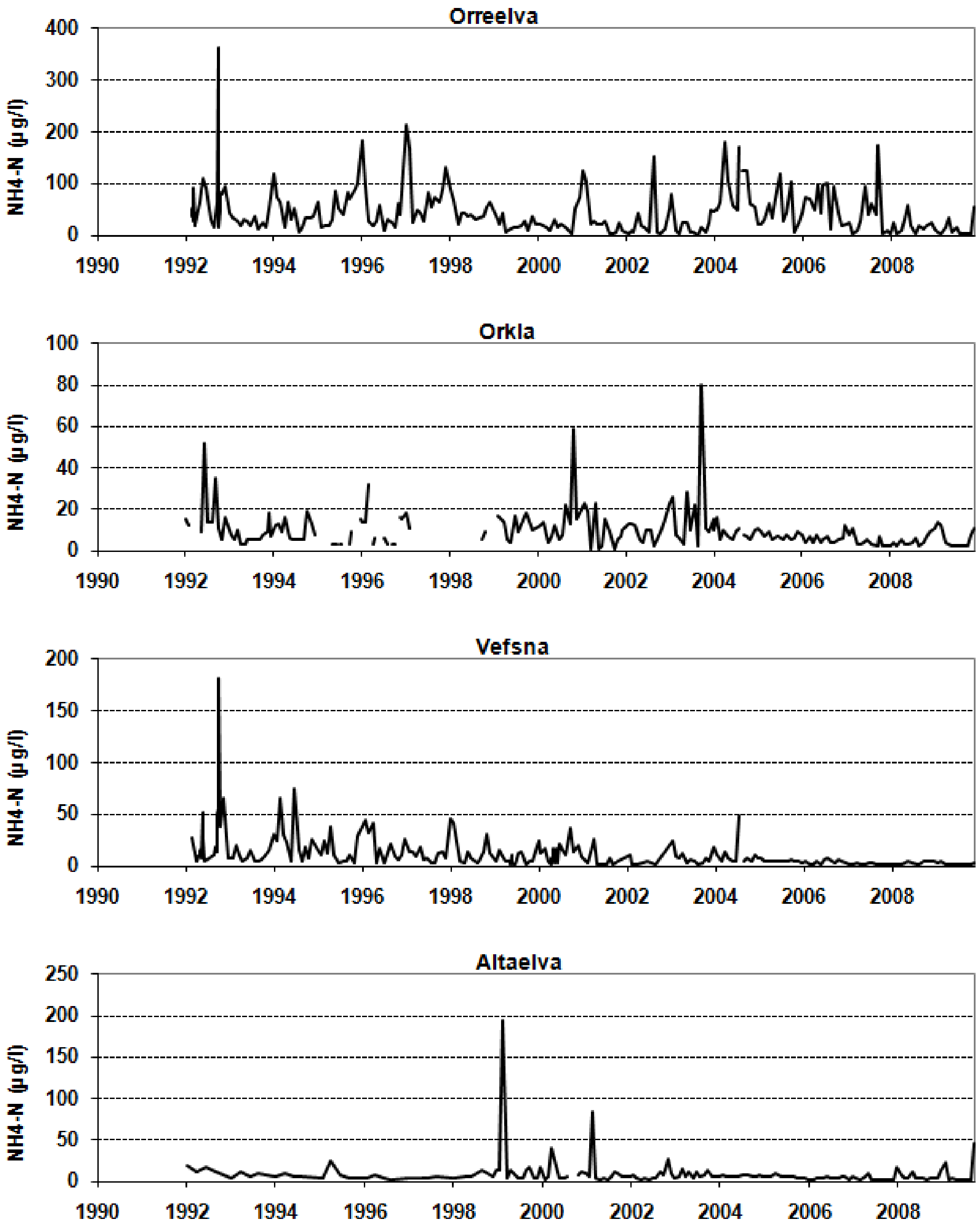


Figure A-V-4b. Monthly concentrations of $\underline{NH_4\text{-}N}$ *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

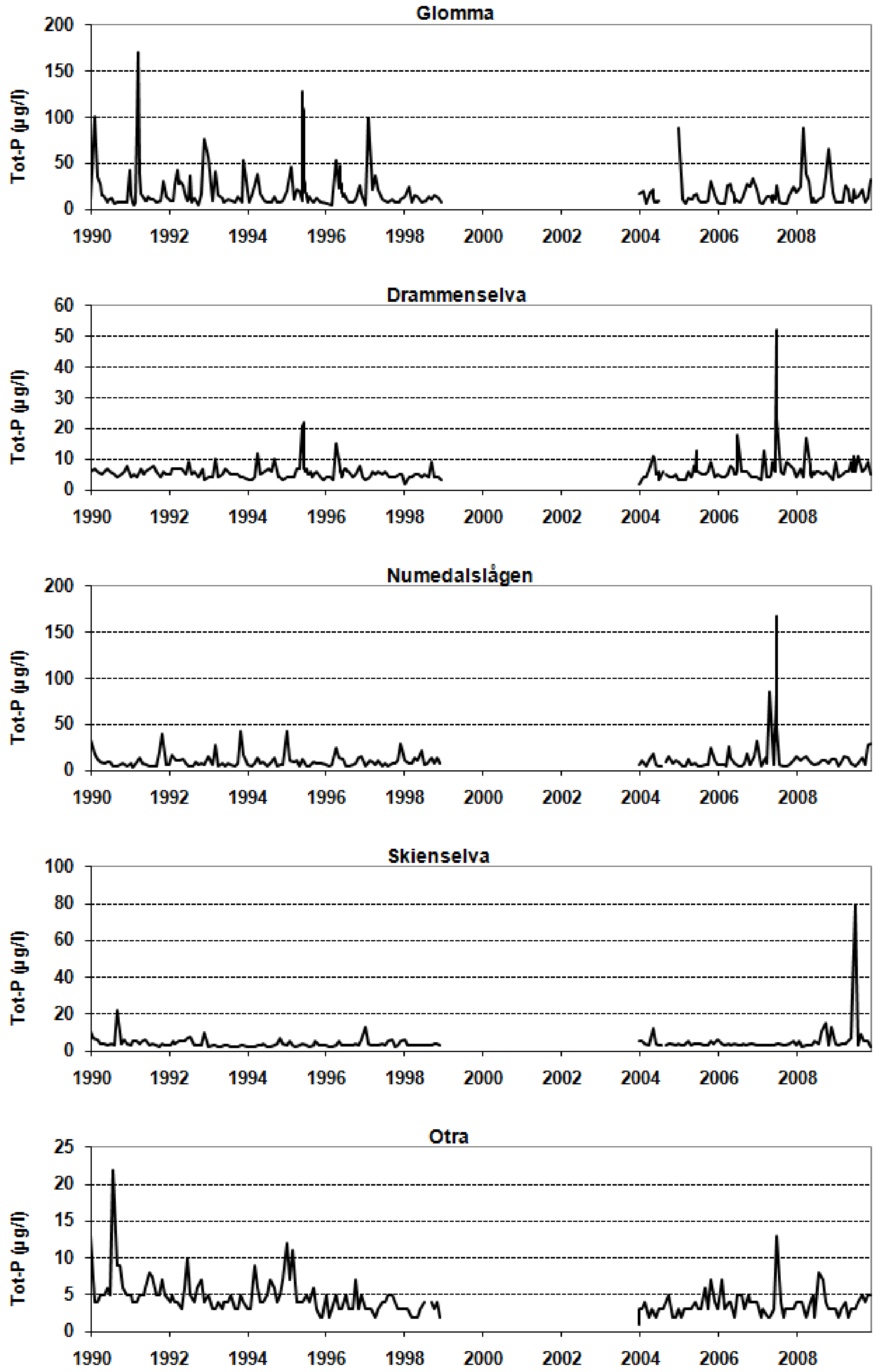


Figure A-V-5a. Monthly concentrations of *<u>total phosphorus</u>* *in the five main Norwegian Skagerrak rivers, 1990-2009.*

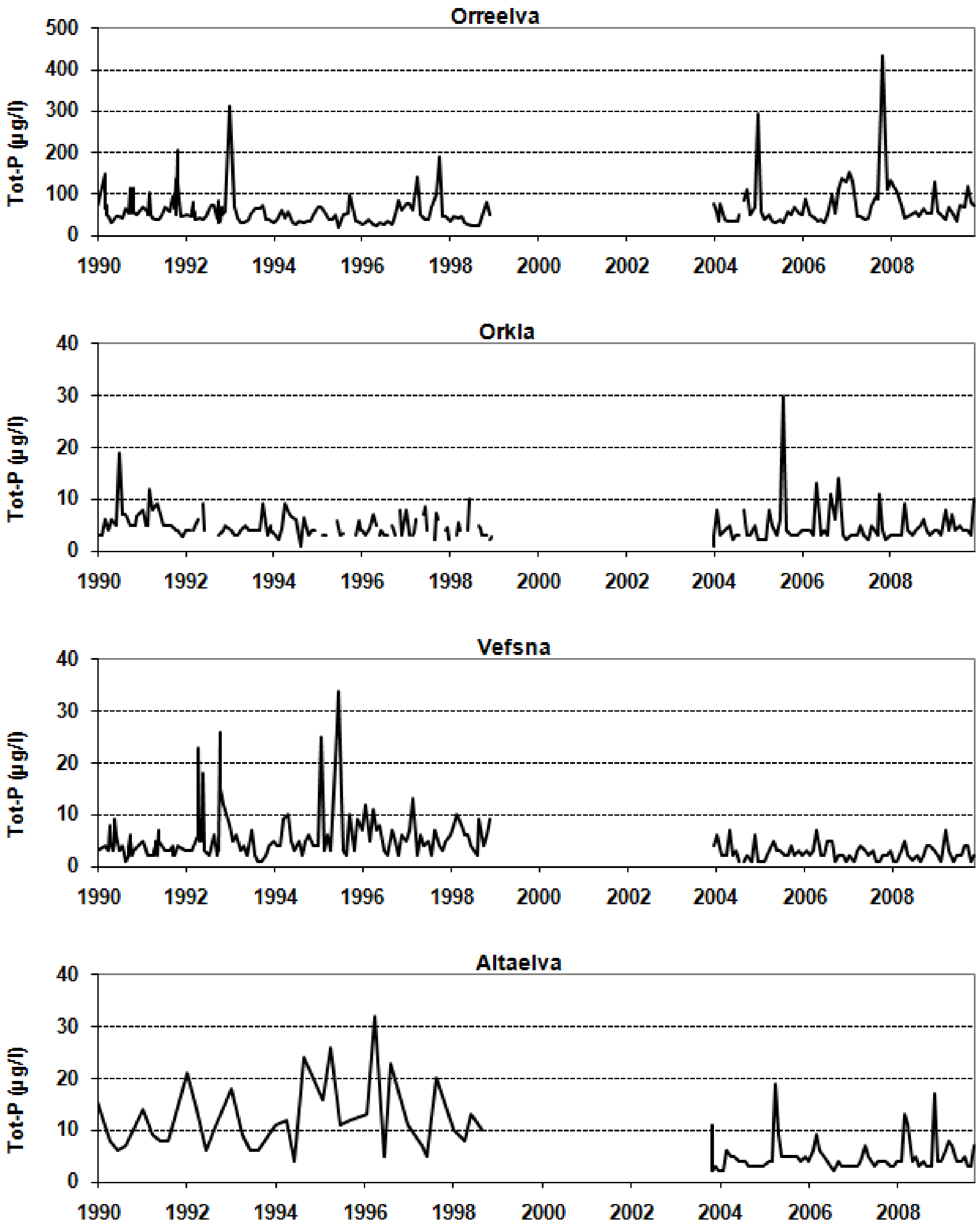


Figure A-V-5b. Monthly concentrations of <u>*total phosphorus*</u> *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

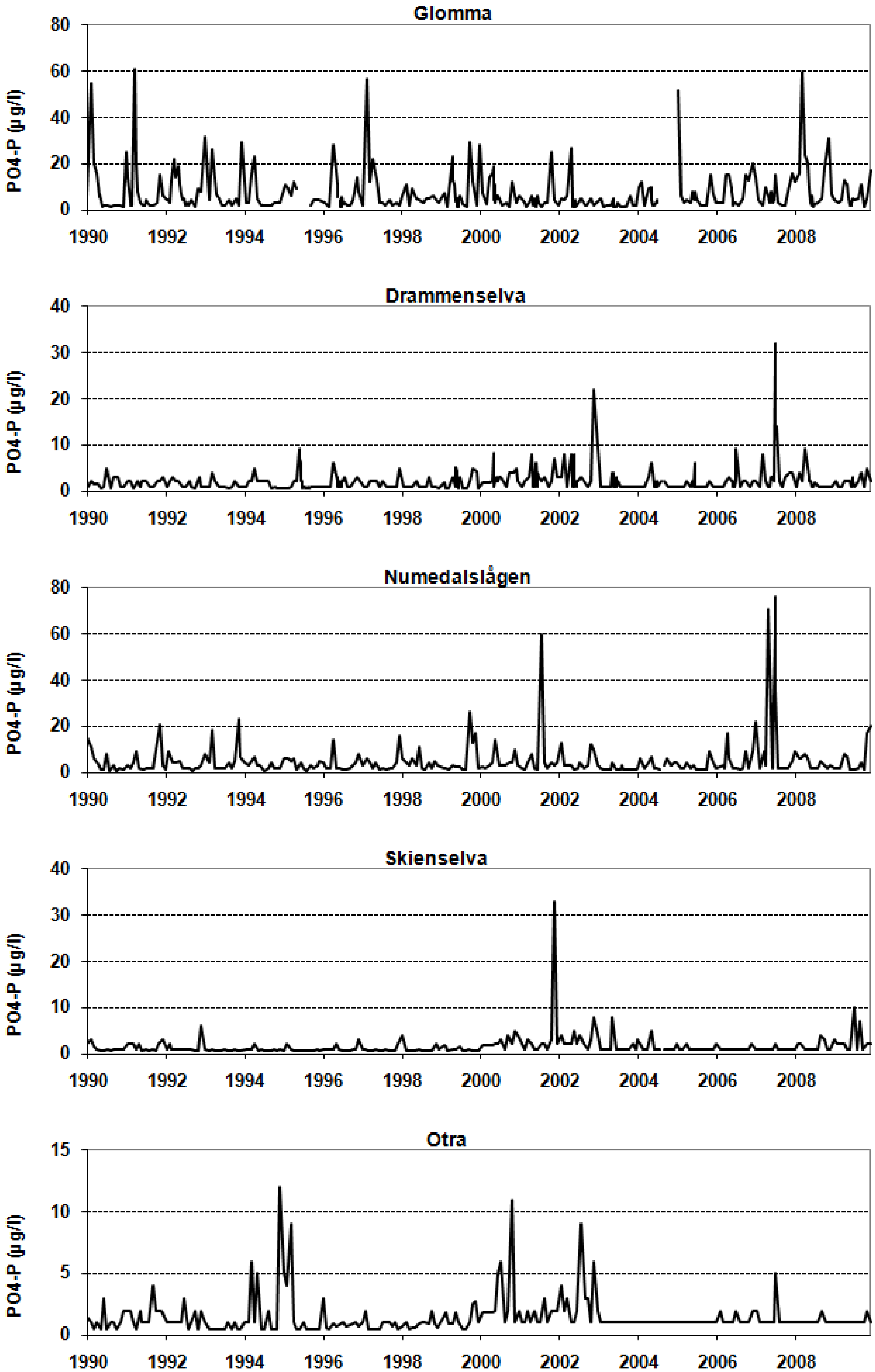


Figure A-V-6a. Monthly concentrations of $\underline{PO_4\text{-}P}$ *in the five main Norwegian Skagerrak rivers, 1990-2009.*

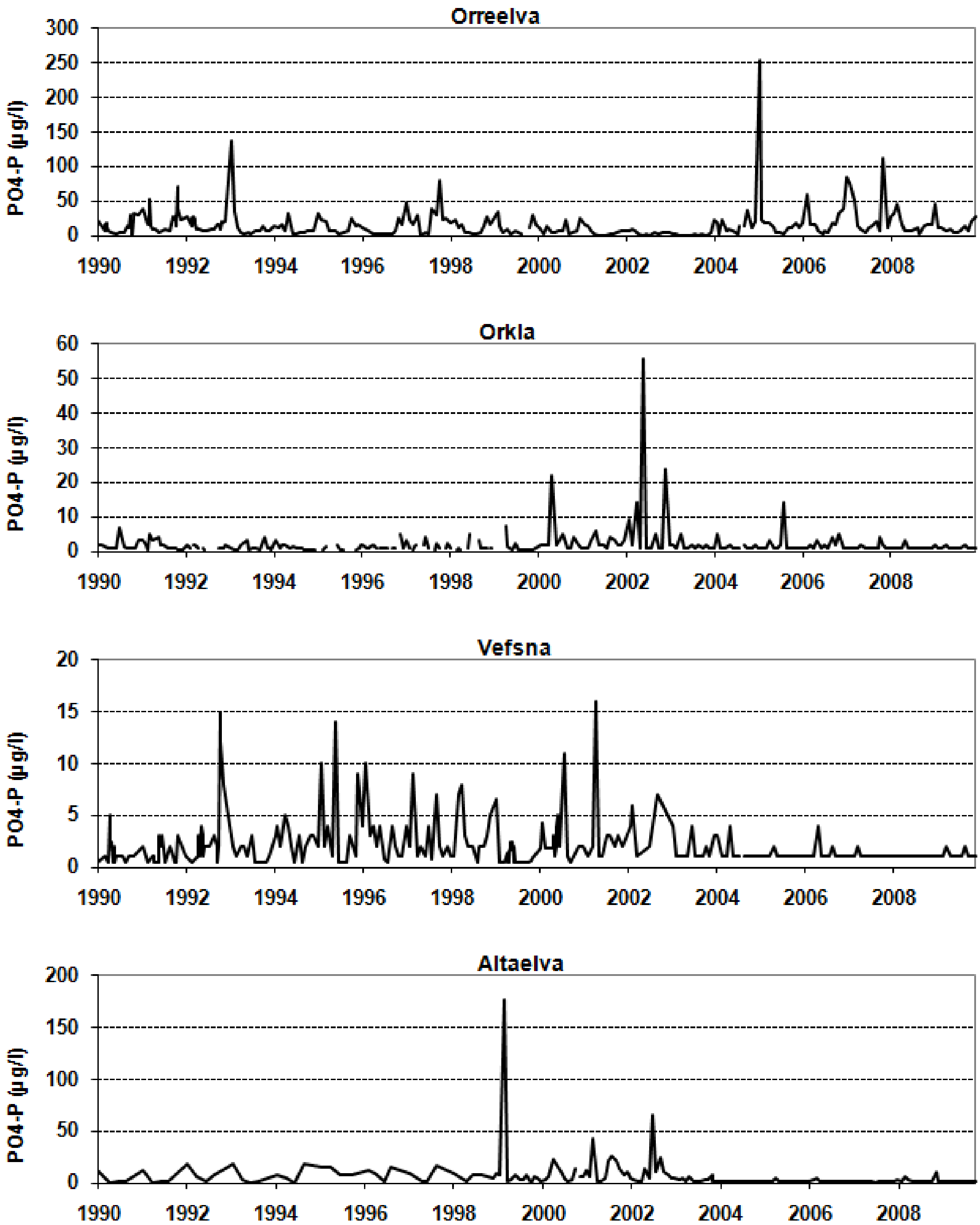


Figure A-V-6b. Monthly concentrations of $\underline{PO_4\text{-}P}$ *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

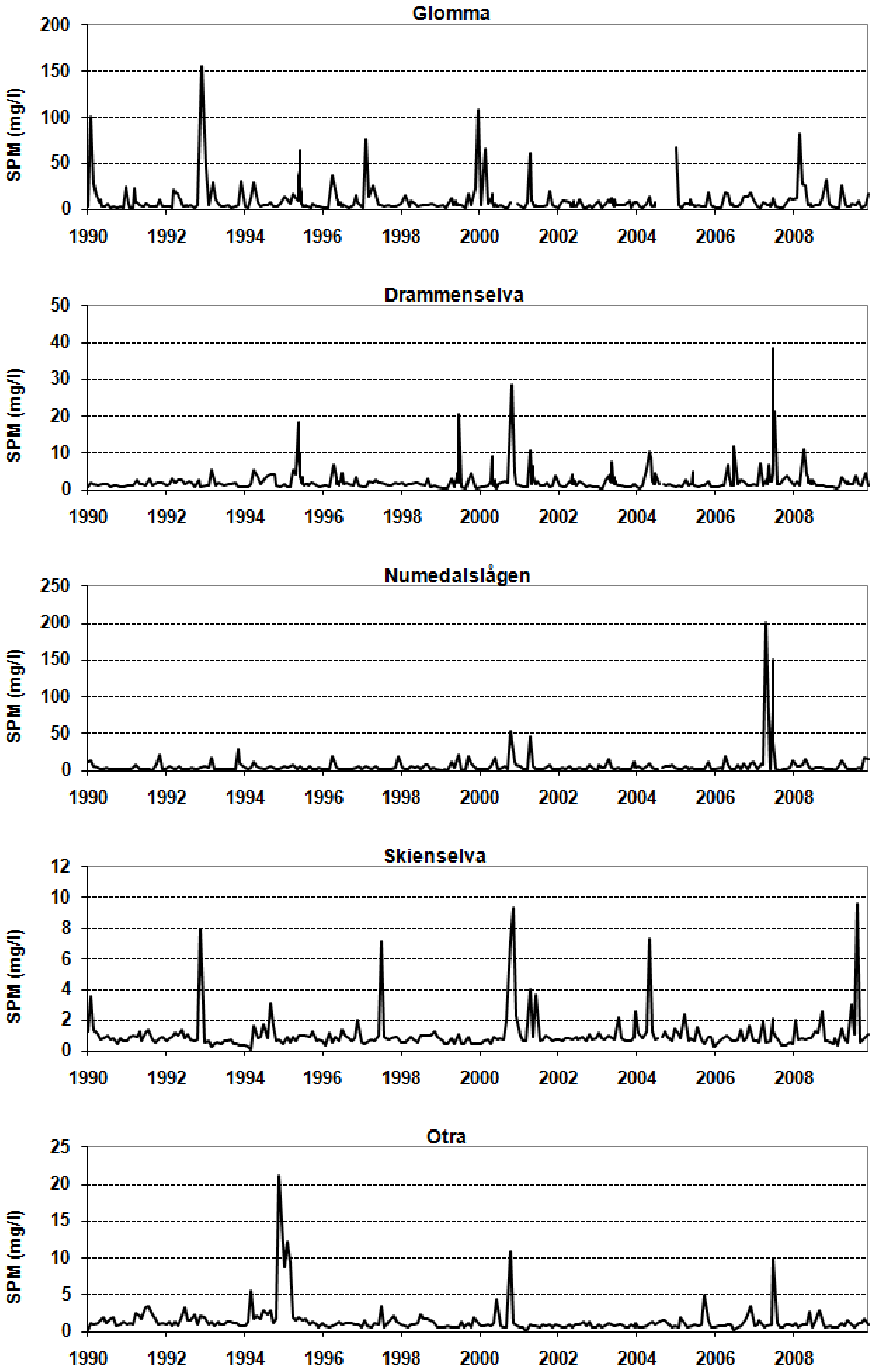


Figure A-V-7a. Monthly concentrations of suspended particulate matter in the five main Norwegian Skagerrak rivers, 1990-2009.

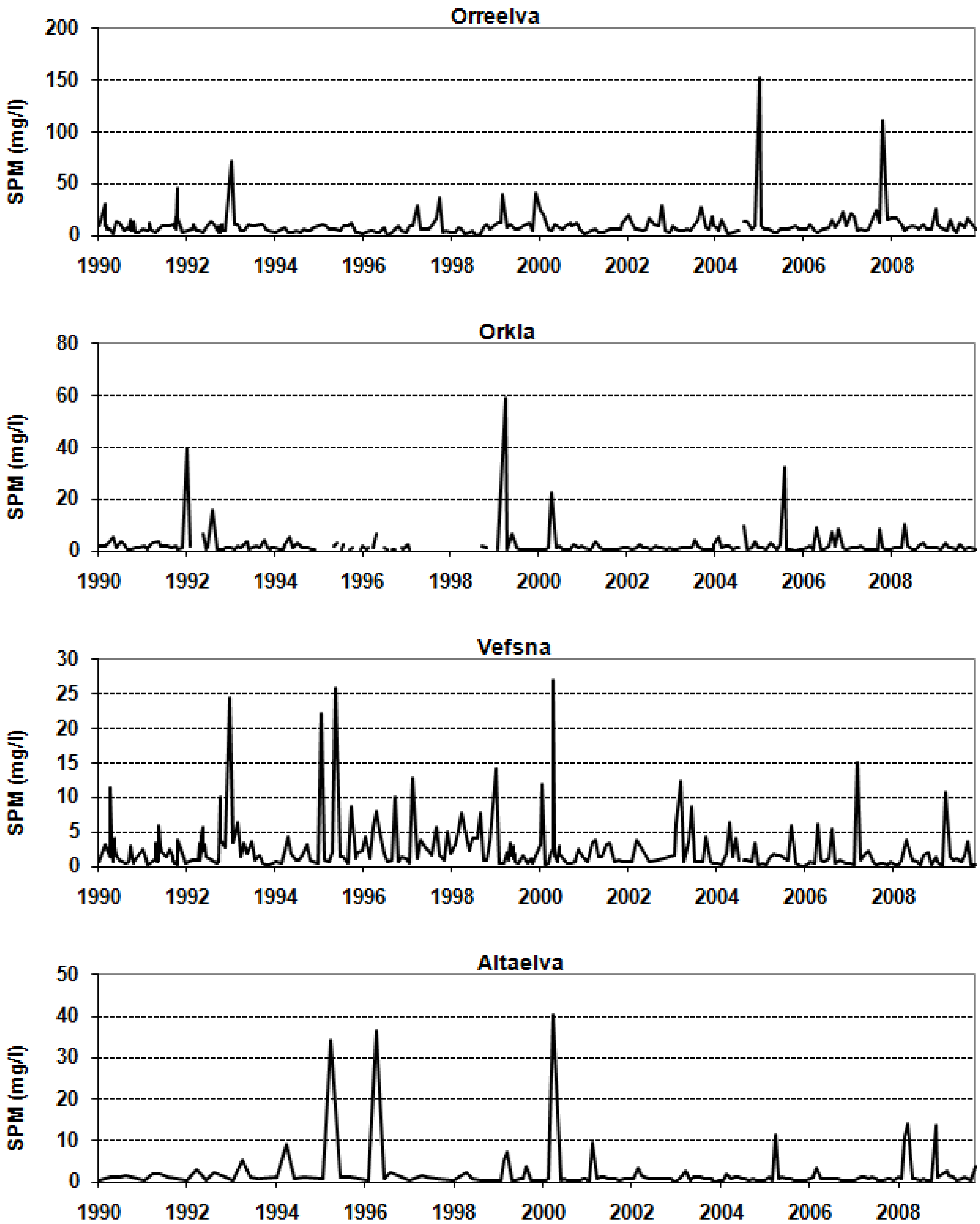


Figure A-V-7b. Monthly concentrations of suspended particulate matter in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

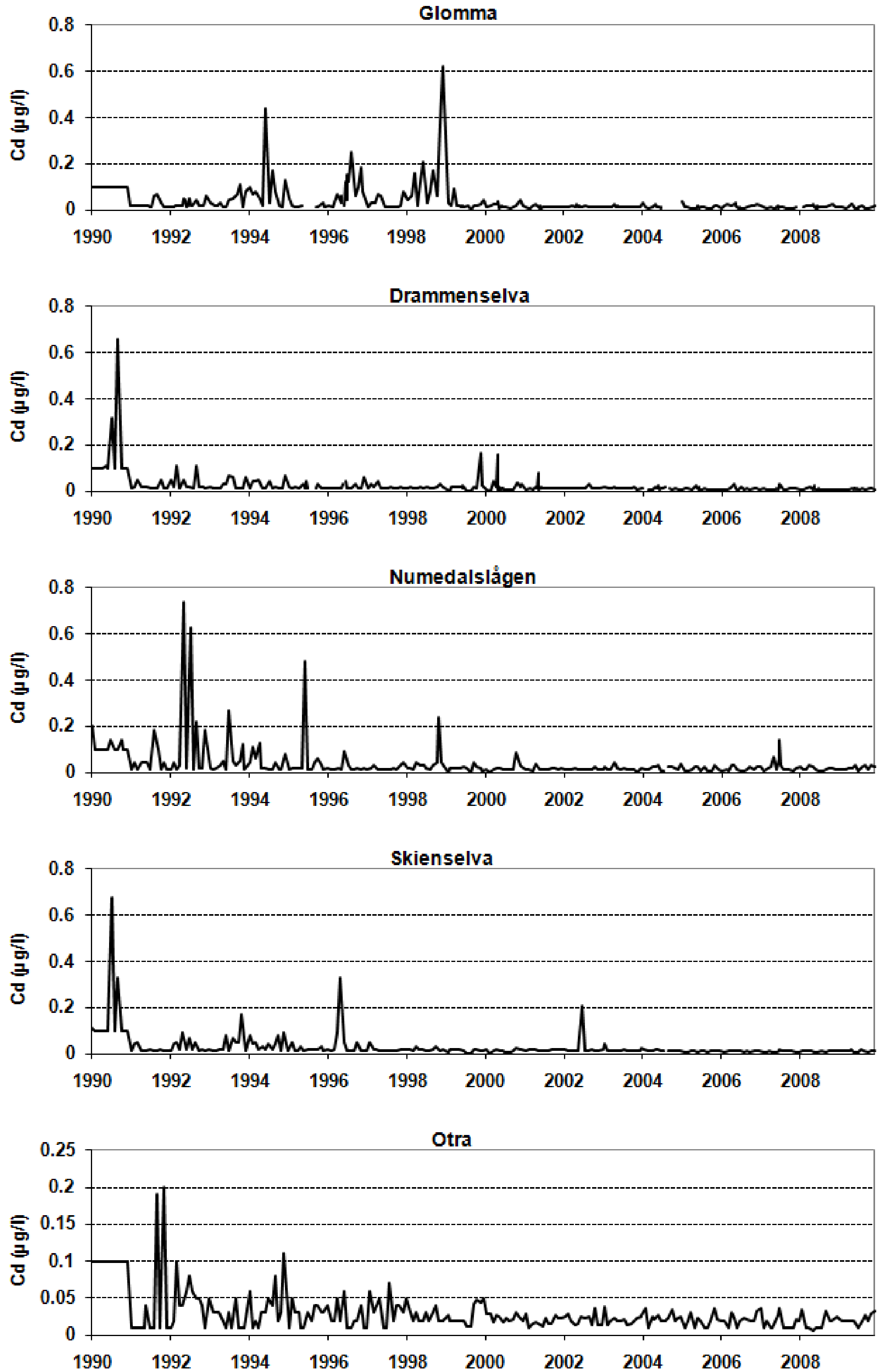


Figure A-V-8a. Monthly concentrations of <u>cadmium</u> in the five main Norwegian Skagerrak rivers, 1990-2009.

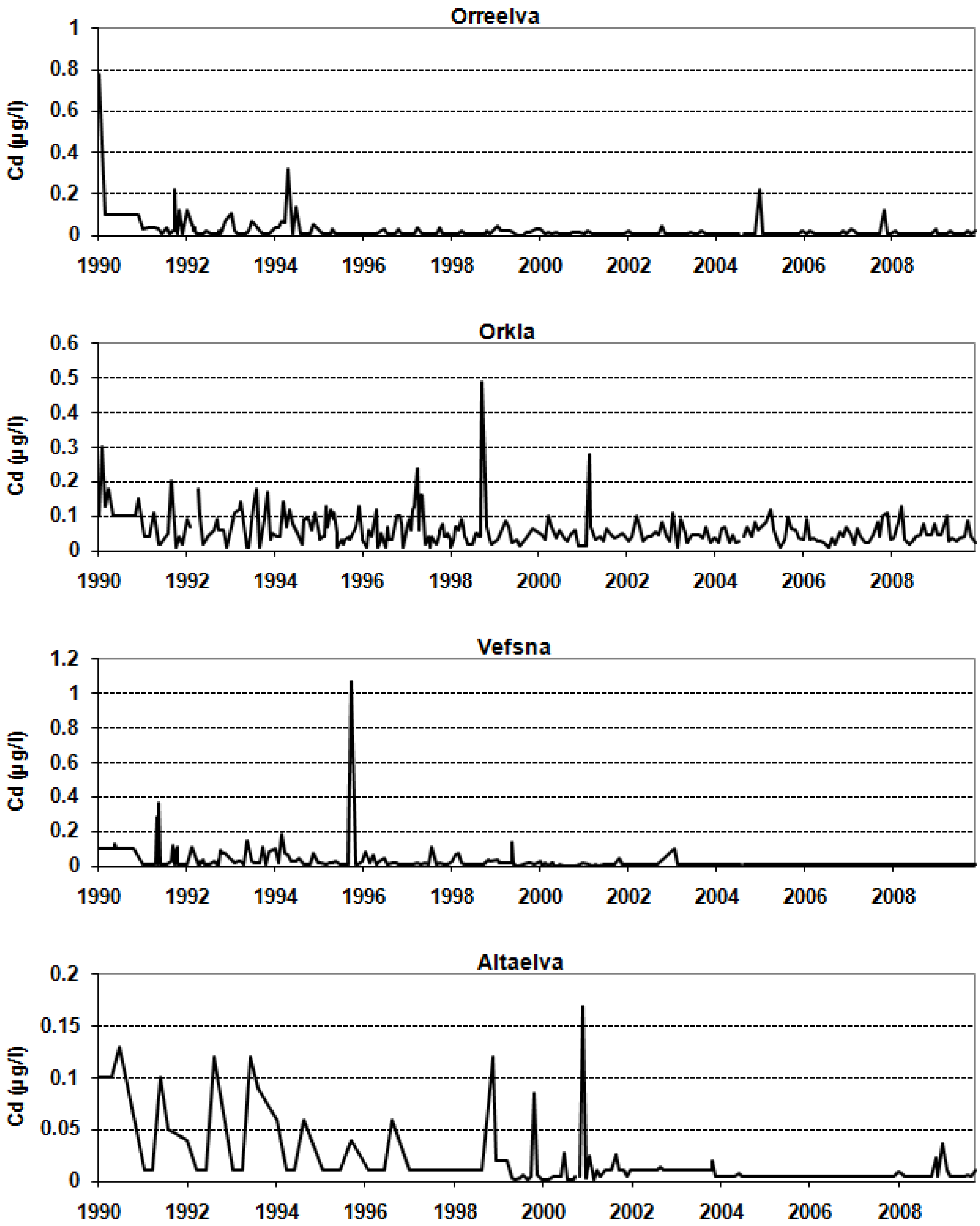


Figure A-V-8b. Monthly concentrations of <u>cadmium</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

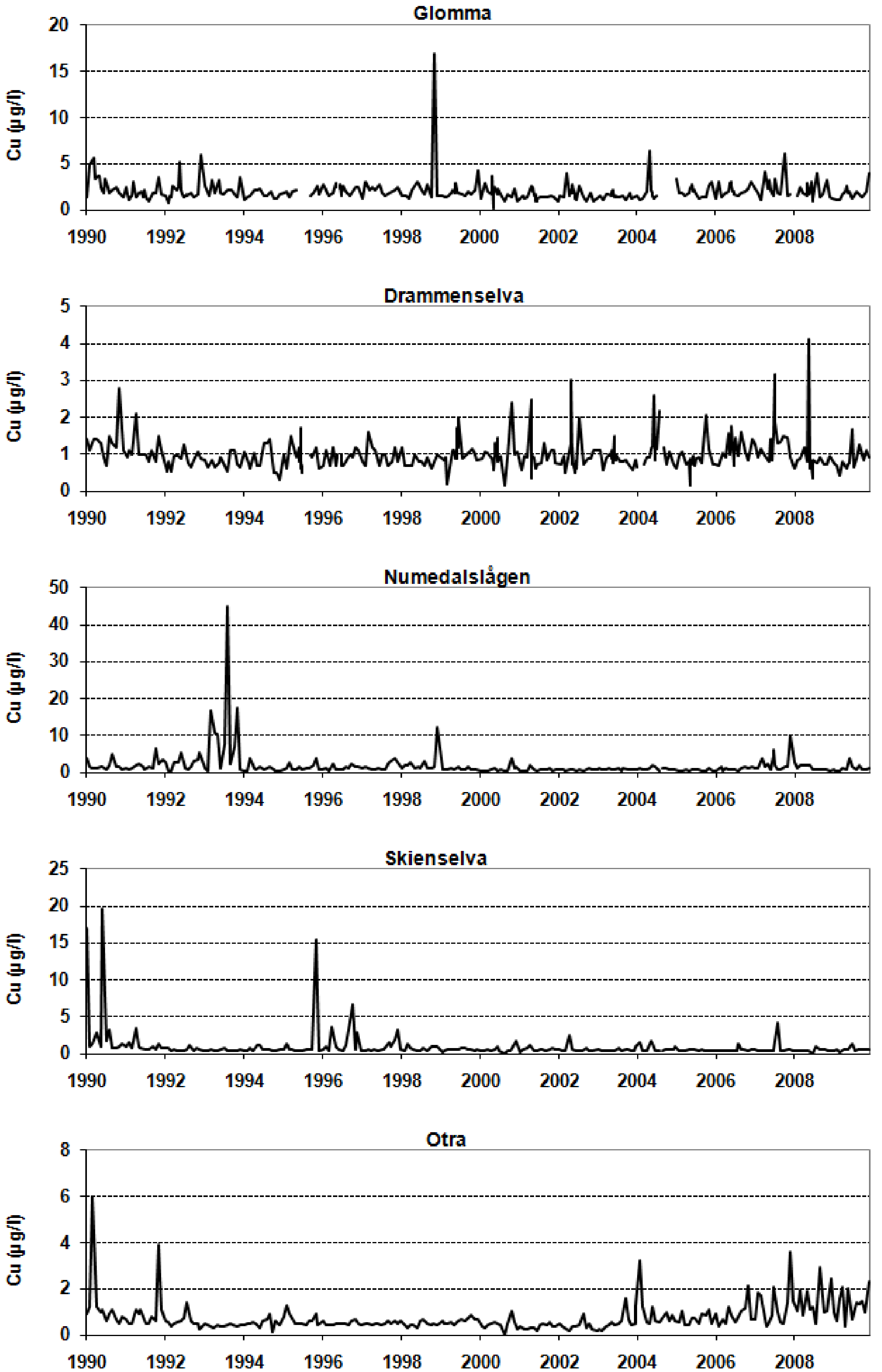


Figure A-V-9a. Monthly concentrations of copper in the five main Norwegian Skagerrak rivers, 1990-2009.

