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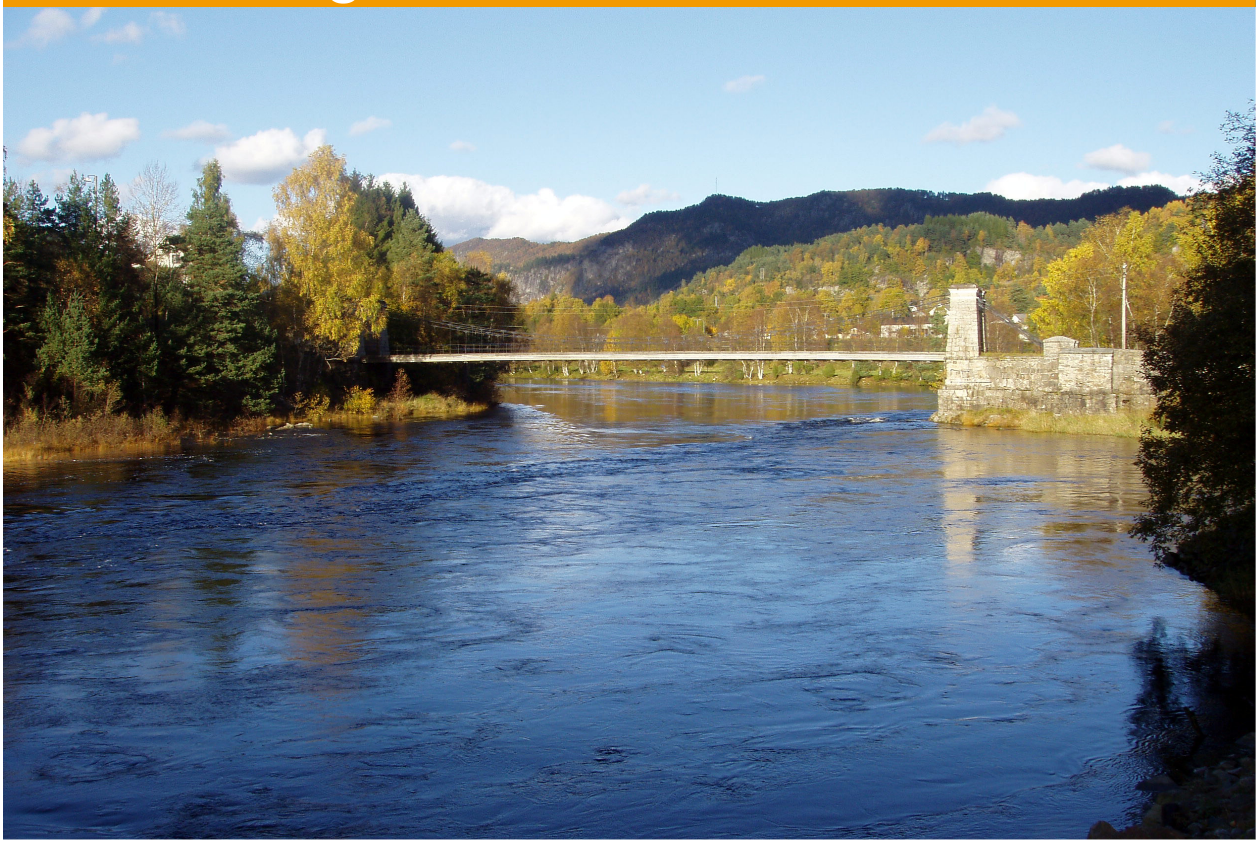

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Riverine inputs and direct discharges to Norwegian coastal waters – 2008

Norwegian Institute for Water Research
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REPORT

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Abstract
Riverine inputs and direct discharges to Norwegian seas in 2008 have been estimated, in accordance with the requirements of the OSPAR Commission. Nutrient inputs from both rivers and point sources (industry, sewage treatment plants and fish farming) have increased slightly compared to the previous four years. In some rivers, however, nutrient concentrations have decreased since 1990. The direct discharges of metals from industry and sewage treatment plants have decreased significantly in recent years, and there are also examples of reductions of metal loads in rivers. Copper discharges from fish farming have increased since 2000, but in several rivers the concentrations of copper have been reduced. Inputs of PCBs and the pesticide lindane are insignificant.