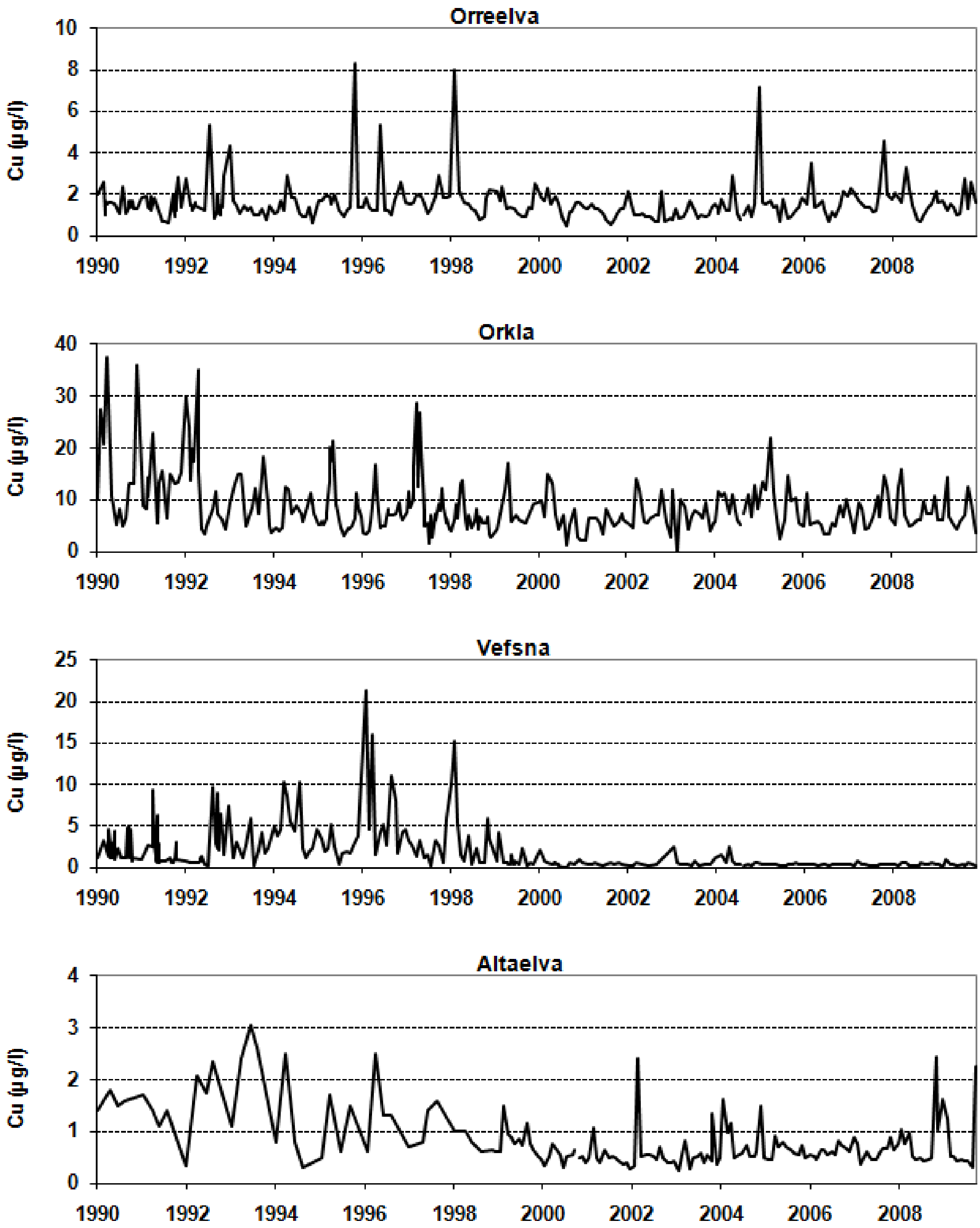


Figure A-V-9b. Monthly concentrations of copper in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

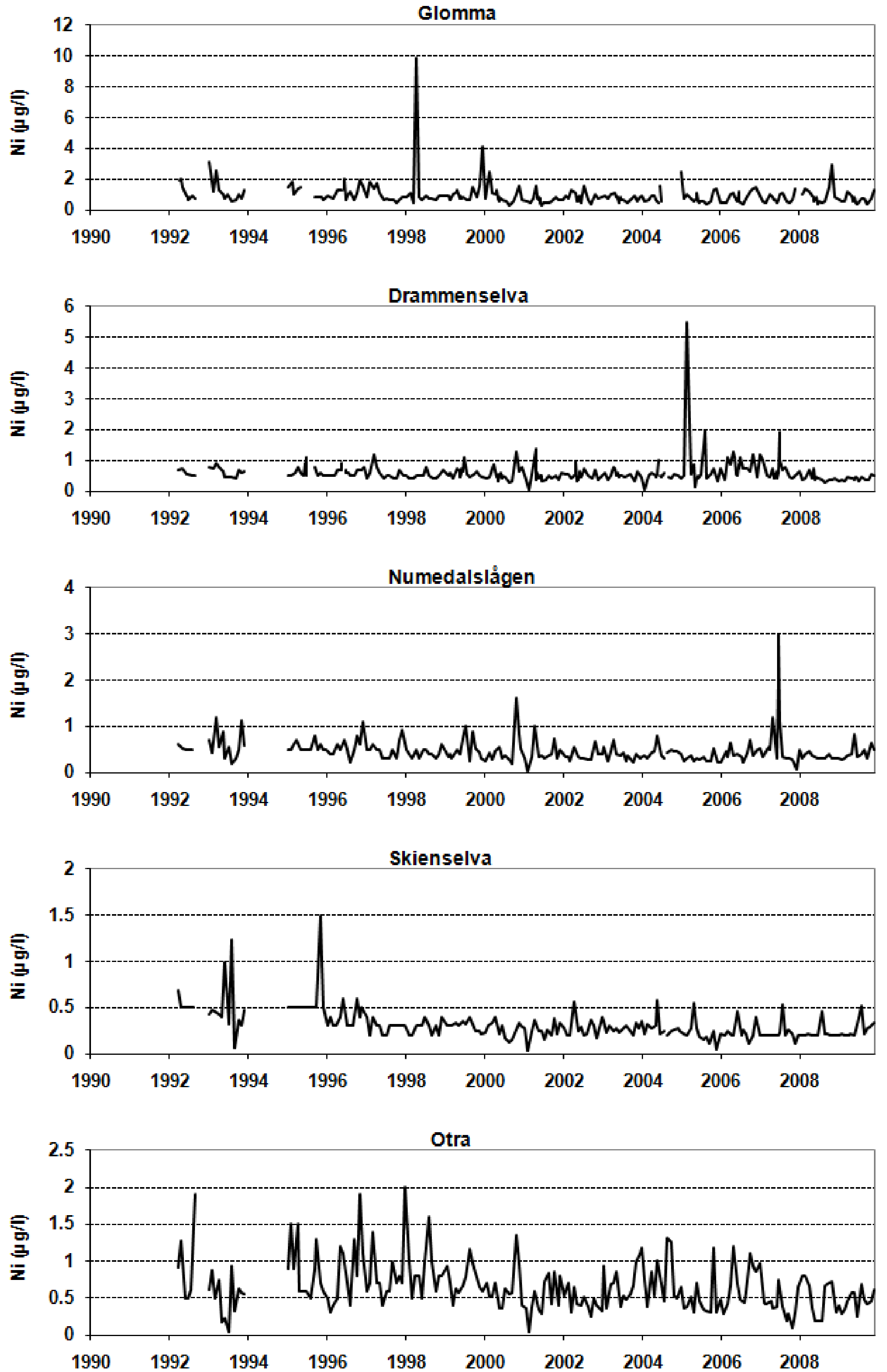


Figure A-V-10a. Monthly concentrations of *<u>nickel</u>* *in the five main Norwegian Skagerrak rivers, 1990-2009.*

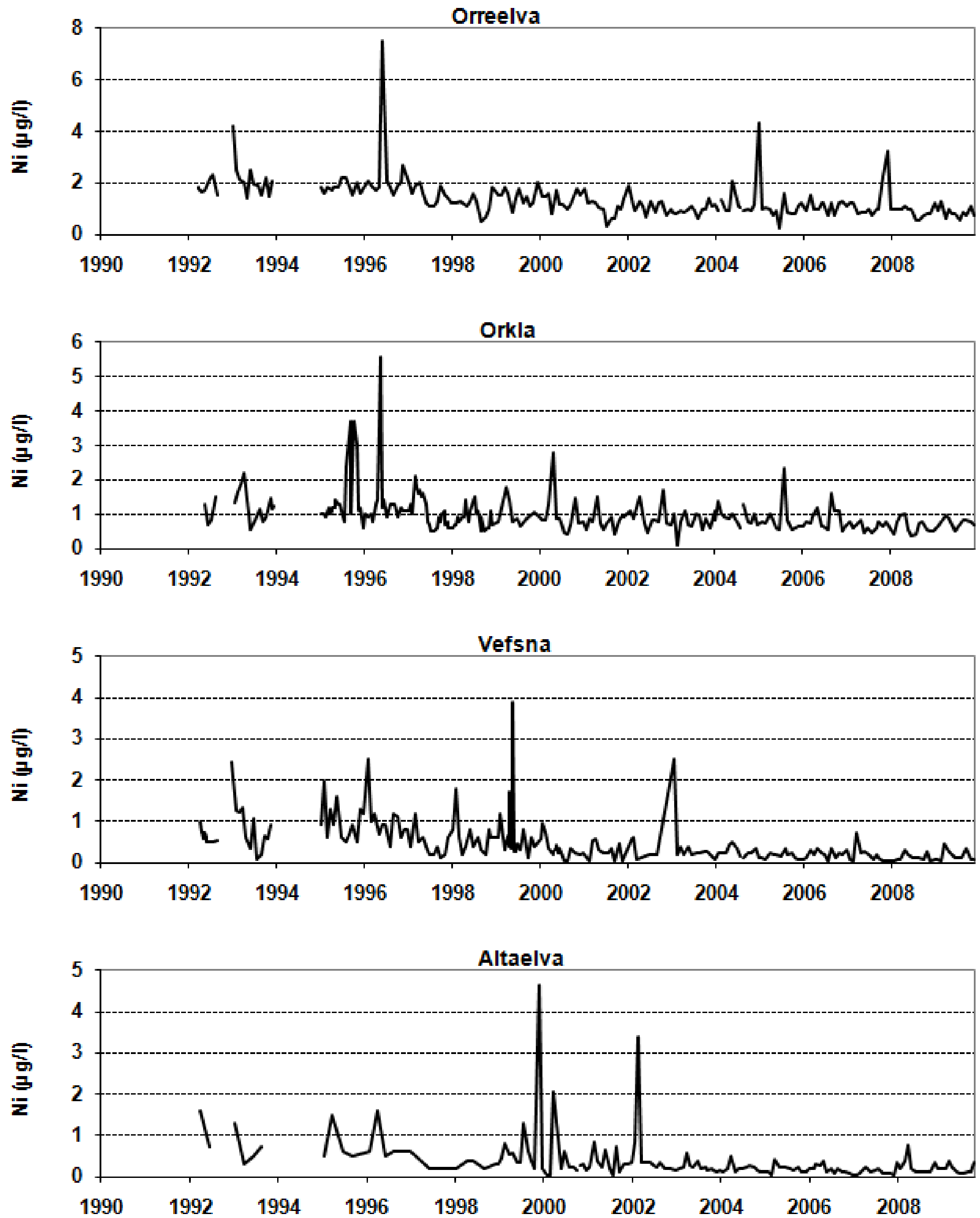


Figure A-V-10b. Monthly concentrations of nickel in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

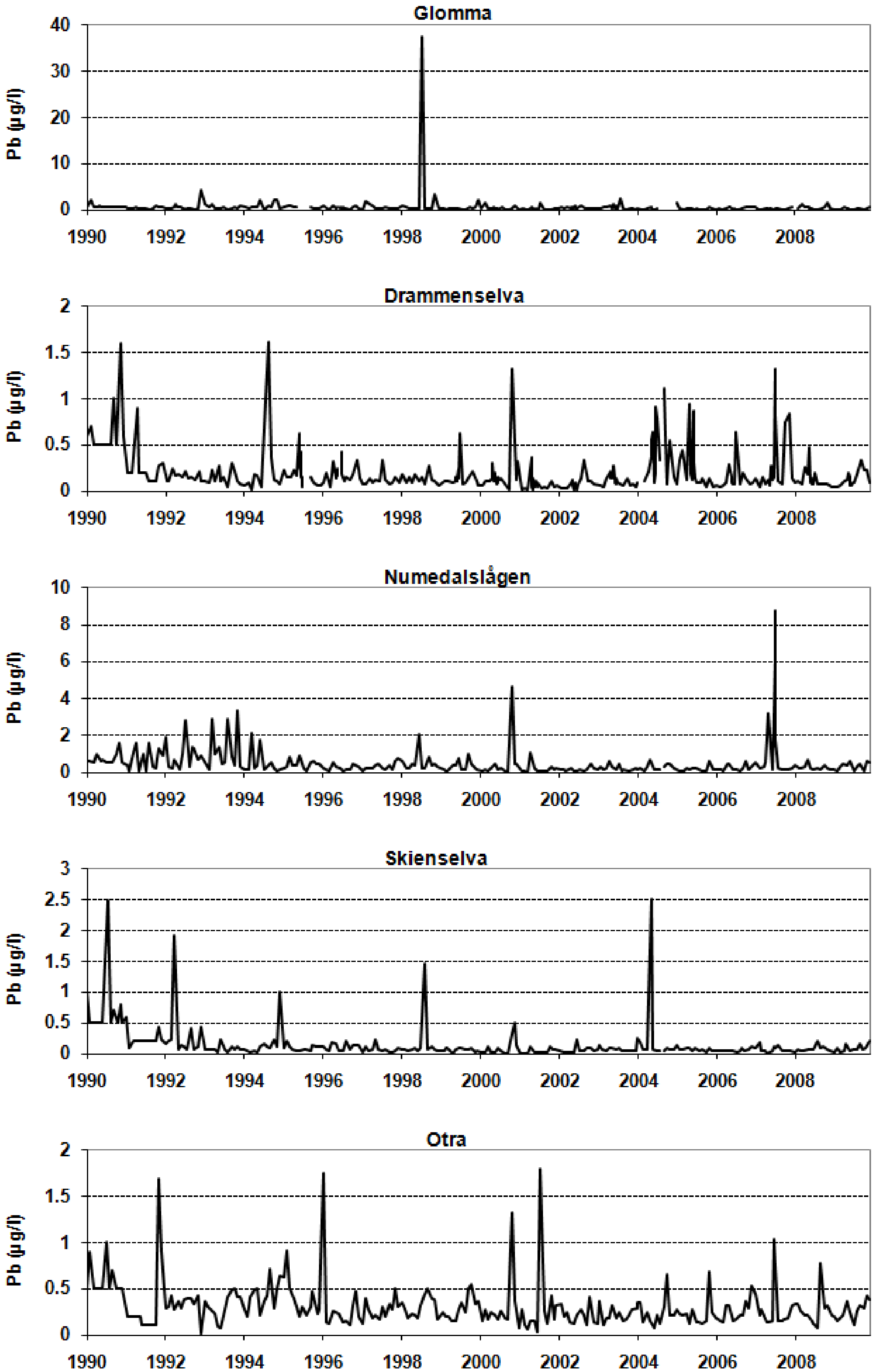


Figure A-V-11a. Monthly concentrations of lead in the five main Norwegian Skagerrak rivers, 1990-2009.

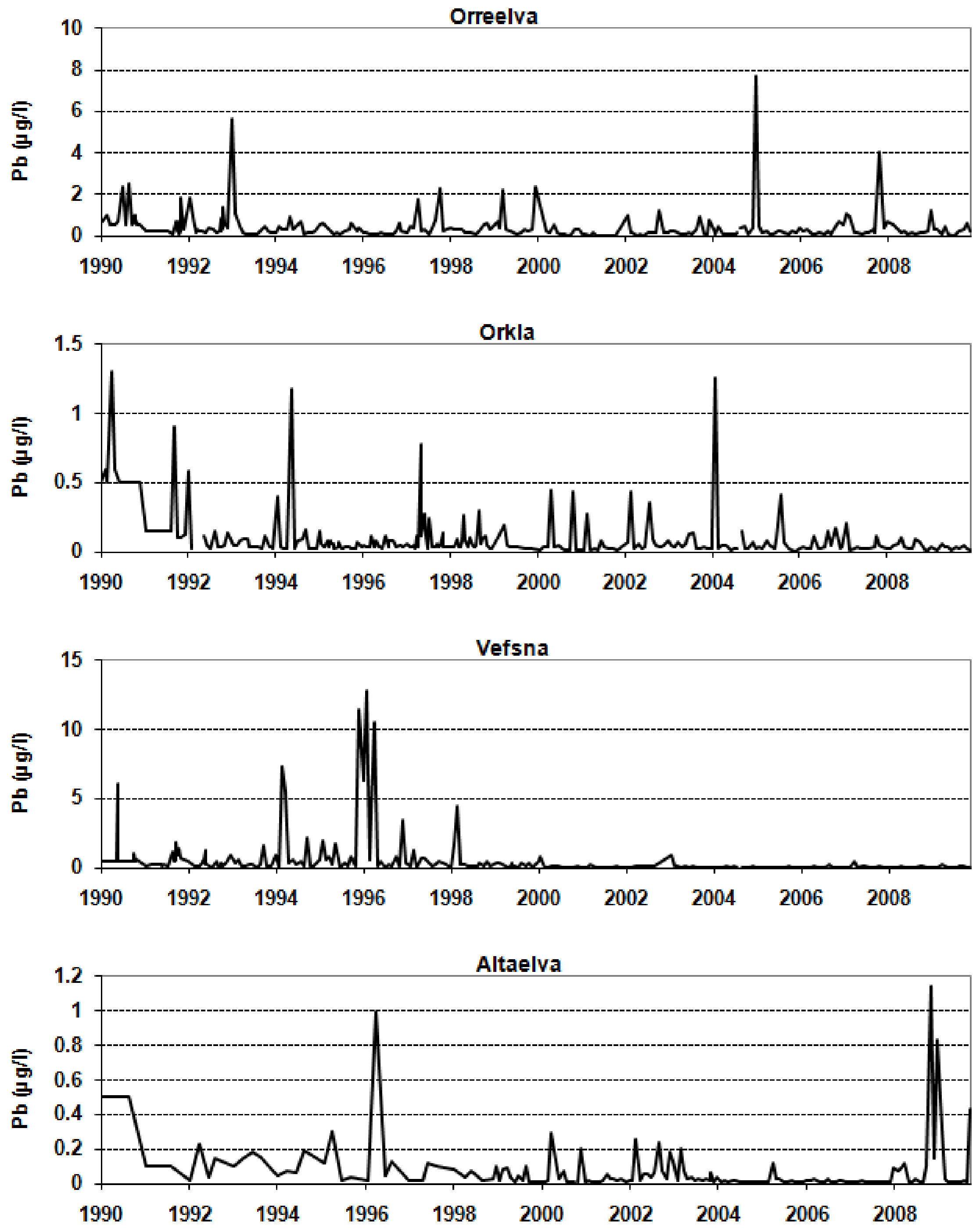


Figure A-V-11b. Monthly concentrations of lead in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

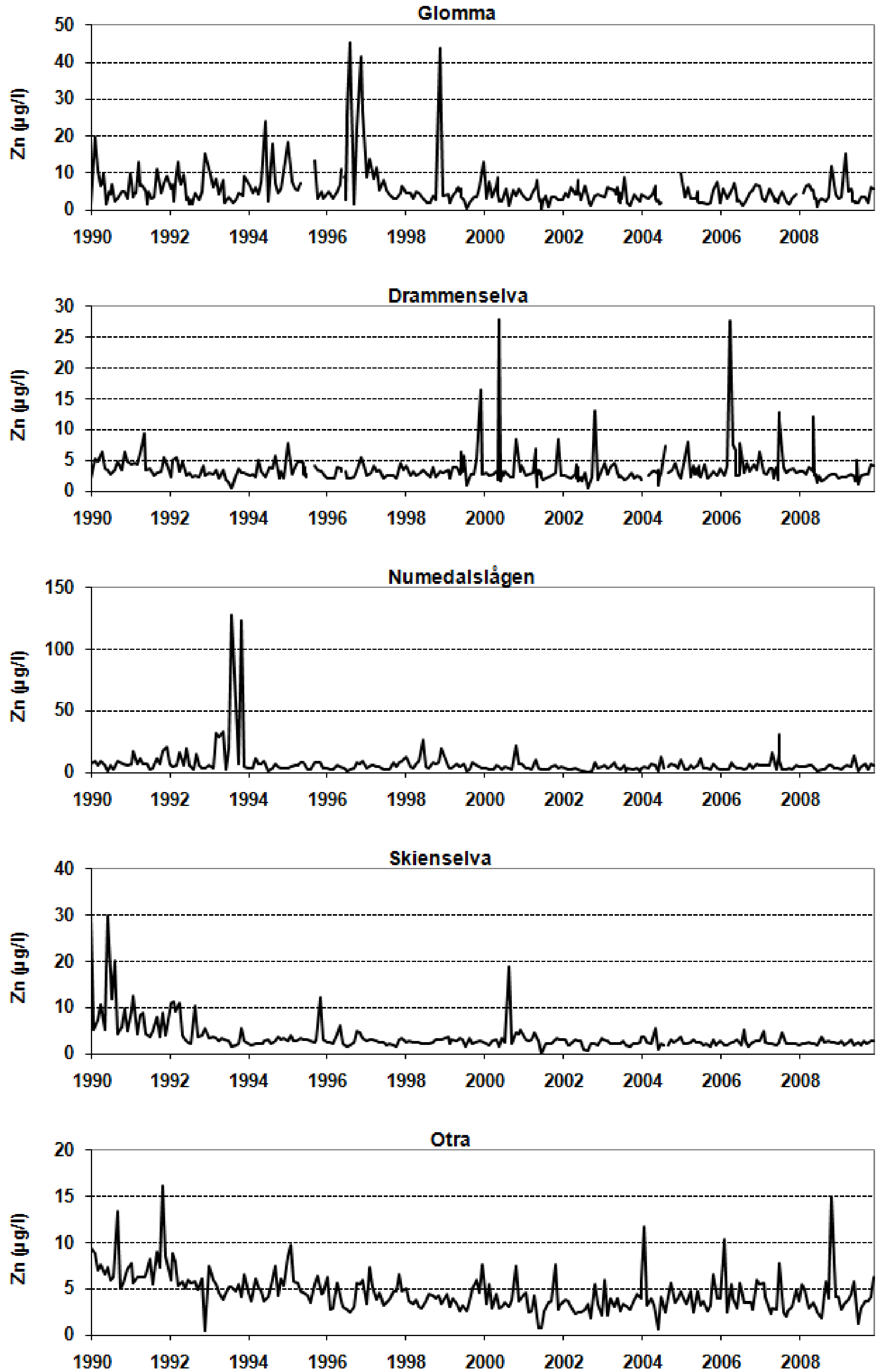


Figure A-V-12a. Monthly concentrations of zinc in the five main Norwegian Skagerrak rivers, 1990-2009.

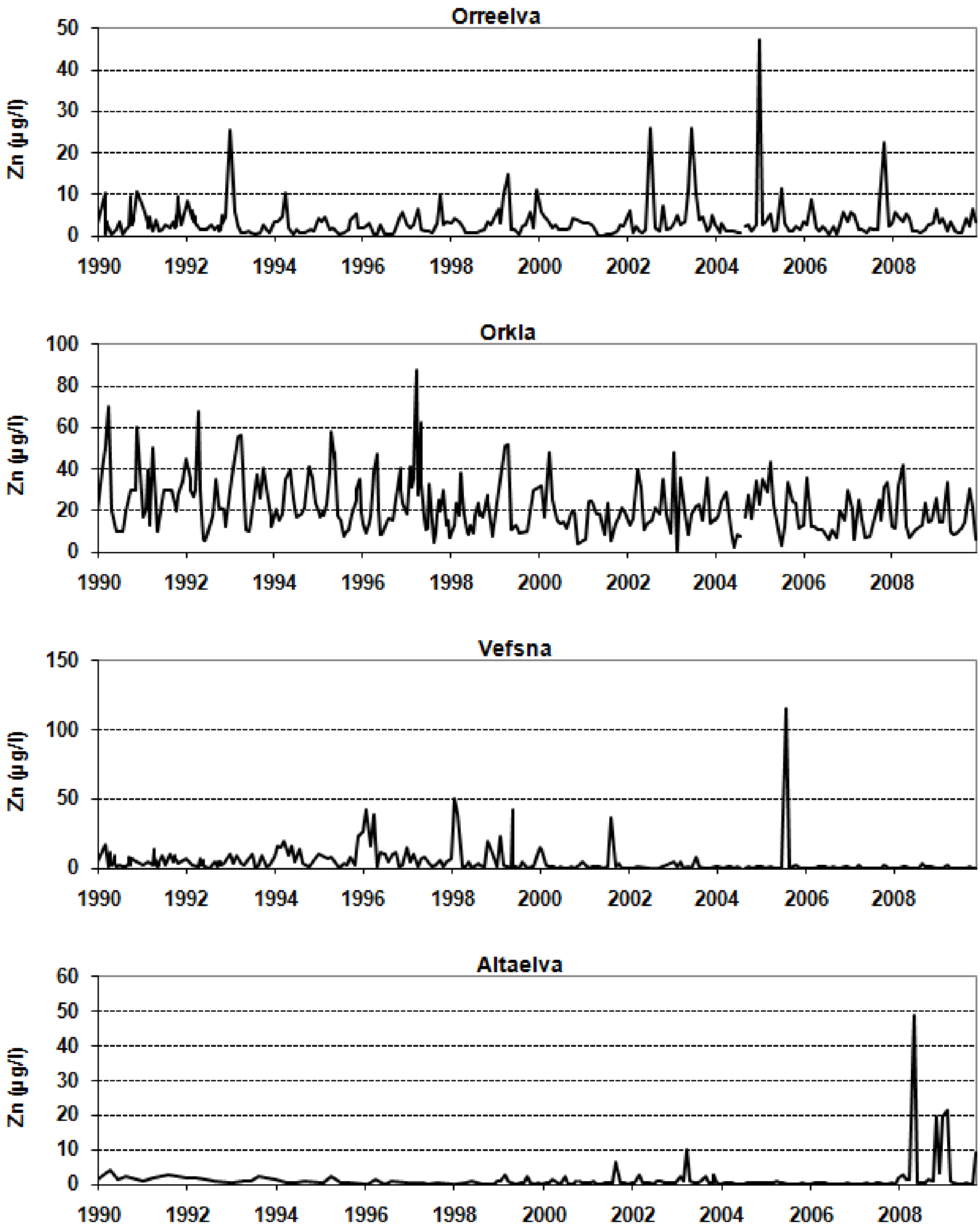


Figure A-V-12b. Monthly concentrations of zinc in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

Appendix VI
Long-term trends in riverine loads. Complementary figures to Chapter 4.4.

The figures 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)
- Copper (Cu)
- Lead (Pb)
- Zinc (Zn)
- Cadmium (Cd)
- Mercury (Hg)
- Arsenic (As)
- PCB7
- Lindane (g-HCH)

The figures in this Appendix are complementary to Chapter 4.4.

Two important changes from former years' reports include:

1) Bars previously labelled "estimated" are now referred to as "calculated", since these in fact present calculated loads based on actual concentration values. This has been done to avoid confusion about the values that are in fact *estimated* (extrapolated or interpolated) based on the 2009 assessment of the Norwegian RID database (Stålnacke et al. 2009).
2) Bars for years with extrapolated or interpolated values have been given other colours (green and yellow) than bars showing years with actual measurements.

The parameters in question include total phosphorus (Tot-P), ammonium-N (NH_4-N), mercury (Hg), arsenic (As) and PCB7. Annex VII gives an overview of the data that have been estimated for each river and each parameter.

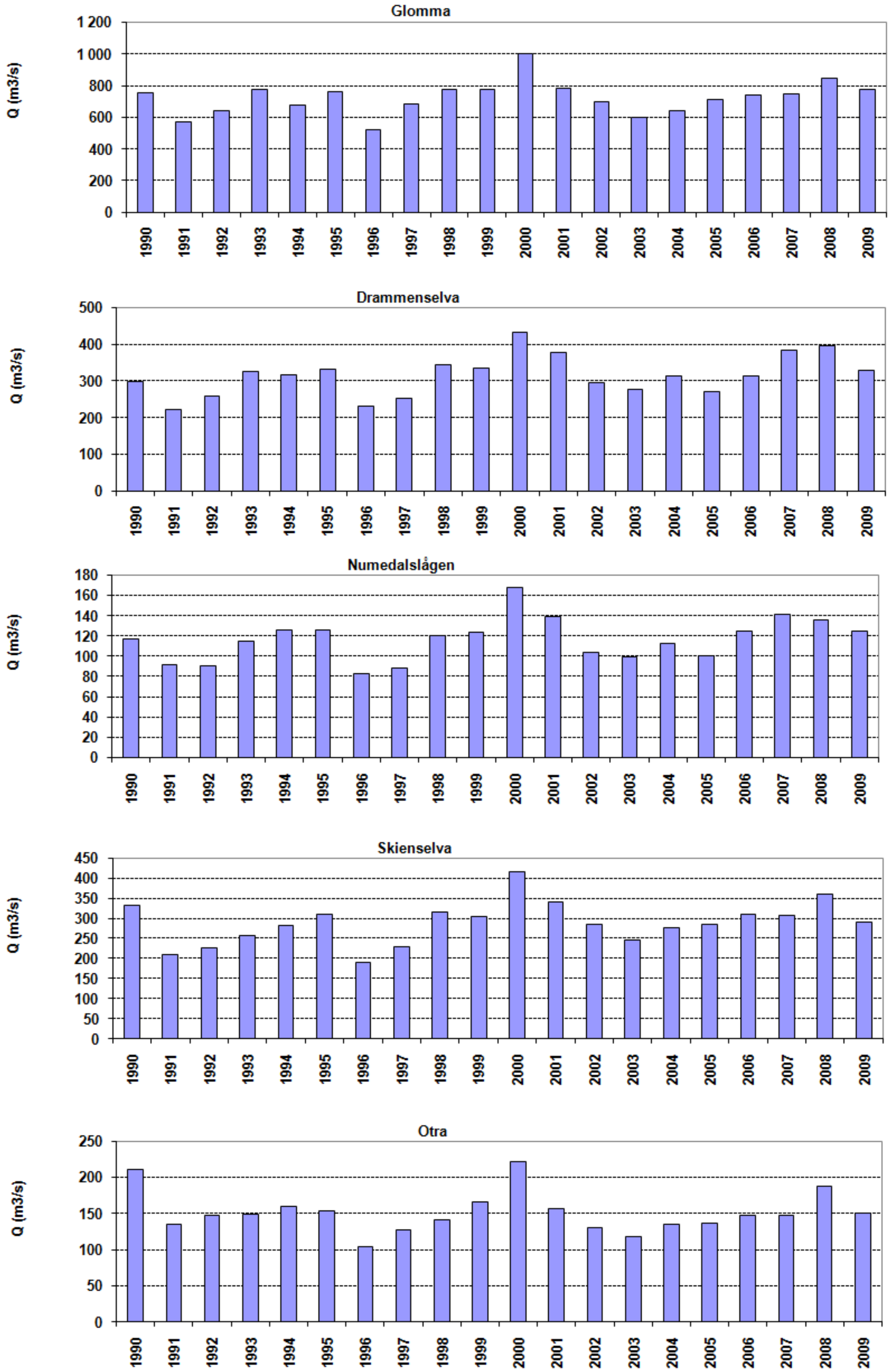


Figure A-VI-1a. Annual <u>water discharge</u> for the five main rivers draining to Skagerrak, Norway, 1990-2009.

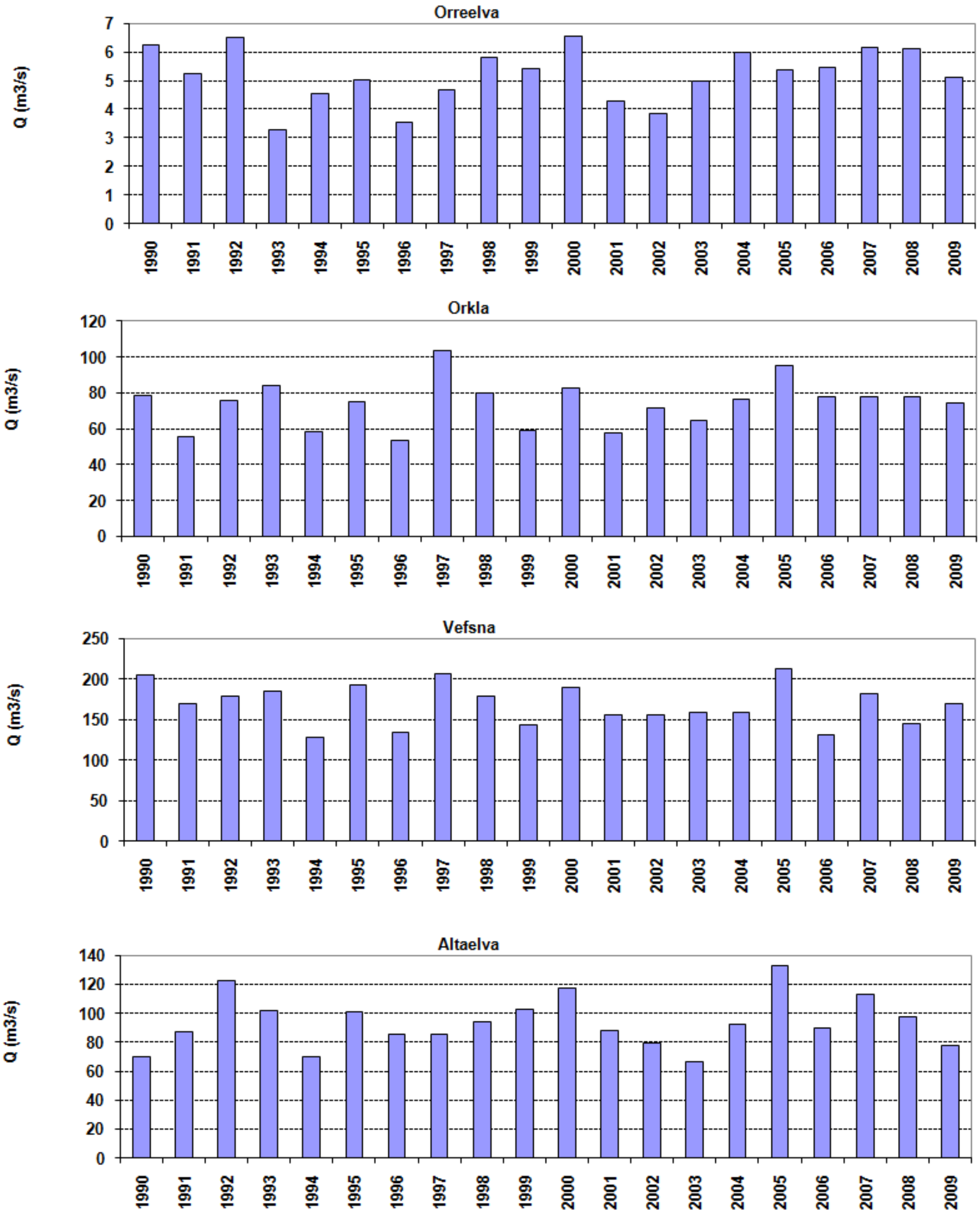
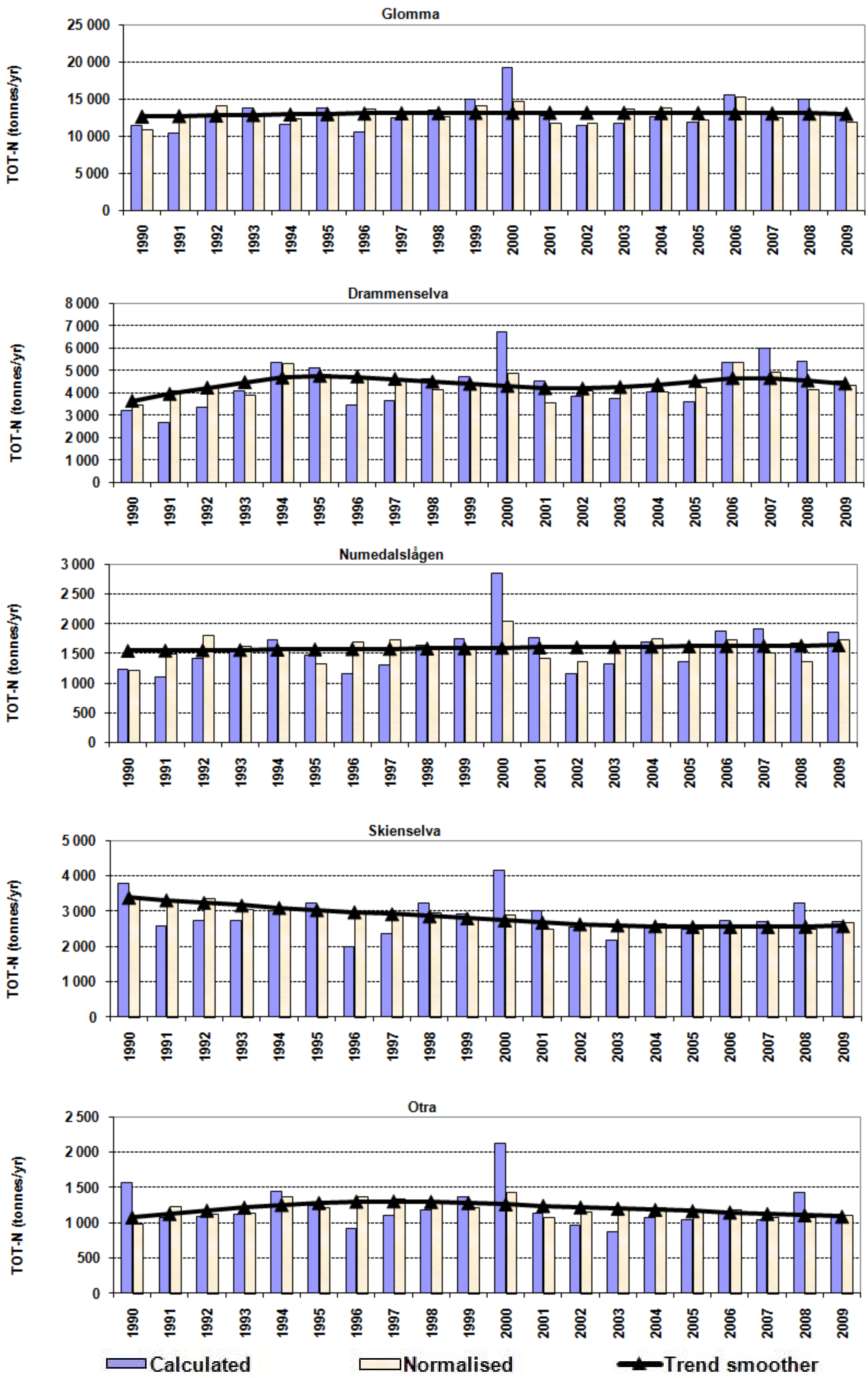


Figure A-VI-1b. Annual water discharge for the four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2009.



FigureA-VI-2a. Calculated, flow-normalised and trend line for annual riverine loads of <u>total nitrogen</u> in the five main Norwegian Skagerrak rivers, 1990-2009.

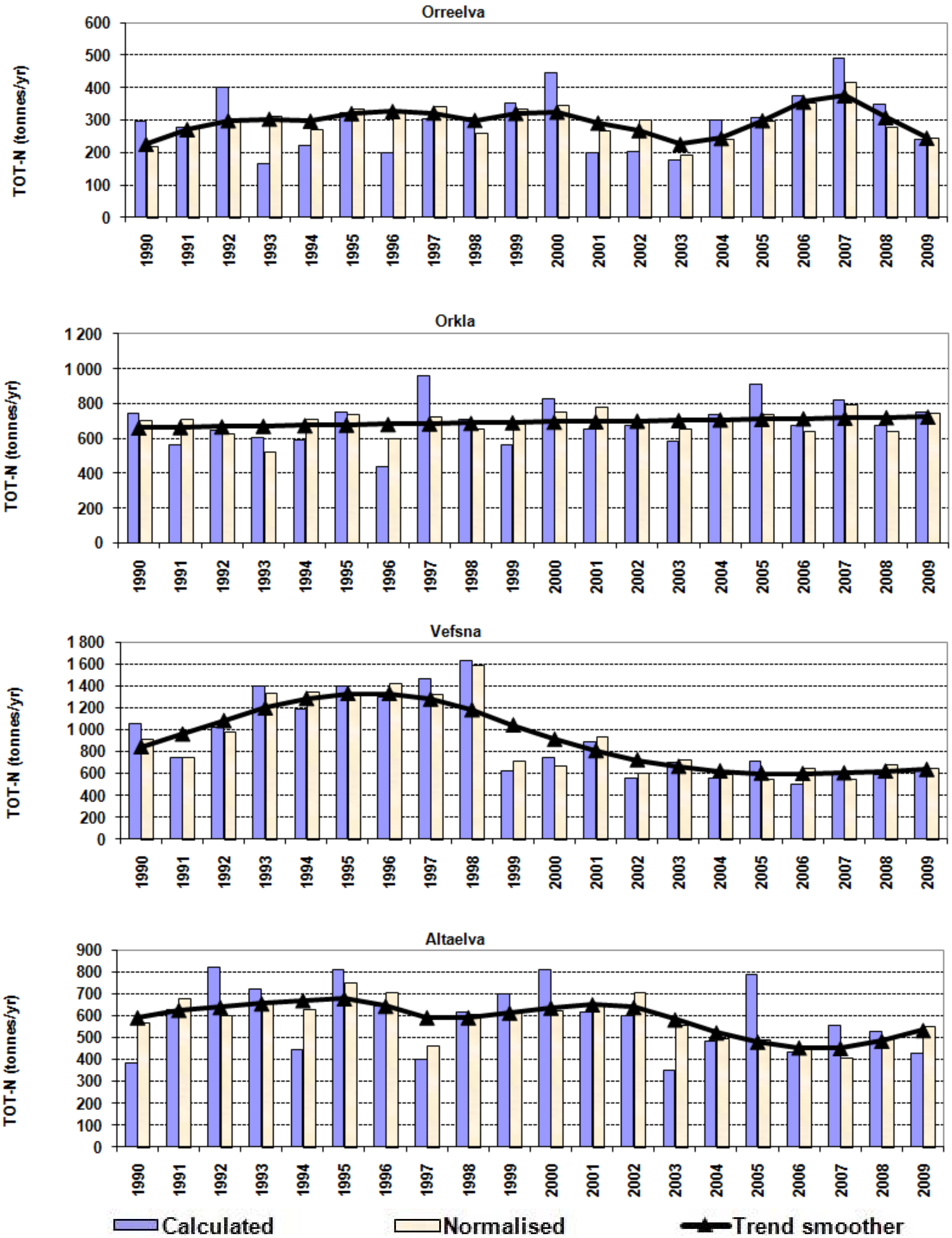


Figure A-VI-2b. Calculated, flow-normalised and trend line for annual riverine loads of ***total nitrogen*** *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

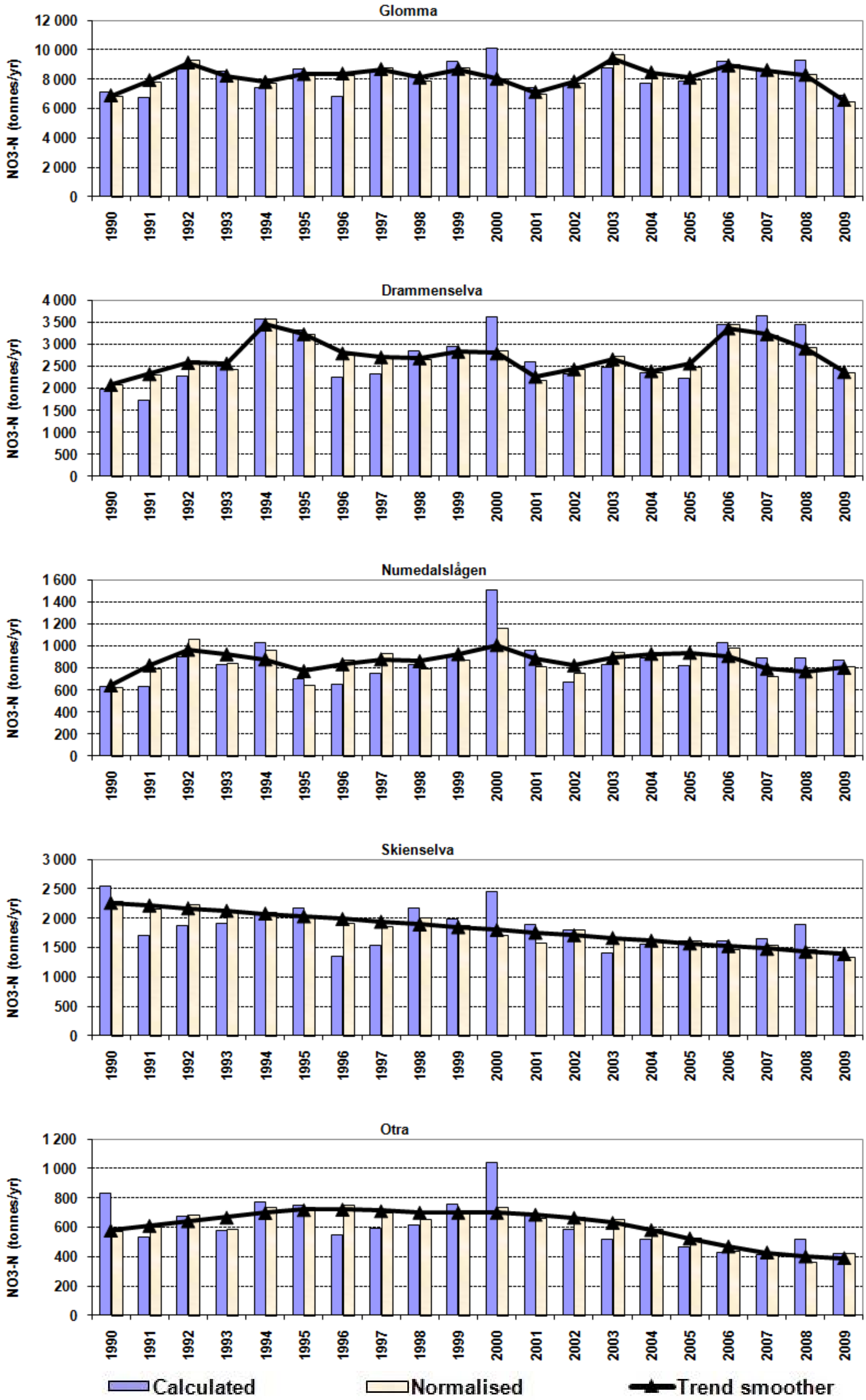


Figure A-VI-3a. Calculated, flow-normalised and trend line for annual riverine loads of *__nitrate nitrogen__* *in the five main Norwegian Skagerrak rivers, 1990-2009.*