4 keywords, Norwegian	4 keywords, English
1. Elvetilførsler	1. Riverine inputs
2. Direkte tilførsler	2. Direct discharges
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Preface

This report presents the results of the 2008 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 2008 has been administered by Christine Daae Olseng at the Norwegian Pollution Control Authority (SFT). SFT 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 2008. 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 2008 reporting, Per G. Stålnacke has been the main responsible for the data handling and the statistical parts of the report, Paul Andreas Aakerøy and Ståle Haaland have assisted in data analyses and reporting.

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 Norwegian Pollution Control Authority (SFT) for data on effluents from industrial plants; the Directorate of Fisheries (FD) for data on fish farming.

Oslo, November 2009

Øyvind Kaste

Project co-ordinator

Content

Addendum

Summary

This report presents the 2008 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. In addition, loads are also estimated from the remaining land area draining into the Atlantic sea, including 201 unmonitored rivers and areas downstream sampling points. Direct discharges are estimated from industry, sewage treatment plants and fish farming.

In 2008, the programme monitored 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).

A methodical work on the 1990-2007 RID database (Stålnacke et al. 2009) has resulted in a more complete and reliable dataset both for 2008 and for comparisons of 2008 data with former years.

Whereas nutrient inputs from both rivers and point sources (direct discharges) have increased slightly compared to the previous four years, there are also many examples of rivers where the average concentrations of nutrients have decreased since 1990. For metals, there are distinct reductions in discharges from industry and sewage treatment plants in recent years, and also examples of rivers where the loads and concentrations of metals have been reduced significantly since 1990. Copper from fish farming have increased steadily since 2000, but in several rivers the concentrations of copper have been reduced. A more detailed summary of the 2008 findings and comparisons with former years is given below:

Climate and water discharge

In spite of some unusual weather events in 2008, the total runoff for the year was relatively close to average values for Norway. The water flow was however much higher (23%) in the Skagerrak region than in the four past years, whereas both in the Norwegian and the Barents Sea the flow was lower than in the former years. In the North Sea, the flow in 2008 was only 7 % higher than in the last years.

Nutrients and suspended particulate matter

The total nutrient inputs to coastal waters from land based sources in Norway in 2008 were estimated to about 12 200 tonnes of phosphorus and about 157 500 tonnes of nitrogen. Total silicate inputs were estimated to about 500 000 tonnes and total organic carbon (TOC) to about 540 000 tonnes. The input of suspended particulate matter amounted to about 970 000 tonnes.

As compared to the period 2004-2007, 2008 showed a slight increase in total nitrogen and a 10% increase of total phosphorus loads. Loads of suspended particulate matter increased as compared to the 2004-2007 period. In terms of long-term riverine loads (since 1990), only a few trends could be detected. These include reductions in loads of nitrogen in River Skienselva and reductions in nitrogen and phosphorus loads in River Vefsna.

In terms of average nutrient concentrations since 1990, there has been a decrease in many rivers. This includes Rivers Skienselva, Vefsna and Altaelva (total nitrogen and nitrate); Rivers Glomma, Orkla, Vefsna and Altaelva (ammonium); River Otra (nitrate); and Rivers Otra, Orkla, Vefsna and Altaelva (total phosphorus and ortho-phosphate). There are also statistically significant downwards trends for suspended particle concentrations in Rivers Otra, Orkla and Vefsna. Three rivers also show increases of total nitrogen concentrations since 1990; these are located in south-east Norway (Rivers Glomma, Drammenselva and Numedalslågen).

The direct discharges of nutrients from industry, sewage treatment plants and fish farming have increased as compared to the period 2004-2007 (33 % for total phosphorus and 25 % for total nitrogen). The highest discharges derive from fish farming, especially in the North and Norwegian Seas.

Metals

Total inputs of metals to the Norwegian seas were estimated to 960 tonnes of copper, 679 tonnes of zinc, 127 tonnes of nickel, 59 tonnes of chromium, 45 tonnes of lead, 26 tonnes of arsenic, 2.6 tonnes of cadmium, and 0.15 tonnes of mercury.

In general, riverine loads of metals did not change much from the period 2004-07 to 2008.
Since 1990, riverine inputs of copper have been reduced in Rivers Vefsna, Orkla, Skienselva and Altaelva. In addition, there has been a reduction in zinc inputs since 1990 in Rivers Orkla and Vefsna, with tendencies of decreased inputs also from Rivers Glomma, Numedalslågen and Skienselva. An increase of chromium in River Glomma was mainly due to one sample with high values in November 2008.

Since 1990, average copper *concentrations* have decreased in Rivers Skienselva, Orkla, Vefsna and Altaelva, and to some extent also in River Numedalslågen. Zinc concentrations have decreased in seven of the main rivers.

Direct discharges of copper from fish farms have increased steadily since 2004, although the increase from 2007 to 2008 seems to be smaller than in previous years. Apart from copper, all other metals from direct discharges show a clear decrease as compared to the period 2004-2007.

Pesticides

Inputs of PCB7 and lindane are as in former years low; these substances can hardly be found in quantities above the detection limit of the analytical methods.

Sammendrag

Resultater fra Elvetilførselsprogrammet (RID) i 2008 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 2008, i tillegg er tilførsler beregnet fra det resterende landområdet som drenerer til Atlanterhavet, herunder 201 vassdrag som ikke er overvåket i 2008 samt områder nedstrøms prøvetakingsstedene. Direkte utslipp fra industri, kloakkrenseanlegg og akvakulturanlegg er også beregnet.

I 2008 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).

RID-databasen fra 1990-2007 har gjennomgått en større revisjon siden forrige rapportering (Stålnacke et al. 2009). Dette har resultert i en mer komplett og pålitelig RID-database både for 2008 og som sammenligningsgrunnlag for 2008-resultatene.

En sammenligning av resultatene fra 2008 med perioden 2004-2007 viser at tilførslene av næringssalter har økt både fra elver og direktetilførsler, men siden 1990 finnes det også eksempler på elver hvor konsentrasjonen av næringssalter har minket. Tilførslene av metaller fra industri og kloakkrenseanlegg har generelt minket i løpet av 2000-tallet. Metalltilførsler i enkelte elver har også minket siden 1990. Det har vært en økning til tilførsler av kobber fra akvakultur, dette skyldes rensing av mjærer, men samtidig har kobbertilførslene fra flere elver gått ned. En mer detaljert oversikt over tilførsler i 2008 sammenlignet med tidligere år er gitt under:

Klimatiske forhold og vannføring i 2008

Til tross for noen uvanlige værforhold i 2008 var total vannføring relativt normal for landet som helhet. Vannføringen i Skagerrak-regionene var imidlertid høyere enn normalt, og 23 % høyere enn i de fire foregående årene. Vannføringen til Nordsjøen var også noe høyere, mens dreneringen til Norskehavet og Barentshavet var noe lavere enn de siste fire årene.

Næringssalt og suspendert tørrstoff

Totale tilførsler av næringssalter til havområder i Norge i 2008 er beregnet til ca 12 200 tonn fosfor og ca 157 500 tonn nitrogen. Tilførsler av silikat er beregnet til ca 500 000 tonn og totalt organisk karbon (TOC) til ca 540 000 tonn. Tilførslene av suspendert partikulært materiale var omlag 970 000 tonn.

Sammenlignet med perioden 2004-2007 var det en svak økning i total nitrogen og en 10 % økning av totale fosfortilførsler fra elver. Tilførslene av sedimenter økte også sett i forhold til de tidligere fire årene. Sett i forhold til hele tidsserien fra 1990 er det imidlertid få trender. Disse omfatter reduksjon av tilførsler av nitrogen i Skienselva og reduksjon av nitrogen- and fosfortilførsler i Vefsna.