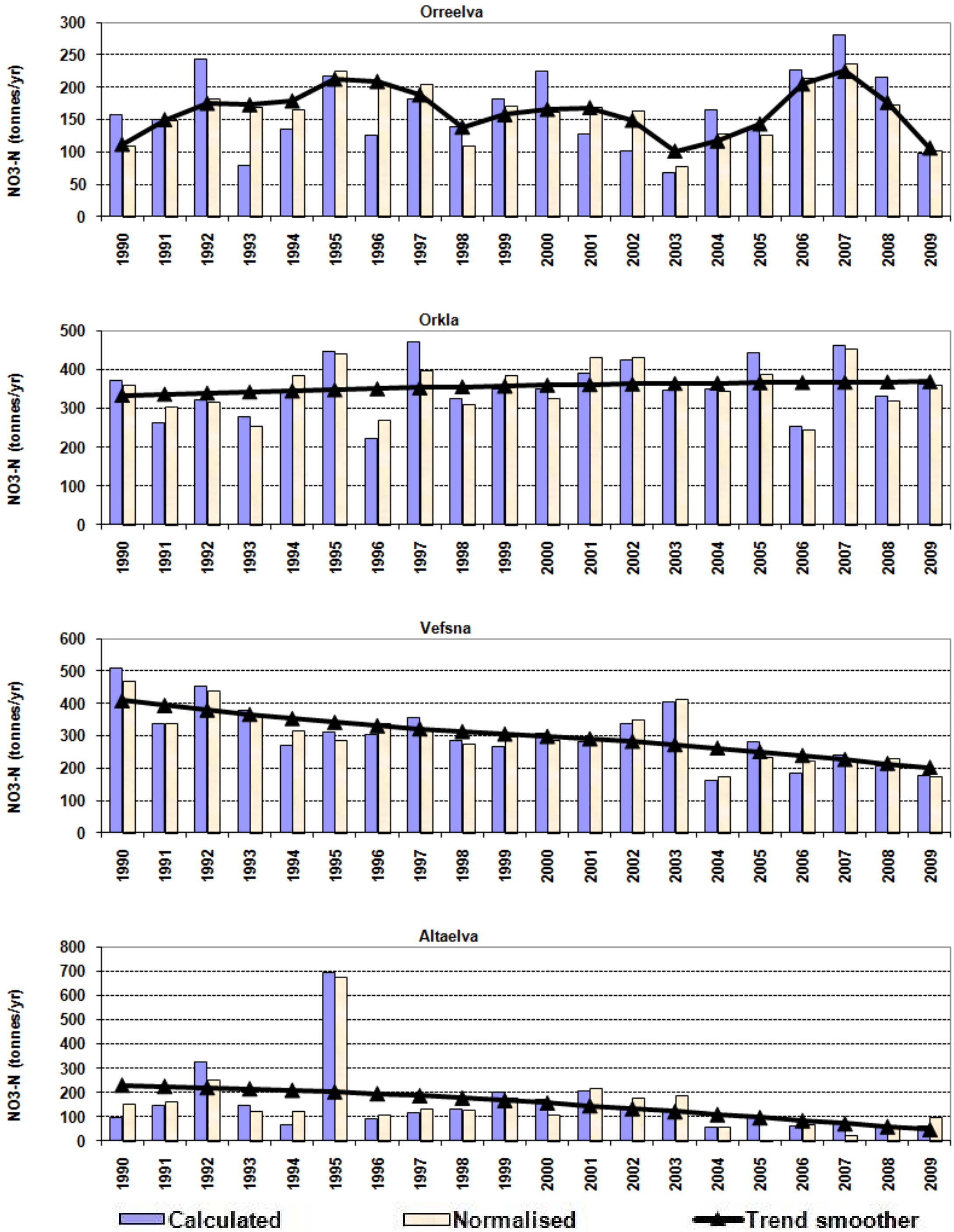


Figure A-VI-3b.Calculated, flow-normalised and trend line for annual riverine loads of nitrate nitrogen in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

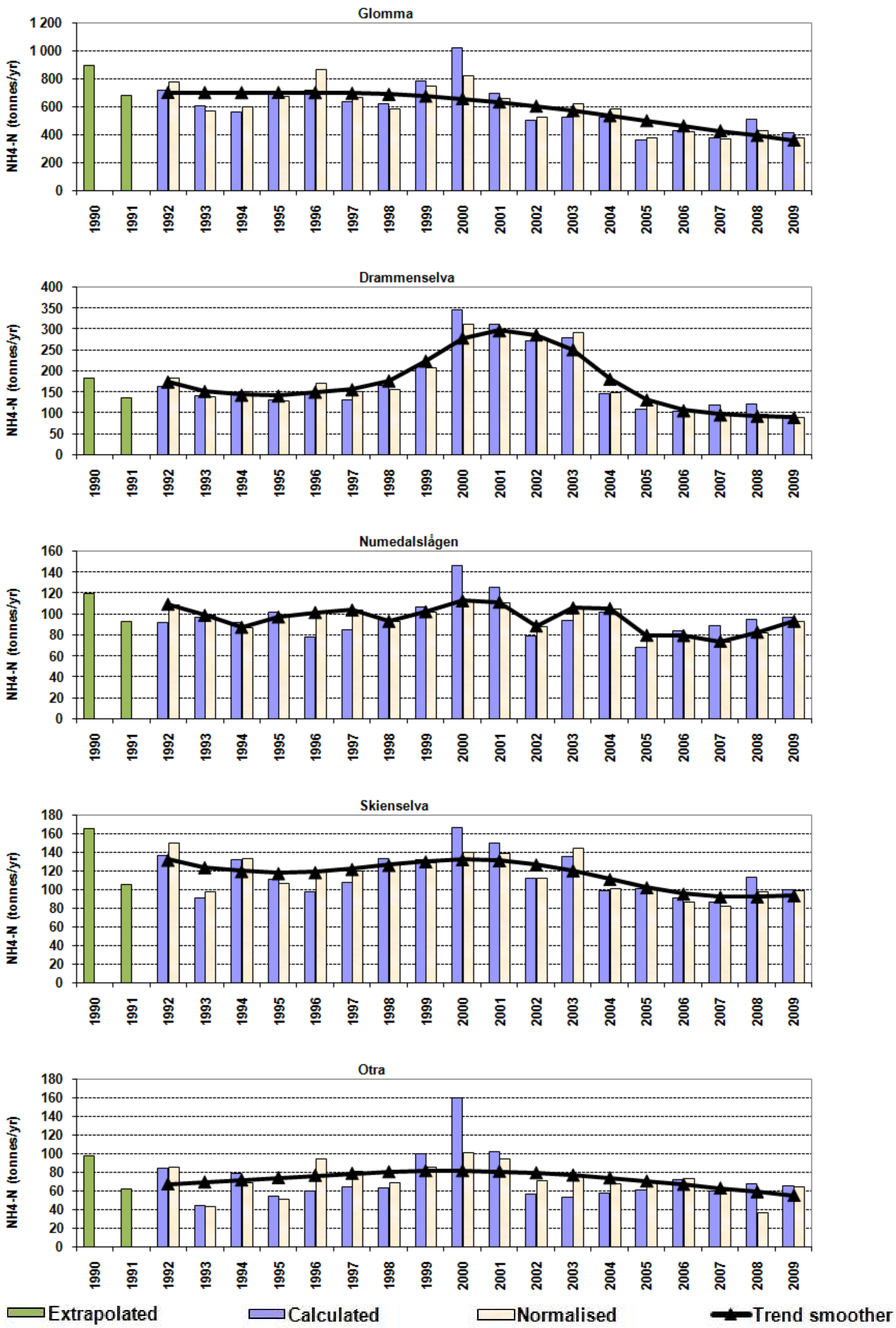


Figure A-VI-4a.Extrapolated, calculated, flow-normalised and trend line for annual riverine loads of NH_4-N in the five main Norwegian Skagerrak rivers, 1990-2009.

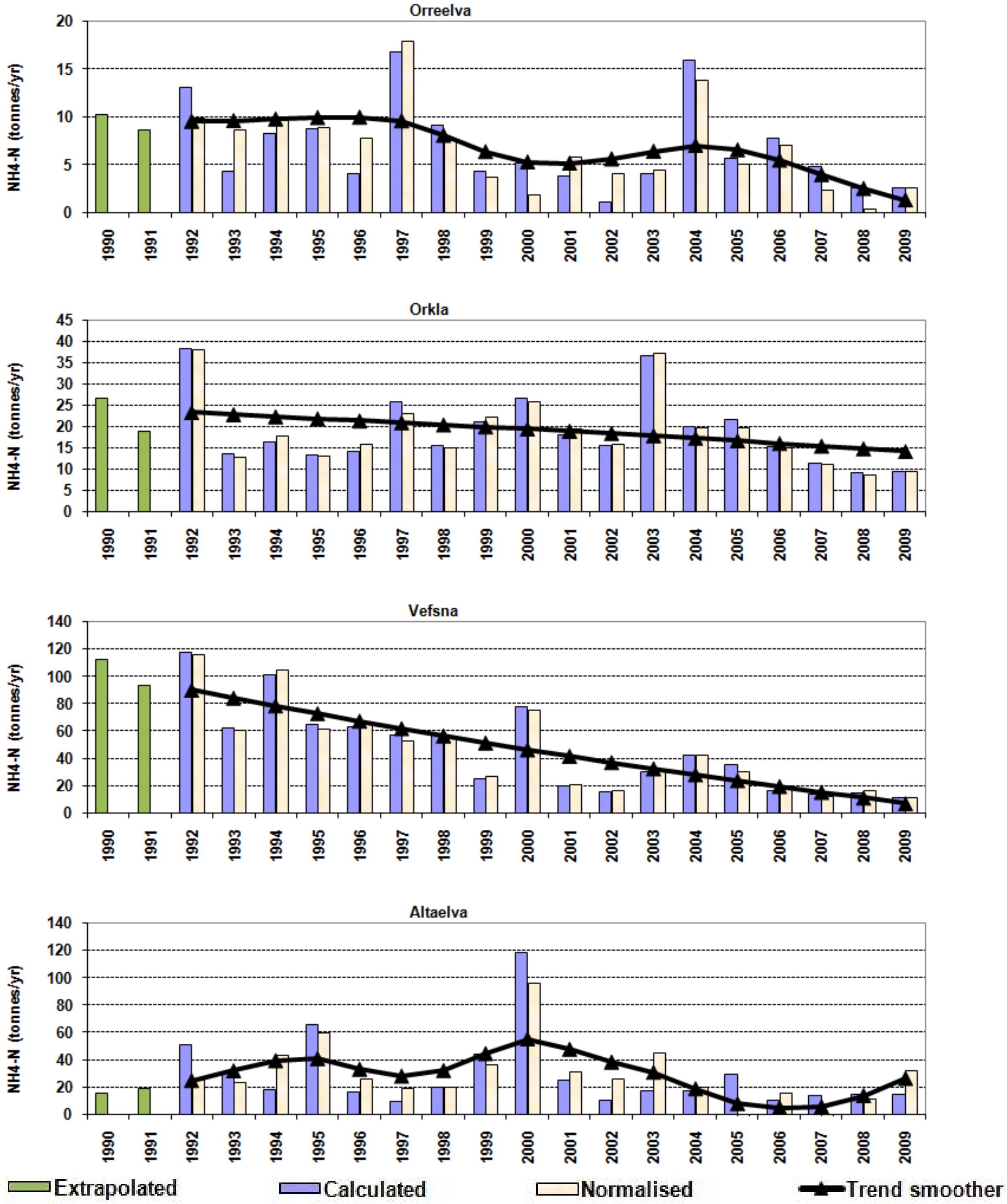


Figure A-VI-4b. Extrapolated, calculated, flow-normalised and trend line for annual riverine loads of NH_4*-N in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

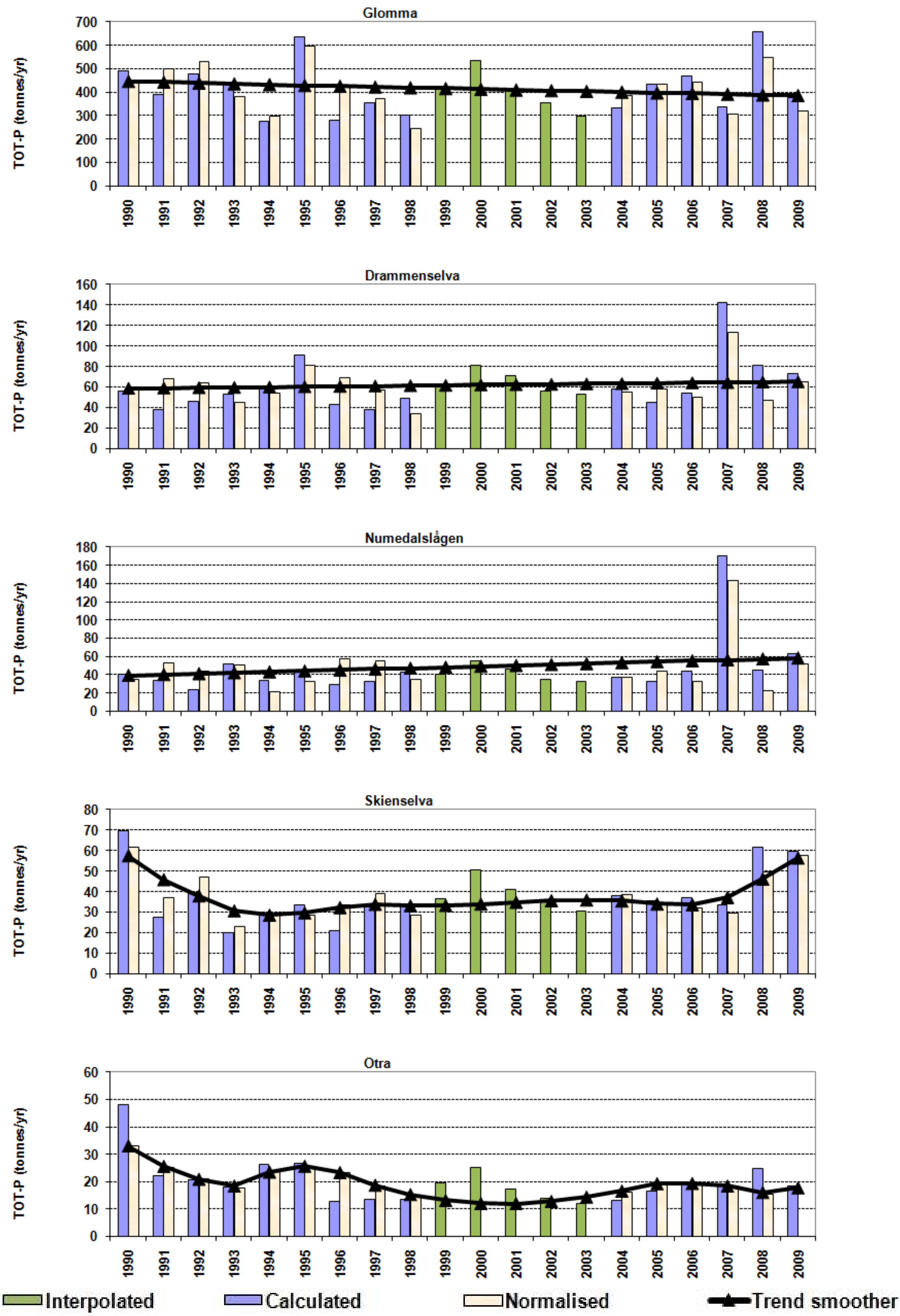


Figure A-VI-5a. Interpolated, calculated, flow-normalised and trend line for annual riverine loads of *total phosphorus* *in the five main Norwegian Skagerrak rivers, 1990-2009.*

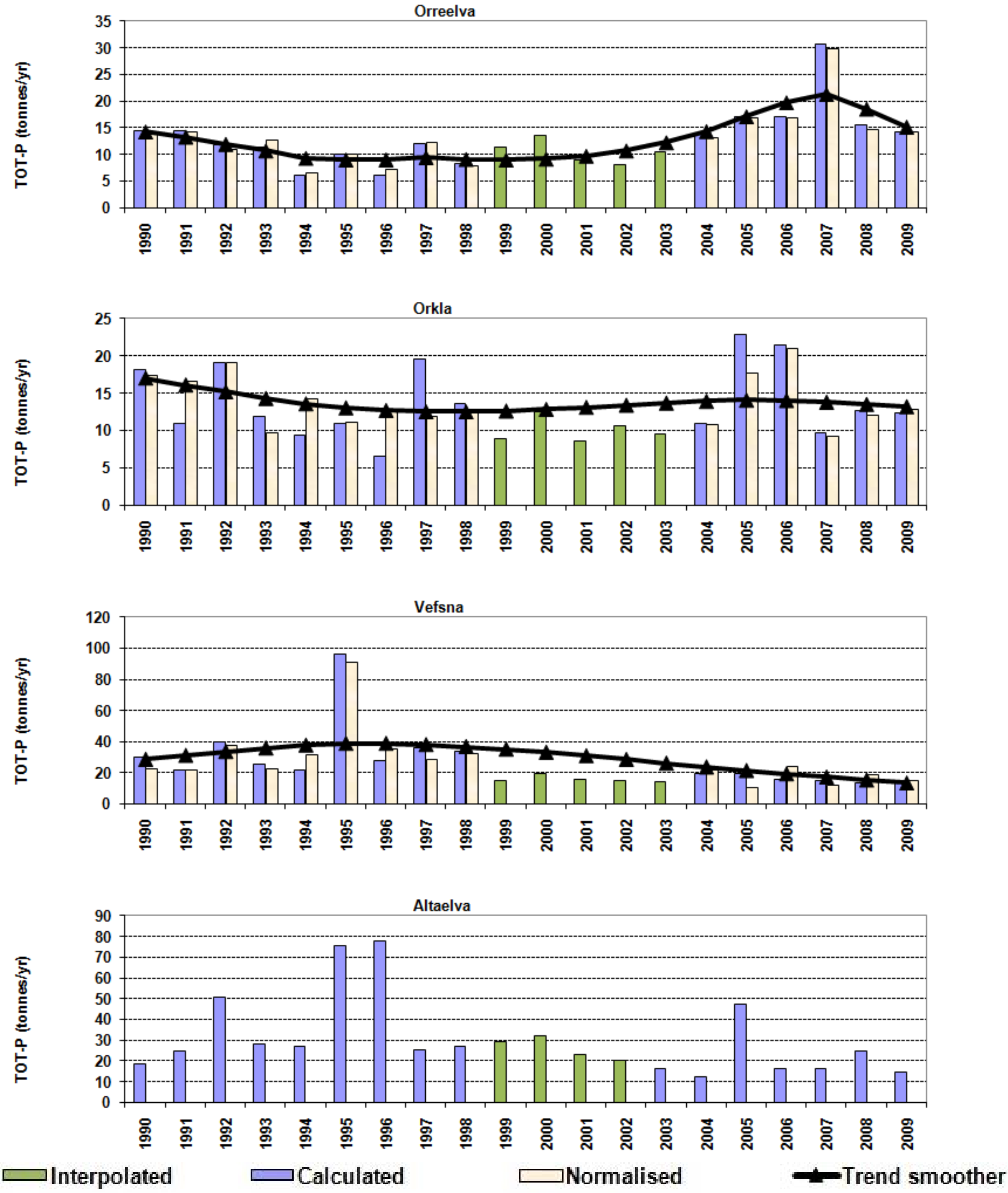


Figure A-VI- 5b. Interpolated, calculated, flow-normalised and trend line for annual riverine loads of <u>total phosphorus</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

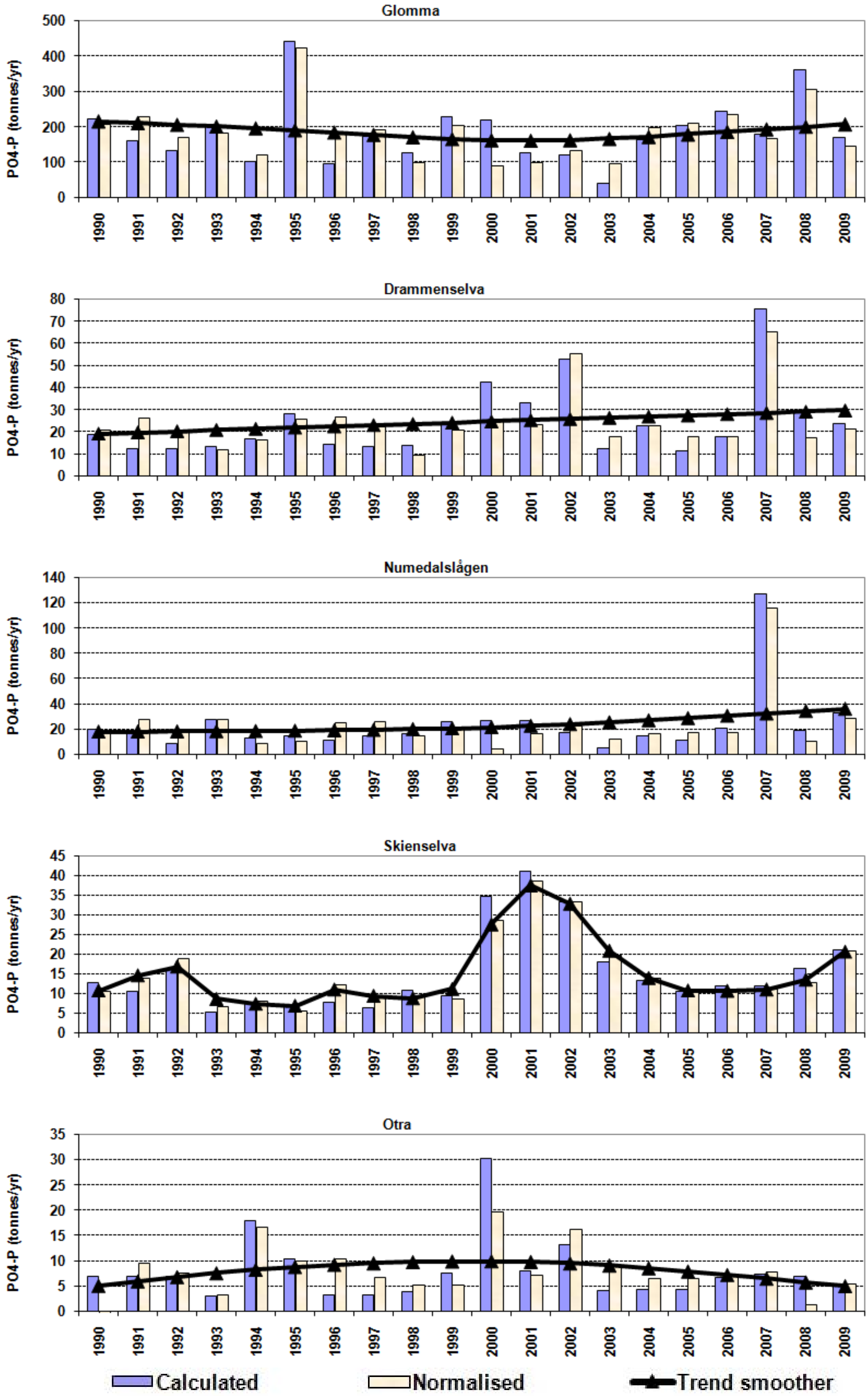


Figure A-VI-6a. Calculated, flow-normalised and trend line for annual riverine loads of PO4-P in the five main Norwegian Skagerrak rivers, 1990-2009.

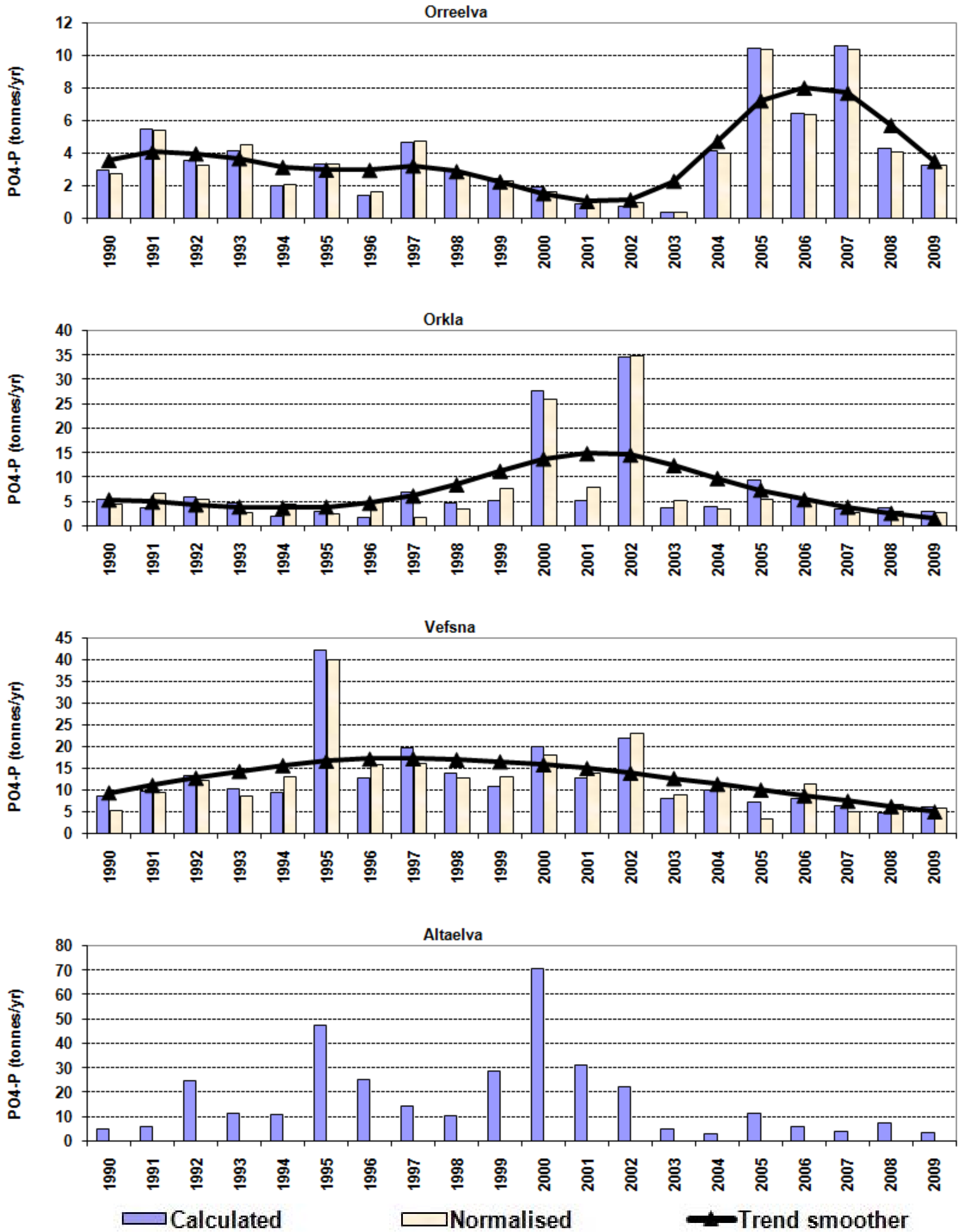


Figure A-VI-6b. Calculated, flow-normalised and trend line for annual riverine loads of <u>PO_4-P</u> *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

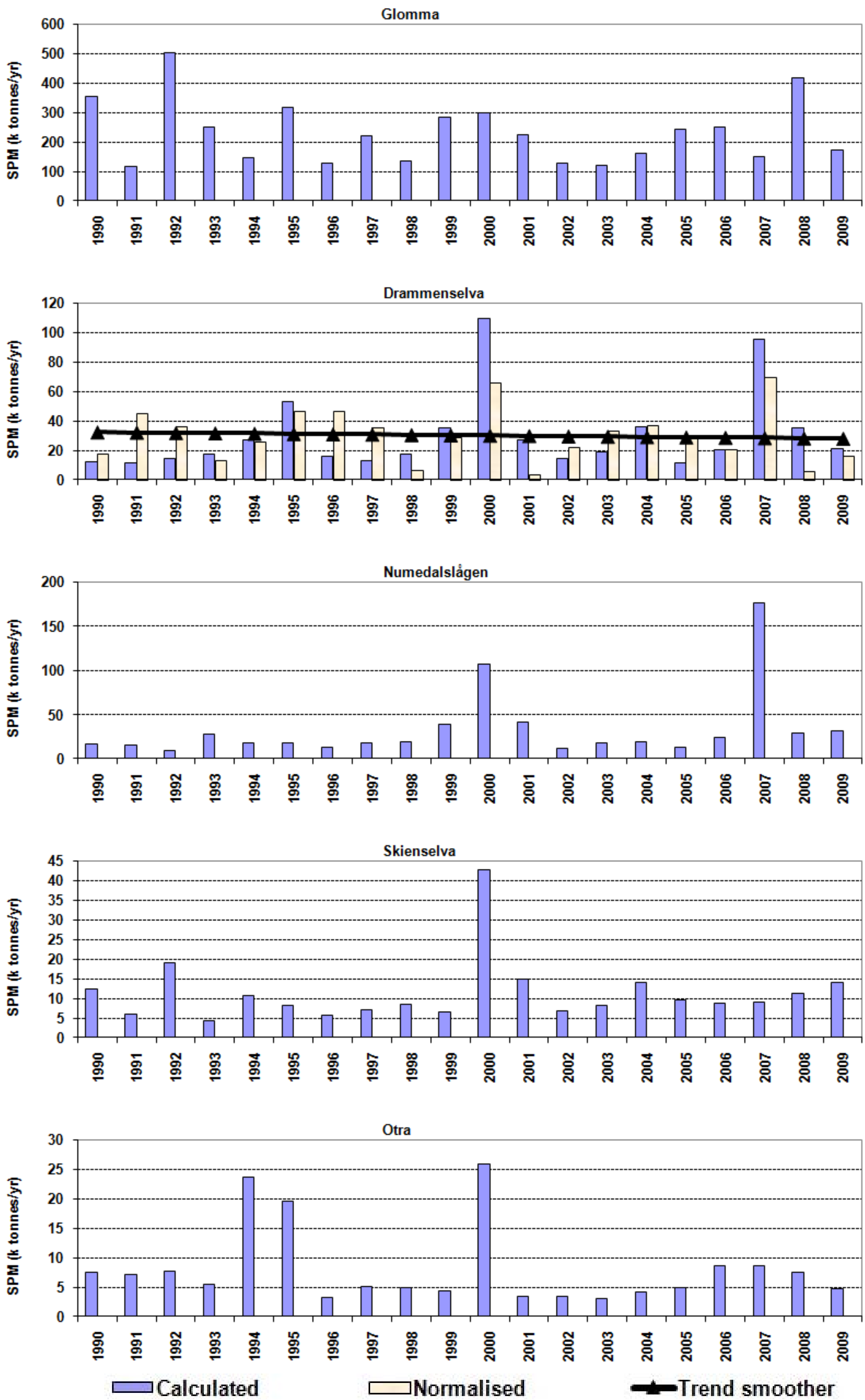


Figure A-VI-7a. Calculated, flow-normalised and trend line for annual riverine loads of suspended particulate matter in in the five main Norwegian Skagerrak rivers, 1990-2009.

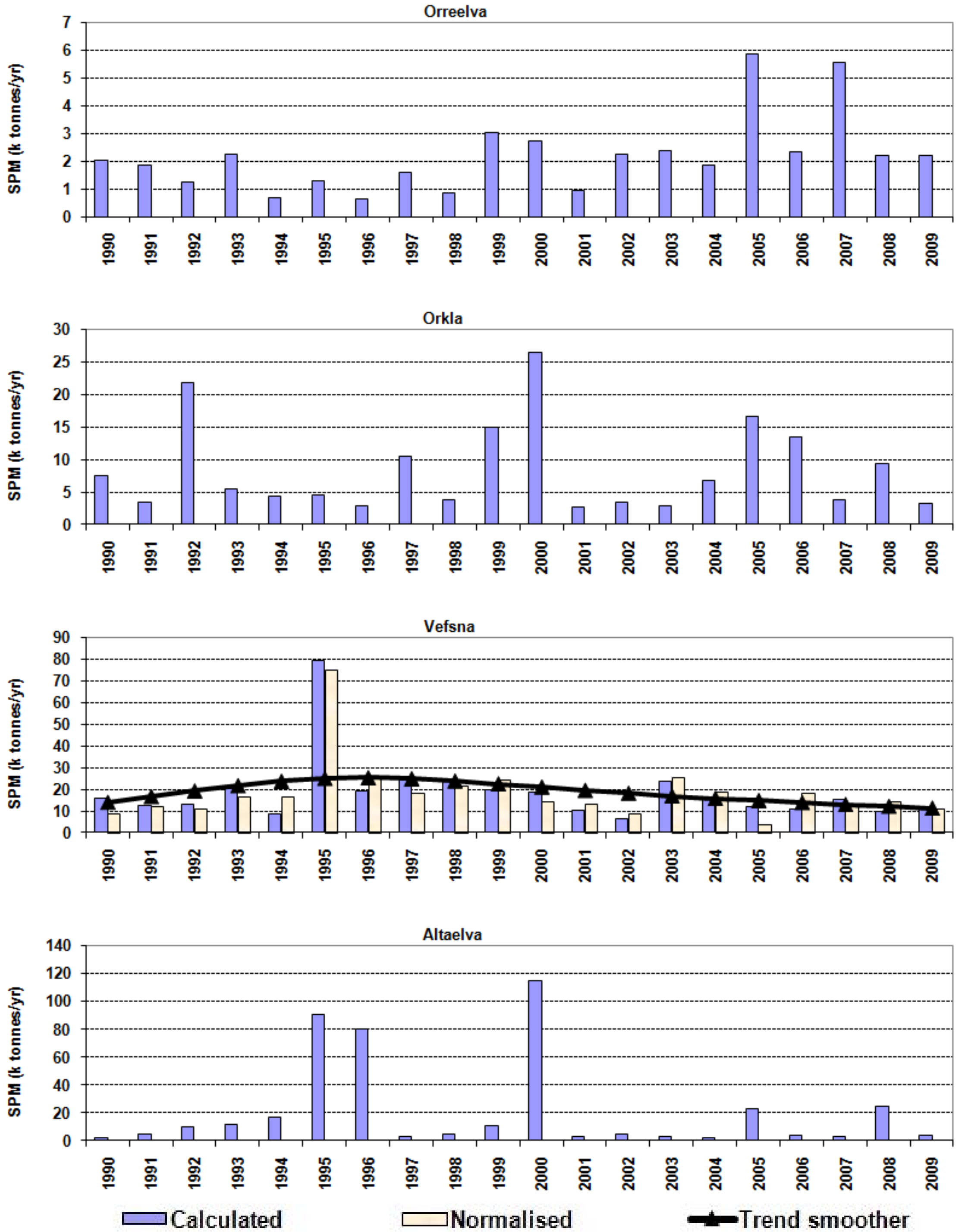


Figure A-VI-7b. Calculated, flow-normalised and trend line for annual riverine loads of <u>*suspended particulate matter*</u> *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.*

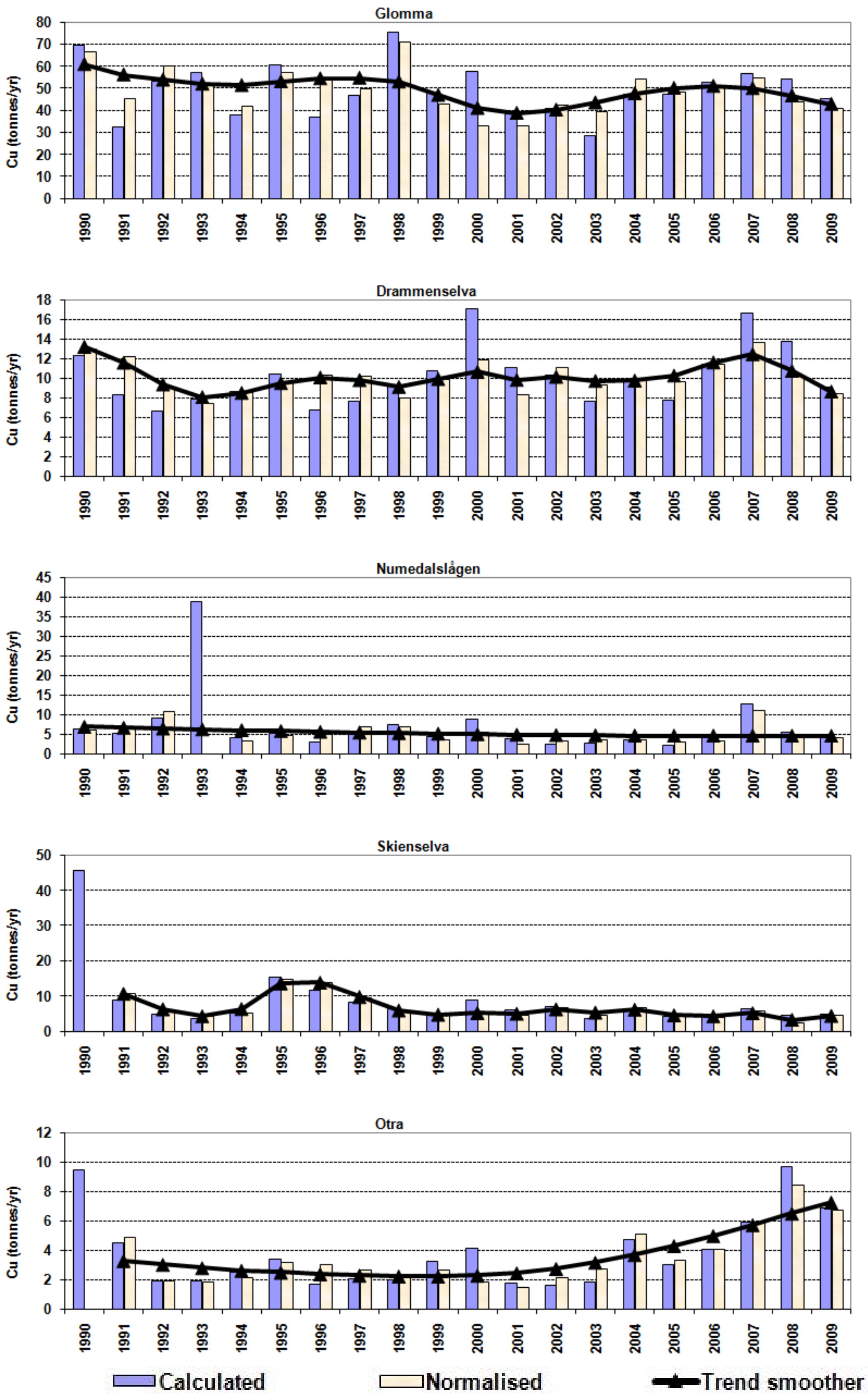


Figure A-VI-8a.Calculated, flow-normalised and trend line for annual riverine loads of *<u>Copper</u>* *in the five main Norwegian Skagerrak rivers, 1990-2009. The following values have been removed before calculating normalized and trend smoother: Numedalslågen in 1993, Skienselva & Otra in 1990.*

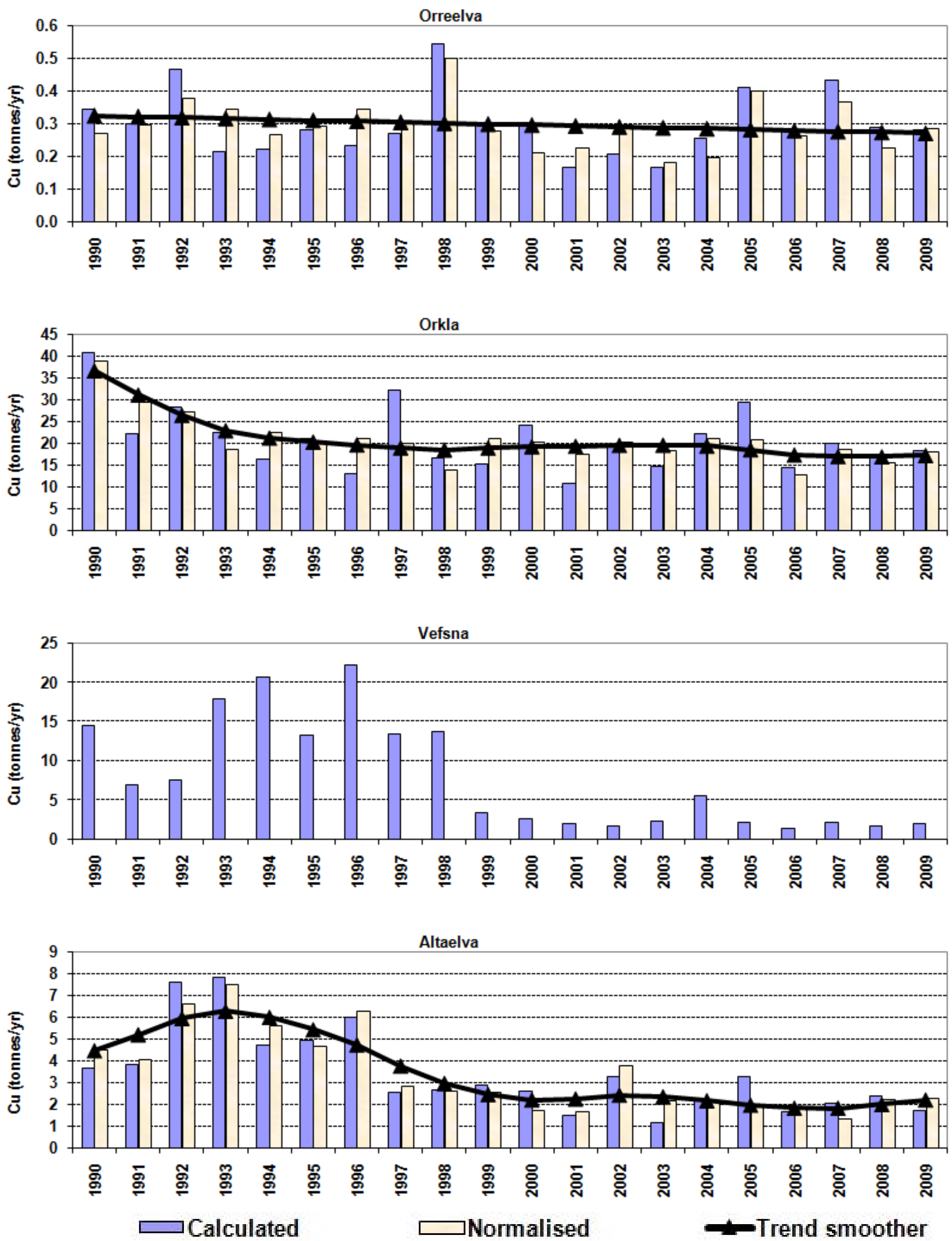


Figure A-VI-8b. Calculated, flow-normalised and trend line for annual riverine loads of Copper in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

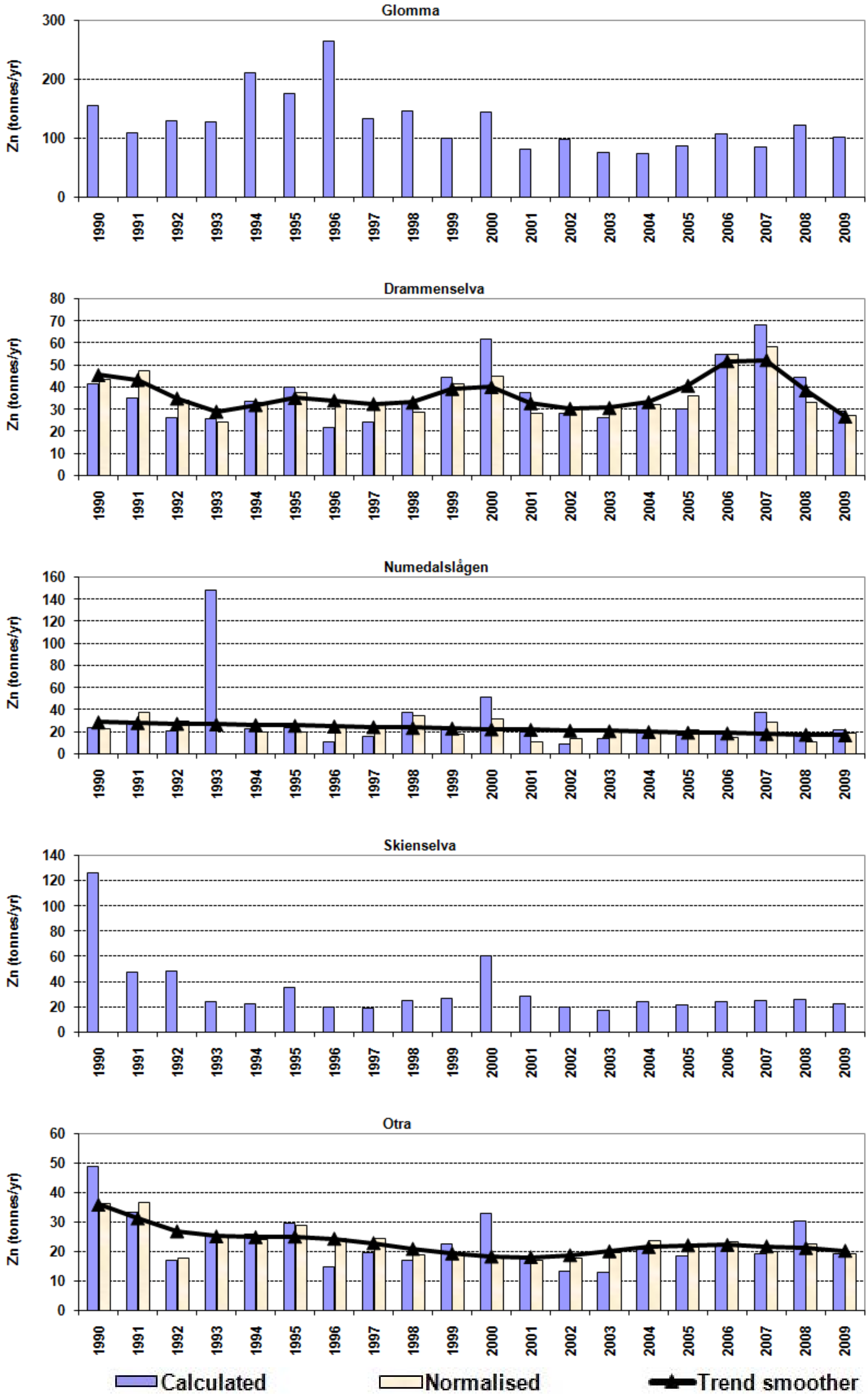


Figure A-VI-9a. Calculated, flow-normalised and trend line for annual riverine loads of <u>Zinc</u> in five main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009. In the calculation of normalized and trend smoother for Numedalslågen has 1993 been removed.

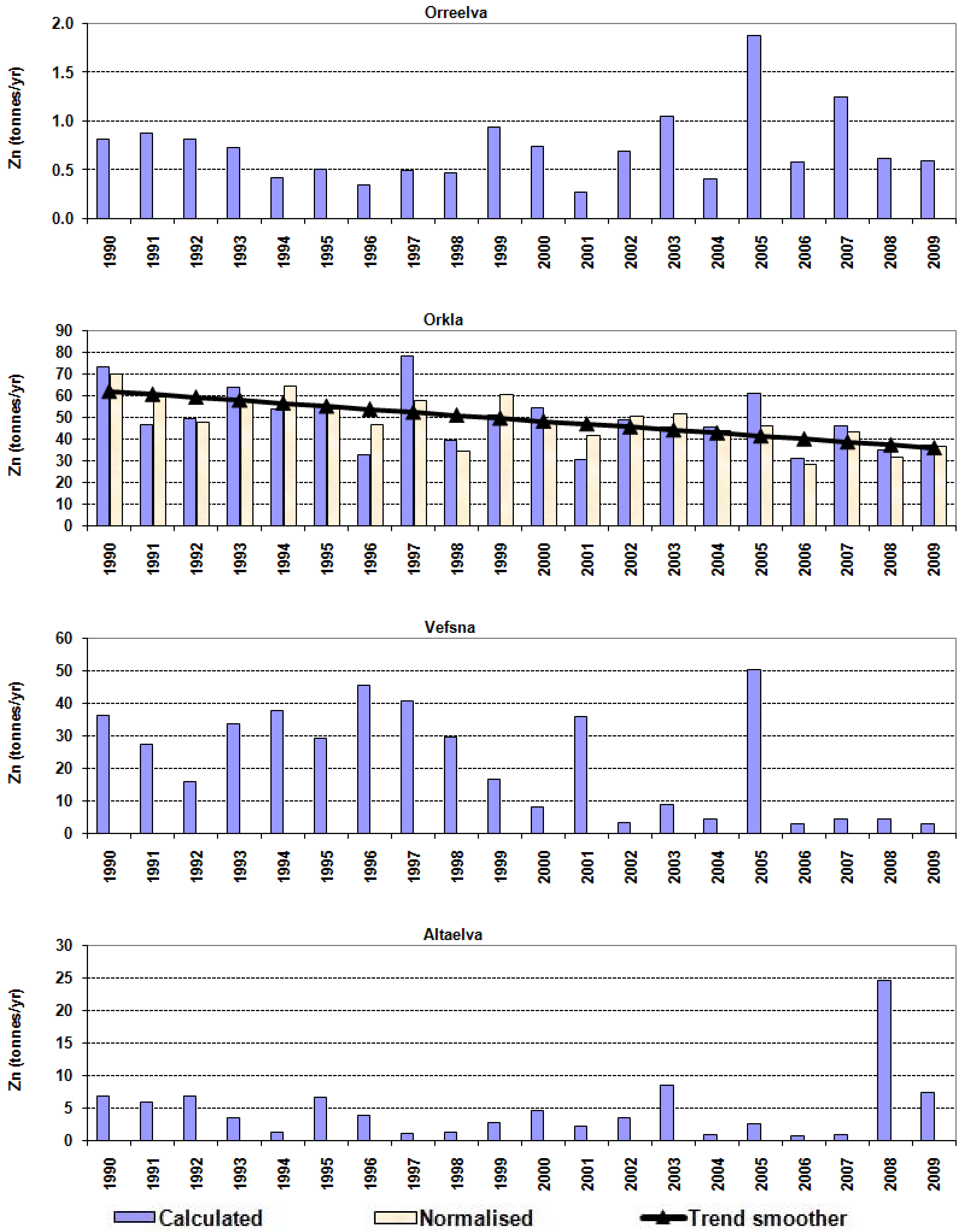


Figure A-VI-9b. Calculated, flow-normalised and trend line for annual riverine loads of Zinc in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

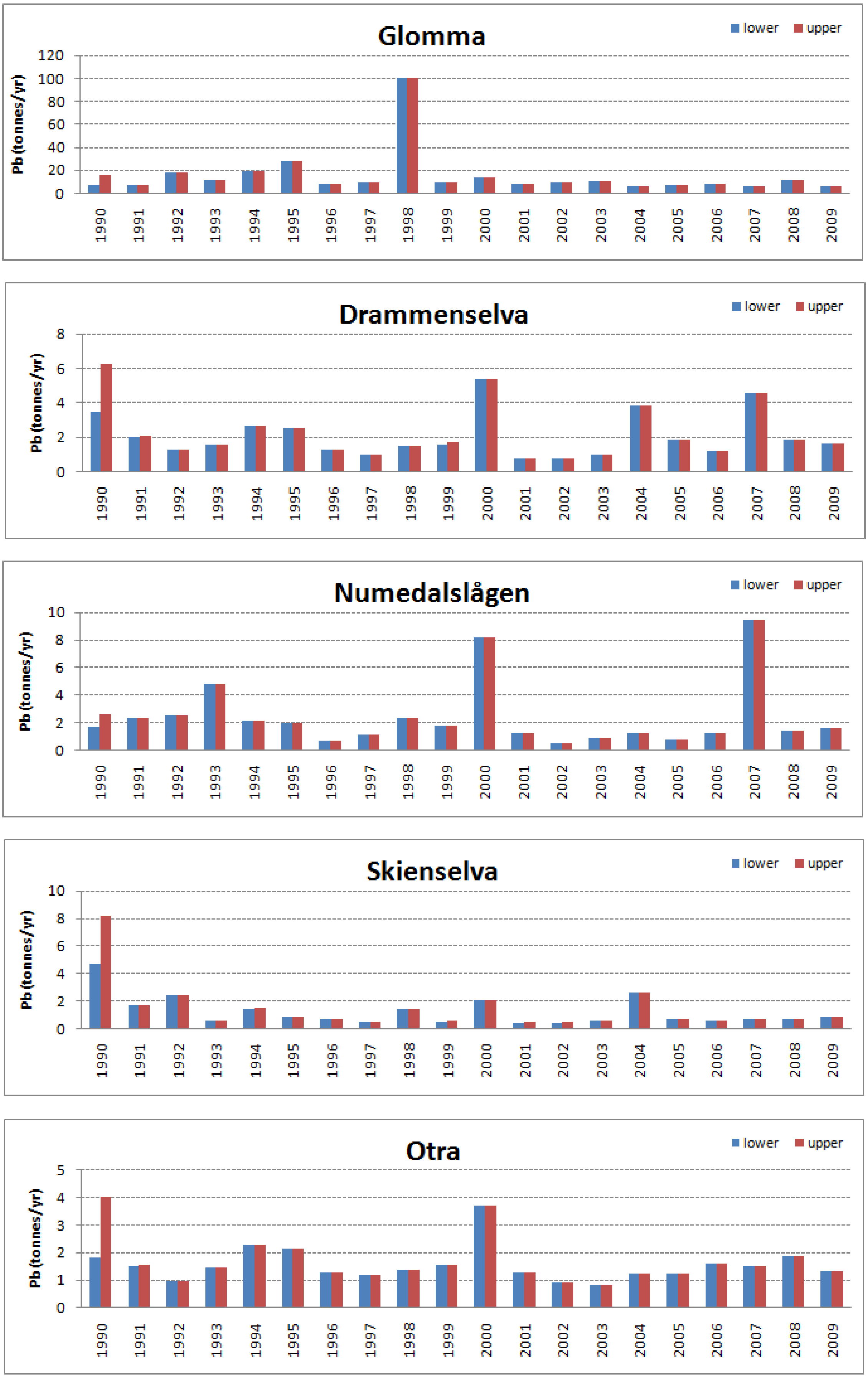


Figure A-VI-10a. Annual riverine loads (upper and lower estimates) of Lead in the five main Skagerrak rivers in Norway, 1990-2009.

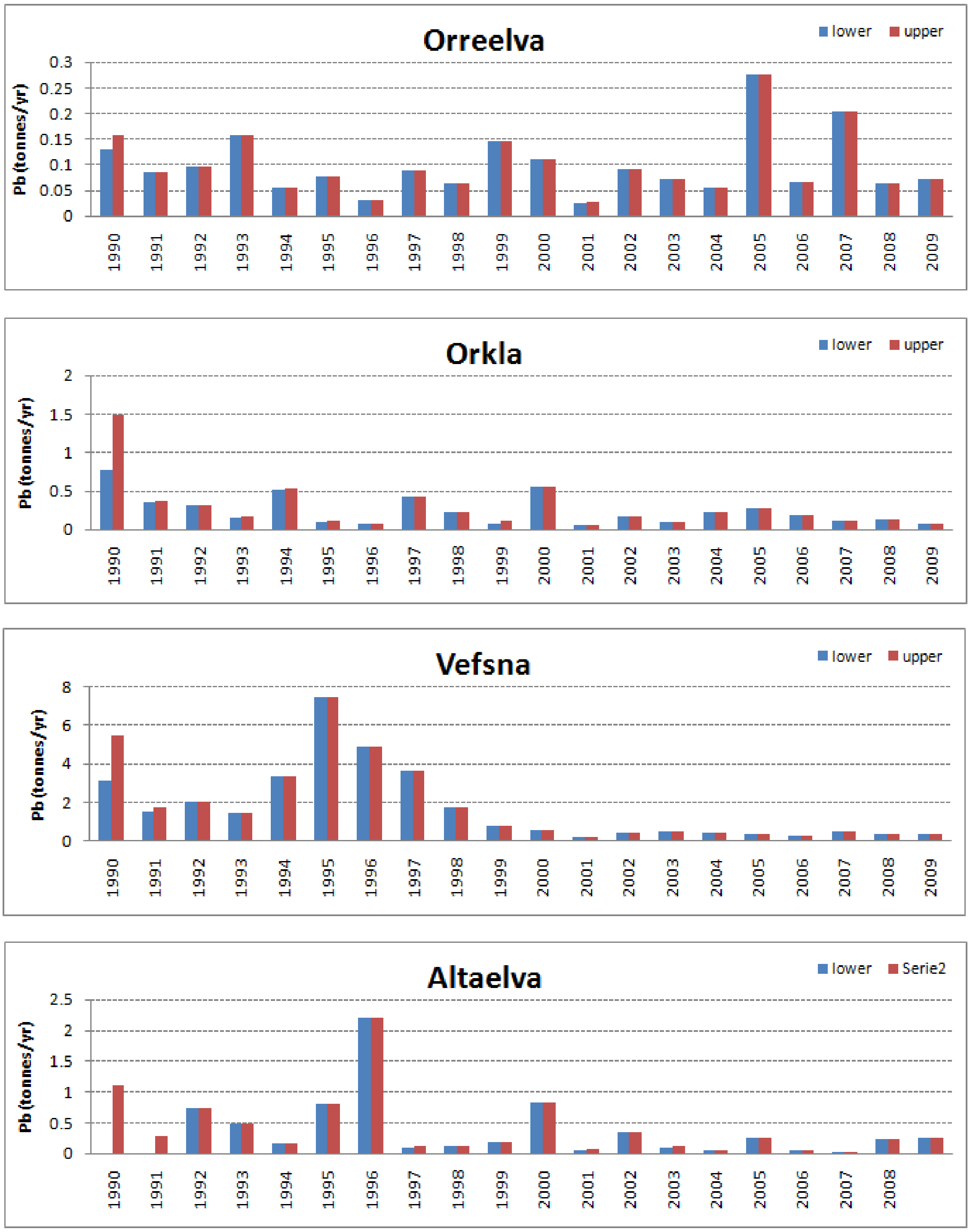


Figure A-VI-10b.Annual riverine loads (upper and lowe estimates) of <u>Lead</u> in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

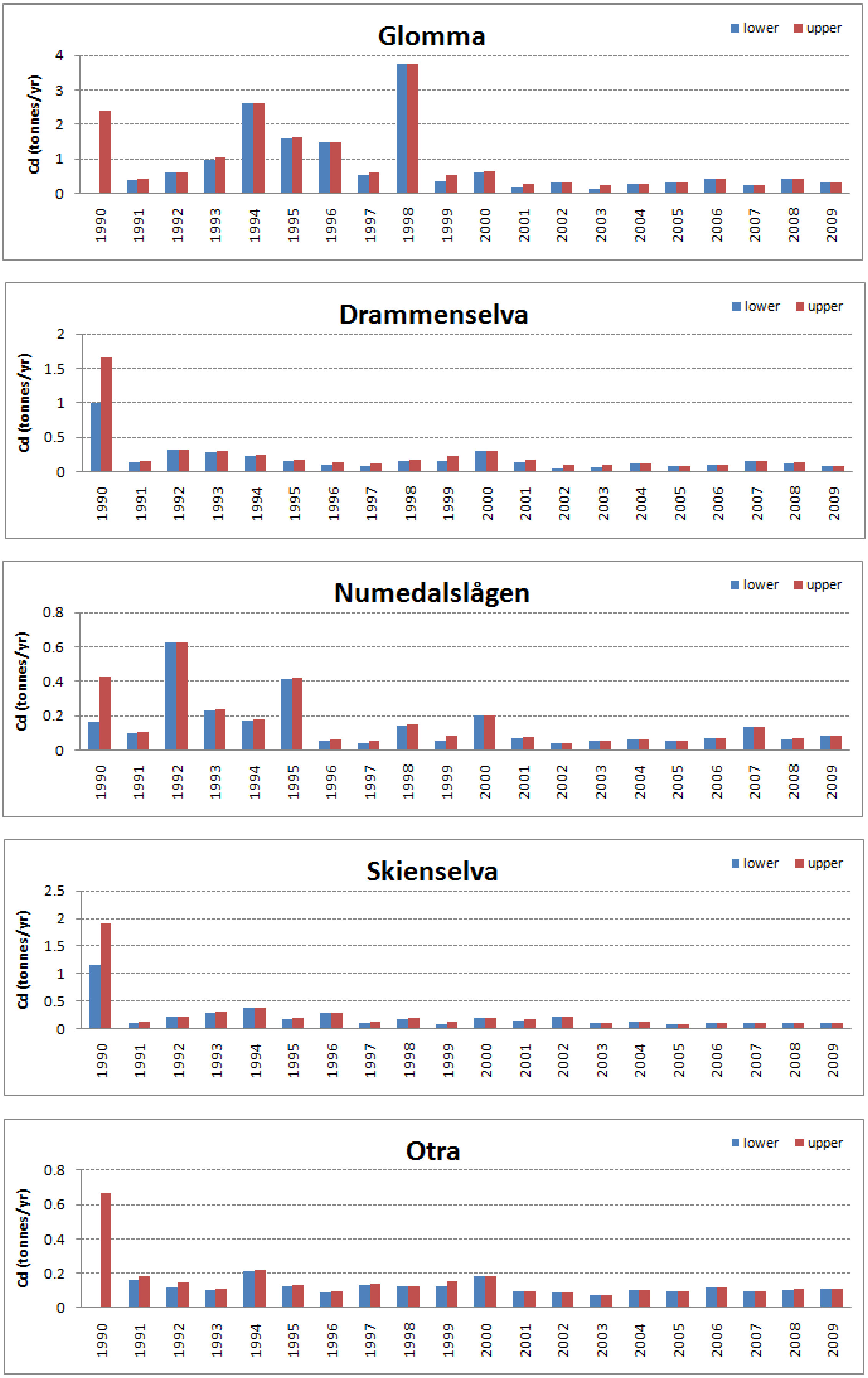


Figure A-VI-11a. Annual riverine loads (upper and lower estimates) of Cadmium in the five main Skagerrak rivers in Norway, 1990-2009.

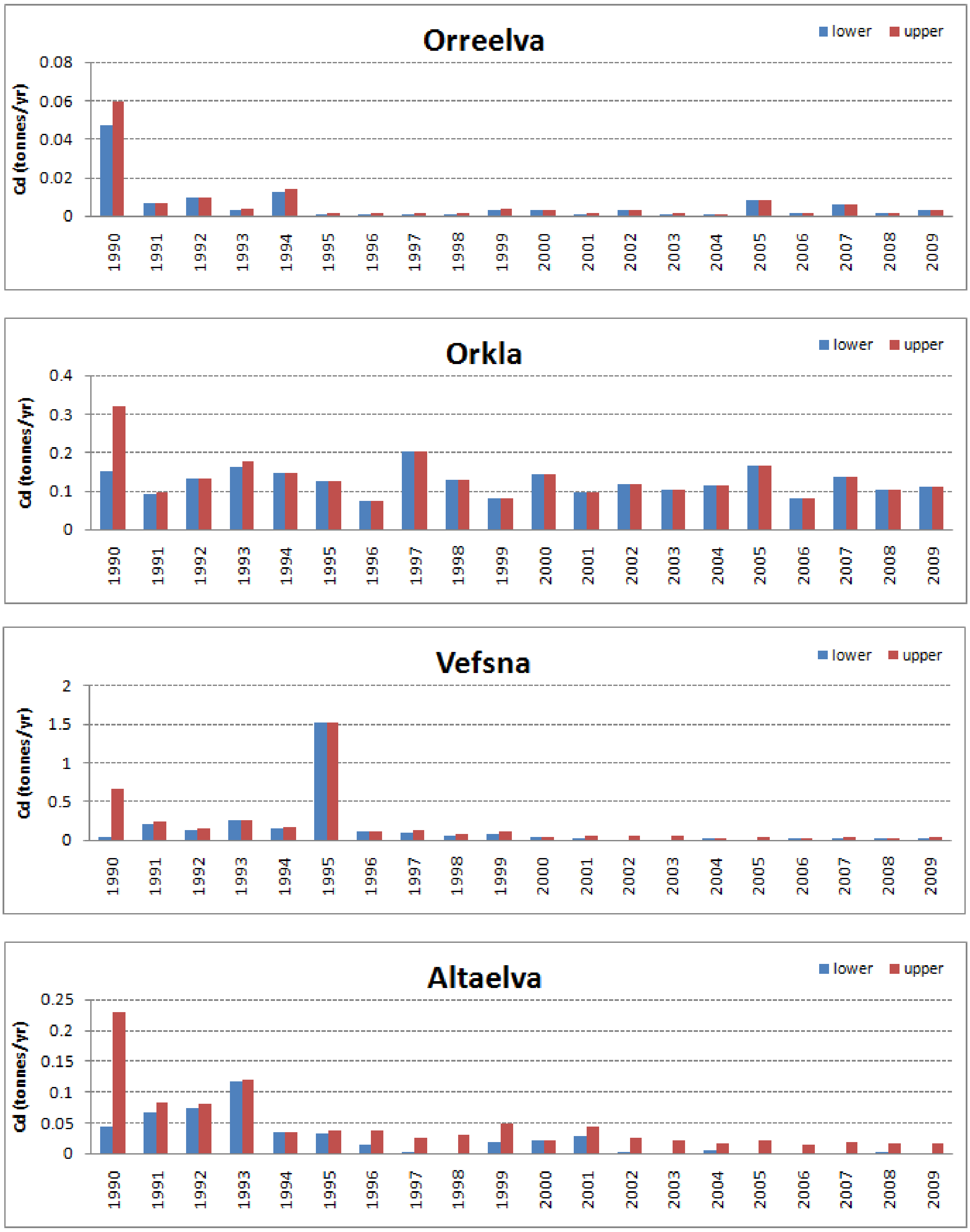


Figure A-VI-11b. Annual riverine loads (upper and lower estimates) of <u>Cadmium</u> in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

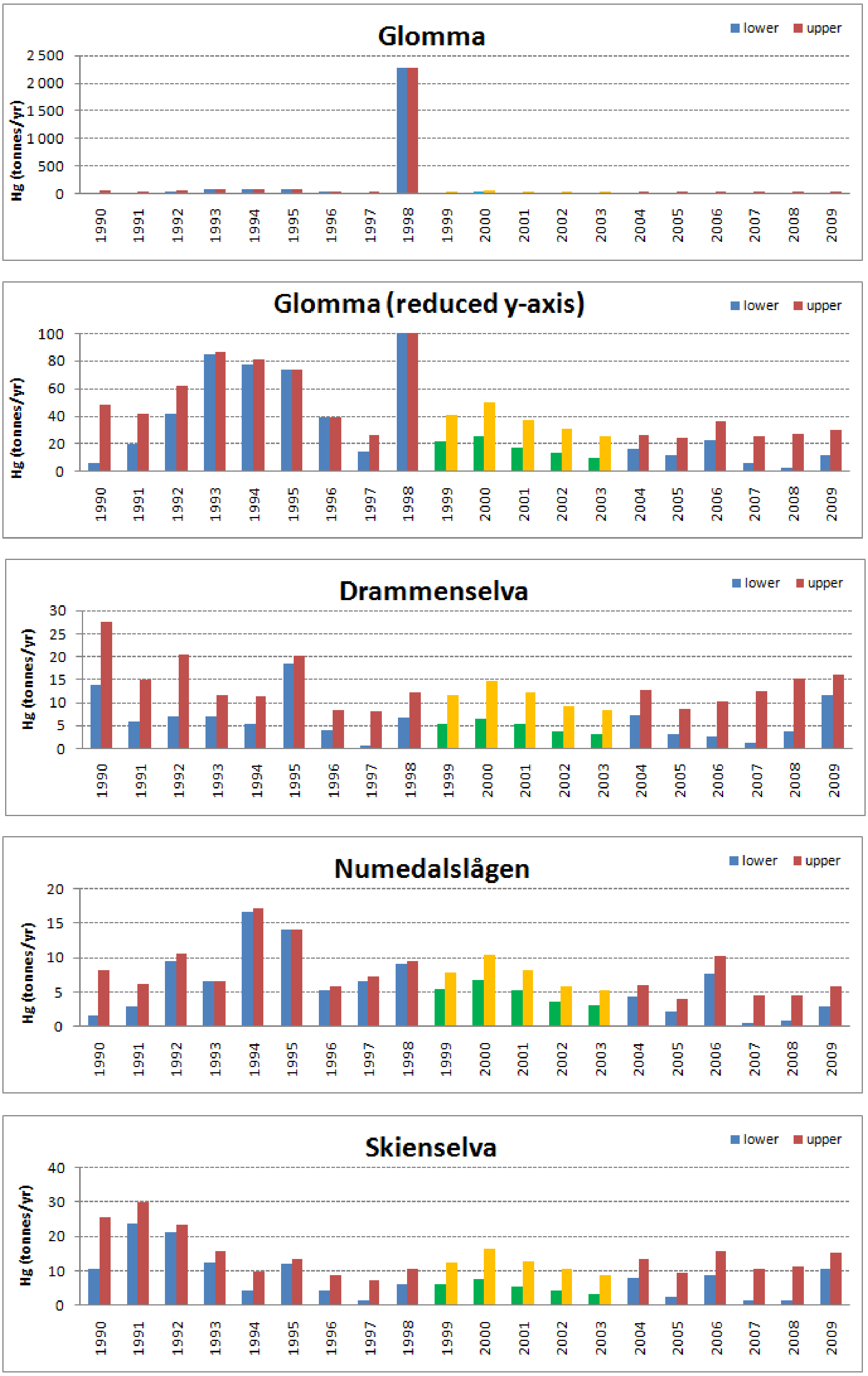


Figure A-VI-12a. Annual riverine loads (upper and lower estimates) of Mercury in four main Skagerrak rivers in Norway, 1990-2009. Years with interpolated upper and lower estimates are given in green (lower) and yellow (upper).

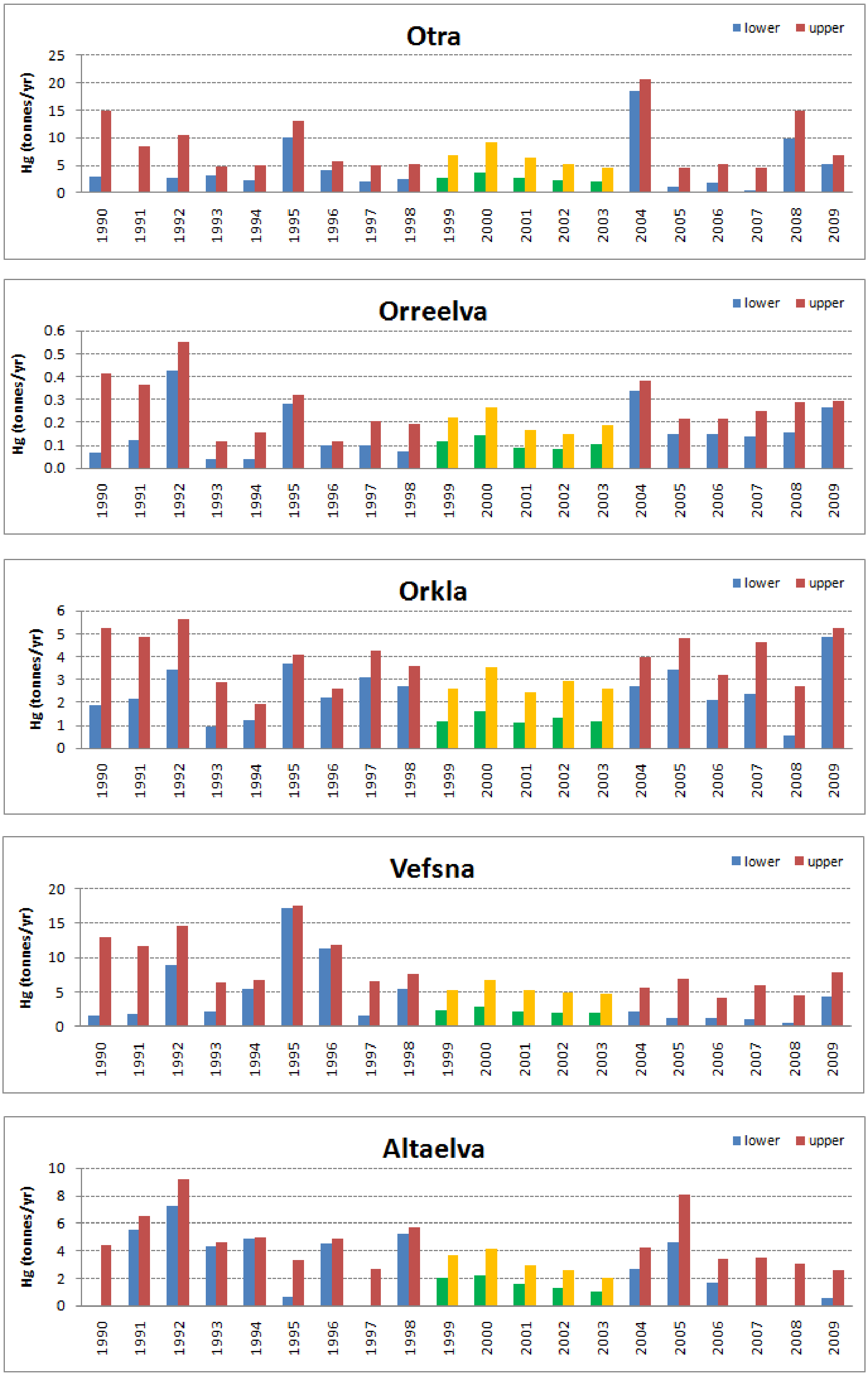


Figure A-VI-12b. Annual riverine loads (upper and lowe estimates) of Mercury in the in five main rivers to Skagerak, North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009. Years with interpolated upper and lower estimates are given in green (lower) and yellow (upper).

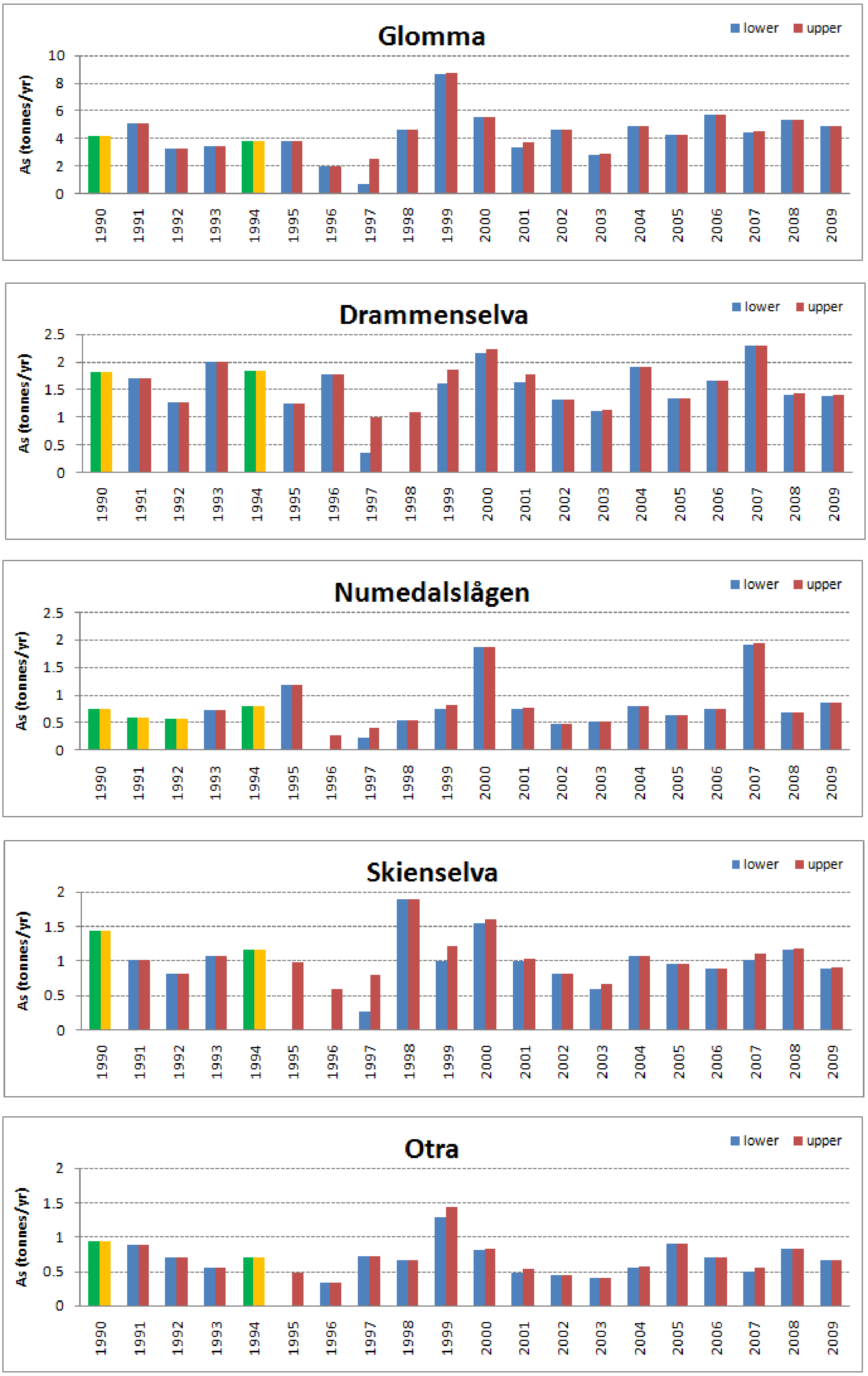


Figure A-VI-13a. Annual riverine loads (upper and lower estimates) of Arsenic in the five main Skagerrak rivers in Norway, 1990-2009. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

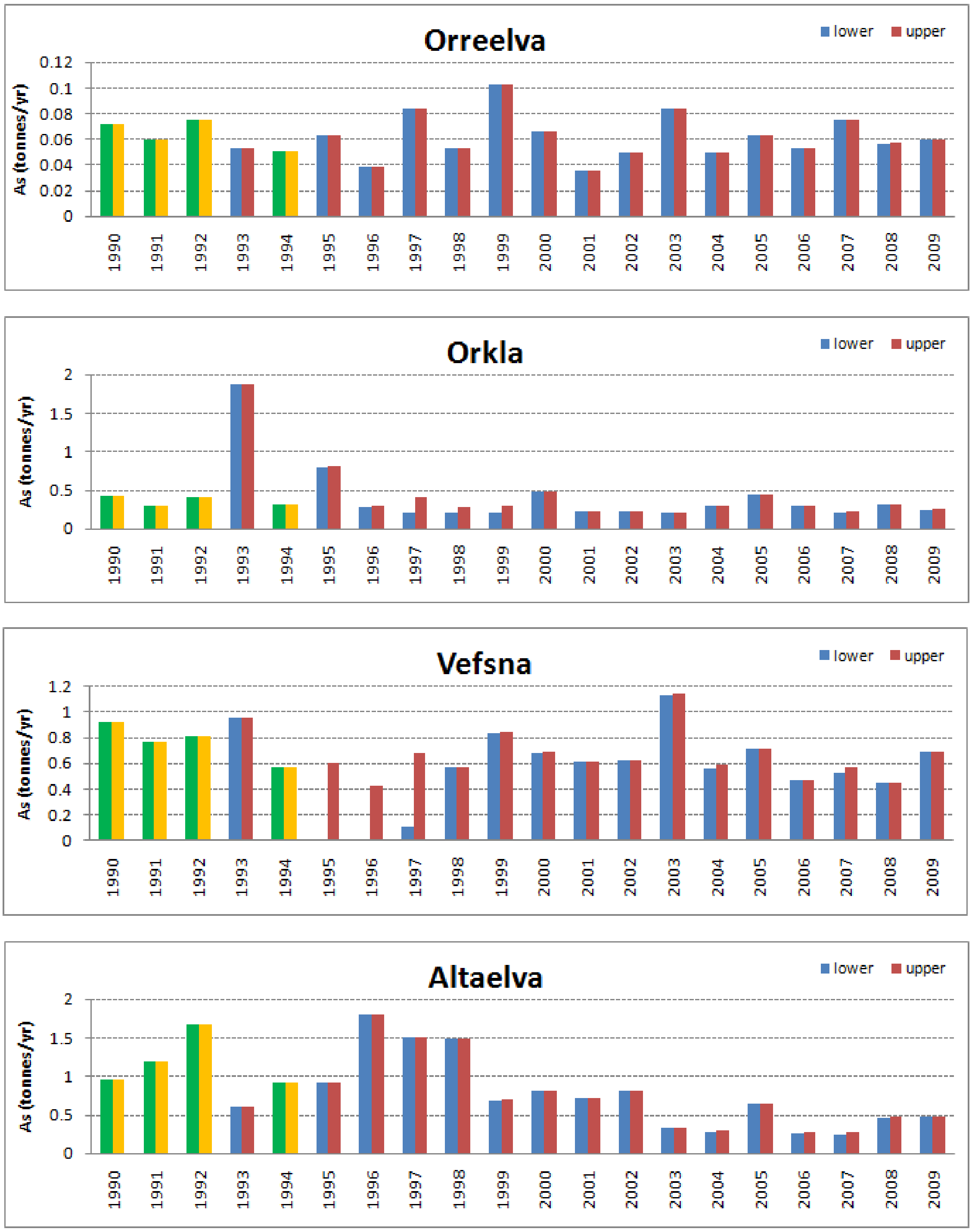


Figure A-VI-13b. Annual riverine loads (upper and lower estimates) of Arsenic in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009. *Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).*

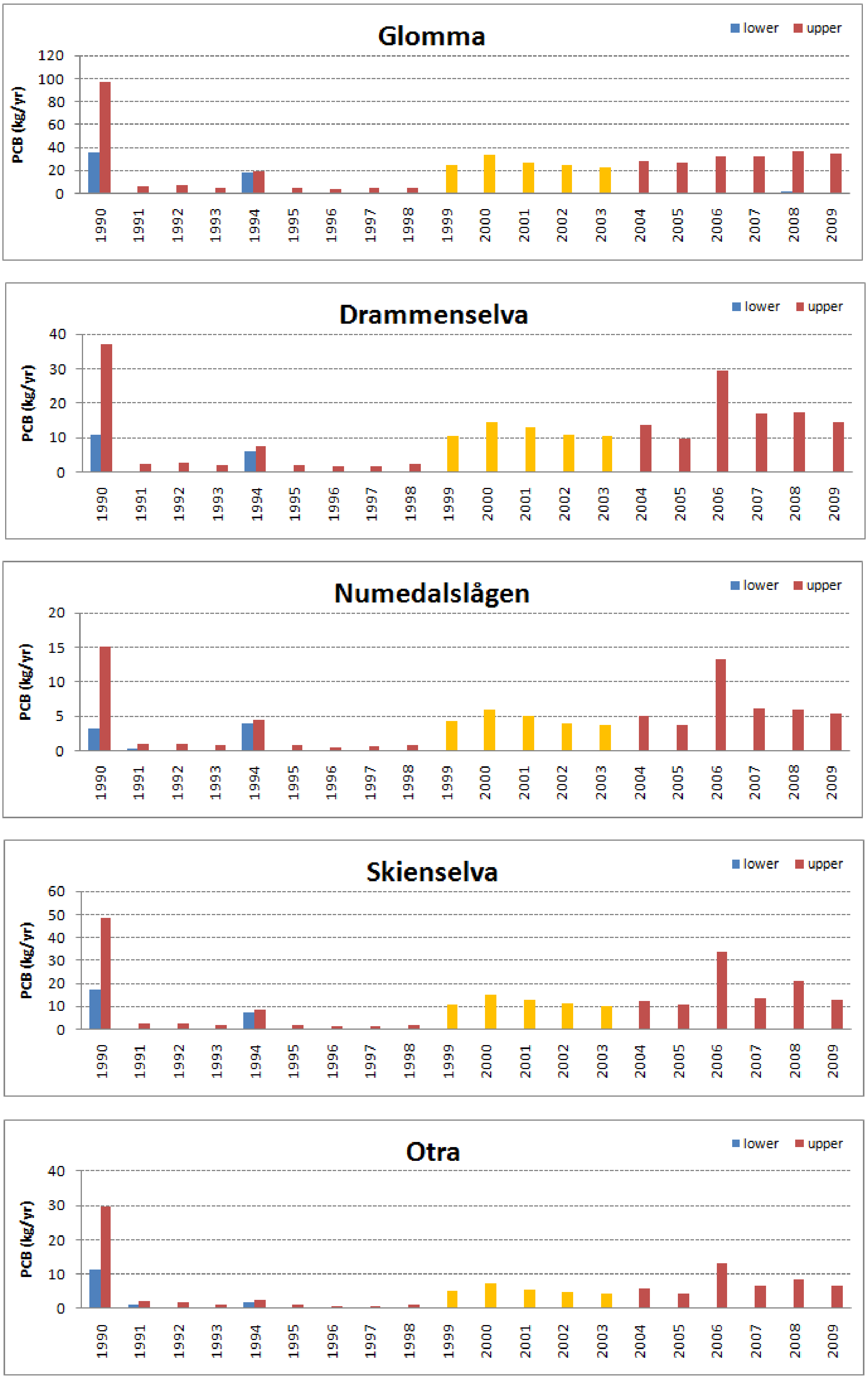


Figure A-VI-14a. Annual riverine loads (upper and lower estimates) of PCB in the five main Skagerrak rivers in Norway, 1990-2009. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