Når det gjelder *konsentrasjoner* av næringssalter har det vært en reduksjon i flere vassdrag siden 1990. Dette omfatter reduksjon av total nitrogen- og nitratkonsentrasjoner i Skienselva, Vefsna og Altaelva; reduksjon av ammoniumkonsentrasjoner i Glomma, Orkla, Vefsna og

Altaelva; reduksjon av nitratkonsentrasjoner i Otra; og reduksjon av totalfosfor- og ortofosfatkonsentrasjoner i Otra, Orkla, Vefsna og Altaelva. For suspenderte partikler er det statistisk signifikante nedadgående trender i Otra, Orkla and Vefsna. På den annen side har tre vassdrag som drenerer til Skagerrak økte tilførsler av total nitrogen siden 1990, dette gjelder Glomma, Drammenselva og Numedalslågen.

Utslipp av næringssalter fra industri, kloakkrenseanlegg og akvakultur har økt siden perioden 2004-2007 (33 % for total fosfor og 25 % for total nitrogen). De høyeste direkteutslippene stammer fra akvakultur, som det er mest av i Nordsjøen og Norskehavet.

Metaller

Totale tilførsler av metaller til norske havområder i 2008 er beregnet til omlag 960 tonn kobber, 679 tonn sink, 127 tonn nikkel, 59 tonn krom, 43 tonn bly, 26 tonn arsen, 2,6 tonn kadmium og 0,15 tonn kvikksølv.

Det har generelt vært få endringer i elvetilførsler av metaller siden 2004. Siden 1990 har elvetilførslene av kobber gått ned i Vefsna, Orkla, Skienselva og Altaelva. I tillegg har sinktilførslene blitt reduserte siden 1990 i Orkla og Vefsna, med tendenser til reduksjon også i Glomma, Numedalslågen og Skienselva. En økning i krom i Glomma skyldes en enkeltprøve med høye verdier i november 2008.

Konsentrasjon av kobber i norske elver siden 1990 har gått ned i Skienselva, Orkla, Vefsna og Altaelva, og tildels også i Numedalslågen. Sinkkonsentrasjoner har blitt redusert i sju av de ti vassdragene som overvåkes månedlig.

Direkteutslipp av kobber fra akvakulturanlegg har økt siden 2004, men økningen fra 2007 til 2008 ser ut til å være lavere enn tidligere år. Bortsett fra kobber har andre metaller fra direkteutslipp vist en nedadgående trend siden perioden 2004-2007.

Pesticider

Tilførsler av PCB7 og lindan er svært lave. Konsentrasjonene er stort sett under deteksjonsgrensen for den analytiske metoden.

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 2008 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).

In 2008, 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 report also gives direct discharges from industry, sewage treatment plants and fish farming.

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*.

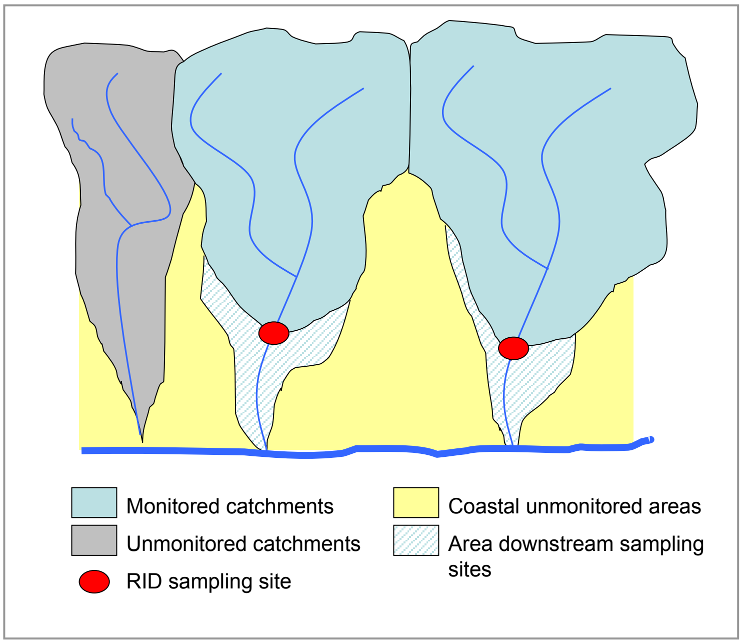

Figure 1. Illustration of RID areas. Areas covered by RID monitoring stations (blue; 46 rivers); areas downstream of the sampling sites (blue shaded); coastal areas between catchments (yellow); and unmonitored catchments (grey).