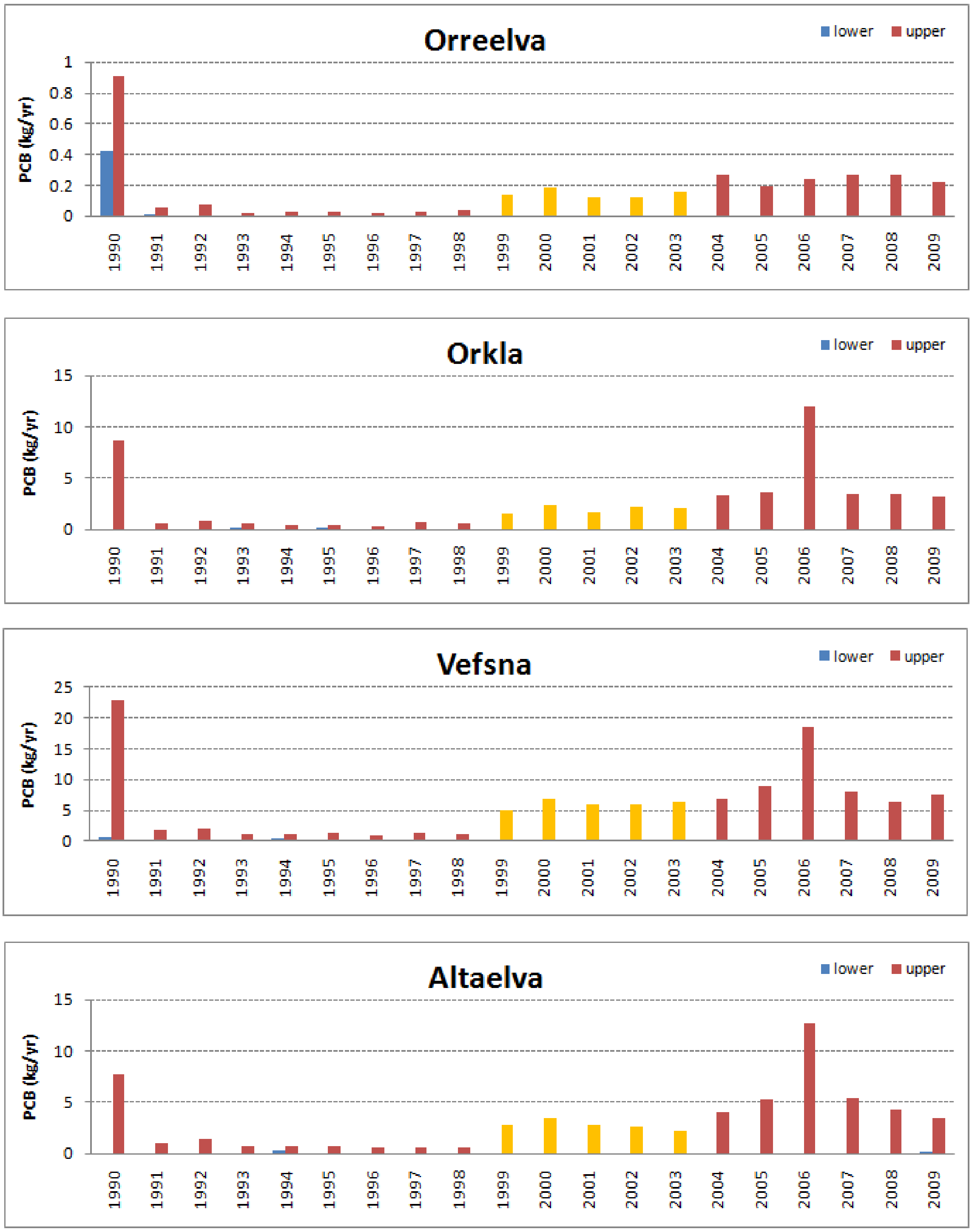


Figure A-VI-14b. Annual riverine loads (upper and lower estimates) of PCB in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

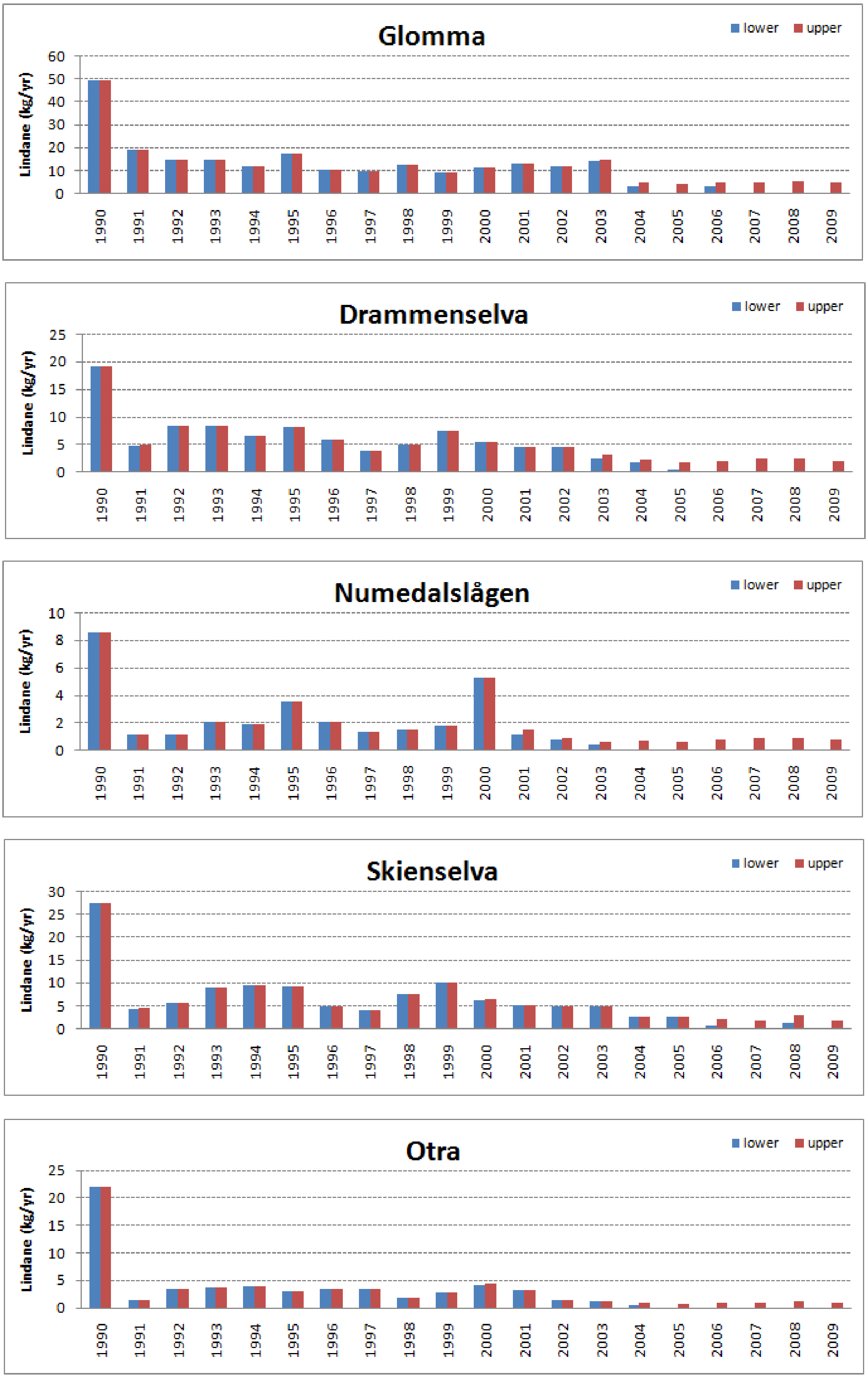


Figure A-VI-15a. Annual riverine loads (upper and lower estimates) of Lindane in the five main Skagerrak rivers in Norway, 1990-2009.

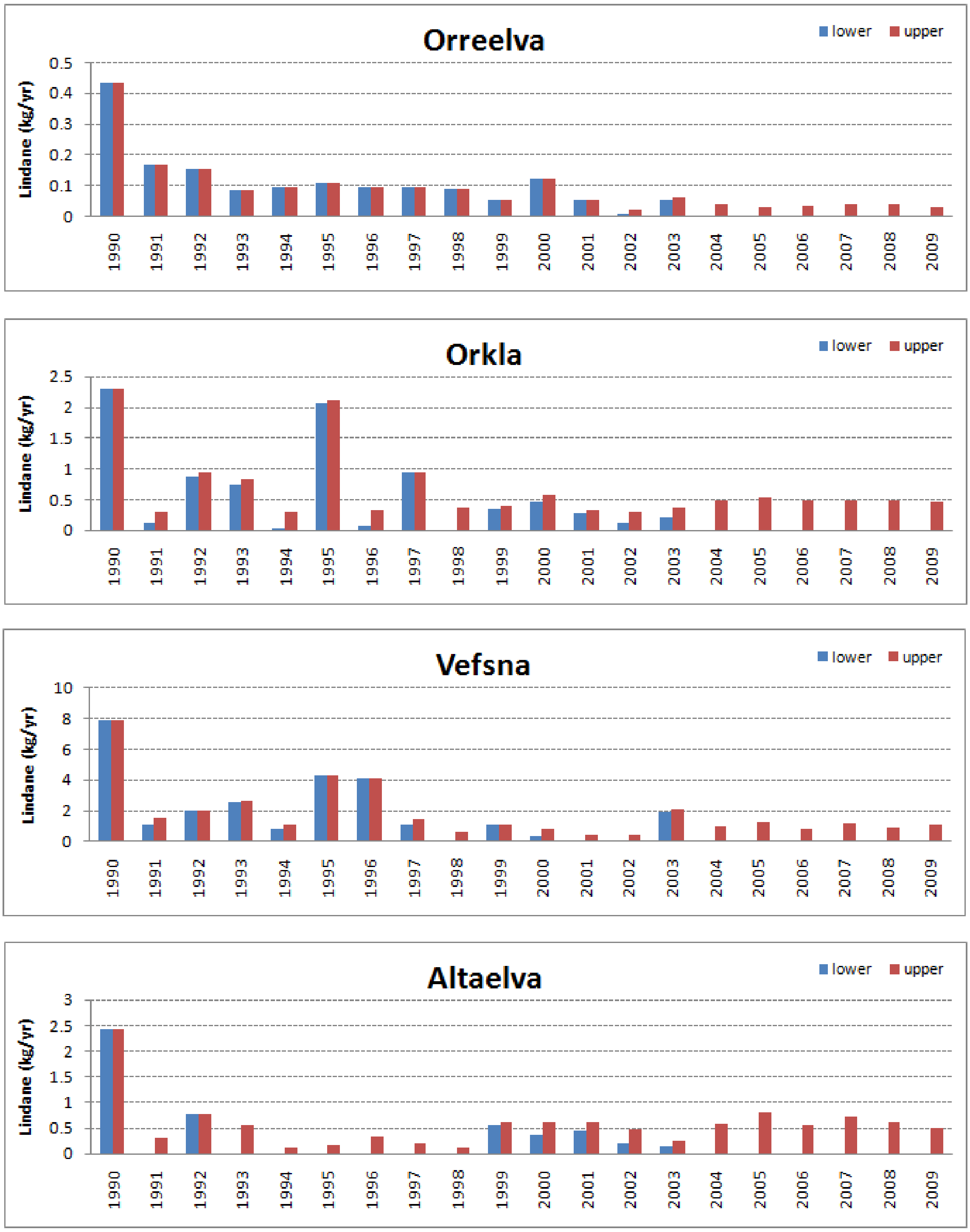


Figure A-VI-15b. Annual riverine loads (upper and lowe estimates) of Lindane in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2009.

Appendix VII. Overview of data that have been estimated

Explanation: x=estimated data.

River	Year	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Hg	Cr	Ni	HCHG	SUMPCB
		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	ng/l	µg/l	µg/l	ng/l	ng/l
Glomma ved Sarpsfoss	1990						x		x	x						x	x		
Glomma ved Sarpsfoss	1991						x		x								x		
Glomma ved Sarpsfoss	1992								x										
Glomma ved Sarpsfoss	1993								x										
Glomma ved Sarpsfoss	1994		x						x	x						x	x		
Glomma ved Sarpsfoss	1995																		
Glomma ved Sarpsfoss	1996																		
Glomma ved Sarpsfoss	1997																		
Glomma ved Sarpsfoss	1998																		
Glomma ved Sarpsfoss	1999				x										x				x
Glomma ved Sarpsfoss	2000				x										x				x
Glomma ved Sarpsfoss	2001				x										x				x
Glomma ved Sarpsfoss	2002				x										x				x
Glomma ved Sarpsfoss	2003				x										x				x
Glomma ved Sarpsfoss	2004																		
Glomma ved Sarpsfoss	2005																		
Glomma ved Sarpsfoss	2006																		
Glomma ved Sarpsfoss	2007																		
Glomma ved Sarpsfoss	2008																		
Glomma ved Sarpsfoss	2009																		
Drammenselva	1990		x				x		x	x						x	x		
Drammenselva	1991						x		x								x		
Drammenselva	1992								x										
Drammenselva	1993								x										
Drammenselva	1994								x	x						x	x		
Drammenselva	1995																		
Drammenselva	1996																		
Drammenselva	1997																		
Drammenselva	1998																		
Drammenselva	1999				x										x				x
Drammenselva	2000				x										x				x
Drammenselva	2001				x										x				x
Drammenselva	2002				x										x				x
Drammenselva	2003				x										x				x
Drammenselva	2004																		
Drammenselva	2005																		
Drammenselva	2006																		
Drammenselva	2007																		
Drammenselva	2008																		
Drammenselva	2009																		

River	Year	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Hg	Cr	Ni	HCHG	SUMPCB
		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	ng/l	µg/l	µg/l	ng/l	ng/l
Numedalslågen	1990		x				x		x	x						x	x		
Numedalslågen	1991						x		x	x						x	x		
Numedalslågen	1992								x	x									
Numedalslågen	1993								x										
Numedalslågen	1994		x						x	x						x	x		
Numedalslågen	1995																		
Numedalslågen	1996																		
Numedalslågen	1997																		
Numedalslågen	1998																		
Numedalslågen	1999				x										x				x
Numedalslågen	2000				x										x				x
Numedalslågen	2001				x										x				x
Numedalslågen	2002				x										x				x
Numedalslågen	2003				x										x				x
Numedalslågen	2004																		
Numedalslågen	2005																		
Numedalslågen	2006																		
Numedalslågen	2007																		
Numedalslågen	2008																		
Numedalslågen	2009																		
Skienselva	1990		x				x		x	x						x	x		
Skienselva	1991						x		x								x		
Skienselva	1992								x										
Skienselva	1993								x										
Skienselva	1994		x						x	x						x	x		
Skienselva	1995																		
Skienselva	1996																		
Skienselva	1997																		
Skienselva	1998																		
Skienselva	1999				x										x				x
Skienselva	2000				x										x				x
Skienselva	2001				x										x				x
Skienselva	2002				x										x				x
Skienselva	2003				x										x				x
Skienselva	2004																		
Skienselva	2005																		
Skienselva	2006																		
Skienselva	2007																		
Skienselva	2008																		
Skienselva	2009																		

River	Year	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Hg	Cr	Ni	HCHG	SUMPCB
		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	ng/l	µg/l	µg/l	ng/l	ng/l
Otra	1990		x				x		x	x						x	x		
Otra	1991						x		x								x		
Otra	1992								x										
Otra	1993								x										
Otra	1994								x	x						x	x		
Otra	1995																		
Otra	1996																		
Otra	1997																		
Otra	1998																		
Otra	1999				x										x				x
Otra	2000				x										x				x
Otra	2001				x										x				x
Otra	2002				x										x				x
Otra	2003				x										x				x
Otra	2004																		
Otra	2005																		
Otra	2006																		
Otra	2007																		
Otra	2008																		
Otra	2009																		
Orreelva	1990						x		x	x						x	x		
Orreelva	1991						x		x	x						x	x		
Orreelva	1992								x	x									
Orreelva	1993								x										
Orreelva	1994		x						x	x						x	x		
Orreelva	1995																		
Orreelva	1996																		
Orreelva	1997																		
Orreelva	1998																		
Orreelva	1999				x										x				x
Orreelva	2000				x										x				x
Orreelva	2001				x										x				x
Orreelva	2002				x										x				x
Orreelva	2003				x										x				x
Orreelva	2004																		
Orreelva	2005																		
Orreelva	2006																		
Orreelva	2007																		
Orreelva	2008																		
Orreelva	2009																		

River	Year	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Hg	Cr	Ni	HCHG	SUMPCB
		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	ng/l	µg/l	µg/l	ng/l	ng/l
Orkla	1990						x		x	x						x	x		
Orkla	1991						x		x	x						x	x		
Orkla	1992								x	x									
Orkla	1993								x										
Orkla	1994								x	x						x	x		
Orkla	1995																		
Orkla	1996																		
Orkla	1997																		
Orkla	1998																		
Orkla	1999				x										x				x
Orkla	2000				x										x				x
Orkla	2001				x										x				x
Orkla	2002				x										x				x
Orkla	2003				x										x				x
Orkla	2004																		
Orkla	2005																		
Orkla	2006																		
Orkla	2007																		
Orkla	2008																		
Orkla	2009																		
Vefsna	1990		x				x		x	x						x	x		
Vefsna	1991						x		x	x						x	x		
Vefsna	1992								x	x									
Vefsna	1993								x										
Vefsna	1994		x						x	x						x	x		
Vefsna	1995																		
Vefsna	1996																		
Vefsna	1997																		
Vefsna	1998																		
Vefsna	1999				x										x				x
Vefsna	2000				x										x				x
Vefsna	2001				x										x				x
Vefsna	2002				x										x				x
Vefsna	2003				x										x				x
Vefsna	2004																		
Vefsna	2005																		
Vefsna	2006																		
Vefsna	2007																		
Vefsna	2008																		
Vefsna	2009																		

River	Year	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Hg	Cr	Ni	HCHG	SUMPCB
		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	ng/l	µg/l	µg/l	ng/l	ng/l
Altaelva	1990		x				x		x	x						x	x		
Altaelva	1991						x		x	x						x	x		
Altaelva	1992								x	x									
Altaelva	1993								x										
Altaelva	1994		x						x	x						x	x		
Altaelva	1995																		
Altaelva	1996																		
Altaelva	1997																		
Altaelva	1998																		
Altaelva	1999				x										x				x
Altaelva	2000				x										x				x
Altaelva	2001				x										x				x
Altaelva	2002				x										x				x
Altaelva	2003				x										x				x
Altaelva	2004																		
Altaelva	2005																		
Altaelva	2006																		
Altaelva	2007																		
Altaelva	2008																		
Altaelva	2009																		

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Study undertaken by	Klif contact person	ISBN-number
NIVA, Bioforsk, NVE	Christine Daae Olseng	978-82-577-5788-5

	Klif Department	TA-number
	Section for Environmental Data	2726/2010 SPFO 1081/2010

Project responsible	Year	No. of pages	Contract number - Klif
Øyvind Kaste, NIVA	2010	75 + Appendices and Addendum	

Publisher	Project financed by
Norwegian Institute for Water Research. NIVA-Report 6053-2010	Climate and Pollution Agency (Klif)

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Title – English and Norwegian
Riverine inputs and direct discharges to Norwegian coastal waters – 2009 Elvetilførsler og direkte tilførsler til norske kystområder – 2009
Summary
Riverine inputs and direct discharges to Norwegian seas in 2009 have been estimated in accordance with the requirements of the OSPAR Commission. Due to the general lower water discharges in 2009 than in 2008, there was a reduction in all nutrient fractions in riverine loads in 2009. Long-term (1990-2009) trends show that nutrient loads have decreased in some Norwegian rivers, although nitrogen *concentrations* have increased in others. Direct discharges of nutrients from fish farming continue to increase. The riverine loads of all metals except mercury were lower in 2009 than in 2008. The copper discharges from fish farming continue to increase. Analyses of long term trends (1990-2009) in metal inputs showed that zinc and copper loads have been reduced in several rivers. Inputs of PCBs and the pesticide lindane in 2009 were insignificant.

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

Addendum

Data from the 2009 RID Programme

Table 1.
Raw data and summary statistics for the 10 main and 36 tributary rivers in Norway in 2009.

Glomma ved Sarpsfossen

Date DD.MM.YYYY	Qs [m3/s]	pH []	KOND [mS/m]	SPM [mg/l]	TOC [mg/l C]	PO4-P [µg/l P]	TOTP [µg/l P]	NO3-N [µg/l N]	NH4-N [µg/l N]	TOTN [µg/l N]	SiO2 [mg/l SiO2]	As [µg/l]	Pb [µg/l]	Cd [µg/l]	Cu [µg/l]	Zn [µg/l]	Ni [µg/l]	Cr [µg/l]	Hg [ng/l]	HCHG [ng/l]	SUMPCB [ng/l]
05.01.2009	417	7.10	5.06	3.44	3.90	4	8	415	20	595	3.91	0.21	0.15	0.01	1.26	3.04	0.75	0.60	<1.00		
20.01.2009	417				3.20		6	335		585											
09.02.2009	417	7.17	4.90	1.35	3.30	3	7	335	43	545	3.79	0.20	0.10	0.01	1.07	3.44	0.53	0.20	<1.00	<0.20	1.40
16.02.2009	417				3.10		6	335		530											
09.03.2009	386	6.97	5.33	1.85	3.00	4	8	360	51	485	3.85	0.10	0.10	0.01	1.00	15.30	0.53	<0.10	1.00		
16.03.2009	344				3.10		8	345		560											
06.04.2009	438	7.08	5.81	25.70	4.00	13	26	515	52	745	4.86	0.24	0.53	0.01	1.67	4.84	1.20	0.40	<1.00		
14.04.2009	823				3.80		23	515		725											
04.05.2009	1537	6.91	3.98	11.20	6.30	11	21	225	27	540	4.69	0.22	0.33	0.02	2.05	5.82	0.87	0.50	<1.00	<0.20	1.40
11.05.2009	1407				5.40		15	175		455											
16.05.2009	1042	7.14	3.64	4.33	4.40	5	10	200	8	425	3.72	0.25	0.26	0.02	2.58	4.44	0.65	0.20	<1.00		
25.05.2009	964	7.22	4.08	3.81	3.40	2	9	225	7	395	3.08	0.10	0.13	0.01	1.82	2.46	0.54	0.20	<1.00		
08.06.2009	834	7.26	3.98	2.96	3.10	2	9	180	5	380	3.00	0.09	0.10	0.01	2.03	2.31	0.80	0.75	<1.00		
18.06.2009	782	6.89	4.16	2.65	2.70	3	7	200	5	370	2.76	0.10	0.11	0.01	1.60	1.90	0.48	0.49	<1.00		
29.06.2009	808	7.23	4.34	3.22	2.50	5	21	190	12	360	2.65	0.10	0.11	<0.01	1.25	2.07	0.40	0.20	<1.00		
06.07.2009	886	7.39	4.41	6.28	2.40	4	12	205	14	380	2.65	0.10	0.13	0.01	1.28	1.80	0.41	0.30	<1.00		
10.08.2009	1381	7.22	4.17	4.52	4.60	5	13	245	5	475	3.55	0.22	0.27	0.02	2.04	3.53	0.77	0.30	1.50	<0.20	1.40
07.09.2009	1536	7.17	4.48	8.73	5.10	11	21	290	7	580	3.89	0.21	0.32	0.01	1.70	3.46	0.76	0.20	<1.00		
05.10.2009	600	7.23	4.42	2.10	3.70	1	8	255	4	425	3.19	0.10	0.08	0.01	1.39	1.90	0.41	0.10	<1.00	<0.20	1.40
09.11.2009	520	7.02	5.07	4.86	4.30	5	12	415	15	630	4.17	0.29	0.19	0.01	1.99	5.91	0.76	0.35	<1.00		
07.12.2009	469	6.93	4.82	16.20	8.00	17	32	330	31	760	5.24	0.45	0.67	0.02	3.91	5.62	1.30	0.97	3.50		
Lower avg.	782	7.12	4.54	6.45	3.97	6	13	300	19	521	3.69	0.19	0.22	0.01	1.79	4.24	0.70	0.36	0.38	0.00	1.40
Upper avg..	782	7.12	4.54	6.45	3.97	6	13	300	19	521	3.69	0.19	0.22	0.01	1.79	4.24	0.70	0.37	1.19	0.20	1.40
Minimum	344	6.89	3.64	1.35	2.40	1	6	175	4	360	2.65	0.09	0.08	0.01	1.00	1.80	0.40	0.10	1.00	0.20	1.40
Maximum	1537	7.39	5.81	25.70	8.00	17	32	515	52	760	5.24	0.45	0.67	0.02	3.91	15.30	1.30	0.97	3.50	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	21	16	16	16	21	16	21	21	16	21	16	16	16	16	16	16	16	16	16	4	4
St.dev	400	0.14	0.58	6.45	1.35	5	8	104	17	124	0.79	0.10	0.17	0.01	0.71	3.28	0.27	0.24	0.63	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]
08.01.2009	312	6.89	3.88	0.77	2.80	2	9	245	8	435	2.87	0.10	0.05	0.01	0.74	2.00	0.32	0.31	<1.00		
04.02.2009	308	7.10	3.75	0.48	2.60	<1	4	230	7	410	2.72	0.10	0.05	0.01	0.69	2.40	0.36	<0.10	<1.00	<0.20	1.40
04.03.2009	254	7.05	4.34	0.80	2.60	<1	5	275	23	440	2.76	0.10	0.06	0.01	0.44	2.31	0.32	0.10	<1.00		
01.04.2009	234	7.16	4.43	3.30	2.60	2	6	275	13	465	2.87	0.10	0.10	0.01	0.79	2.63	0.48	<0.10	1.50		
06.05.2009	619	6.97	3.41	1.90	3.20	2	6	235	9	400	2.82	0.10	0.12	0.01	0.63	2.67	0.42	<0.10	<1.00	<0.20	1.40
18.05.2009	372	7.17	3.72	1.40	3.10	2	7	240	10	405	2.70	0.20	0.20	0.01	0.73	2.60	0.42	<0.10	<1.00		
27.05.2009	421	7.14	3.84	2.46	3.30	2	9	250	11	420	2.76	<0.05	0.16	0.01	0.76	2.45	0.38	0.36	2.00		
04.06.2009	345	7.25	3.55	1.56	3.30	<1	6	185	5	400	2.59	<0.05	0.07	0.01	0.81	1.70	0.41	0.93	<1.00		
16.06.2009	202	6.81	3.47	1.62	3.40	3	6	150	10	365	2.50	0.10	0.07	0.01	1.22	2.82	0.47	0.85	<1.00		
23.06.2009	194	7.00	3.51	1.53	3.30	2	11	165	8	360	2.44	0.20	0.09	0.01	1.69	4.98	0.41	<0.10	1.00		
08.07.2009	233	7.20	3.15	1.44	3.10	<1	6	110	12	295	2.35	0.10	0.10	<0.01	0.67	1.10	0.34	<0.10	<1.00		
05.08.2009	667	6.94	3.29	3.81	4.50	2	11	190	5	395	2.74	0.20	0.19	0.01	0.88	2.56	0.46	0.20	2.00	<0.20	1.40
07.09.2009	556	7.20	3.68	1.39	4.20	4	6	200	9	410	2.82	0.10	0.33	0.01	1.26	2.82	0.38	0.20	2.00		
07.10.2009	141	7.19	3.55	1.25	3.60	<1	7	190	7	360	2.72	0.10	0.22	0.01	0.83	2.75	0.37	0.10	<1.00	<0.20	1.40
04.11.2009	320	7.18	4.77	4.56	4.30	5	9	470	15	730	3.72	0.20	0.23	0.01	1.10	4.36	0.56	0.36	2.50		
02.12.2009	327	6.98	4.23	1.22	3.60	2	5	250	2	510	3.23	0.20	0.10	0.01	0.93	4.02	0.50	0.65	2.00		
Lower avg.	344	7.08	3.79	1.84	3.34	2	7	229	10	425	2.79	0.12	0.13	0.01	0.88	2.76	0.41	0.25	0.81	0.00	1.40
Upper avg..	344	7.08	3.79	1.84	3.34	2	7	229	10	425	2.79	0.13	0.13	0.01	0.88	2.76	0.41	0.29	1.38	0.20	1.40
Minimum	141	6.81	3.15	0.48	2.60	1	4	110	2	295	2.35	0.05	0.05	0.01	0.44	1.10	0.32	0.10	1.00	0.20	1.40
Maximum	667	7.25	4.77	4.56	4.50	5	11	470	23	730	3.72	0.20	0.33	0.01	1.69	4.98	0.56	0.93	2.50	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	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	4
St.dev	153	0.13	0.45	1.14	0.59	1	2	79	5	95	0.32	0.06	0.08	0.00	0.30	0.97	0.07	0.28	0.53	0.00	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]
12.01.2009	131	6.72	2.70	2.58	2.10	2	12	140	41	335	2.82	0.20	0.19	0.01	0.69	3.17	0.31	<0.10	<1.00		
02.02.2009	86	6.69	3.09	0.95	2.10	2	5	195	42	370	3.02	0.10	0.10	0.01	0.46	2.79	0.28	0.10	1.00		
03.03.2009	50	6.71	4.80	3.95	2.00	2	9	410	88	640	4.02	0.20	0.29	0.01	0.45	4.33	0.32	0.10	3.00		
02.04.2009	79	6.86	5.14	13.30	3.20	8	15	360	46	630	4.36	0.21	0.44	0.02	1.00	5.69	0.37	0.20	<1.00	<0.20	1.40
07.05.2009	137	6.81	2.51	7.96	3.90	7	13	155	19	355	3.21	0.20	0.37	0.02	0.65	4.31	0.40	0.20	<1.00	<0.20	1.40
02.06.2009	88	6.95	2.55	1.92	4.00	1	7	110	12	315	2.87	0.09	0.62	0.03	3.95	14.00	0.83	0.30	<1.00		
07.07.2009	74	7.00	2.51	1.15	2.10	<1	5	65	21	210	2.22	0.20	0.11	0.01	1.54	1.40	0.33	<0.10	<1.00		
11.08.2009	119	6.93	2.79	1.59	6.90	2	8	110	16	355	3.25	0.22	0.29	0.02	0.93	4.20	0.39	0.20	<1.00	<0.20	1.40
07.09.2009	159	6.87	3.27	4.43	8.40	4	14	165	3	455	3.87	0.28	0.45	0.03	2.04	6.37	0.50	0.20	<1.00		
06.10.2009	55	7.08	3.21	1.82	3.40	<1	6	140	29	340	3.19	0.20	0.10	0.01	0.63	2.23	0.29	0.10	<1.00	<0.20	1.40
04.11.2009	256	6.88	3.54	17.20	5.80	17	28	335	22	630	5.16	0.29	0.64	0.03	0.90	7.16	0.65	0.47	<1.00		
07.12.2009	149	6.81	4.20	14.90	4.60	20	29	315	22	655	5.05	0.24	0.53	0.03	0.98	5.67	0.49	0.32	4.00		
Lower avg.	115	6.86	3.36	5.98	4.04	5	13	208	30	441	3.59	0.20	0.34	0.02	1.18	5.11	0.43	0.18	0.67	0.00	1.40
Upper avg..	115	6.86	3.36	5.98	4.04	6	13	208	30	441	3.59	0.20	0.34	0.02	1.18	5.11	0.43	0.20	1.42	0.20	1.40
Minimum	50	6.69	2.51	0.95	2.00	1	5	65	3	210	2.23	0.09	0.10	0.01	0.45	1.40	0.28	0.10	1.00	0.20	1.40
Maximum	256	7.08	5.14	17.20	8.40	20	29	410	88	655	5.16	0.29	0.64	0.03	3.95	14.00	0.83	0.47	4.00	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	57	0.12	0.90	5.90	2.07	6	8	115	22	156	0.91	0.06	0.20	0.01	0.98	3.29	0.17	0.12	1.00	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]
14.01.2009	250	6.51	2.02	0.45	2.50	3	4	170	10	300	2.31	0.10	0.03	0.01	0.43	2.11	0.20	<0.10	<1.00		
09.02.2009	266	6.61	1.88	0.84	2.70	2	3	155	19	450	2.14	0.10	0.09	0.01	0.65	2.66	0.21	<0.10	<1.00	<0.20	1.40
06.03.2009	289	6.66	1.98	0.37	2.10	2	4	160	3	230	2.12	0.08	0.03	0.01	0.18	1.80	0.20	<0.10	4.50		
14.04.2009	533	6.76	2.14	1.42	2.40	2	4	180	9	315	2.31	0.09	0.04	0.01	0.49	2.49	0.20	<0.10	1.50		
04.05.2009	405	6.69	1.98	0.81	2.10	1	5	150	7	270	2.42	0.10	0.17	0.02	0.50	3.12	0.22	0.20	<1.00	<0.20	1.40
02.06.2009	189	6.85	1.99	0.54	2.20	<1	7	145	8	290	2.06	<0.05	0.05	0.01	0.63	1.80	0.20	<0.10	<1.00		
07.07.2009	93	6.81	2.54	3.00	2.80	10	79	120	33	500	2.06	0.09	0.07	0.01	1.34	2.41	0.32	<0.10	5.50		
06.08.2009	479	6.78	1.82	1.07	2.40	<1	3	110	7	245	1.95	0.09	0.08	0.02	0.47	1.90	0.52	0.10	1.00	<0.20	1.40
02.09.2009	237	6.89	2.05	9.63	3.30	7	9	105	14	260	2.18	0.20	0.15	0.01	0.56	2.83	0.21	<0.10	1.50		
02.10.2009	125	6.74	1.92	0.51	3.10	<1	5	105	16	270	1.97	0.10	0.06	0.01	0.48	2.13	0.28	<0.10	3.50	<0.20	1.40
02.11.2009	244	6.92	2.13	0.79	3.00	2	5	125	20	285	2.11	0.10	0.10	0.01	0.65	2.69	0.29	0.10	<1.00		
10.12.2009	305	6.68	2.13	1.14	2.70	2	2	185	9	295	2.40	0.10	0.20	0.01	0.51	2.62	0.33	0.10	<1.00		
Lower avg.	285	6.74	2.05	1.71	2.61	3	11	143	13	309	2.17	0.10	0.09	0.01	0.57	2.38	0.27	0.04	1.46	0.00	1.40
Upper avg..	285	6.74	2.05	1.71	2.61	3	11	143	13	309	2.17	0.10	0.09	0.01	0.57	2.38	0.27	0.11	1.96	0.20	1.40
Minimum	93	6.51	1.82	0.37	2.10	1	2	105	3	230	1.95	0.05	0.03	0.01	0.18	1.80	0.20	0.10	1.00	0.20	1.40
Maximum	533	6.92	2.54	9.63	3.30	10	79	185	33	500	2.42	0.20	0.20	0.02	1.34	3.12	0.52	0.20	5.50	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	132	0.12	0.18	2.59	0.39	3	22	29	8	82	0.16	0.04	0.06	0.00	0.27	0.43	0.09	0.03	1.60	0.00	0.00

Otra

Date DD.MM.YYYY	Qs [m3/s]	pH []	KOND [mS/m]	SPM [mg/l]	TOC [mg/l C]	PO4-P [µg/l P]	TOTP [µg/l P]	NO3-N [µg/l N]	NH4-N [µg/l N]	TOTN [µg/l N]	SiO2 [mg/l SiO2]	As [µg/l]	Pb [µg/l]	Cd [µg/l]	Cu [µg/l]	Zn [µg/l]	Ni [µg/l]	Cr [µg/l]	Hg [ng/l]	HCHG [ng/l]	SUMPCB [ng/l]
13.01.2009	141	6.20	1.77	0.60	2.20	<1	3	105	16	225	1.80	0.10	0.20	0.02	0.95	4.17	0.40	0.10	<1.00		
09.02.2009	124	6.06	1.49	0.64	1.80	<1	2	84	11	200	1.62	0.10	0.16	0.02	0.60	2.67	0.29	<0.10	<1.00	<0.20	1.40
05.03.2009	186	6.24	1.81	0.65	1.90	<1	3	110	16	230	1.70	0.10	0.18	0.02	1.61	3.37	0.34	<0.10	1.50		
07.04.2009	232	6.18	1.79	1.06	2.40	1	4	110	10	230	1.66	0.10	0.22	0.02	2.10	3.88	0.46	<0.10	1.00		
06.05.2009	121	6.20	1.35	0.70	1.80	1	2	75	3	180	1.35	0.10	0.37	0.02	0.38	4.49	0.58	0.10	<1.00	<0.20	1.40
02.06.2009	83	6.37	1.50	1.58	1.90	<1	3	69	<2	190	1.01	0.05	0.24	0.02	2.02	5.76	0.57	0.10	3.00		
08.07.2009	122	6.33	1.25	1.01	1.90	<1	3	54	<2	195	1.09	0.09	0.10	0.01	0.68	1.20	0.24	<0.10			
10.08.2009	116	6.15	1.31	0.64	3.10	<1	4	61	5	220	1.30	0.10	0.26	0.02	1.42	2.96	0.69	<0.10	2.00	<0.20	1.40
09.09.2009	114	5.96	1.55	1.13	3.90	1	5	63	12	245	1.48	0.22	0.31	0.03	1.35	3.60	0.48	0.20	2.00		
07.10.2009	120	6.33	1.58	1.12	3.10	1	4	76	4	220	1.57	0.20	0.29	0.02	1.47	3.61	0.41	0.20		<0.20	1.40
04.11.2009	254	6.10	1.77	1.74	3.90	2	5	86	19	270	1.96	0.20	0.43	0.03	0.96	4.15	0.46	0.20	1.50		
09.12.2009	242	6.07	2.12	0.86	3.20	1	5	110	31	270	1.84	0.20	0.38	0.03	2.29	6.25	0.61	0.10	<1.00		
Lower avg.	154	6.18	1.61	0.98	2.59	1	4	84	11	223	1.53	0.13	0.26	0.02	1.32	3.84	0.46	0.08	1.10	0.00	1.40
Upper avg..	154	6.18	1.61	0.98	2.59	1	4	84	11	223	1.53	0.13	0.26	0.02	1.32	3.84	0.46	0.12	1.50	0.20	1.40
Minimum	83	5.96	1.25	0.60	1.80	1	2	54	2	180	1.01	0.05	0.10	0.01	0.38	1.20	0.24	0.10	1.00	0.20	1.40
Maximum	254	6.37	2.12	1.74	3.90	2	5	110	31	270	1.96	0.22	0.43	0.03	2.29	6.25	0.69	0.20	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	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	10	4	4
St.dev	58	0.12	0.25	0.38	0.81	0	1	21	9	29	0.30	0.06	0.10	0.01	0.62	1.33	0.14	0.05	0.67	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]
12.01.2009	22	7.66	19.50	26.40	5.60	45	128	1100	11	2150	1.45	0.52	1.20	0.03	2.15	6.33	1.20	0.61	2.50		
02.02.2009	4	7.56	18.50	10.50	5.20	12	57	1350	6	1910	1.18	0.31	0.31	0.01	1.61	2.87	0.90	0.47	1.50		
02.03.2009	5	7.61	18.60	7.79	5.00	11	50	1350	3	2000	1.44	0.36	0.28	0.01	1.66	4.12	1.30	0.56	1.50		
14.04.2009	2	7.86	20.10	3.98	4.70	8	40	615	15	1700	0.11	0.10	0.07	0.01	1.23	1.20	0.63	<0.10	1.50	<0.20	1.40
11.05.2009	3	7.91	20.70	14.90	5.30	10	70	260	34	1070	0.79	0.36	0.49	0.02	1.51	3.30	0.97	0.10	<1.00	<0.20	1.40
08.06.2009	1	7.69	20.30	6.47	6.75	4	49	<1	7	940	0.13	0.10	0.08	0.01	1.38	1.10	0.80	0.43	1.00		
06.07.2009	0	8.51	22.10	3.12	6.50	4	36	<1	15	675	1.16	0.30	0.03	0.01	0.97	0.82	0.81	0.46	1.50		
03.08.2009	8	7.47	20.30	12.20	5.40	8	72	19	<2	1200	3.79	0.30	0.08	0.01	1.08	0.89	0.53	0.30	1.50	<0.20	1.40
07.09.2009	7	7.78	20.07	7.95	5.10	13	67	<1	<2	785	3.70	0.26	0.25	0.01	2.78	4.33	0.83	0.10	<1.00		
05.10.2009	17	7.79	20.60	16.30	5.10	7	120	32	<2	1005	3.00	0.37	0.33	0.02	1.32	2.42	0.73	0.81	1.50		
02.11.2009	2	7.83	19.80	12.50	5.00	20	80	215	3	1030	2.97	0.25	0.60	0.01	2.62	6.37	1.10	0.47	<1.00		
07.12.2009	11	7.56	18.10	6.19	5.30	28	72	1050	54	1650	5.03	0.40	0.24	0.02	1.62	3.45	0.75	0.20	2.50		
Lower avg.	7	7.77	19.89	10.69	5.41	14	70	499	12	1343	2.06	0.30	0.33	0.01	1.66	3.10	0.88	0.38	1.25	0.00	1.40
Upper avg..	7	7.77	19.89	10.69	5.41	14	70	500	13	1343	2.06	0.30	0.33	0.01	1.66	3.10	0.88	0.38	1.50	0.20	1.40
Minimum	0	7.47	18.10	3.12	4.70	4	36	1	2	675	0.11	0.10	0.03	0.01	0.97	0.82	0.53	0.10	1.00	0.20	1.40
Maximum	22	8.51	22.10	26.40	6.75	45	128	1350	54	2150	5.03	0.52	1.20	0.03	2.78	6.37	1.30	0.81	2.50	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	yes	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	3	3
St.dev	7	0.27	1.10	6.45	0.61	12	29	561	16	509	1.59	0.12	0.32	0.01	0.58	1.96	0.23	0.23	0.52	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]
12.01.2009	281	6.40	1.72	0.70	0.97	2	9	110	7	185									<1.00		
02.02.2009	11	6.48	1.87	0.57	1.00	1	4	125	11	210	1.13	0.07	0.06	0.01	0.40	2.38	0.45	0.20	2.50		
02.03.2009	16	6.41	1.64	0.35	0.75	<1	2	110	14	185	0.90	0.10	0.04	0.01	0.08	2.27	0.30	<0.10	<1.00		
14.04.2009	134	6.55	1.91	0.39	1.10	<1	3	150	8	230	1.13	0.05	0.03	<0.01	0.38	1.50	0.37	<0.10	<1.00	<0.20	1.40
04.05.2009	260	6.52	1.94	0.63	1.30	<1	5	175	33	300	1.26	0.05	0.05	0.01	0.33	1.50	0.34	<0.10	<1.00	<0.20	1.40
22.06.2009	143	6.45	1.17	0.48	0.79	<1	2	66	<2	134	0.79	0.05	0.03	0.01	0.35	0.86	0.20	0.36	<1.00		
06.07.2009	178	6.79	1.00	0.58	0.57	<1	3	41	2	101	0.64	<0.05	0.09	0.01	0.45	1.70	0.20	0.10	<1.00		
03.08.2009	82	6.59	0.88	0.43	0.64	<1	3	35	3	105	0.58	<0.05	0.08	0.01	0.84	2.69	0.27	0.20	<1.00	<0.20	1.40
07.09.2009	85	6.58	1.08	1.09	1.50	1	6	59	6	160	0.92	0.09	0.10	0.01	0.36	1.30	0.26	0.10	2.50		
05.10.2009	82	6.57	1.29	0.75	1.40	<1	4	78	6	160	1.05	0.10	0.07	0.01	0.40	1.20	0.28	0.10	1.50	<0.20	1.40
02.11.2009	14	6.37	1.42	1.56	1.10	1	4	90	6	175	0.94	0.07	0.10	0.01	0.69	1.20	0.32	0.10	2.00		
07.12.2009	19	6.46	1.57	0.68	1.50	2	5	59	11	230	1.18	0.09	0.06	0.01	0.40	5.74	0.34	0.20	1.50		
Lower avg.	109	6.51	1.46	0.68	1.05	1	4	92	9	181	0.96	0.06	0.06	0.01	0.42	2.03	0.30	0.12	0.83	0.00	1.40
Upper avg..	109	6.51	1.46	0.68	1.05	1	4	92	9	181	0.96	0.07	0.06	0.01	0.42	2.03	0.30	0.15	1.42	0.20	1.40
Minimum	11	6.37	0.88	0.35	0.57	1	2	35	2	101	0.58	0.05	0.03	0.01	0.08	0.86	0.20	0.10	1.00	0.20	1.40
Maximum	281	6.79	1.94	1.56	1.50	2	9	175	33	300	1.26	0.10	0.10	0.01	0.84	5.74	0.45	0.36	2.50	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	11	11	11	11	11	11	11	11	12	4	4
St.dev	94	0.11	0.37	0.34	0.33	0	2	44	8	57	0.22	0.02	0.03	0.00	0.20	1.35	0.07	0.08	0.60	0.00	0.00