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 2008, 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, as they all drain directly into the sea. The programme in 2008 has undergone some changes since last year; these are outlined in Section 1.4, below. In Appendix IV, details on former changes of the RID monitoring programme are given.

The surface of Norway is mainly divided into areas covered by forest, agriculture and other artificial surfaces, mountains and mountain plateaus, as well as lakes and wetlands (Figure 3). Mountains and forests are the main land cover categories, and this is reflected in the area distribution of the RID rivers. The land use 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 inputs from 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 Norwegian Pollution Control Authority'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 Main changes in the Norwegian RID programme in 2008

In 2008, some changes in the Norwegian RID Programme were introduced. The reasons for these will be more discussed in the respective sections throughout the report, but an overview is given here.

Most of the changes in 2008 are linked to a thorough and methodical assessment and revision of the historical data from the RID Programme in the period 1990-2007 (Stålnacke et al. 2009). The revision covered all data from the programme started in 1990 to 2007. The method used to revise some of the data has been continued in 2008 in order to ensure a consistent database. The most important changes that affect the present reporting include:

- A revised methodology for the calculation of loads in rivers.
- New method for the direct discharges, 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 2008 will be set equal to the value of the trend line in 2007 (or the year with the most recent data).
- A couple of industrial point sources that had huge discharges of sediments have now been excluded from the reporting. The reason is that these do not represent particle pollution to the coastal areas since the sediments are disposed of in very restricted dumping tips. This has significantly reduced sediment inputs to the Norwegian maritime areas as compared to former years.
- The result of the work, i.e. an upgraded historical database, will have significant implications for the comparison of the 2008 inputs and discharges with former years, including the 1990-2008 trend analyses.

In addition, a decision was taken in 2008 to phase out River Suldalslågen as a main river and instead introduce River Vosso; the reason is outlined in Section 2.2. This will give implications for the comparisons between 2008 and former years, and 2008 must therefore be regarded as a 'transition year' for this particular change.

Furthermore, the data from a parallel sampling programme have been included in the database for River Glomma, and the number of samples in this river in 2008 therefore amounts to 30 This parallel data series only contains data for some nutrients and TOC (cf. Section 2.2).

1.5 Outline of the 2008 RID Report

The 2008 RID Report is organised as follows:

- Chapter 2: The methodology of the RID Programme;
- Chapter 3: The results, including concentrations and loads in 2008 as well as climatic and water discharge conditions this year;

- Chapter 4: Discussions, including comparisons with recent years 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 RID Report, some of the 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 2008; the calculated annual loads of each river in 2008; as well as overview tables of all loads to the four coastal areas and total for Norway in 2008.

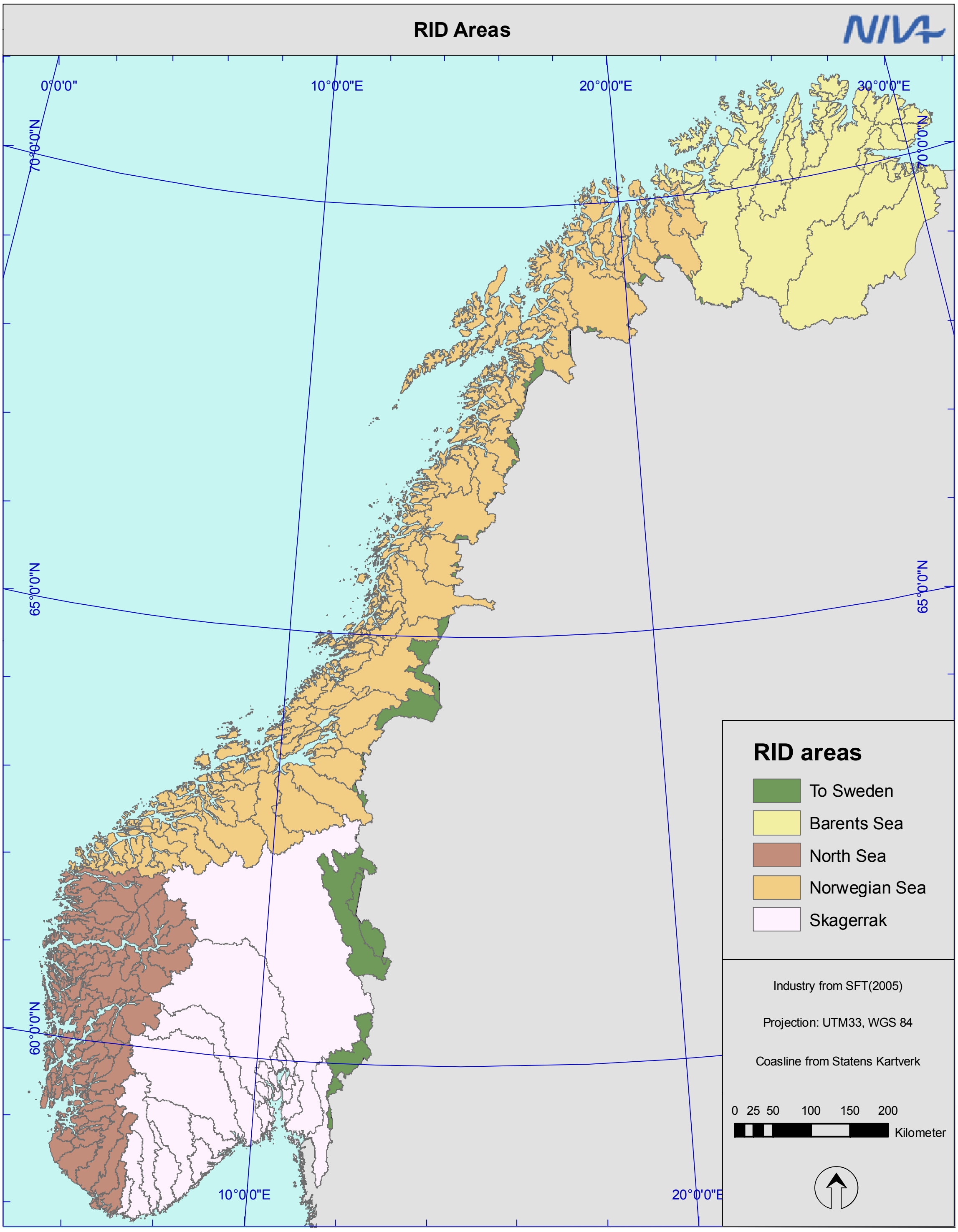

Figure 2. Norway has been divided into four Discharge Areas, i.e. Skagerrak, North Sea, Norwegian Sea and the Barents Sea. Minor parts of Norway drain to Sweden.