Orkla

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]
08.01.2009	31	7.29	6.41	0.94	1.90	2	4	165	11	305	3.00	0.10	0.04	0.08	10.70	26.00	0.51	0.38	<1.00		
04.02.2009	28	7.51	6.65	0.96	1.80	<1	4	150	14	305	3.10	0.09	0.03	0.05	6.17	14.60	0.66	0.20	1.00	<0.20	1.40
04.03.2009	23	7.63	7.36	0.71	1.60	<1	3	205	12	355	3.29	0.10	0.01	0.05	6.00	14.30	0.80	<0.10	<1.00		
15.04.2009	100	7.32	6.30	3.16	5.30	2	8	315	4	525	3.19	0.20	0.06	0.10	14.20	33.60	0.95	0.20	2.00		
07.05.2009	229	7.30	4.58	1.26	3.50	<1	4	125	3	290	2.72	0.08	0.04	0.03	6.78	9.80	0.85	0.30	2.00	<0.20	1.40
04.06.2009	157	7.39	4.75	1.14	4.20	<1	7	115	<2	310	2.08	<0.05	0.03	0.04	5.24	8.54	0.70	1.30	1.50		
06.07.2009	49	7.54	4.97	0.68	1.80	<1	4	120	2	225	2.02	0.09	0.01	0.03	4.39	9.14	0.49	0.20	9.50		
05.08.2009	58	7.53	5.74	2.17	2.30	1	5	105	<2	235	2.67	0.10	0.04	0.04	5.83	11.40	0.66	0.20	2.50	<0.20	1.40
08.09.2009	71	7.49	5.96	0.65	5.20	2	4	115	<2	305	2.91	0.10	0.02	0.04	6.87	14.50	0.83	0.20	2.00		
08.10.2009	78	7.43	6.14	1.28	4.60	1	4	170	<2	335	2.91	0.20	0.05	0.09	12.50	30.20	0.81	0.46	2.50	<0.20	1.40
05.11.2009	50	7.45	5.94	1.28	2.20	<1	3	155	8	280	2.93	0.24	0.03	0.04	9.46	21.40	0.78	0.30	<1.00		
10.12.2009	29	7.51	6.14	0.63	1.80	<1	10	155	11	265	2.91	0.08	0.01	0.02	3.63	6.48	0.68	0.30	<1.00		
Lower avg.	75	7.45	5.91	1.24	3.02	1	5	158	5	311	2.81	0.12	0.03	0.05	7.65	16.66	0.73	0.34	1.92	0.00	1.40
Upper avg..	75	7.45	5.91	1.24	3.02	1	5	158	6	311	2.81	0.12	0.03	0.05	7.65	16.66	0.73	0.34	2.25	0.20	1.40
Minimum	23	7.29	4.58	0.63	1.60	1	3	105	2	225	2.02	0.05	0.01	0.02	3.63	6.48	0.49	0.10	1.00	0.20	1.40
Maximum	229	7.63	7.36	3.16	5.30	2	10	315	14	525	3.30	0.24	0.06	0.10	14.20	33.60	0.95	1.30	9.50	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	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	61	0.11	0.81	0.74	1.45	0	2	57	5	77	0.40	0.06	0.02	0.03	3.32	9.02	0.14	0.32	2.36	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]
09.01.2009	47	7.33	9.13	1.26	2.10	<1	3	120	5	265	2.04	0.10	0.04	<0.01	0.44	0.42	0.07	0.20	<1.00		
02.02.2009	43	7.69	9.25	0.59	1.50	<1	2	90	3	210	2.11	0.20	<0.01	<0.01	0.34	0.38	0.08	0.30	<1.00	<0.20	1.40
03.03.2009	32	7.75	9.66	0.10	1.20	<1	1	115	4	200	2.09	0.20	<0.01	<0.01	0.07	<0.05	<0.05	<0.10	<1.00		
03.04.2009	119	7.20	5.47	10.80	2.50	2	7	42	<2	134	1.20	0.20	0.26	0.01	0.92	2.32	0.46	0.20	2.00		
08.05.2009	317	7.46	4.85	1.41	1.90	<1	3	25	<2	118	1.33	0.20	0.06	<0.01	0.35	0.50	0.26	<0.10	<1.00	<0.20	1.40
05.06.2009	304	7.55	4.32	1.01	1.34	<1	<1	34	<2	106	1.18	0.06	0.02	<0.01	0.31	0.42	0.20	0.20	<1.00		
03.07.2009	258	7.25	2.68	1.24	0.68	<1	2	16	<2	82	0.73	0.10	0.04	<0.01	0.20	<0.05	0.10	<0.10			
17.08.2009	89	7.55	3.63	0.73	1.10	<1	2	11	<2	75	0.86	0.10	0.03	<0.01	0.31	0.35	0.10	0.58	<1.00	<0.20	1.40
04.09.2009	155	7.33	4.11	1.51	1.90	2	4	9	<2	107	1.13	0.20	0.07	0.01	0.28	0.51	0.20	0.10	1.50		
02.10.2009	260	7.66	6.12	3.57	2.20	<1	4	41	<2	144	1.67	0.10	0.10	0.01	0.56	0.90	0.33	0.30	1.50	<0.20	1.40
02.11.2009	71	7.61	6.18	0.31	1.30	<1	1	62	2	134	1.70	0.10	0.02	<0.01	0.32	0.23	0.09	0.20	<1.00		
03.12.2009	70	7.70	7.80	0.21	1.70	1	2	29	3	160	1.92	0.10	0.03	0.01	0.26	0.30	0.08	<0.10	6.00		
Lower avg.	147	7.51	6.10	1.90	1.62	0	3	50	1	145	1.50	0.14	0.06	0.00	0.36	0.53	0.16	0.17	1.00	0.00	1.40
Upper avg..	147	7.51	6.10	1.90	1.62	1	3	50	3	145	1.50	0.14	0.06	0.01	0.36	0.54	0.17	0.21	1.64	0.20	1.40
Minimum	32	7.20	2.68	0.10	0.68	1	1	9	2	75	0.73	0.06	0.01	0.01	0.07	0.05	0.05	0.10	1.00	0.20	1.40
Maximum	317	7.75	9.66	10.80	2.50	2	7	120	5	265	2.11	0.20	0.26	0.01	0.92	2.32	0.46	0.58	6.00	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	11	4	4
St.dev	108	0.19	2.37	2.95	0.53	0	2	39	1	56	0.49	0.06	0.07	0.00	0.21	0.61	0.13	0.14	1.49	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]
13.01.2009	29	7.23	6.80	13.80	3.10	11	17	33	4	240	5.07	0.49	1.14	0.02	2.44	19.90	0.35	0.32	<1.00		
02.02.2009	28	7.59	7.54	1.29	3.10	<1	4	44	3	220	5.63	0.22	0.15	0.01	1.03	3.34	0.20	0.30	<1.00	<0.20	1.40
06.03.2009	23	7.36	7.90	1.77	3.00	<1	4	51	13	170	6.10	0.62	0.83	0.04	1.62	19.60	0.20	0.33	<1.00		
14.04.2009	40	7.60	7.24	2.48	2.80	2	6	37	23	230	4.56	0.51	0.32	0.01	1.24	21.50	0.20	0.30	<1.00		
06.05.2009	133	7.33	6.70	1.69	4.50	1	8	31	<2	210	4.64	0.10	0.03	<0.01	0.52	0.69	0.37	0.39	<1.00	<0.20	1.40
05.06.2009	237	7.50	4.45	0.98	3.77	<1	7	13	3	155	3.27	0.08	0.01	<0.01	0.52	0.48	0.21	0.30	<1.00		
07.07.2009	72	7.46	4.70	0.46	2.70	<1	4	11	<2	122	3.17	0.08	<0.01	<0.01	0.43	<0.05	0.10	<0.10			
10.08.2009	43	7.63	5.59	0.84	2.50	<1	4	24	<2	165	3.10	0.07	0.01	<0.01	0.46	0.22	0.08	0.20	<1.00	<0.20	1.40
08.09.2009	130	7.40	5.78	1.01	2.60	2	5	22	<2	160	3.25	0.28	<0.01	<0.01	0.42	0.29	0.08	0.20	<1.00		
05.10.2009	63	7.58	5.92	0.60	2.60	<1	3	24	<2	141	3.64	0.20	0.02	0.01	0.42	0.10	0.10	0.20	2.00	<0.20	1.40
02.11.2009	38	7.59	6.43	0.47	2.80	<1	3	35	2	160	3.96	0.09	<0.01	<0.01	0.31	0.10	0.10	0.20	1.00		
04.12.2009	33	7.36	6.42	3.93	3.10	1	7	44	46	290	3.91	0.55	0.43	0.01	2.27	9.14	0.35	0.59			
Lower avg.	72	7.47	6.29	2.44	3.05	1	6	31	8	189	4.19	0.27	0.24	0.01	0.97	6.28	0.20	0.28	0.30	0.00	1.40
Upper avg..	72	7.47	6.29	2.44	3.05	2	6	31	9	189	4.19	0.27	0.25	0.01	0.97	6.28	0.20	0.29	1.10	0.20	1.40
Minimum	23	7.23	4.45	0.46	2.50	1	3	11	2	122	3.10	0.07	0.01	0.01	0.31	0.05	0.08	0.10	1.00	0.20	1.40
Maximum	237	7.63	7.90	13.80	4.50	11	17	51	46	290	6.10	0.62	1.14	0.04	2.44	21.50	0.37	0.59	2.00	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	yes	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	10	4	4
St.dev	64	0.13	1.06	3.71	0.57	3	4	12	13	49	1.01	0.21	0.38	0.01	0.76	8.86	0.11	0.13	0.32	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]
09.02.2009	14	6.70	5.42	4.48	8.40	7	16	530	10	860	3.91	0.30	0.26	0.02	1.21	3.95	0.77	0.39	<1.00		
04.05.2009	19	6.70	5.39	4.00	8.10	6	16	510	3	815	4.00	0.33	0.29	0.02	1.28	3.72	0.80	0.49	<1.00		
02.06.2009	15				8.20	4															
10.08.2009	26	7.01	5.14	2.48	7.70	3	11	360	5	710	3.10	0.27	0.21	0.02	1.18	2.46	0.68	0.31			
05.10.2009	18	6.89	5.20	1.49	7.90	4	10	310	10	725	3.32	0.34	0.18	0.02	1.21	2.61	0.73	0.38	<1.00		
Lower avg.	18	6.82	5.29	3.11	8.06	5	13	428	7	778	3.58	0.31	0.24	0.02	1.22	3.18	0.74	0.39	0.00		
Upper avg..	18	6.82	5.29	3.11	8.06	5	13	428	7	778	3.58	0.31	0.24	0.02	1.22	3.18	0.74	0.39	1.00		
Minimum	14	6.70	5.14	1.49	7.70	3	10	310	3	710	3.10	0.27	0.18	0.02	1.18	2.46	0.68	0.31	1.00		
Maximum	26	7.01	5.42	4.48	8.40	7	16	530	10	860	4.00	0.34	0.29	0.02	1.28	3.95	0.80	0.49	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	5	4	4	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	3		
St.dev	5	0.15	0.14	1.38	0.27	2	3	109	4	72	0.44	0.03	0.05	0.00	0.04	0.76	0.05	0.07	0.00		

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]
11.02.2009	17	5.99	2.22	1.32	6.00	1	6	210	<2	425	3.21	0.20	0.22	0.03	0.48	6.00	0.41	0.20	<1.00		
06.05.2009	29	6.13	2.05	1.16	5.00	<1	3	185	<2	350	3.00	0.20	0.23	0.03	0.35	5.20	0.43	0.10	<1.00		
10.08.2009	33	6.36	1.93	0.80	4.40	<1	3	110	9	310	2.42	0.10	0.18	0.03	0.89	7.00	0.49	0.10	6.50		
14.10.2009	17	6.36	2.41	0.93	5.80	1	6	110	9	315	2.61	0.27	0.16	0.03	0.53	4.80	0.40	0.10	<1.00		
Lower avg.	24	6.21	2.15	1.05	5.30	1	5	154	5	350	2.81	0.19	0.20	0.03	0.56	5.75	0.43	0.12	1.62		
Upper avg..	24	6.21	2.15	1.05	5.30	1	5	154	6	350	2.81	0.19	0.20	0.03	0.56	5.75	0.43	0.12	2.38		
Minimum	17	5.99	1.93	0.80	4.40	1	3	110	2	310	2.42	0.10	0.16	0.03	0.35	4.80	0.40	0.10	1.00		
Maximum	33	6.36	2.41	1.32	6.00	1	6	210	9	425	3.21	0.27	0.23	0.03	0.89	7.00	0.49	0.20	6.50		
More than 70%LOD	yes	yes	yes	yes	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	8	0.18	0.21	0.23	0.74	0	2	52	4	53	0.36	0.07	0.03	0.00	0.23	0.97	0.04	0.05	2.75		

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]
09.02.2009	64	6.37	2.76	2.33	3.20	3	7	215	27	400	2.95	0.20	0.27	0.03	0.64	4.98	0.24	0.10	<1.00		
05.05.2009	188	6.47	1.68	0.86	3.20	<1	1	145	8	290	1.94	0.10	0.25	0.02	0.49	3.80	0.21	<0.10	1.00		
10.08.2009	134	6.69	2.60	11.70	4.90	1	6	96	6	310	2.12	0.21	0.35	0.03	0.80	5.09	0.28	0.20	9.00		
14.10.2009	79	6.72	3.23	1.52	3.60	2	6	82	9	370	2.57	0.20	0.19	0.02	0.88	4.82	0.29	0.20	6.00		
Lower avg.	116	6.56	2.57	4.10	3.72	2	5	135	13	343	2.40	0.18	0.26	0.03	0.70	4.67	0.26	0.12	4.00		
Upper avg..	116	6.56	2.57	4.10	3.72	2	5	135	13	343	2.40	0.18	0.26	0.03	0.70	4.67	0.26	0.15	4.25		
Minimum	64	6.37	1.68	0.86	3.20	1	1	82	6	290	1.95	0.10	0.19	0.02	0.49	3.80	0.21	0.10	1.00		
Maximum	188	6.72	3.23	11.70	4.90	3	7	215	27	400	2.95	0.21	0.35	0.03	0.88	5.09	0.29	0.20	9.00		
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	57	0.17	0.65	5.10	0.81	1	3	60	10	51	0.45	0.05	0.06	0.00	0.18	0.59	0.04	0.06	3.95		

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]
09.02.2009	43	6.24	2.73	1.03	4.20	<1	4	185	21	370	3.08	0.23	0.55	0.05	0.93	7.41	0.43	0.20	<1.00		
06.05.2009	55	6.50	1.75	2.27	3.60	<1	1	125	16	290	1.70	0.20	0.34	0.03	1.17	3.69	0.26	<0.10	1.50		
10.08.2009	54	6.54	1.68	0.45	5.40	<1	4	44	24	305	1.35	0.25	0.48	0.03	2.42	5.61	0.61	0.20	5.50		
07.10.2009	61	5.19	3.07	4.44	9.80	<1	9	50	9	415	2.63	0.37	1.18	0.09	1.84	11.70	0.77	0.30	5.50		
Lower avg.	53	6.12	2.31	2.05	5.75	0	5	101	18	345	2.19	0.26	0.64	0.05	1.59	7.10	0.52	0.18	3.12		
Upper avg..	53	6.12	2.31	2.05	5.75	1	5	101	18	345	2.19	0.26	0.64	0.05	1.59	7.10	0.52	0.20	3.38		
Minimum	43	5.19	1.68	0.45	3.60	1	1	44	9	290	1.35	0.20	0.34	0.03	0.93	3.69	0.26	0.10	1.00		
Maximum	61	6.54	3.07	4.44	9.80	1	9	185	24	415	3.08	0.37	1.18	0.09	2.42	11.70	0.77	0.30	5.50		
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	7	0.63	0.70	1.77	2.80	0	3	67	7	58	0.80	0.08	0.37	0.03	0.67	3.42	0.22	0.08	2.46		

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]
10.02.2009	46	6.19	1.82	1.11	3.00	<1	4	94	20	270	1.39	0.10	0.39	0.02	1.17	3.93	0.10	<0.10	2.50		
11.05.2009	108	6.46	1.96	1.22	3.20	1	5	140	11	300	1.26	0.20	0.41	0.02	1.43	3.16	0.20	<0.10	<1.00		
11.08.2009	65	6.35	1.73	1.26	4.80	<1	5	110	8	325	1.22	0.20	0.49	0.03	0.57	3.66	0.20	<0.10	9.00		
08.10.2009	108	6.27	2.12	1.71	5.30	4	9	96	12	315	1.45	0.26	0.61	0.04	1.40	4.43	0.21	0.20	<1.00		
Lower avg.	82	6.32	1.91	1.32	4.08	1	6	110	13	303	1.33	0.19	0.47	0.03	1.14	3.80	0.18	0.05	2.88		
Upper avg..	82	6.32	1.91	1.32	4.08	2	6	110	13	303	1.33	0.19	0.47	0.03	1.14	3.80	0.18	0.12	3.38		
Minimum	46	6.19	1.73	1.11	3.00	1	4	94	8	270	1.22	0.10	0.39	0.02	0.57	3.16	0.10	0.10	1.00		
Maximum	108	6.46	2.12	1.71	5.30	4	9	140	20	325	1.45	0.26	0.61	0.04	1.43	4.43	0.21	0.20	9.00		
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	31	0.12	0.17	0.26	1.15	2	2	21	5	24	0.11	0.07	0.10	0.01	0.40	0.53	0.05	0.05	3.82		

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]
10.02.2009	19	6.39	3.78	0.33	2.50	1	4	265	9	415	2.82	0.10	0.30	0.04	0.91	4.96	0.10	0.10	2.00		
12.05.2009	27	6.68	2.45	1.35	3.60	1	6	140	5	335	1.01	0.20	0.39	0.02	0.67	3.88	0.10	<0.10	1.00		
11.08.2009	23	6.59	2.31	1.31	4.50	<1	5	145	<2	345	1.51	0.29	0.44	0.03	0.33	3.43	0.20	<0.10	3.50		
08.10.2009	43	6.44	2.63	1.36	5.00	1	7	115	10	320	1.59	0.24	0.59	0.03	0.75	4.36	0.10	0.10			
Lower avg.	28	6.52	2.79	1.09	3.90	1	6	166	6	354	1.73	0.21	0.43	0.03	0.66	4.16	0.12	0.05	2.17		
Upper avg..	28	6.52	2.79	1.09	3.90	1	6	166	7	354	1.73	0.21	0.43	0.03	0.66	4.16	0.12	0.10	2.17		
Minimum	19	6.39	2.31	0.33	2.50	1	4	115	2	320	1.01	0.10	0.30	0.02	0.33	3.43	0.10	0.10	1.00		
Maximum	43	6.68	3.78	1.36	5.00	1	7	265	10	415	2.82	0.29	0.59	0.04	0.91	4.96	0.20	0.10	3.50		
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	3		
St.dev	11	0.13	0.67	0.51	1.10	0	1	67	4	42	0.77	0.08	0.12	0.01	0.24	0.66	0.05	0.00	1.26		

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]
10.02.2009	37	6.62	3.96	1.30	2.90	2	7	260	44	550	2.42	0.10	0.33	0.03	1.17	4.86	0.20	0.20	2.00		
12.05.2009	89	6.59	2.36	1.66	3.80	<1	5	110	<2	300	0.60	0.20	0.50	0.02	1.09	4.06	0.20	<0.10	<1.00		
11.08.2009	45	7.16	6.30	6.12	6.70	1	16	92	3	390	1.18	0.25	0.63	0.02	1.68	3.75	0.20	<0.10	1.50		
08.10.2009	89	6.06	2.42	2.65	6.50	2	10	64	2	335	1.76	0.30	1.10	0.03	3.49	4.89	0.20	0.20	<1.00		
Lower avg.	65	6.61	3.76	2.93	4.97	1	10	132	12	394	1.49	0.21	0.64	0.02	1.86	4.39	0.20	0.10	0.88		
Upper avg..	65	6.61	3.76	2.93	4.97	2	10	132	13	394	1.49	0.21	0.64	0.02	1.86	4.39	0.20	0.15	1.38		
Minimum	37	6.06	2.36	1.30	2.90	1	5	64	2	300	0.60	0.10	0.33	0.02	1.09	3.75	0.20	0.10	1.00		
Maximum	89	7.16	6.30	6.12	6.70	2	16	260	44	550	2.42	0.30	1.10	0.03	3.49	4.89	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	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	28	0.45	1.85	2.20	1.91	1	5	88	21	111	0.78	0.09	0.33	0.01	1.12	0.57	0.00	0.06	0.48		

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]
10.02.2009	73	5.53	2.13	0.52	1.50	<1	3	75	14	195	0.88	0.09	0.24	0.01	0.82	2.27	0.10	<0.10	1.50		
12.05.2009	162	5.71	1.44	0.41	1.30	<1	2	85	14	175	0.88	0.06	0.26	0.02	0.87	2.71	0.10	<0.10	<1.00		
11.08.2009	92	5.73	1.43	1.40	3.00	<1	5	88	18	265	0.88	0.20	0.44	0.01	0.26	2.30	0.09	<0.10	1.00		
08.10.2009	215	5.53	1.38	0.56	2.60	<1	3	78	14	210	0.90	0.10	0.44	0.01	0.69	2.28	0.10	0.10	8.00		
Lower avg.	135	5.62	1.60	0.72	2.10	0	3	82	15	211	0.88	0.11	0.35	0.01	0.66	2.39	0.10	0.02	2.62		
Upper avg..	135	5.62	1.60	0.72	2.10	1	3	82	15	211	0.88	0.11	0.35	0.01	0.66	2.39	0.10	0.10	2.88		
Minimum	73	5.53	1.38	0.41	1.30	1	2	75	14	175	0.88	0.06	0.24	0.01	0.26	2.27	0.09	0.10	1.00		
Maximum	215	5.73	2.13	1.40	3.00	1	5	88	18	265	0.90	0.20	0.44	0.02	0.87	2.71	0.10	0.10	8.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	65	0.11	0.36	0.46	0.83	0	1	6	2	39	0.01	0.06	0.11	0.01	0.28	0.21	0.01	0.00	3.43		

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]
23.02.2009	45	6.41	4.60	0.74	1.20	2	7	435	13	555	1.95	0.10	0.13	0.02	0.08	3.15	0.20	0.33	1.00		
18.05.2009	31	6.48	3.17	0.34	1.10	<1	3	260	<2	355	1.30	0.06	0.14	0.02	0.19	2.11	0.20	<0.10	<1.00		
31.08.2009	89	6.33	3.19	0.83	1.90	2	6	235	9	360	1.30	0.20	0.29	0.02	0.28	2.70	0.10	<0.10	4.00		
15.10.2009	34	6.16	3.83	0.39	1.50	<1	4	284	6	390	1.41	0.06	0.14	0.02	0.25	2.26	0.20	<0.10	1.00		
Lower avg.	50	6.34	3.70	0.58	1.42	1	5	304	7	415	1.49	0.10	0.18	0.02	0.20	2.55	0.18	0.08	1.50		
Upper avg..	50	6.34	3.70	0.58	1.42	2	5	304	8	415	1.49	0.10	0.18	0.02	0.20	2.55	0.18	0.16	1.75		
Minimum	31	6.16	3.17	0.34	1.10	1	3	235	2	355	1.31	0.06	0.13	0.02	0.08	2.11	0.10	0.10	1.00		
Maximum	89	6.48	4.60	0.83	1.90	2	7	435	13	555	1.95	0.20	0.29	0.02	0.28	3.15	0.20	0.33	4.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	27	0.14	0.68	0.25	0.36	1	2	90	5	95	0.31	0.07	0.08	0.00	0.09	0.47	0.05	0.12	1.50		

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]
03.02.2009	5	7.22	13.00	3.24	2.80	18	28	1150	48	1500	4.71	0.21	1.92	0.03	1.45	8.95	0.54	0.49	2.00		
04.05.2009	4	7.39	12.70	2.79	2.60	7	22	775	<2	1120	1.60	0.10	0.13	0.01	0.78	2.02	0.29	0.20	<1.00		
04.08.2009	10	6.95	9.61	2.02	3.60	8	22	605	6	975	2.27	0.20	0.32	0.02	1.16	4.34	0.47	0.30	6.50		
05.10.2009	11	6.99	8.55	2.65	4.10	7	22	555	11	1180	2.25	0.20	0.50	0.02	1.35	6.12	0.48	0.20	2.00		
Lower avg.	7	7.14	10.96	2.68	3.28	10	24	771	16	1194	2.70	0.18	0.72	0.02	1.18	5.36	0.44	0.30	2.62		
Upper avg..	7	7.14	10.96	2.68	3.28	10	24	771	17	1194	2.70	0.18	0.72	0.02	1.18	5.36	0.44	0.30	2.88		
Minimum	4	6.95	8.55	2.02	2.60	7	22	555	2	975	1.60	0.10	0.13	0.01	0.78	2.02	0.29	0.20	1.00		
Maximum	11	7.39	13.00	3.24	4.10	18	28	1150	48	1500	4.71	0.21	1.92	0.03	1.45	8.95	0.54	0.49	6.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	3	0.21	2.22	0.50	0.70	5	3	269	21	222	1.37	0.05	0.82	0.01	0.30	2.93	0.11	0.14	2.46		

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]
16.02.2009	7	6.67	2.80	0.11	0.42	<1	<1	165	<2	200	2.80	0.08	0.23	0.01	0.16	1.04	<0.05	0.30	1.00		
10.05.2009	23	6.59	1.77	0.36	1.30	<1	2	55	<2	118	1.09	<0.05	0.17	0.01	0.18	1.30	0.09	<0.10	2.00		
02.08.2009	23	6.66	1.54	0.20	1.50	<1	4	70	2	155	1.46	0.10	0.17	<0.01	0.28	0.83	<0.05	0.10	3.00		
04.10.2009	32	6.25	1.30	0.21	1.70	<1	2	22	2	90	1.11	0.07	0.22	0.01	0.24	1.10	0.06	<0.10	3.00		
Lower avg.	21	6.54	1.85	0.22	1.23	0	2	78	1	141	1.62	0.06	0.20	0.01	0.22	1.07	0.04	0.10	2.25		
Upper avg..	21	6.54	1.85	0.22	1.23	1	2	78	2	141	1.62	0.08	0.20	0.01	0.22	1.07	0.06	0.15	2.25		
Minimum	7	6.25	1.30	0.11	0.42	1	1	22	2	90	1.09	0.05	0.17	0.01	0.16	0.83	0.05	0.10	1.00		
Maximum	32	6.67	2.80	0.36	1.70	1	4	165	2	200	2.80	0.10	0.23	0.01	0.28	1.30	0.09	0.30	3.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	no	yes		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	10	0.20	0.66	0.10	0.56	0	1	61	0	48	0.81	0.02	0.03	0.00	0.06	0.19	0.02	0.10	0.96		

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]
19.03.2009	32	6.43	2.52	0.12	1.10	<1	2	115	<2	160	1.35	<0.05	0.10	0.01	0.11	1.80	0.09	<0.10	1.50		
13.05.2009	52	6.47	2.15	0.31	1.00	<1	2	100	<2	150	0.98	<0.05	0.09	0.01	0.12	1.60	0.10	<0.10	<1.00		
16.09.2009	21	6.39	2.06	0.27	1.60	<1	2	150	<2	260	1.11	0.06	0.13	<0.01	0.23	1.20	0.05	<0.10			
26.10.2009	22	6.47	2.35	0.24	1.00	<1	<1	175	6	270	1.80	0.07	0.08	<0.01	0.14	1.10	0.06	<0.10	<1.00		
Lower avg.	32	6.44	2.27	0.24	1.18	0	2	135	2	210	1.31	0.03	0.10	0.00	0.15	1.43	0.08	0.00	0.50		
Upper avg..	32	6.44	2.27	0.24	1.18	1	2	135	3	210	1.31	0.06	0.10	0.01	0.15	1.43	0.08	0.10	1.17		
Minimum	21	6.39	2.06	0.12	1.00	1	1	100	2	150	0.98	0.05	0.08	0.01	0.11	1.10	0.05	0.10	1.00		
Maximum	52	6.47	2.52	0.31	1.60	1	2	175	6	270	1.80	0.07	0.13	0.01	0.23	1.80	0.10	0.10	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	3		
St.dev	14	0.04	0.21	0.08	0.29	0	1	34	2	64	0.36	0.01	0.02	0.00	0.06	0.33	0.02	0.00	0.29		

Ulladalsåna (Ulla)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
15.03.2009	24	6.62	2.65	0.22	1.80	<1	2	73	<2	143	1.88	0.05	0.08	0.01	0.21	1.70	0.20	<0.10	4.50		
13.05.2009	37	6.71	2.15	0.14	1.00	<1	1	40	<2	83	1.43	0.08	0.05	0.01	0.25	1.20	0.10	<0.10			
16.09.2009	19	6.77	2.01	0.14	1.20	<1	1	48	2	131	1.82	0.07	0.05	<0.01	0.27	0.84	<0.05	<0.10			
26.10.2009	19	6.80	2.22	0.12	0.88	<1	<1	60	8	122	2.18	0.06	0.04	0.01	0.56	3.45	0.10	<0.10	1.00		
Lower avg.	25	6.72	2.26	0.16	1.22	0	1	55	3	120	1.83	0.06	0.05	0.01	0.32	1.80	0.10	0.00	2.75		
Upper avg..	25	6.72	2.26	0.16	1.22	1	1	55	4	120	1.83	0.06	0.05	0.01	0.32	1.80	0.11	0.10	2.75		
Minimum	19	6.62	2.01	0.12	0.88	1	1	40	2	83	1.43	0.05	0.04	0.01	0.21	0.84	0.05	0.10	1.00		
Maximum	37	6.80	2.65	0.22	1.80	1	2	73	8	143	2.18	0.08	0.08	0.01	0.56	3.45	0.20	0.10	4.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	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	2		
St.dev	8	0.08	0.28	0.04	0.41	0	1	14	3	26	0.31	0.01	0.01	0.00	0.16	1.16	0.06	0.00	2.48		

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]
03.03.2009	21	6.48	2.04	1.50	1.20	<1	4	190	3	265	1.22	0.10	0.08	0.01	0.01	1.80	0.20	<0.10	1.50		
15.05.2009	73	6.57	1.42	3.40	0.78	2	6	95	4	160	0.75	0.08	0.32	0.01	0.26	1.80	0.20	<0.10	<1.00		
24.08.2009	81	6.48	1.41	0.34	1.30	<1	3	110	<2	155	0.90	0.09	0.10	0.01	0.24	1.50	0.10	<0.10	1.50		
02.11.2009	42	6.62	1.43	0.42	0.73	2	2	120	3	210	0.92	0.07	0.05	<0.01	0.22	1.20	0.20	0.10	<1.00		
Lower avg.	54	6.54	1.58	1.42	1.00	1	4	129	3	198	0.95	0.08	0.14	0.01	0.18	1.58	0.18	0.02	0.75		
Upper avg..	54	6.54	1.58	1.42	1.00	2	4	129	3	198	0.95	0.08	0.14	0.01	0.18	1.58	0.18	0.10	1.25		
Minimum	21	6.48	1.41	0.34	0.73	1	2	95	2	155	0.75	0.07	0.05	0.01	0.01	1.20	0.10	0.10	1.00		
Maximum	81	6.62	2.04	3.40	1.30	2	6	190	4	265	1.22	0.10	0.32	0.01	0.26	1.80	0.20	0.10	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	27	0.07	0.31	1.43	0.29	1	2	42	1	51	0.20	0.01	0.12	0.00	0.12	0.29	0.05	0.00	0.29		

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]
10.03.2009	20	6.44	2.27	0.16	0.96	2	4	245	4	280	1.35	<0.05	0.07	0.01	0.34	2.29	0.20	<0.10	<1.00		
12.05.2009	47	5.63	1.80	0.14	0.68	1	2	125	<2	200	0.88	0.07	0.08	0.01	0.23	1.90	0.20	<0.10	1.00		
16.09.2009	18	6.33	1.18	0.11	0.78	1	2	83	<2	135	0.79	0.08	0.07	0.01	0.86	1.50	0.09	<0.10	<1.00		
06.10.2009	62	6.40	3.00	0.17	1.00	<1	4	91	5	185	1.01	0.10	0.09	0.01	0.36	1.70	0.10	0.20	4.00		
Lower avg.	37	6.20	2.06	0.15	0.86	1	3	136	2	200	1.01	0.06	0.08	0.01	0.45	1.85	0.15	0.05	1.25		
Upper avg..	37	6.20	2.06	0.15	0.86	1	3	136	3	200	1.01	0.08	0.08	0.01	0.45	1.85	0.15	0.12	1.75		
Minimum	18	5.63	1.18	0.11	0.68	1	2	83	2	135	0.79	0.05	0.07	0.01	0.23	1.50	0.09	0.10	1.00		
Maximum	62	6.44	3.00	0.17	1.00	2	4	245	5	280	1.35	0.10	0.09	0.01	0.86	2.29	0.20	0.20	4.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	21	0.38	0.77	0.03	0.15	1	1	75	2	60	0.25	0.02	0.01	0.00	0.28	0.34	0.06	0.05	1.50		

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]
10.03.2009	14	6.63	3.98	1.22	1.20	3	6	325	10	355	1.13	0.24	0.14	0.02	0.69	3.31	0.51	0.10	<1.00		
12.05.2009	9	6.65	2.74	0.55	0.96	<1	3	145	6	235	0.90	0.20	0.15	0.01	0.39	2.54	0.28	<0.10	<1.00		
07.09.2009	9	6.53	3.16	1.58	2.20	4	10	215	7	350	1.22	0.38	0.26	0.02	0.76	3.09	0.40	0.10			
05.10.2009	25	6.61	2.61	0.82	1.70	<1	4	145	8	260	0.88	0.20	0.30	0.02	1.52	4.71	0.46	0.10	1.00		
Lower avg.	14	6.60	3.12	1.04	1.52	2	6	208	8	300	1.03	0.26	0.21	0.02	0.84	3.41	0.41	0.08	0.33		
Upper avg..	14	6.60	3.12	1.04	1.52	2	6	208	8	300	1.03	0.26	0.21	0.02	0.84	3.41	0.41	0.10	1.00		
Minimum	9	6.53	2.61	0.55	0.96	1	3	145	6	235	0.88	0.20	0.14	0.01	0.39	2.54	0.28	0.10	1.00		
Maximum	25	6.65	3.98	1.58	2.20	4	10	325	10	355	1.22	0.38	0.30	0.02	1.52	4.71	0.51	0.10	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3		
St.dev	7	0.05	0.62	0.45	0.55	2	3	85	2	62	0.17	0.09	0.08	0.01	0.48	0.92	0.10	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]
05.02.2009	22	6.98	3.36	0.93	0.76	2	3	200	3	260	4.24	<0.05	0.01	<0.01	0.46	0.41	0.06	<0.10	<1.00		
12.05.2009	41	6.80	2.47	1.23	1.20	2	4	115	3	200	2.80	<0.05	0.05	<0.01	0.64	0.97	0.10	<0.10	3.50		
11.08.2009	144	6.52	0.64	29.80	0.11	5	22	30	<2	57	2.46	0.08	0.40	0.01	1.12	4.22	1.10	1.60	1.50		
13.10.2009	38	6.80	2.85	0.82	0.94	1	2	36	3	195	3.21	0.08	0.05	<0.01	0.56	0.49	0.10	0.10	<1.00		
Lower avg.	61	6.78	2.33	8.20	0.75	3	8	95	2	178	3.18	0.04	0.13	0.00	0.70	1.52	0.34	0.43	1.25		
Upper avg..	61	6.78	2.33	8.20	0.75	3	8	95	3	178	3.18	0.06	0.13	0.01	0.70	1.52	0.34	0.48	1.75		
Minimum	22	6.52	0.64	0.82	0.11	1	2	30	2	57	2.46	0.05	0.01	0.01	0.46	0.41	0.06	0.10	1.00		
Maximum	144	6.98	3.36	29.80	1.20	5	22	200	3	260	4.24	0.08	0.40	0.01	1.12	4.22	1.10	1.60	3.50		
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	56	0.19	1.18	14.40	0.47	2	10	80	1	86	0.77	0.02	0.18	0.00	0.29	1.82	0.51	0.75	1.19		

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]
17.02.2009	24	6.16	1.94	1.71	1.10	5	8	150	5	220	1.37	0.10	0.17	0.02	0.49	2.78	0.20	0.40	1.00		
14.05.2009	62	6.20	1.53	0.57	1.20	<1	3	92	<2	190	1.03	<0.05	0.05	<0.01	0.16	1.40	0.08	<0.10	<1.00		
10.08.2009	43	6.41	1.04	0.28	0.59	<1	2	33	4	89	0.60	0.08	0.05	0.01	0.26	1.00	0.07	<0.10			
23.10.2009	34	6.12	1.46	0.54	1.90	2	5	17	13	180	1.09	0.05	0.05	0.01	0.33	1.70	0.20	0.10	10.00		
Lower avg.	41	6.22	1.49	0.77	1.20	2	5	73	6	170	1.02	0.06	0.08	0.01	0.31	1.72	0.14	0.12	3.67		
Upper avg..	41	6.22	1.49	0.77	1.20	2	5	73	6	170	1.02	0.07	0.08	0.01	0.31	1.72	0.14	0.18	4.00		
Minimum	24	6.12	1.04	0.28	0.59	1	2	17	2	89	0.60	0.05	0.05	0.01	0.16	1.00	0.07	0.10	1.00		
Maximum	62	6.41	1.94	1.71	1.90	5	8	150	13	220	1.37	0.10	0.17	0.02	0.49	2.78	0.20	0.40	10.00		
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	3		
St.dev	16	0.13	0.37	0.64	0.54	2	3	61	5	56	0.32	0.02	0.06	0.01	0.14	0.76	0.07	0.15	5.20		

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]
17.02.2009	28	6.24	2.09	3.98	0.91	7	11	180	<2	280	1.41	<0.05	0.07	0.01	0.38	2.14	0.10	0.20	1.50		
11.05.2009	109	6.45	1.82	0.85	1.50	1	4	125	2	225	1.05	<0.05	0.05	<0.01	0.25	1.50	0.10	<0.10	<1.00		
12.08.2009	40	6.56	1.51	0.24	0.74	<1	3	94	<2	160	0.79	0.10	0.03	<0.01	0.25	0.98	0.07	<0.10	2.00		
16.10.2009	54	6.17	1.82	0.64	1.40	2	5	118	5	205	<0.04								<1.00		
Lower avg.	58	6.36	1.81	1.43	1.14	3	6	129	2	218	0.81	0.03	0.05	0.00	0.29	1.54	0.09	0.07	0.88		
Upper avg..	58	6.36	1.81	1.43	1.14	3	6	129	3	218	0.82	0.07	0.05	0.01	0.29	1.54	0.09	0.13	1.38		
Minimum	28	6.17	1.51	0.24	0.74	1	3	94	2	160	0.04	0.05	0.03	0.01	0.25	0.98	0.07	0.10	1.00		
Maximum	109	6.56	2.09	3.98	1.50	7	11	180	5	280	1.41	0.10	0.07	0.01	0.38	2.14	0.10	0.20	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	no	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	4		
St.dev	36	0.18	0.24	1.72	0.37	3	4	36	2	50	0.58	0.03	0.02	0.00	0.07	0.58	0.02	0.06	0.48		

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]
17.02.2009	11	6.24	2.45	0.23	0.86	1	4	145	4	200	1.93	0.08	0.03	0.01	0.17	1.60	0.10	0.30	7.50		
11.05.2009	42	6.33	1.63	0.73	1.40	2	4	51	<2	133	0.94	<0.05	0.07	<0.01	0.17	1.50	0.10	<0.10	1.50		
12.08.2009	15	6.58	1.34	0.68	2.40	4	12	63	2	210	0.83	0.06	0.10	<0.01	0.30	0.92	0.10	<0.10	2.00		
16.10.2009	21	6.21	2.17	0.48	2.30	2	5	35	2	122	1.13	0.07	0.07	<0.01	0.18	1.12	0.10	<0.10	1.50		
Lower avg.	22	6.34	1.90	0.53	1.74	2	6	74	2	166	1.21	0.05	0.07	0.00	0.21	1.28	0.10	0.08	3.12		
Upper avg..	22	6.34	1.90	0.53	1.74	2	6	74	3	166	1.21	0.06	0.07	0.00	0.21	1.28	0.10	0.15	3.12		
Minimum	11	6.21	1.34	0.23	0.86	1	4	35	2	122	0.83	0.05	0.03	0.01	0.17	0.92	0.10	0.10	1.50		
Maximum	42	6.58	2.45	0.73	2.40	4	12	145	4	210	1.93	0.08	0.10	0.01	0.30	1.60	0.10	0.30	7.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	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	14	0.17	0.50	0.23	0.74	1	4	49	1	45	0.49	0.01	0.03	0.00	0.07	0.32	0.00	0.10	2.93		

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]
17.03.2009	26	6.56	2.07	0.73	1.60	1	5	195	3	280	1.84	<0.05	0.04	<0.01	0.37	1.20	0.10	<0.10	1.00		
28.05.2009	76	6.59	1.88	1.14	0.97	<1	5	165	6	245	1.37	<0.05	0.03	<0.01	0.56	0.59	0.10	<0.10	<1.00		
26.08.2009	57	6.58	1.37	0.59	0.68	<1	3	73	5	120	0.90	<0.05	0.03	<0.01	0.15	0.37	0.08	<0.10	4.00		
02.11.2009	23	6.63	1.69	1.09	0.99	1	3	140	8	255	1.37	<0.05	0.03	<0.01	0.26	0.86	0.20	0.10	<1.00		
Lower avg.	45	6.59	1.75	0.89	1.06	1	4	143	6	225	1.37	0.00	0.03	0.00	0.33	0.76	0.12	0.02	1.25		
Upper avg..	45	6.59	1.75	0.89	1.06	1	4	143	6	225	1.37	0.05	0.03	0.00	0.33	0.76	0.12	0.10	1.75		
Minimum	23	6.56	1.37	0.59	0.68	1	3	73	3	120	0.90	0.05	0.03	0.01	0.15	0.37	0.08	0.10	1.00		
Maximum	76	6.63	2.07	1.14	1.60	1	5	195	8	280	1.84	0.05	0.04	0.01	0.56	1.20	0.20	0.10	4.00		
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	26	0.03	0.30	0.27	0.39	0	1	52	2	72	0.38	0.00	0.01	0.00	0.17	0.36	0.05	0.00	1.50		