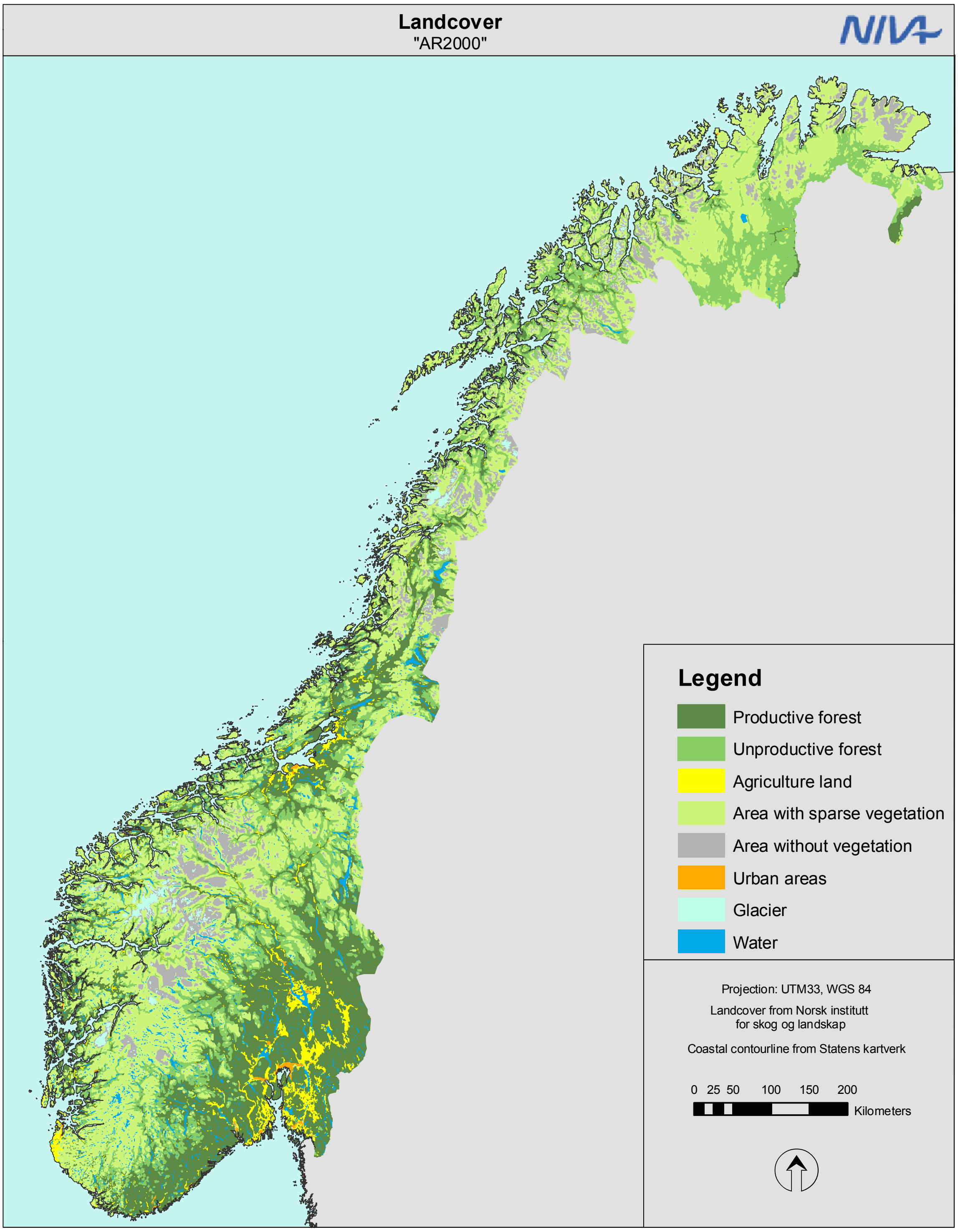

Figure 3. Land cover map of Norway. See also Figure 4 where the land use in the catchments of the 10 main RID rivers is shown.