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]
03.03.2009	38	7.02	4.14	0.25	0.93	1	2	230	3	320	3.23	0.10	<0.01	<0.01	1.26	0.70	0.08	0.10	1.50		
15.05.2009	103	7.22	3.49	1.39	1.50	<1	9	97	<2	195	2.87	<0.05	0.03	<0.01	1.21	8.27	0.10	<0.10	<1.00		
04.08.2009	66	7.21	2.70	0.74	0.65	<1	2	57	<2	122	2.29	<0.05	0.01	0.01	0.44	0.08	0.09	0.20	6.00		
15.10.2009	49	7.18	3.99	0.20	1.00	1	2	105	6	265	3.21	<0.05	0.01	0.01	0.78	1.30	0.10	0.10	1.00		
Lower avg.	64	7.16	3.58	0.64	1.02	1	4	122	2	226	2.90	0.02	0.01	0.00	0.92	2.59	0.09	0.10	2.12		
Upper avg..	64	7.16	3.58	0.64	1.02	1	4	122	3	226	2.90	0.06	0.01	0.00	0.92	2.59	0.09	0.12	2.38		
Minimum	38	7.02	2.70	0.20	0.65	1	2	57	2	122	2.29	0.05	0.01	0.01	0.44	0.08	0.08	0.10	1.00		
Maximum	103	7.22	4.14	1.39	1.50	1	9	230	6	320	3.23	0.10	0.03	0.01	1.26	8.27	0.10	0.20	6.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	no	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	29	0.09	0.65	0.55	0.35	0	4	75	2	86	0.44	0.03	0.01	0.00	0.39	3.82	0.01	0.05	2.43		

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]
09.02.2009	22	6.78	2.28	0.79	1.60	<1	3	79	8	160	1.82	<0.05	0.04	<0.01	0.33	0.54	0.10	<0.10	3.00		
04.05.2009	138	7.06	2.85	3.11	2.30	3	6	73	2	195	1.72	<0.05	0.04	<0.01	0.58	0.60	0.64	0.36	<1.00		
04.08.2009	36	6.92	2.16	0.50	1.40	<1	3	55	<2	127	1.35	<0.05	0.01	<0.01	0.31	0.20	0.10	0.10	2.00		
05.10.2009	78	6.98	3.47	3.08	3.10	2	6	125	3	275	2.00	<0.05	0.04	<0.01	0.75	0.76	0.50	0.35	<1.00		
Lower avg.	68	6.94	2.69	1.87	2.10	1	5	83	3	189	1.72	0.00	0.03	0.00	0.49	0.52	0.34	0.20	1.25		
Upper avg..	68	6.94	2.69	1.87	2.10	2	5	83	4	189	1.72	0.05	0.03	0.00	0.49	0.52	0.34	0.23	1.75		
Minimum	22	6.78	2.16	0.50	1.40	1	3	55	2	127	1.35	0.05	0.01	0.01	0.31	0.20	0.10	0.10	1.00		
Maximum	138	7.06	3.47	3.11	3.10	3	6	125	8	275	2.01	0.05	0.04	0.01	0.75	0.76	0.64	0.36	3.00		
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	52	0.12	0.60	1.42	0.77	1	2	30	3	64	0.28	0.00	0.02	0.00	0.21	0.24	0.28	0.15	0.96		

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]
17.02.2009	26	7.54	35.60	5.44	2.50	5	8	240	31	460	4.54	0.34	0.10	0.01	1.29	1.80	1.20	1.60	<1.00		
12.05.2009	289	7.28	7.17	6.37	3.20	2	7	57	<2	200	2.59	0.20	0.13	0.01	2.69	3.33	1.20	0.45	2.00		
05.08.2009	90	7.57	12.40	4.12	2.80	2	5	89	<2	250	3.32	0.10	0.07	0.01	1.26	1.50	1.30	0.65	<1.00		
14.10.2009	70	7.61	20.40	2.66	3.70	2	5	238	14	400	4.11	0.06	0.08	<0.01	1.24	2.21	1.60	0.44	1.50		
Lower avg.	119	7.50	18.89	4.65	3.05	3	6	156	11	328	3.64	0.18	0.10	0.01	1.62	2.21	1.33	0.78	0.88		
Upper avg..	119	7.50	18.89	4.65	3.05	3	6	156	12	328	3.64	0.18	0.10	0.01	1.62	2.21	1.33	0.78	1.38		
Minimum	26	7.28	7.17	2.66	2.50	2	5	57	2	200	2.59	0.06	0.07	0.01	1.24	1.50	1.20	0.44	1.00		
Maximum	289	7.61	35.60	6.37	3.70	5	8	240	31	460	4.54	0.34	0.13	0.01	2.69	3.33	1.60	1.60	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	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	117	0.15	12.40	1.62	0.52	2	2	97	14	123	0.86	0.13	0.03	0.00	0.71	0.80	0.19	0.55	0.48		

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]
17.02.2009	29	7.12	3.17	1.09	2.20	<1	3	94	3	190	1.92	0.08	0.02	<0.01	0.71	0.36	0.59	0.30	<1.00		
12.05.2009	231	7.19	3.23	0.95	2.30	2	2	88	2	200	1.88	0.06	0.03	<0.01	1.85	1.10	0.60	<0.10	<1.00		
05.08.2009	82	7.23	2.96	0.92	2.80	<1	4	43	4	180	1.64	0.25	0.04	0.01	0.69	0.69	0.72	0.20	1.50		
15.10.2009	77	7.04	3.20	1.20	2.80	<1	4	81	3	195	1.87	0.05	0.01	<0.01	0.60	0.53	0.70	0.10	2.00		
Lower avg.	105	7.14	3.14	1.04	2.52	1	3	77	3	191	1.83	0.11	0.02	0.00	0.96	0.67	0.65	0.15	0.88		
Upper avg..	105	7.14	3.14	1.04	2.52	1	3	77	3	191	1.83	0.11	0.02	0.01	0.96	0.67	0.65	0.18	1.38		
Minimum	29	7.04	2.96	0.92	2.20	1	2	43	2	180	1.64	0.05	0.01	0.01	0.60	0.36	0.59	0.10	1.00		
Maximum	231	7.23	3.23	1.20	2.80	2	4	94	4	200	1.92	0.25	0.04	0.01	1.85	1.10	0.72	0.30	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	87	0.08	0.12	0.13	0.32	1	1	23	1	9	0.13	0.09	0.01	0.00	0.60	0.32	0.07	0.10	0.48		

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]
17.02.2009	24	7.04	3.62	74.60	2.60	50	58	92	17	260	2.70	0.10	0.46	0.02	1.64	11.10	0.75	0.83	4.00		
13.05.2009	159	6.96	2.28	4.09	3.70	1	5	39	<2	175	1.26	0.07	0.08	0.01	3.61	3.58	0.52	0.10	1.50		
06.08.2009	50	7.23	4.43	1.42	3.30	1	3	115	<2	260	1.43	0.20	0.08	0.01	2.14	3.17	0.47	0.20	4.50		
15.10.2009	60	6.91	3.92	1.26	3.30	<1	4	135	6	270	1.68	<0.05	0.03	0.01	1.74	3.15	0.45	0.20	1.50		
Lower avg.	73	7.04	3.56	20.34	3.23	13	18	95	6	241	1.77	0.09	0.16	0.01	2.28	5.25	0.55	0.33	2.88		
Upper avg..	73	7.04	3.56	20.34	3.23	13	18	95	7	241	1.77	0.10	0.16	0.01	2.28	5.25	0.55	0.33	2.88		
Minimum	24	6.91	2.28	1.26	2.60	1	3	39	2	175	1.26	0.05	0.03	0.01	1.64	3.15	0.45	0.10	1.50		
Maximum	159	7.23	4.43	74.60	3.70	50	58	135	17	270	2.70	0.20	0.46	0.02	3.61	11.10	0.75	0.83	4.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	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	59	0.14	0.92	36.20	0.46	25	27	41	7	44	0.64	0.07	0.20	0.01	0.91	3.91	0.14	0.34	1.60		

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]
17.02.2009	16	7.43	10.30	1.43	2.90	<1	3	220	16	375	3.29	0.10	0.14	<0.01	0.86	1.20	0.45	0.48	4.00		
13.05.2009	128	7.10	2.50	6.61	3.60	2	4	48	2	180	1.44	0.10	0.11	<0.01	1.79	1.20	0.47	<0.10	<1.00		
06.08.2009	33	7.56	6.08	0.71	2.80	1	3	79	<2	220	1.39	0.20	0.04	0.01	0.62	0.37	0.30	0.20			
15.10.2009	42	7.09	5.81	1.28	3.80	<1	3	68	3	310	2.12	0.10	0.04	<0.01	0.67	0.61	0.46	0.20	1.50		
Lower avg.	55	7.30	6.17	2.51	3.28	1	3	104	5	271	2.06	0.12	0.08	0.00	0.99	0.84	0.42	0.22	1.83		
Upper avg..	55	7.30	6.17	2.51	3.28	1	3	104	6	271	2.06	0.12	0.08	0.01	0.99	0.84	0.42	0.24	2.17		
Minimum	16	7.09	2.50	0.71	2.80	1	3	48	2	180	1.39	0.10	0.04	0.01	0.62	0.37	0.30	0.10	1.00		
Maximum	128	7.56	10.30	6.61	3.80	2	4	220	16	375	3.30	0.20	0.14	0.01	1.79	1.20	0.47	0.48	4.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3		
St.dev	50	0.24	3.20	2.75	0.50	1	1	79	7	88	0.89	0.05	0.05	0.00	0.55	0.42	0.08	0.16	1.61		

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]
17.02.2009	11	7.16	5.23	2.41	3.70	2	5	205	2	345	1.71	0.10	0.09	0.01	0.97	3.09	0.44	0.30			
13.05.2009	58	7.29	4.75	1.33	4.00	1	5	185	<2	360	1.45	0.10	0.04	<0.01	1.69	1.10	0.35	<0.10	<1.00		
06.08.2009	15	7.40	5.16	0.92	3.40	<1	3	78	3	230	1.01	0.10	0.04	0.01	0.58	0.38	0.28	0.20	10.00		
15.10.2009	29	6.78	5.32	0.73	4.20	<1	5	181	4	340	1.54	0.07	0.02	<0.01	0.59	0.83	0.36	0.20	2.00		
Lower avg.	28	7.16	5.12	1.35	3.82	1	5	162	2	319	1.42	0.09	0.05	0.00	0.96	1.35	0.36	0.18	4.00		
Upper avg..	28	7.16	5.12	1.35	3.82	1	5	162	3	319	1.42	0.09	0.05	0.01	0.96	1.35	0.36	0.20	4.33		
Minimum	11	6.78	4.75	0.73	3.40	1	3	78	2	230	1.01	0.07	0.02	0.01	0.58	0.38	0.28	0.10	1.00		
Maximum	58	7.40	5.32	2.41	4.20	2	5	205	4	360	1.71	0.10	0.09	0.01	1.69	3.09	0.44	0.30	10.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3		
St.dev	21	0.27	0.25	0.75	0.35	1	1	57	1	60	0.30	0.02	0.03	0.00	0.52	1.20	0.07	0.08	4.93		

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]
12.03.2009	11	6.84	6.51	2.70	1.60	3	7	140	17	245	1.78	0.09	0.06	0.01	1.07	3.21	0.41	0.30	1.50		
13.05.2009	88	6.96	2.40	13.00	3.20	4	6	35	<2	165	2.25	0.09	0.19	<0.01	0.70	2.00	0.82	0.51	1.00		
11.08.2009	21	6.38	2.12	2.85	1.30	2	5	20	<2	122	1.24	0.10	0.09	<0.01	0.75	1.30	0.38	<0.10	4.50		
14.10.2009	34	7.00	4.10	1.68	2.90	2	4	87	7	225	1.82	0.09	0.10	0.01	1.20	2.00	0.62	0.30	2.50		
Lower avg.	39	6.80	3.78	5.06	2.25	3	6	71	6	189	1.77	0.09	0.11	0.00	0.93	2.13	0.56	0.28	2.38		
Upper avg..	39	6.80	3.78	5.06	2.25	3	6	71	7	189	1.77	0.09	0.11	0.01	0.93	2.13	0.56	0.30	2.38		
Minimum	11	6.38	2.12	1.68	1.30	2	4	20	2	122	1.24	0.09	0.06	0.01	0.70	1.30	0.38	0.10	1.00		
Maximum	88	7.00	6.51	13.00	3.20	4	7	140	17	245	2.25	0.10	0.19	0.01	1.20	3.21	0.82	0.51	4.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	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	34	0.29	2.02	5.32	0.94	1	1	55	7	56	0.41	0.01	0.06	0.00	0.24	0.79	0.21	0.17	1.55		

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]
02.02.2009	52	7.37	4.05	0.21	0.78	<1	2	61	4	111	0.90	0.08	<0.01	<0.01	0.28	1.80	0.39	<0.10	<1.00		
08.05.2009	128	7.46	4.64	0.38	1.10	<1	2	39	<2	118	0.88	0.10	0.08	0.01	0.37	3.29	0.34	<0.10	<1.00		
17.08.2009	92	7.51	3.99	0.33	0.79	<1	2	26	4	86	0.66	0.10	0.02	0.01	0.45	1.30	0.37	0.52	5.00		
21.10.2009	84	7.13	4.09	0.46	1.00	<1	2	40	10	102	0.90	0.08	0.02	0.01	0.32	3.55	0.42	0.10	1.00		
Lower avg.	89	7.37	4.19	0.34	0.92	0	2	42	5	104	0.83	0.09	0.03	0.01	0.36	2.48	0.38	0.16	1.50		
Upper avg..	89	7.37	4.19	0.34	0.92	1	2	42	5	104	0.83	0.09	0.03	0.01	0.36	2.48	0.38	0.20	2.00		
Minimum	52	7.13	3.99	0.21	0.78	1	2	26	2	86	0.66	0.08	0.01	0.01	0.28	1.30	0.34	0.10	1.00		
Maximum	128	7.51	4.64	0.46	1.10	1	2	61	10	118	0.90	0.10	0.08	0.01	0.45	3.55	0.42	0.52	5.00		
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	32	0.17	0.30	0.11	0.16	0	0	14	3	14	0.12	0.01	0.03	0.00	0.07	1.10	0.03	0.21	2.00		

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]
02.02.2009	84	7.47	4.97	0.43	0.85	<1	3	53	13	126	1.39	0.09	<0.01	0.01	0.30	1.07	0.22	<0.10	<1.00		
08.05.2009	246	7.58	6.22	1.18	1.50	<1	3	30	<2	118	1.39	0.08	0.04	<0.01	0.40	1.00	0.25	<0.10	1.00		
17.08.2009	244	7.49	4.39	0.26	0.74	<1	2	20	2	75	1.03	0.10	0.01	0.01	0.44	0.74	0.20	0.77	1.50		
21.10.2009	151	7.31	5.31	0.43	1.20	<1	2	32	5	96	1.44	0.06	0.01	<0.01	0.40	0.47	0.32	0.20	2.00		
Lower avg.	181	7.46	5.22	0.57	1.07	0	3	34	5	104	1.31	0.08	0.01	0.00	0.38	0.82	0.25	0.24	1.12		
Upper avg..	181	7.46	5.22	0.57	1.07	1	3	34	6	104	1.31	0.08	0.01	0.01	0.38	0.82	0.25	0.29	1.38		
Minimum	84	7.31	4.39	0.26	0.74	1	2	20	2	75	1.03	0.06	0.01	0.01	0.30	0.47	0.20	0.10	1.00		
Maximum	246	7.58	6.22	1.18	1.50	1	3	53	13	126	1.44	0.10	0.04	0.01	0.44	1.07	0.32	0.77	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	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	79	0.11	0.77	0.41	0.35	0	1	14	5	23	0.19	0.02	0.02	0.00	0.06	0.27	0.05	0.32	0.48		

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]
19.03.2009	19	7.52	10.43	0.67	1.30	<1	4	205	61	660	4.43	0.07	0.08	0.01	1.93	8.30	0.26	0.10	1.50		
03.06.2009	73	7.11	4.10	2.73	0.87	<1	3	80	<2	99	1.70	<0.05	0.05	0.01	0.59	1.30	0.48	0.74	<1.00		
20.08.2009	47	7.41	4.37	0.48	0.44	<1	1	13	<2	46	2.02	0.06	0.08	0.01	1.29	3.88	2.18	1.70	4.50		
15.10.2009	31	7.15	5.41	4.10	2.50	<1	7	27	6	134	3.17	0.06	0.03	<0.01	0.53	0.32	0.54	<0.10	1.50		
Lower avg.	43	7.30	6.08	2.00	1.28	0	4	81	17	235	2.83	0.05	0.06	0.01	1.08	3.45	0.86	0.64	1.88		
Upper avg..	43	7.30	6.08	2.00	1.28	1	4	81	18	235	2.83	0.06	0.06	0.01	1.08	3.45	0.86	0.66	2.12		
Minimum	19	7.11	4.10	0.48	0.44	1	1	13	2	46	1.70	0.05	0.03	0.01	0.53	0.32	0.26	0.10	1.00		
Maximum	73	7.52	10.43	4.10	2.50	1	7	205	61	660	4.43	0.07	0.08	0.01	1.93	8.30	2.18	1.70	4.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	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	23	0.20	2.96	1.73	0.89	0	3	87	29	286	1.24	0.01	0.03	0.00	0.66	3.57	0.89	0.76	1.60		

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]
02.02.2009	61	7.73	9.55	0.36	0.96	<1	3	80	14	200	2.93	0.06	<0.01	0.01	1.43	1.70	<0.05	0.20	<1.00		
18.05.2009	313	7.44	6.25	8.12	2.00	5	11	15	4	138	2.12	<0.05	0.06	0.01	0.66	0.74	0.32	0.20	<1.00		
04.08.2009	130	7.74	6.86	0.50	0.57	<1	1	13	<2	64	1.71	<0.05	0.01	<0.01	0.31	0.10	0.07	0.10	5.50		
05.10.2009	86	7.65	8.40	0.32	1.10	<1	1	21	3	87	2.50	0.20	0.05	0.01	0.47	1.50	0.09	0.20	<1.00		
Lower avg.	147	7.64	7.76	2.32	1.16	1	4	32	5	122	2.32	0.06	0.03	0.00	0.72	1.01	0.12	0.18	1.38		
Upper avg..	147	7.64	7.76	2.32	1.16	2	4	32	6	122	2.32	0.09	0.03	0.01	0.72	1.01	0.13	0.18	2.12		
Minimum	61	7.44	6.25	0.32	0.57	1	1	13	2	64	1.71	0.05	0.01	0.01	0.31	0.10	0.05	0.10	1.00		
Maximum	313	7.74	9.55	8.12	2.00	5	11	80	14	200	2.93	0.20	0.06	0.01	1.43	1.70	0.32	0.20	5.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	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	114	0.14	1.50	3.86	0.61	2	5	32	6	60	0.52	0.07	0.03	0.00	0.50	0.73	0.13	0.05	2.25		

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]
02.02.2009	55	7.59	7.36	2.56	1.50	<1	5	77	71	475	2.20	0.08	0.07	0.01	3.21	6.99	0.20	0.20	3.50		
18.05.2009	284	7.80	11.20	18.20	1.90	6	10	13	<2	111	3.00	0.06	0.18	0.01	0.90	1.80	0.34	0.51	<1.00		
04.08.2009	118	7.87	8.39	1.80	0.37	2	2	23	<2	65	1.74	0.06	0.05	<0.01	0.39	0.34	0.10	0.20	3.00		
05.10.2009	78	7.77	11.70	1.98	1.80	1	4	79	<2	175	2.70	0.10	0.06	<0.01	0.59	0.48	0.20	0.20	<1.00		
Lower avg.	134	7.76	9.66	6.14	1.39	2	5	48	18	207	2.41	0.08	0.09	0.00	1.27	2.40	0.21	0.28	1.62		
Upper avg..	134	7.76	9.66	6.14	1.39	3	5	48	19	207	2.41	0.08	0.09	0.01	1.27	2.40	0.21	0.28	2.12		
Minimum	55	7.59	7.36	1.80	0.37	1	2	13	2	65	1.74	0.06	0.05	0.01	0.39	0.34	0.10	0.20	1.00		
Maximum	284	7.87	11.70	18.20	1.90	6	10	79	71	475	3.00	0.10	0.18	0.01	3.21	6.99	0.34	0.51	3.50		
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	104	0.12	2.12	8.05	0.70	2	3	35	35	185	0.55	0.02	0.06	0.00	1.31	3.13	0.10	0.16	1.32		

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]
09.02.2009	56	7.00	8.11	0.31	1.60	2	4	185	2	325	9.41	0.08	0.35	0.01	1.44	5.89	0.20	0.58	2.00		
08.05.2009	307	7.15	3.94	8.54	6.30	3	17	4	8	245	5.52	0.06	0.11	0.01	0.88	1.40	0.68	0.35	2.00		
03.08.2009	127	7.37	4.69	0.53	2.50	<1	5	4	6	150	5.84	0.05	0.01	<0.01	0.39	0.10	0.24	0.30			
06.10.2009	95	7.39	4.78	0.52	2.60	<1	5	4	3	131	6.93	0.08	0.01	<0.01	0.34	0.29	0.24	0.36	1.50		
Lower avg.	146	7.23	5.38	2.47	3.25	1	8	49	5	213	6.93	0.07	0.12	0.00	0.76	1.92	0.34	0.40	1.83		
Upper avg..	146	7.23	5.38	2.47	3.25	2	8	49	5	213	6.93	0.07	0.12	0.01	0.76	1.92	0.34	0.40	1.83		
Minimum	56	7.00	3.94	0.31	1.60	1	4	4	2	131	5.52	0.05	0.01	0.01	0.34	0.10	0.20	0.30	1.50		
Maximum	307	7.39	8.11	8.54	6.30	3	17	185	8	325	9.41	0.08	0.35	0.01	1.44	5.89	0.68	0.58	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	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	3		
St.dev	111	0.19	1.86	4.05	2.08	1	6	91	3	90	1.77	0.02	0.16	0.00	0.51	2.71	0.23	0.12	0.29		

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]
09.02.2009	56	6.99	3.42	0.31	2.60	<1	3	51	11	740	4.11	0.20	0.15	0.01	2.39	3.83	1.90	0.20	1.50		
10.05.2009	665	7.18	3.45	0.64	3.30	2	5	31	3	165	5.26	0.20	0.15	0.01	2.22	1.10	3.67	<0.10	1.50		
04.08.2009	100	7.28	3.57	0.62	2.80	<1	4	<1	7	155	4.24	0.20	0.05	0.02	2.08	2.39	6.18	0.20	7.50		
06.10.2009	90	7.18	3.51	0.59	3.30	<1	5	5	6	139	4.75	0.10	0.03	<0.01	1.28	0.98	5.08	0.20	1.50		
Lower avg.	228	7.16	3.49	0.54	3.00	1	4	22	7	300	4.59	0.18	0.09	0.01	1.99	2.08	4.21	0.15	3.00		
Upper avg..	228	7.16	3.49	0.54	3.00	1	4	22	7	300	4.59	0.18	0.09	0.01	1.99	2.08	4.21	0.18	3.00		
Minimum	56	6.99	3.42	0.31	2.60	1	3	1	3	139	4.11	0.10	0.03	0.01	1.28	0.98	1.90	0.10	1.50		
Maximum	665	7.28	3.57	0.64	3.30	2	5	51	11	740	5.26	0.20	0.15	0.02	2.39	3.83	6.18	0.20	7.50		
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	292	0.12	0.07	0.16	0.36	1	1	23	3	294	0.53	0.05	0.06	0.01	0.49	1.33	1.85	0.05	3.00		

Table 2.
Riverine inputs from the 10 main and 36 + 109 tributary rivers in Norway in 2009

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.*	66 792	172 316	107 220	168	372	6 936	412	12 780	92 661	4.914	6.207	0.322	45.46	101.656	17.843	8.484	12.034	0	0
	upper avg.	66 792	172 316	107 220	168	372	6 936	412	12 780	92 661	4.914	6.207	0.326	45.46	101.656	17.843	8.577	30.16	4.876	34.131
Drammenselva	*lower avg.*	28 352	21 240	36 733	21	73	2 446	92	4 534	29 669	1.376	1.614	0.088	9.032	29.113	4.376	2.349	11.77	0	0
	upper avg.	28 352	21 240	36 733	24	73	2 446	92	4 534	29 669	1.404	1.614	0.09	9.032	29.113	4.376	2.681	16.18	2.07	14.488
Numedalslågen	*lower avg.*	10 721	32 057	18 182	32	63	870	97	1 856	15 230	0.866	1.603	0.084	4.64	21.666	1.845	0.924	2.865	0	0
	upper avg.	10 721	32 057	18 182	33	63	870	97	1 856	15 230	0.866	1.603	0.084	4.64	21.666	1.845	0.975	5.878	0.783	5.478
Skienselva	*lower avg.*	25 185	14 102	23 359	19	60	1 362	100	2 715	20 178	0.88	0.858	0.11	4.788	22.012	2.533	0.487	10.676	0	0
	upper avg.	25 185	14 102	23 359	21	60	1 362	100	2 715	20 178	0.907	0.858	0.11	4.788	22.012	2.533	1.008	15.182	1.839	12.87
Otra	*lower avg.*	13 006	4 797	12 953	4	18	423	65	1 104	7 666	0.667	1.329	0.109	6.837	19.257	2.23	0.402	5.326	0	0
	upper avg.	13 006	4 797	12 953	5	18	423	66	1 104	7 666	0.667	1.329	0.109	6.837	19.257	2.23	0.596	6.939	0.949	6.646
Orreelva	*lower avg.*	442	2 205	853	3	14	98	2	239	457	0.06	0.073	0.003	0.279	0.586	0.142	0.071	0.266	0	0
	upper avg.	442	2 205	853	3	14	98	3	239	457	0.06	0.073	0.003	0.279	0.586	0.142	0.071	0.291	0.032	0.226
Vosso(Bolstadelvi)	*lower avg.*	8 065	1 839	3 101	1	14	312	35	575	2 903	0.146	0.172	0.018	1.19	4.775	0.856	0.311	1.015	0	0
	upper avg.	8 065	1 839	3 101	3	14	312	36	575	2 903	0.175	0.172	0.02	1.19	4.775	0.856	0.441	3.448	0.589	4.121
Orkla	*lower avg.*	6 400	3 247	8 412	1	12	362	8	749	6 325	0.246	0.078	0.11	18.166	37.15	1.797	1.045	4.852	0	0
	upper avg.	6 400	3 247	8 412	3	12	362	10	749	6 325	0.266	0.078	0.11	18.166	37.15	1.797	1.052	5.22	0.467	3.271
Vefsna	*lower avg.*	14 643	11 332	8 509	2	14	176	3	646	6 913	0.694	0.34	0.013	1.983	2.924	1.102	0.764	4.36	0	0
	upper avg.	14 643	11 332	8 509	6	15	176	12	646	6 913	0.694	0.341	0.031	1.983	2.975	1.106	0.995	7.86	1.069	7.482
Altaelva	*lower avg.*	6 718	3 845	8 030	2	15	59	13	430	9 277	0.481	0.26	0.008	1.735	7.384	0.476	0.666	0.538	0	0.043
	upper avg.	6 718	3 845	8 030	4	15	59	15	430	9 277	0.481	0.263	0.017	1.735	7.395	0.476	0.688	2.602	0.49	3.433
TRIBUTARY RIVERS (36)																				
Tista utløp Femsjøen	*lower avg.*	2 168	2 283	6 331	4	10	324	5	605	2 787	0.246	0.182	0.017	0.964	2.422	0.585	0.308	0		
	upper avg.	2 168	2 283	6 331	4	10	324	5	605	2 787	0.246	0.182	0.017	0.964	2.422	0.585	0.308	0.791		
Tokkeelva	*lower avg.*	2 936	1 099	5 532	0	4	160	5	367	2 967	0.198	0.209	0.034	0.62	6.219	0.47	0.125	2.149		
	upper avg.	2 936	1 099	5 532	1	4	160	6	367	2 967	0.198	0.209	0.034	0.62	6.219	0.47	0.125	2.89		
Nidelva(Rykene)	*lower avg.*	11 602	16 868	15 764	4	17	542	43	1 379	9 515	0.685	1.127	0.103	2.838	19.031	1.052	0.448	16.862		
	upper avg.	11 602	16 868	15 764	6	17	542	43	1 379	9 515	0.685	1.127	0.103	2.838	19.031	1.052	0.621	17.395		
Tovdalselva	*lower avg.*	5 954	5 284	13 675	0	11	200	35	765	4 795	0.601	1.534	0.116	3.539	16.556	1.187	0.402	7.593		
	upper avg.	5 954	5 284	13 675	2	11	200	35	765	4 795	0.601	1.534	0.116	3.539	16.556	1.187	0.457	7.987		
Mandalselva	*lower avg.*	7 459	3 830	11 602	5	18	305	33	833	3 668	0.575	1.361	0.076	3.4	10.455	0.521	0.216	4.747		

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.	7 459	3 830	11 602	6	18	305	33	833	3 668	0.575	1.361	0.076	3.4	10.455	0.521	0.38	6.694		
Lyngdalselva	*lower avg.*	2 566	1 116	3 949	1	6	139	7	320	1 531	0.204	0.447	0.028	0.644	3.929	0.109	0.057	2.322		
	upper avg.	2 566	1 116	3 949	1	6	139	7	320	1 531	0.204	0.447	0.028	0.644	3.929	0.109	0.094	2.322		
Kvina	*lower avg.*	5 779	5 541	10 937	3	19	227	14	756	2 916	0.496	1.566	0.053	4.561	9.405	0.422	0.226	0.968		
	upper avg.	5 779	5 541	10 937	3	19	227	16	756	2 916	0.496	1.566	0.053	4.561	9.405	0.422	0.324	2.521		
Sira	*lower avg.*	11 389	2 591	8 953	0	12	336	60	855	3 688	0.418	1.518	0.053	2.902	9.987	0.41	0.194	16.81		
	upper avg.	11 389	2 591	8 953	4	12	336	60	855	3 688	0.418	1.518	0.053	2.902	9.987	0.41	0.416	17.98		
Bjerkreimselva	*lower avg.*	3 977	928	2 195	2	8	434	11	601	2 160	0.18	0.285	0.03	0.302	3.814	0.234	0.12	2.89		
	upper avg.	3 977	928	2 195	2	8	434	12	601	2 160	0.18	0.285	0.03	0.302	3.814	0.234	0.229	3.134		
Figgjoelva	*lower avg.*	552	519	723	2	5	137	3	234	509	0.038	0.122	0.004	0.25	1.113	0.093	0.054	0.603		
	upper avg.	552	519	723	2	5	137	3	234	509	0.038	0.122	0.004	0.25	1.113	0.093	0.054	0.628		
Lyseelva	*lower avg.*	1 305	112	697	0	1	24	1	57	625	0.029	0.093	0.003	0.109	0.518	0.024	0.021	1.242		
	upper avg.	1 305	112	697	0	1	24	1	57	625	0.034	0.093	0.004	0.109	0.518	0.031	0.055	1.242		
Årdalselva	*lower avg.*	3 531	306	1 443	0	2	160	1	243	1 599	0.026	0.127	0.006	0.176	1.956	0.107	0	0.534		
	upper avg.	3 531	306	1 443	1	2	160	3	243	1 599	0.071	0.127	0.008	0.176	1.956	0.107	0.129	1.467		
Ulladalsåna (Ulla)	*lower avg.*	2 768	160	1 242	0	1	54	2	116	1 776	0.067	0.056	0.007	0.301	1.696	0.111	0	3.016		
	upper avg.	2 768	160	1 242	1	1	54	3	116	1 776	0.067	0.056	0.008	0.301	1.696	0.12	0.101	3.016		
Suldalslågen	*lower avg.*	4 027	2 185	1 472	2	6	170	3	265	1 306	0.123	0.234	0.009	0.32	2.307	0.242	0.03	1.027		
	upper avg.	4 027	2 185	1 472	2	6	170	4	265	1 306	0.123	0.234	0.011	0.32	2.307	0.242	0.147	1.812		
Saudaelva	*lower avg.*	2 952	165	936	1	3	133	3	214	1 070	0.08	0.089	0.01	0.389	1.973	0.157	0.094	2.224		
	upper avg.	2 952	165	936	1	3	133	4	214	1 070	0.087	0.089	0.01	0.389	1.973	0.157	0.155	2.482		
Vikedalselva	*lower avg.*	807	287	448	0	1	59	2	86	291	0.068	0.068	0.005	0.308	1.128	0.129	0.025	0.187		
	upper avg.	807	287	448	1	1	59	2	86	291	0.068	0.068	0.005	0.308	1.128	0.129	0.029	0.295		
Jostedøla	*lower avg.*	5 590	33 234	1 084	7	27	125	3	262	5 766	0.119	0.472	0.009	1.762	5.204	1.28	1.774	2.923		
	upper avg.	5 590	33 234	1 084	7	27	125	5	262	5 766	0.147	0.472	0.013	1.762	5.204	1.28	1.829	3.509		
Gaular	*lower avg.*	4 883	1 185	2 165	2	7	122	9	300	1 770	0.082	0.118	0.013	0.49	2.828	0.223	0.151	6.365		
	upper avg.	4 883	1 185	2 165	3	7	122	10	300	1 770	0.115	0.118	0.016	0.49	2.828	0.223	0.258	7.277		
Jølstra	*lower avg.*	5 218	2 030	2 457	3	9	238	4	412	1 444	0.073	0.083	0.002	0.507	2.632	0.169	0.048	0.899		
	upper avg.	5 218	2 030	2 457	4	9	238	5	412	1 467	0.132	0.083	0.01	0.507	2.632	0.169	0.215	2.299		
Nausta	*lower avg.*	2 009	436	1 275	2	4	43	1	109	803	0.028	0.05	0	0.141	0.967	0.073	0.026	1.668		
	upper avg.	2 009	436	1 275	2	4	43	2	109	803	0.044	0.05	0.004	0.141	0.967	0.073	0.09	1.668		

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]
Gloppenelva(Breimselva)	*lower avg.*	3 917	1 287	1 435	0	6	201	8	310	1 886	0	0.042	0	0.523	0.964	0.154	0.019	1.906		
	upper avg.	3 917	1 287	1 435	1	6	201	8	310	1 886	0.071	0.042	0.007	0.523	0.964	0.154	0.143	2.664		
Driva	*lower avg.*	6 572	1 812	2 609	1	11	269	5	520	6 915	0.04	0.034	0.006	2.248	8.187	0.226	0.208	4.453		
	upper avg.	6 572	1 812	2 609	2	11	269	8	520	6 915	0.14	0.036	0.012	2.248	8.187	0.226	0.294	5.31		
Surna	*lower avg.*	4 428	4 307	3 947	3	9	145	4	346	2 891	0	0.058	0	0.961	0.987	0.802	0.492	0.672		
	upper avg.	4 428	4 307	3 947	4	9	145	4	346	2 891	0.081	0.058	0.008	0.961	0.987	0.802	0.503	2.007		
Gaula	*lower avg.*	8 808	16 836	10 252	7	20	344	14	838	9 990	0.529	0.35	0.021	6.742	8.761	4.156	1.754	4.688		
	upper avg.	8 808	16 836	10 252	7	20	344	19	838	9 990	0.529	0.35	0.024	6.742	8.761	4.156	1.754	5.406		
Nidelva(Tr.heim)	*lower avg.*	7 973	2 948	7 261	3	8	230	8	567	5 354	0.267	0.077	0.005	3.72	2.458	1.872	0.229	2.104		
	upper avg.	7 973	2 948	7 261	4	8	230	8	567	5 354	0.267	0.077	0.017	3.72	2.458	1.872	0.382	3.837		
Stjørdalselva	*lower avg.*	5 804	18 345	7 308	10	18	168	6	463	3 199	0.156	0.21	0.021	5.835	8.508	1.087	0.422	4.543		
	upper avg.	5 804	18 345	7 308	10	18	168	9	463	3 199	0.183	0.21	0.021	5.835	8.508	1.087	0.422	4.543		
Verdalselva	*lower avg.*	4 161	6 333	5 306	2	5	105	5	351	2 628	0.172	0.131	0.001	1.972	1.44	0.674	0.166	1.008		
	upper avg.	4 161	6 333	5 306	2	5	105	5	351	2 628	0.172	0.131	0.008	1.972	1.44	0.674	0.25	2.008		
Snåsavassdraget	*lower avg.*	2 359	1 031	3 415	1	4	149	2	291	1 250	0.078	0.031	0.001	0.99	0.967	0.305	0.098	1.075		
	upper avg.	2 359	1 031	3 415	1	4	149	2	291	1 250	0.078	0.031	0.005	0.99	0.967	0.305	0.139	1.675		
Namsen	*lower avg.*	3 583	10 017	3 589	4	7	74	4	240	2 565	0.119	0.183	0.004	1.15	2.632	0.882	0.483	2.491		
	upper avg.	3 583	10 017	3 589	4	7	74	6	240	2 565	0.119	0.183	0.008	1.15	2.632	0.882	0.499	2.491		
Røssåga	*lower avg.*	9 236	1 242	3 244	0	7	132	14	356	2 819	0.311	0.141	0.023	1.229	9.147	1.262	0.493	4.773		
	upper avg.	9 236	1 242	3 244	3	7	132	16	356	2 819	0.311	0.143	0.025	1.229	9.147	1.262	0.663	6.479		
Ranaelva	*lower avg.*	19 251	4 563	7 967	0	17	209	22	707	9 078	0.579	0.129	0.021	2.821	5.646	1.745	1.971	9.041		
	upper avg.	19 251	4 563	7 967	7	17	209	27	707	9 078	0.579	0.132	0.042	2.821	5.646	1.745	2.295	9.746		
Beiarelva	*lower avg.*	3 657	2 978	1 623	0	5	96	14	242	3 373	0.05	0.079	0.009	1.25	3.633	1.115	0.912	2.094		
	upper avg.	3 657	2 978	1 623	1	5	96	16	242	3 373	0.077	0.079	0.01	1.25	3.633	1.115	0.943	2.622		
Målselv	*lower avg.*	9 470	15 764	5 119	9	23	77	14	420	7 618	0.153	0.145	0.018	2.201	3.006	0.698	0.632	3.259		
	upper avg.	9 470	15 764	5 119	11	23	77	15	420	7 618	0.276	0.147	0.021	2.201	3.006	0.714	0.632	6.123		
Barduelva	*lower avg.*	8 600	33 750	4 958	12	22	106	22	473	8 303	0.219	0.389	0.015	3.061	5.655	0.811	1.153	2.684		
	upper avg.	8 600	33 750	4 958	12	22	106	27	473	8 303	0.219	0.389	0.021	3.061	5.655	0.811	1.153	4.979		
Tanaelva	*lower avg.*	12 997	21 878	20 816	8	52	96	29	997	29 556	0.305	0.429	0.019	3.426	6.281	2.191	1.725	8.842		
	upper avg.	12 997	21 878	20 816	10	52	96	29	997	29 556	0.305	0.429	0.028	3.426	6.281	2.191	1.725	8.842		
Pasvikelva	*lower avg.*	10 840	2 423	12 713	6	19	103	17	769	19 915	0.74	0.495	0.038	8.285	5.392	15.753	0.223	8.116		

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.	10 840	2 423	12 713	7	19	103	17	769	19 915	0.74	0.495	0.041	8.285	5.392	15.753	0.507	8.116		
TRIBUTARY RIVERS(109)																				
Mosselva	*lower avg.*	761	1 869	2 143	1	7	121	4	254	116	0.105	0.072	0.001	0.417	0.414	0.283	0	0.417		
	upper avg.	761	1 869	2 143	1	7	121	4	254	116	0.105	0.072	0.001	0.417	0.414	0.283	0.002	0.417		
Hølenelva	*lower avg.*	126	305	457	2	4	65	2	88	405	0.031	0.024	0.001	0.112	0.198	0.13	0	0.115		
	upper avg.	126	305	457	2	4	65	2	88	405	0.031	0.024	0.001	0.112	0.198	0.13	0	0.115		
Årungelva	*lower avg.*	55	57	117	0	1	56	0	69	49	0.004	0.002	0	0.038	0.019	0.024	0	0.03		
	upper avg.	55	57	117	0	1	56	0	69	49	0.004	0.002	0	0.038	0.019	0.024	0	0.03		
Gjersjøelva	*lower avg.*	94	29	245	0	0	39	1	52	170	0.009	0.002	0	0.052	0.014	0.072	0	0.077		
	upper avg.	94	29	245	0	0	39	1	52	170	0.009	0.002	0	0.052	0.014	0.072	0	0.077		
Ljanselva	*lower avg.*	61	133	118	1	2	20	1	27	141	0.012	0.005	0	0.054	0	0.056	0.01	0.067		
	upper avg.	61	133	118	1	2	20	1	27	141	0.012	0.005	0	0.054	0	0.056	0.01	0.067		
Loelva	*lower avg.*	102	595	220	2	5	42	8	66	269	0.021	0.036	0.001	0.162	0.348	0.064	0.029	0		
	upper avg.	102	595	220	2	5	42	8	66	269	0.021	0.036	0.001	0.162	0.348	0.064	0.029	0.037		
Akerselva	*lower avg.*	333	141	497	0	2	26	4	51	432	0.031	0.077	0.002	0.168	0.607	0.039	0.008	0.517		
	upper avg.	333	141	497	0	2	26	4	51	432	0.031	0.077	0.002	0.168	0.607	0.039	0.008	0.517		
Frognerelva	*lower avg.*	30	33	47	0	1	13	1	18	65	0.005	0	0	0.051	0.02	0.017	0.002	0.038		
	upper avg.	30	33	47	0	1	13	1	18	65	0.005	0	0	0.051	0.02	0.017	0.002	0.038		
Lysakerelva	*lower avg.*	274	104	559	0	0	18	1	29	232	0.033	0.01	0	0	0.047	0.005	0.011	0.2		
	upper avg.	274	104	559	0	0	18	1	29	232	0.033	0.01	0	0.001	0.047	0.005	0.011	0.2		
Sandvikselva	*lower avg.*	291	124	552	1	2	19	1	34	494	0.038	0	0	0.062	0	0.036	0.05	0		
	upper avg.	291	124	552	1	2	19	1	34	494	0.038	0.001	0	0.062	0.001	0.036	0.05	0		
Åroselva	*lower avg.*	177	817	459	1	2	102	2	117	435	0.042	0.062	0.003	0.143	0.24	0.071	0.077	0.113		
	upper avg.	177	817	459	1	2	102	2	117	435	0.042	0.062	0.003	0.143	0.24	0.071	0.077	0.113		
Lierelva	*lower avg.*	477	6 444	1 265	2	8	137	0	159	1 239	0.142	0.244	0.008	0.43	2.346	0.214	0.33	0.62		
	upper avg.	477	6 444	1 265	2	8	137	0	159	1 239	0.142	0.244	0.008	0.43	2.346	0.214	0.33	0.62		
Sandeelva	*lower avg.*	299	910	488	0	1	46	2	71	401	0.084	0.15	0.013	0.36	3.956	0.136	0.077	0.164		
	upper avg.	299	910	488	0	1	46	2	71	401	0.084	0.15	0.013	0.36	3.956	0.136	0.077	0.164		
Aulielva	*lower avg.*	503	2 565	1 159	8	31	268	20	318	1 561	0.17	0.094	0.011	0.498	0.925	0.501	0.135	0.804		
	upper avg.	503	2 565	1 159	8	31	268	20	318	1 561	0.17	0.094	0.011	0.498	0.925	0.501	0.135	0.804		
Farriselva-Siljanvassdraget	*lower avg.*	1 117	282	1 944	1	1	137	2	202	1 542	0.061	0	0.018	0	4.156	0.035	0.008	0		

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.	1 117	282	1 944	1	1	137	2	202	1 542	0.061	0.002	0.018	0.003	4.156	0.035	0.008	0.408		
Gjerstadelva	*lower avg.*	1 206	530	2 407	1	2	77	12	154	748	0.106	0.206	0.004	0.222	2.078	0.261	0.026	0.66		
	upper avg.	1 206	530	2 407	1	2	77	12	154	748	0.106	0.206	0.004	0.222	2.078	0.261	0.026	0.66		
Vegårdselva	*lower avg.*	1 250	590	2 477	1	2	63	5	143	447	0.124	0.128	0.01	0.274	0.1	0.248	0.046	0.456		
	upper avg.	1 250	590	2 477	1	2	63	5	143	447	0.124	0.128	0.01	0.274	0.1	0.248	0.046	0.456		
Søgneelva-Songdalselva	*lower avg.*	796	281	1 278	1	3	114	6	171	185	0.076	0.114	0.015	0.157	1.553	0.152	0	0.29		
	upper avg.	796	281	1 278	1	3	114	6	171	185	0.076	0.114	0.015	0.157	1.553	0.152	0.002	0.29		
Audnedalselva	*lower avg.*	1 238	429	1 649	0	2	136	5	218	413	0.088	0.194	0.013	0.138	2.59	0.154	0	0.565		
	upper avg.	1 238	429	1 649	0	2	136	5	218	413	0.088	0.194	0.013	0.138	2.59	0.154	0.004	0.565		
Soknedalselva	*lower avg.*	1 783	820	1 217	2	5	164	11	231	768	0.104	0.188	0.015	0.325	2.086	1.565	0.047	0.813		
	upper avg.	1 783	820	1 217	2	5	164	11	231	768	0.104	0.188	0.015	0.325	2.086	1.565	0.047	0.813		
Hellelandselva	*lower avg.*	1 356	533	1 156	1	3	145	7	212	515	0.074	0.193	0.011	0.183	1.645	0.157	0.038	0.619		
	upper avg.	1 356	533	1 156	1	3	145	7	212	515	0.074	0.193	0.011	0.183	1.645	0.157	0.038	0.619		
Håelva	*lower avg.*	405	395	700	2	5	145	10	253	380	0.066	0.024	0.002	0.129	0.595	0.08	0	0.222		
	upper avg.	405	395	700	2	5	145	10	253	380	0.066	0.024	0.002	0.129	0.595	0.08	0.001	0.222		
Imselva	*lower avg.*	341	117	424	0	1	67	2	91	4	0.012	0.011	0.001	0.065	0.237	0.06	0	0.125		
	upper avg.	341	117	424	0	1	67	2	91	4	0.012	0.011	0.001	0.065	0.237	0.06	0.001	0.125		
Oltedalselva,utløp Ragsvatnet	*lower avg.*	716	178	433	0	0	74	3	89	536	0.018	0.039	0.005	0.105	0.775	0.108	0.029	0		
	upper avg.	716	178	433	0	0	74	3	89	536	0.018	0.039	0.005	0.105	0.775	0.108	0.029	0.261		
Dirdalsåna	*lower avg.*	1 121	158	674	0	1	102	1	137	406	0.044	0.075	0.003	0.108	0.523	0.301	0	0.511		
	upper avg.	1 121	158	674	0	1	102	1	137	406	0.044	0.075	0.003	0.108	0.523	0.301	0.003	0.511		
Frafjordelva	*lower avg.*	1 263	227	729	0	1	89	5	115	427	0.033	0.105	0.005	0.143	0.441	0.023	0.042	0.461		
	upper avg.	1 263	227	729	0	1	89	5	115	427	0.033	0.105	0.005	0.143	0.441	0.023	0.042	0.461		
Espedalselva	*lower avg.*	979	193	497	1	1	63	2	100	510	0.019	0.045	0.003	0.021	0.241	0.063	0.07	0.357		
	upper avg.	979	193	497	1	1	63	2	100	510	0.019	0.045	0.003	0.021	0.241	0.063	0.07	0.357		
Førrelva	*lower avg.*	1 148	210	737	1	1	26	1	38	676	0.025	0.06	0.002	0.046	0.179	0.096	0.036	0		
	upper avg.	1 148	210	737	1	1	26	1	38	676	0.025	0.06	0.002	0.046	0.179	0.096	0.036	0.419		
Åbøelva	*lower avg.*	686	106	225	0	1	23	0	32	82	0.018	0.017	0.001	0.033	0.235	0.048	0.068	0.313		
	upper avg.	686	106	225	0	1	23	0	32	82	0.018	0.017	0.001	0.033	0.235	0.048	0.068	0.313		
Etneelva	*lower avg.*	1 372	379	584	1	1	156	2	199	345	0.087	0.038	0.007	0.194	0.548	0.411	0.576	0.876		
	upper avg.	1 372	379	584	1	1	156	2	199	345	0.087	0.038	0.007	0.194	0.548	0.411	0.576	0.876		

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]
Opo	*lower avg.*	4 039	4 178	1 228	5	3	138	15	234	1 752	0.297	0.59	0	0.37	2.352	0.503	0	0		
	upper avg.	4 039	4 178	1 228	5	3	138	15	234	1 752	0.297	0.59	0	0.37	2.352	0.503	0.012	1.474		
Tysso	*lower avg.*	2 870	397	1 707	2	0	156	5	211	769	0.117	0.053	0.006	0.887	3.609	0.691	0.134	1.571		
	upper avg.	2 870	397	1 707	2	1	156	5	211	769	0.117	0.053	0.006	0.887	3.609	0.691	0.134	1.571		
Kinso	*lower avg.*	1 364	493	283	2	0	13	5	44	97	0.05	0.025	0	0	0.037	0.055	0.136	0.498		
	upper avg.	1 364	493	283	2	0	13	5	44	97	0.05	0.025	0	0	0.037	0.055	0.136	0.498		
Veig	*lower avg.*	2 408	527	866	2	2	25	2	79	1 175	0.041	0.041	0.002	0.072	0	0.374	0.203	0.879		
	upper avg.	2 408	527	866	2	2	25	2	79	1 175	0.041	0.041	0.002	0.072	0.009	0.374	0.203	0.879		
Bjoreio	*lower avg.*	2 874	750	2 208	1	3	44	5	111	1 079	0.096	0.077	0	0.369	0.244	0.629	0	1.049		
	upper avg.	2 874	750	2 208	1	3	44	5	111	1 079	0.096	0.077	0	0.369	0.244	0.629	0.008	1.049		
Sima	*lower avg.*	704	196	109	0	1	22	1	34	579	0.018	0.007	0	0.026	0.186	0.078	0.011	0.257		
	upper avg.	704	196	109	0	1	22	1	34	579	0.018	0.007	0	0.026	0.186	0.078	0.011	0.257		
Austdøla	*lower avg.*	619	145	71	0	0	18	2	26	69	0.014	0.014	0.002	0.027	0.102	0.025	0.01	0.283		
	upper avg.	619	145	71	0	0	18	2	26	69	0.014	0.014	0.002	0.027	0.102	0.025	0.01	0.283		
Nordøla /Austdøla	*lower avg.*	186	67	14	0	0	7	0	9	82	0.007	0.004	0	0.008	0.001	0.033	0.004	0		
	upper avg.	186	67	14	0	0	7	0	9	82	0.007	0.004	0	0.008	0.001	0.033	0.004	0.068		
Tysselvi Samnangervassdraget	*lower avg.*	1 694	384	1 046	1	2	52	4	109	148	0.057	0.101	0.008	0.179	0.866	0.148	0	0.618		
	upper avg.	1 694	384	1 046	1	2	52	4	109	148	0.057	0.101	0.008	0.179	0.866	0.148	0.005	0.618		
Oselva	*lower avg.*	762	298	912	1	3	39	2	90	263	0.043	0.072	0.005	0.278	0	0.148	0	0		
	upper avg.	762	298	912	1	3	39	2	90	263	0.043	0.072	0.005	0.278	0.003	0.148	0.002	0.278		
DaleelviBergsdalsvassdraget	*lower avg.*	1 524	385	626	1	1	46	4	97	285	0.046	0.106	0.006	0.189	0.924	0.136	0	0		
	upper avg.	1 524	385	626	1	1	46	4	97	285	0.046	0.106	0.006	0.189	0.924	0.136	0.004	0.556		
Ekso -Storelvi	*lower avg.*	3 483	890	1 891	3	5	68	10	203	244	0.043	0.159	0.013	0	0	0.216	0.083	0		
	upper avg.	3 483	890	1 891	3	5	68	10	203	244	0.043	0.159	0.013	0.009	0.013	0.216	0.083	1.271		
Modalselva -Moelvi	*lower avg.*	3 122	570	975	1	4	99	5	148	629	0.034	0.148	0.011	0	0.269	0.237	0.208	0		
	upper avg.	3 122	570	975	1	4	99	5	148	629	0.034	0.148	0.011	0.008	0.269	0.237	0.208	1.139		
Nærøydalselvi	*lower avg.*	1 502	441	333	1	2	40	3	82	1 314	0.027	0	0	0.126	0.473	0.048	0.118	0.548		
	upper avg.	1 502	441	333	1	2	40	3	82	1 314	0.027	0.003	0	0.126	0.473	0.048	0.118	0.548		
Flåmselvi	*lower avg.*	1 002	451	156	1	1	21	2	37	225	0.036	0.009	0	0.04	0.228	0.102	0.069	0		
	upper avg.	1 002	451	156	1	1	21	2	37	225	0.036	0.009	0	0.04	0.228	0.102	0.069	0.366		
Aurlandselvi	*lower avg.*	2 912	1 026	637	2	1	94	4	139	1 132	0.085	0.159	0	0.353	0.901	0.256	0.052	0		

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.	2 912	1 026	637	2	1	94	4	139	1 132	0.085	0.159	0	0.353	0.901	0.256	0.052	1.063		
Erdalselvi	*lower avg.*	397	76	138	0	0	1	0	11	84	0.008	0.006	0	0.012	0.012	0.012	0.035	0		
	upper avg.	397	76	138	0	0	1	0	11	84	0.008	0.006	0	0.012	0.012	0.012	0.035	0.145		
Lærdalselva /Mjeldo	*lower avg.*	3 370	769	972	2	3	104	5	205	1 359	0.083	0.074	0	0.394	0.495	0.267	0.201	0		
	upper avg.	3 370	769	972	2	3	104	5	205	1 359	0.083	0.074	0	0.394	0.495	0.267	0.201	1.23		
Årdalselvi	*lower avg.*	3 116	774	796	1	3	76	6	129	1 883	0.046	0.022	0.005	1.138	0.398	0.3	0	3.413		
	upper avg.	3 116	774	796	1	3	76	6	129	1 883	0.046	0.022	0.005	1.138	0.398	0.3	0	3.413		
Fortundalselva	*lower avg.*	2 156	2 141	357	1	2	71	3	100	1 128	0.12	0.048	0.009	0.679	0.901	0.208	0.11	1.574		
	upper avg.	2 156	2 141	357	1	2	71	3	100	1 128	0.12	0.048	0.009	0.679	0.901	0.208	0.11	1.574		
Mørkrisdalselvi	*lower avg.*	1 197	1 895	187	1	1	26	2	46	807	0.031	0.057	0	0.239	0.76	0.221	0.155	0		
	upper avg.	1 197	1 895	187	1	1	26	2	46	807	0.031	0.057	0	0.239	0.76	0.221	0.155	0.437		
Årøyelva	*lower avg.*	2 516	1 132	698	1	3	62	6	119	1 322	0.052	0.07	0	0.061	0.654	0.122	0.156	0		
	upper avg.	2 516	1 132	698	1	3	62	6	119	1 322	0.052	0.07	0	0.061	0.654	0.122	0.156	0.918		
Sogndalselva	*lower avg.*	970	237	427	2	2	30	3	56	145	0.032	0.036	0.005	0.07	0.577	0.021	0.135	0		
	upper avg.	970	237	427	2	2	30	3	56	145	0.032	0.036	0.005	0.07	0.577	0.021	0.135	0.354		
Oselva	*lower avg.*	2 135	530	1 948	0	3	41	12	120	460	0.129	0.075	0	0.249	1.325	0.244	0	1.169		
	upper avg.	2 135	530	1 948	0	3	41	12	120	460	0.129	0.075	0	0.249	1.325	0.244	0.006	1.169		
Hopselva	*lower avg.*	618	170	158	0	0	20	1	29	54	0.012	0.02	0.002	0.006	0.233	0.016	0.092	0.225		
	upper avg.	618	170	158	0	0	20	1	29	54	0.012	0.02	0.002	0.006	0.233	0.016	0.092	0.225		
Ååelva (Gjengedalselva)	*lower avg.*	1 422	410	773	1	2	31	3	63	158	0.043	0.032	0	0.095	0.406	0.048	0.098	1.012		
	upper avg.	1 422	410	773	1	2	31	3	63	158	0.043	0.032	0	0.095	0.406	0.048	0.098	1.012		
Oldenelva	*lower avg.*	1 289	683	365	0	2	60	5	94	539	0.099	0.049	0.005	0.141	0.307	0.067	0.051	0		
	upper avg.	1 289	683	365	0	2	60	5	94	539	0.099	0.049	0.005	0.141	0.307	0.067	0.051	0.471		
Loelvi	*lower avg.*	1 490	843	272	0	2	47	2	75	748	0.119	0.039	0.005	0.156	0.079	0.044	0.133	0		
	upper avg.	1 490	843	272	0	2	47	2	75	748	0.119	0.039	0.005	0.156	0.079	0.044	0.133	0.544		
Stryneelva	*lower avg.*	3 037	1 422	554	1	4	106	7	195	1 303	0.122	0.065	0.007	0.671	0.998	0.215	0.193	1.109		
	upper avg.	3 037	1 422	554	1	4	106	7	195	1 303	0.122	0.065	0.007	0.671	0.998	0.215	0.193	1.109		
Hornindalselva(Horndøla)	*lower avg.*	2 215	606	970	1	4	98	6	143	939	0.092	0.023	0.004	0.231	0.65	0.248	0	0.808		
	upper avg.	2 215	606	970	1	4	98	6	143	939	0.092	0.023	0.004	0.231	0.65	0.248	0.006	0.808		
Ørstaelva	*lower avg.*	987	299	564	3	8	36	5	75	604	0.033	0.007	0	0.116	0.34	0.101	0	0.36		
	upper avg.	987	299	564	3	8	36	5	75	604	0.033	0.007	0	0.116	0.34	0.101	0.003	0.36		

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]
Valldøla	*lower avg.*	1 845	404	347	0	2	0	4	0	491	0.034	0.004	0.001	0.128	0.473	0.061	0.037	0		
	upper avg.	1 845	404	347	0	2	1	4	7	491	0.034	0.004	0.001	0.128	0.473	0.061	0.037	0.673		
Rauma	*lower avg.*	4 664	970	1 030	1	3	29	9	94	1 300	0.097	0.057	0	0.518	0.86	0.288	0	0		
	upper avg.	4 664	970	1 030	1	3	29	9	94	1 300	0.097	0.057	0	0.518	0.86	0.288	0.014	1.702		
Isa	*lower avg.*	686	200	136	0	1	4	1	4	392	0.013	0	0	0.078	0.009	0.055	0.061	0.25		
	upper avg.	686	200	136	0	1	4	1	4	392	0.013	0.001	0	0.078	0.009	0.055	0.061	0.25		
Eira	*lower avg.*	4 338	0	930	1	3	166	7	235	3 156	0.158	0.02	0	0.452	0.42	0.19	0.396	2.375		
	upper avg.	4 338	79	930	1	3	166	7	235	3 156	0.158	0.02	0	0.452	0.42	0.19	0.396	2.375		
Litledalselva	*lower avg.*	891	185	195	0	1	45	1	51	1 165	0.018	0	0	0.011	0.016	0.215	0.091	0		
	upper avg.	891	185	195	0	1	45	1	51	1 165	0.018	0.002	0	0.011	0.016	0.215	0.091	0.325		
Ålvunda	*lower avg.*	757	401	488	0	1	36	2	64	533	0.011	0.022	0	0.231	0.207	0.055	0.015	0.345		
	upper avg.	757	401	488	0	1	36	2	64	533	0.011	0.022	0	0.231	0.207	0.055	0.015	0.345		
Toåa	*lower avg.*	955	202	438	0	1	6	2	33	376	0.01	0.016	0	0.156	0.077	0.016	0	0		
	upper avg.	955	202	438	0	1	6	2	33	376	0.01	0.016	0	0.156	0.077	0.016	0.003	0.348		
Bøvra	*lower avg.*	897	245	835	0	0	41	3	84	442	0.027	0.008	0.002	0.077	0.075	0.058	0.014	0		
	upper avg.	897	245	835	0	0	41	3	84	442	0.027	0.008	0.002	0.077	0.075	0.058	0.014	0.327		
Børselva	*lower avg.*	241	388	489	1	1	28	2	53	119	0.018	0.004	0	0.123	0	0.123	0.014	0.308		
	upper avg.	241	388	489	1	1	28	2	53	119	0.018	0.004	0	0.123	0.001	0.123	0.014	0.308		
Vigda	*lower avg.*	362	1 390	492	1	1	25	1	48	264	0.024	0.008	0	0.122	0	0	0	0.297		
	upper avg.	362	1 390	492	1	1	25	1	48	264	0.024	0.008	0	0.122	0.001	0.001	0.001	0.297		
Homla	*lower avg.*	404	100	988	0	1	6	2	32	235	0.072	0.003	0.001	0.096	0	0.073	0	0.295		
	upper avg.	404	100	988	0	1	6	2	32	235	0.072	0.003	0.001	0.096	0.001	0.073	0.001	0.295		
Gråe	*lower avg.*	255	212	510	1	1	41	2	66	18	0.03	0	0	0.101	0	0.036	0.024	0		
	upper avg.	255	212	510	1	1	41	2	66	18	0.03	0	0	0.101	0.001	0.036	0.024	0.093		
Figgja	*lower avg.*	611	1 415	1 704	1	3	83	1	103	335	0.063	0.036	0.001	0.245	0.145	0.19	0.083	0		
	upper avg.	611	1 415	1 704	1	3	83	1	103	335	0.063	0.036	0.001	0.245	0.145	0.19	0.083	0.223		
Årgårdselva	*lower avg.*	1 715	1 748	4 173	1	11	62	11	232	951	0.027	0.059	0	0.425	0.197	0.28	0	1.987		
	upper avg.	1 715	1 748	4 173	1	11	62	11	232	951	0.027	0.059	0	0.425	0.197	0.28	0.005	1.987		
Moelva(Salsvatenelva)	*lower avg.*	1 758	331	1 275	0	0	37	4	79	642	0.065	0.013	0.003	0	0.658	0.081	0	0		
	upper avg.	1 758	331	1 275	0	1	37	4	79	642	0.065	0.013	0.003	0.004	0.658	0.081	0.005	0.642		
Åelva(Åbjøra)	*lower avg.*	2 612	712	980	1	2	29	9	89	384	0.071	0.044	0	0.153	0.62	0.231	0.096	0		

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.	2 612	712	980	1	2	29	9	89	384	0.071	0.044	0	0.153	0.62	0.231	0.096	0.953		
Skjerva	*lower avg.*	430	290	526	1	3	15	11	69	207	0.038	0.049	0.003	0.166	0.315	0.234	0.009	0.314		
	upper avg.	430	290	526	1	3	15	11	69	207	0.038	0.049	0.003	0.166	0.315	0.234	0.009	0.314		
Fusta	*lower avg.*	2 907	939	942	1	5	15	22	121	482	0.137	0.019	0.021	0.145	0.733	0.239	0	1.061		
	upper avg.	2 907	939	942	1	5	15	22	121	482	0.137	0.019	0.021	0.145	0.733	0.239	0.008	1.061		
Drevja	*lower avg.*	942	514	256	1	1	6	2	29	106	0.009	0	0.005	0.079	0.129	0.02	0	0		
	upper avg.	942	514	256	1	1	6	2	29	106	0.009	0.002	0.005	0.079	0.129	0.02	0.003	0.344		
Bjerkaelva	*lower avg.*	1 704	587	1 185	1	0	15	5	63	510	0.027	0.052	0.001	0.313	0.424	0.394	0.022	1.555		
	upper avg.	1 704	587	1 185	1	0	15	5	63	510	0.027	0.052	0.001	0.313	0.424	0.394	0.022	1.555		
Dalselva	*lower avg.*	1 056	245	602	0	2	3	3	26	311	0	0.013	0	0.145	0.003	0.186	0.031	1.06		
	upper avg.	1 056	245	602	0	2	3	3	26	311	0.004	0.013	0	0.145	0.003	0.186	0.031	1.06		
Fykanåga	*lower avg.*	1 719	1 164	314	1	2	22	4	51	219	0.119	0	0	0.071	0.323	0.072	0	0		
	upper avg.	1 719	1 164	314	1	2	22	4	51	219	0.119	0.003	0	0.071	0.323	0.072	0.005	0.628		
Saltelva	*lower avg.*	3 288	4 933	585	2	0	27	6	100	2 250	0.117	0	0	0.28	1.394	0.336	2.748	0		
	upper avg.	3 288	4 933	585	2	1	27	6	100	2 250	0.117	0.006	0	0.28	1.394	0.336	2.748	1.2		
SulitjelmavassdragetUtl Øvrevt	*lower avg.*	2 801	0	1 074	2	0	12	8	61	659	0	0	0	0	0	0.16	6.488	2.301		
	upper avg.	2 801	51	1 074	2	0	12	8	61	659	0.01	0.005	0	0.007	0.01	0.16	6.488	2.301		
Kobbelva	*lower avg.*	1 676	456	245	1	0	17	2	42	662	0.055	0.004	0.009	0.031	0.007	0.095	0	0		
	upper avg.	1 676	456	245	1	0	17	2	42	662	0.055	0.004	0.009	0.031	0.007	0.095	0.005	0.612		
Elvegårdselva	*lower avg.*	3 329	2 695	1 349	1	4	12	10	77	2 183	0.088	0.153	0.017	0.516	1.105	0.759	0.82	2.126		
	upper avg.	3 329	2 695	1 349	1	4	12	10	77	2 183	0.088	0.153	0.017	0.516	1.105	0.759	0.82	2.126		
Spanselva	*lower avg.*	448	102	92	0	0	5	1	15	239	0.009	0.011	0.002	0.077	0.08	0.164	0	0		
	upper avg.	448	102	92	0	0	5	1	15	239	0.009	0.011	0.002	0.077	0.08	0.164	0.001	0.164		
Salangselva	*lower avg.*	1 760	336	681	1	1	10	5	40	504	0	0.023	0.013	0.161	0.193	0.292	0.411	0		
	upper avg.	1 760	336	681	1	1	10	5	40	504	0.006	0.023	0.013	0.161	0.193	0.292	0.411	0.643		
Lakselva(Rossfjordelva)	*lower avg.*	562	179	358	1	0	0	1	20	125	0.011	0.008	0.002	0.03	0.038	0.083	0	0.41		
	upper avg.	562	179	358	1	0	0	1	20	125	0.011	0.008	0.002	0.03	0.038	0.083	0.002	0.41		
Nordkjoselva	*lower avg.*	491	146	206	0	0	3	1	13	365	0.022	0.008	0.002	0.046	0.075	0	0.134	0		
	upper avg.	491	146	206	0	0	3	1	13	365	0.022	0.008	0.002	0.046	0.075	0.002	0.134	0.179		
Signaldalselva	*lower avg.*	1 224	430	826	1	1	8	4	27	924	0.039	0	0.004	0.232	0.007	0.183	0	0		
	upper avg.	1 224	430	826	1	1	8	4	27	924	0.039	0.002	0.004	0.232	0.007	0.183	0.004	0.447		

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]
Skibotnelva	*lower avg.*	1 416	363	853	1	0	12	3	31	832	0.032	0.007	0.008	0.224	0	0.536	0.362	1.292		
	upper avg.	1 416	363	853	1	0	12	3	31	832	0.032	0.007	0.008	0.224	0.005	0.536	0.362	1.292		
Kåfjordelva	*lower avg.*	797	116	204	0	0	17	1	33	436	0.008	0.015	0.004	0.283	0.025	0.189	0.06	0		
	upper avg.	797	116	204	0	0	17	1	33	436	0.008	0.015	0.004	0.283	0.025	0.189	0.06	0.291		
Reisaelva	*lower avg.*	4 185	1 265	2 631	2	3	55	10	156	3 697	0.116	0.118	0.017	1.104	1.165	1.058	0	5.346		
	upper avg.	4 185	1 265	2 631	2	3	55	10	156	3 697	0.116	0.118	0.017	1.104	1.165	1.058	0.012	5.346		
Mattiselva	*lower avg.*	312	73	407	0	0	1	0	11	167	0.014	0	0.002	0.075	0.022	0.034	0.137	0		
	upper avg.	312	73	407	0	0	1	0	11	167	0.014	0.001	0.002	0.075	0.022	0.034	0.137	0.114		
Tverrelva	*lower avg.*	224	82	470	0	0	3	0	17	175	0.007	0.001	0.001	0.063	0.04	0.029	0.011	0		
	upper avg.	224	82	470	0	0	3	0	17	175	0.007	0.001	0.001	0.063	0.04	0.029	0.011	0.082		
Repparfjordelva	*lower avg.*	2 271	489	4 191	1	1	13	9	101	959	0.056	0	0.008	1.094	0.262	0.249	0.048	1.658		
	upper avg.	2 271	489	4 191	1	1	13	9	101	959	0.056	0.004	0.008	1.094	0.262	0.249	0.048	1.658		
Stabburselva	*lower avg.*	1 260	106	1 104	0	1	8	3	29	986	0.025	0.004	0.003	0.052	0.26	0.046	0.191	0		
	upper avg.	1 260	106	1 104	0	1	8	3	29	986	0.025	0.004	0.003	0.052	0.26	0.046	0.191	0.46		
Lakseelv	*lower avg.*	1 138	1 166	1 204	0	2	5	3	43	856	0.023	0.016	0.004	0.228	0	0.247	0.227	0		
	upper avg.	1 138	1 166	1 204	0	2	5	3	43	856	0.023	0.016	0.004	0.228	0.004	0.247	0.227	0.415		
Børselva	*lower avg.*	1 073	392	392	0	0	2	5	31	1 112	0.002	0.043	0.002	0.078	0.207	0.085	0.247	0		
	upper avg.	1 073	392	392	0	0	2	5	31	1 112	0.002	0.043	0.002	0.078	0.207	0.085	0.247	0.392		
Mattusjåkka	*lower avg.*	134	24	64	0	0	3	0	4	59	0.003	0.02	0.002	0.02	0.188	0.039	0.118	0		
	upper avg.	134	24	64	0	0	3	0	4	59	0.003	0.02	0.002	0.02	0.188	0.039	0.118	0.049		
Stuorrajåkka	*lower avg.*	915	0	234	0	0	8	1	30	788	0.03	0.074	0.008	0	0.284	0.055	0.145	0		
	upper avg.	915	17	234	0	0	8	1	30	788	0.03	0.074	0.008	0.002	0.284	0.055	0.145	0.334		
Soussjåkka	*lower avg.*	122	0	58	0	0	1	0	3	122	0.001	0.004	0.001	0.004	0.018	0.002	0.032	0		
	upper avg.	122	2	58	0	0	1	0	3	122	0.001	0.004	0.001	0.004	0.018	0.002	0.032	0.045		
Adamselva	*lower avg.*	1 016	24	593	0	0	0	2	35	830	0.046	0.015	0.007	0.04	0.304	0	0	1.113		
	upper avg.	1 016	24	593	0	0	0	2	35	830	0.046	0.015	0.007	0.04	0.304	0.004	0.003	1.113		
Syltefjordelva(Vesterelva)	*lower avg.*	979	0	286	1	1	2	3	21	785	0.058	0	0.006	0.021	0.064	0	0.629	0.715		
	upper avg.	979	18	286	1	1	2	3	21	785	0.058	0.002	0.006	0.021	0.064	0.004	0.629	0.715		
Jakobselv	*lower avg.*	864	115	883	1	1	0	2	39	1 119	0.024	0	0.003	0.023	0	0.003	0.011	0		
	upper avg.	864	115	883	1	1	0	2	39	1 119	0.024	0.002	0.003	0.023	0.003	0.003	0.011	0.315		
Neidenelva	*lower avg.*	2 464	1 034	4 314	2	1	16	11	171	1 799	0.059	0	0.018	0.468	0	0.202	0.522	0		

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.	2 464	1 034	4 314	2	1	16	11	171	1 799	0.059	0.004	0.018	0.468	0.009	0.202	0.522	0.9		
Grense Jakobselv	*lower avg.*	246	68	324	0	0	0	1	12	268	0.016	0.006	0.002	0.202	0.17	0.698	0.266	0.269		
	upper avg.	246	68	324	0	0	0	1	12	268	0.016	0.006	0.002	0.202	0.17	0.698	0.266	0.269		

Table 3.
Total inputs from Norway 2009

TOTAL INPUTS

Discharge region	Estimate	Flow rate (km^3/d)	SPM [tonnes]	TOC [tonnes]	PO4-P [tonnes]	TOTP [tonnes]	NO3-N [tonnes]	NH4-N [tonnes]	TOTN [tonnes]	SiO2 [tonnes]	As [tonnes]	Pb [tonnes]	Cd [tonnes]	Cu [tonnes]	Zn [tonnes]	Ni [tonnes]	Cr [tonnes]	Hg [kg]	HCHG [kg]	SUMPCB [kg]
INPUTS TO OSPAR REGION: TOTAL NORWAY																				
RIVERINE INPUTS																				
Main Rivers	low avg.	180 324	266 981	227 353	254	655	13 043	826	25 628	191 279	10.33	12.53	0.87	94.11	246.52	33.20	15.50	54	0	0
	upp avg.		266 981	227 353	270	656	13 043	841	25 628	191 279	10.43	12.54	0.90	94.11	246.59	33.21	17.08	94	13	92
Tributary Rivers (36)	low avg.	209 130	225 671	194 443	104	406	6 437	432	16 669	168 323	8.05	12.66	0.78	70.94	177.80	41.33	15.30	137		
	upp avg.		225 671	194 443	142	406	6 438	476	16 669	168 346	8.67	12.67	0.90	70.94	177.80	41.36	18.32	164		
Tributary Rivers (109)	low avg.	145 085	69 977	90 156	101	225	5 199	461	9 641	70 905	5.64	5.36	0.44	21.06	57.03	19.86	18.60	50		
	upp avg.		70 144	90 156	101	229	5 200	462	9 648	70 905	5.66	5.39	0.44	21.09	57.09	19.87	18.74	74		
Total Riverine Inputs	**low avg.**	534 539	562 629	511 951	459	1 287	24 680	1 719	51 939	430 508	24.02	30.55	2.08	186.11	481.36	94.39	49.41	240	0	0
	upp avg.		562 797	511 951	513	1 292	24 681	1 778	51 945	430 531	24.77	30.61	2.24	186.14	481.48	94.44	54.14	332	13	92
Sewage Effluents	low avg.		9 878	3 922	552	921	608	9 126	12 168		0.23	0.61	0.02	4.87	14.38	1.92	1.12	8		21
	upp avg.																			
Industrial Effluents	low avg.		34 382	526	154	256	116	1 734	2 312		1.94	2.94	0.17	8.53	15.78	8.05	1.05	10		0
	upp avg.																			
Fish Farming	low avg.				7 038	10 200	5 475	39 818	49 773					836.02						
	upp avg.																			
Total Direct Inputs	**low avg.**		44 260	4 448	7 744	11 377	6 199	50 678	64 253		2.17	3.54	0.19	849.42	30.16	9.97	2.18	17		21
	upp avg.																			
Unmonitored Areas	low avg.	284 531			97	393	17 990	1 583	28 784											
	upp avg.																			
REGION TOTAL	**low avg.**	819 070	606 890	516 399	8 300	13 057	48 870	53 980	144 976	430 508	26.19	34.09	2.28	1 035	511.52	104.36	51.59	258	0	22
	upp avg.		607 057	516 399	8 354	13 062	48 871	54 040	144 983	430 531	26.94	34.15	2.43	1 035	511.64	104.41	56.32	350	13	113

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.	144 056	244 513	198 446	244	586	12 036	766	22 989	165 404	8.70	11.61	0.71	70.76	193.70	28.83	12.65	43	0	0
	upp avg.		244 513	198 446	251	586	12 036	767	22 989	165 404	8.76	11.61	0.72	70.76	193.70	28.83	13.84	74	11	74
Tributary Rivers (36)	low avg.	30 119	29 363	52 904	14	60	1 532	121	3 950	23 731	2.30	4.41	0.35	11.36	54.68	3.82	1.50	31		
	upp avg.		29 363	52 904	19	60	1 532	122	3 950	23 731	2.30	4.41	0.35	11.36	54.68	3.82	1.89	36		
Tributary Rivers (109)	low avg.	9 190	16 239	18 079	23	78	1 501	79	2 241	9 347	1.18	1.42	0.10	3.34	19.61	2.50	0.81	5		
	upp avg.		16 239	18 079	23	78	1 501	79	2 241	9 347	1.18	1.42	0.10	3.34	19.61	2.50	0.82	6		
Total Riverine Inputs	**low avg.**	183 365	290 116	269 429	281	725	15 069	965	29 181	198 482	12.19	17.44	1.16	85.46	268.00	35.14	14.96	79	0	
	upp avg.		290 116	269 429	293	725	15 069	967	29 181	198 482	12.24	17.44	1.17	85.46	268.00	35.14	16.55	116	11	74
Sewage Effluents	low avg.		2 858	2 376	61	101	236	3 536	4 715		0.17	0.34	0.01	2.95	8.87	1.40	0.57	2		20
	upp avg.																			
Industrial Effluents	low avg.		3 028	198	49	82	50	743	991		0.17	0.44	0.04	7.79	6.35	2.32	1.03	7		0
	upp avg.																			
Fish Farming	low avg.				5	7	4	26	33					0.57						
	upp avg.																			
Total Direct Inputs	**low avg.**		5 886	2 574	115	190	289	4 306	5 739		0.33	0.79	0.05	11.31	15.22	3.72	1.60	9		21
	upp avg.																			
Unmonitored Areas	low avg.	5 722			4	17	930	82	1 488											
	upp avg.																			
REGION TOTAL	**low avg.**	189 087	296 002	272 003	400	932	16 288	5 353	36 408	198 482	12.52	18.23	1.21	96.77	283.22	38.86	16.56	88	0	21
	upp avg.		296 002	272 003	411	932	16 288	5 355	36 408	198 482	12.58	18.23	1.21	96.78	283.22	38.86	18.15	125	11	95

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.	8 507	4 044	3 954	5	28	410	37	814	3 360	0.21	0.24	0.02	1.47	5.36	1.00	0.38	1	0	0
	upp avg.		4 044	3 954	7	28	410	38	814	3 360	0.24	0.24	0.02	1.47	5.36	1.00	0.51	4	1	4
Tributary Rivers (36)	low avg.	61 271	52 081	41 412	24	117	2 604	133	5 138	29 139	2.03	5.37	0.23	13.68	50.42	3.94	2.84	46		
	upp avg.		52 081	41 412	36	118	2 604	146	5 138	29 162	2.30	5.37	0.26	13.68	50.42	3.95	4.27	54		
Tributary Rivers (109)	low avg.	68 162	26 202	29 053	42	80	2 708	177	4 535	25 421	2.50	2.97	0.15	8.42	25.49	8.62	3.29	19		
	upp avg.		26 202	29 053	42	81	2 708	177	4 535	25 421	2.50	2.98	0.15	8.44	25.51	8.62	3.34	30		
Total Riverine Inputs	**low avg.**	137 940	82 327	74 420	71	225	5 722	347	10 488	57 919	4.73	8.59	0.40	23.57	81.27	13.56	6.52	66	0	0
	upp avg.		82 327	74 420	85	226	5 722	361	10 488	57 942	5.03	8.59	0.44	23.59	81.29	13.58	8.12	88	1	4
Sewage Effluents	low avg.		4 278		208	347	178	2 672	3 563		0.04	0.22	0.01	1.25	3.88	0.34	0.31	4		1
	upp avg.																			
Industrial Effluents	low avg.		9 535	269	57	95	24	363	484		1.72	0.86	0.08	0.47	7.19	3.71	0.02	2		
	upp avg.																			
Fish Farming	low avg.				2 487	3 605	1 937	14 085	17 606					295.06						
	upp avg.																			
Total Direct Inputs	**low avg.**		13 813	269	2 753	4 047	2 139	17 120	21 653		1.76	1.08	0.09	296.79	11.07	4.05	0.33	6		1
	upp avg.																			
Unmonitored Areas	low avg.	90 484			30	121	7 203	634	11 524											
	upp avg.																			
REGION TOTAL	**low avg.**	228 424	96 140	74 688	2 853	4 393	15 063	18 101	43 665	57 919	6.50	9.67	0.49	320.36	92.34	17.62	6.85	72	0	1
	upp avg.		96 140	74 688	2 868	4 394	15 063	18 115	43 665	57 942	6.79	9.67	0.53	320.37	92.36	17.63	8.45	95	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.	21 043	14 579	16 922	3	26	538	10	1 395	13 238	0.94	0.42	0.12	20.15	40.07	2.90	1.81	9	0	0
	upp avg.		14 579	16 922	9	27	538	21	1 395	13 238	0.96	0.42	0.14	20.15	40.13	2.90	2.05	13	2	11
Tributary Rivers (36)	low avg.	93 903	119 926	66 598	52	157	2 104	133	5 814	65 982	2.67	1.96	0.14	34.18	61.03	15.63	9.01	43		
	upp avg.		119 926	66 598	70	157	2 104	163	5 814	65 982	3.03	1.97	0.22	34.18	61.03	15.65	9.93	57		
Tributary Rivers (109)	low avg.	54 713	23 963	28 499	30	61	927	164	2 318	26 113	1.60	0.78	0.12	6.94	10.11	7.05	11.92	22		
	upp avg.		24 093	28 499	30	63	928	164	2 325	26 113	1.62	0.80	0.12	6.95	10.13	7.05	11.99	31		
Total Riverine Inputs	**low avg.**	169 659	158 468	112 019	85	244	3 569	307	9 527	105 334	5.21	3.15	0.39	61.27	111.21	25.58	22.74	74	0	0
	upp avg.		158 598	112 019	109	247	3 569	348	9 534	105 334	5.61	3.19	0.48	61.28	111.28	25.61	23.96	102	2	11
Sewage Effluents	low avg.		2 732	1 545	263	439	182	2 724	3 632		0.02	0.05	0.00	0.67	1.62	0.18	0.24	2		0
	upp avg.																			
Industrial Effluents	low avg.		21 820	58	47	79	42	628	838		0.05	1.63	0.05	0.26	2.25	2.01	0.00	0		
	upp avg.																			
Fish Farming	low avg.				4 123	5 975	3 205	23 310	29 137					490.24						
	upp avg.																			
Total Direct Inputs	**low avg.**		24 552	1 603	4 434	6 493	3 429	26 661	33 606		0.08	1.68	0.06	491.17	3.87	2.19	0.24	2		0
	upp avg.																			
Unmonitored Areas	low avg.	157 276			53	217	8 480	746	13 568											
	upp avg.																			
REGION TOTAL	**low avg.**	326 935	183 020	113 622	4 572	6 954	15 477	27 715	56 701	105 334	5.29	4.83	0.44	552.44	115.08	27.77	22.98	76	0	0
	upp avg.		183 150	113 622	4 596	6 956	15 478	27 756	56 708	105 334	5.68	4.86	0.54	552.45	115.15	27.80	24.21	104	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.	6 718	3 845	8 030	2	15	59	13	430	9 277	0.48	0.26	0.01	1.74	7.38	0.48	0.67	1	0	0
	upp avg.		3 845	8 030	4	15	59	15	430	9 277	0.48	0.26	0.02	1.74	7.40	0.48	0.69	3	0	3
Tributary Rivers (36)	low avg.	23 837	24 301	33 529	14	71	198	45	1 766	49 471	1.04	0.92	0.06	11.71	11.67	17.94	1.95	17		
	upp avg.		24 301	33 529	17	71	199	45	1 766	49 471	1.04	0.92	0.07	11.71	11.67	17.94	2.23	17		
Tributary Rivers (109)	low avg.	13 019	3 573	14 524	6	7	64	42	547	10 024	0.36	0.18	0.07	2.37	1.82	1.69	2.58	4		
	upp avg.		3 610	14 524	6	8	64	42	547	10 024	0.36	0.19	0.07	2.37	1.84	1.70	2.59	7		
Total Riverine Inputs	**low avg.**	43 574	31 719	56 083	22	93	321	99	2 743	68 772	1.89	1.37	0.13	15.81	20.88	20.11	5.20	21	0	0
	upp avg.		31 755	56 083	27	94	322	102	2 743	68 772	1.89	1.38	0.15	15.82	20.90	20.12	5.51	26	0	3
Sewage Effluents	low avg.		10		20	34	13	194	258											
	upp avg.																			
Industrial Effluents	low avg.			2	0	0	0	0	0							0.01	0.00	0		
	upp avg.																			
Fish Farming	low avg.				423	613	330	2 398	2 997					50.15						
	upp avg.																			
Total Direct Inputs	**low avg.**		10	2	443	647	343	2 591	3 255					50.15		0.01	0.00	0		
	upp avg.																			
Unmonitored Areas	low avg.	31 049			9	38	1 378	121	2 204											
	upp avg.																			
REGION TOTAL	**low avg.**	74 623	31 728	56 085	475	778	2 041	2 812	8 202	68 772	1.89	1.37	0.13	65.96	20.88	20.11	5.20	22	0	0
	upp avg.		31 765	56 085	479	779	2 042	2 814	8 202	68 772	1.89	1.38	0.15	65.97	20.90	20.12	5.51	27	0	3

Statlig program for forurensningsovervåking

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Om Statlig program for forurensningsovervåking

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

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

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

SPFO-rapport 1081/2010
TA-2726/2010