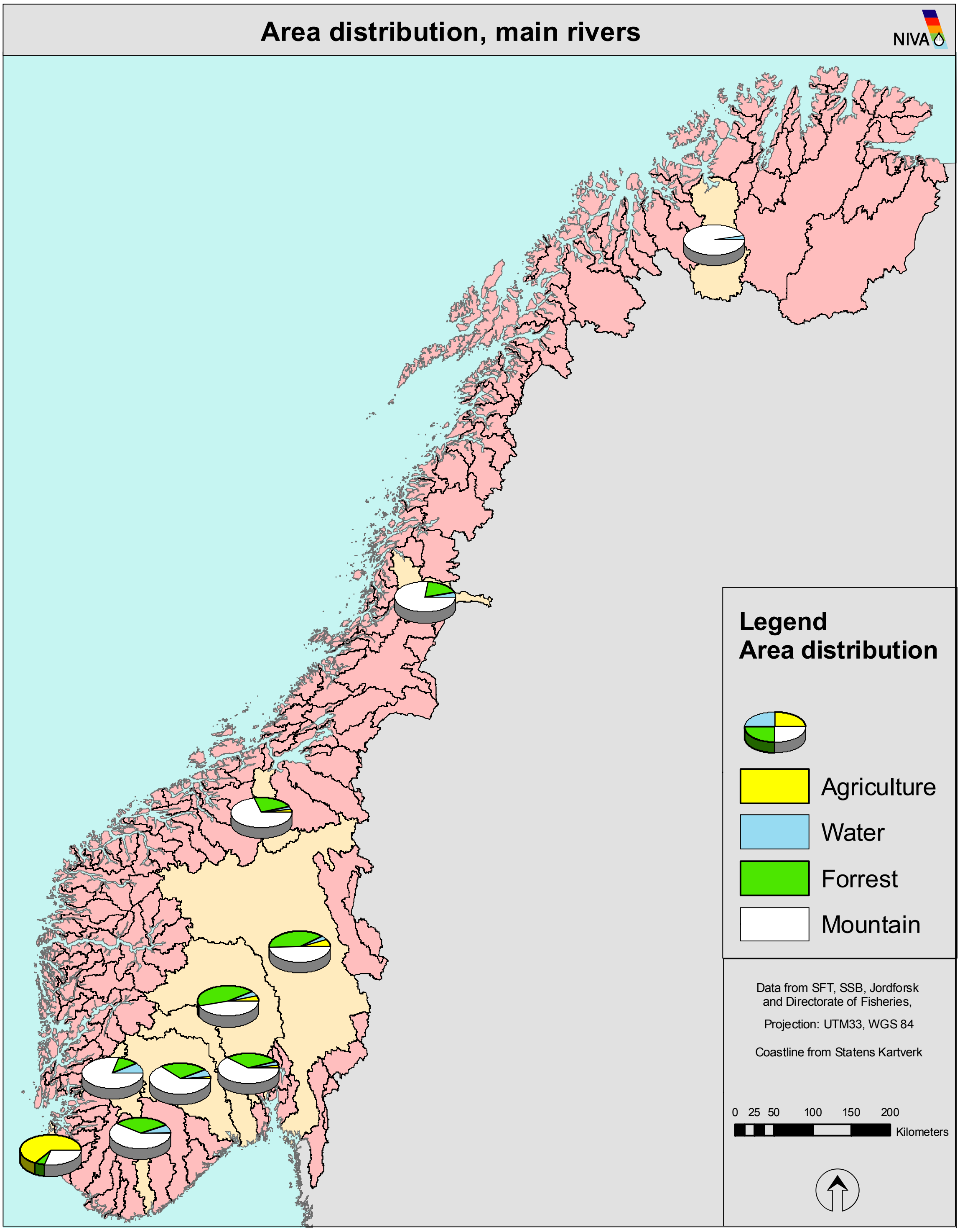

Figure 4. Land use in the catchment areas of the 10 main rivers. "Water" signifies proportion of lakes in the catchment; "Mountains" include moors and mountain plateaus not covered by forest. Based on data from The Norwegian Forest and Landscape Institute.

2. Materials and methods

This chapter presents the methodology used in the RID 2008 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; as well as 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 related to 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 available 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.

In 2008 it was decided to reduce the sampling in River Suldalslågen to 4 times a year and increase the sampling in River Vosso to 10 times a year. In other words, River Vosso has from this year on been sampled as a main river whereas Suldalslågen is now sampled as one of the 36 tributary rivers. The main reason is that River Suldalslågen is heavily modified due to hydropower developments, and the load in this river is therefore not representative for an unmodified watershed in this region. River Vosso fits 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 under agricultural land. The river is situated in the same maritime region as River Suldalslågen.

Since such changes will inevitably be a challenge for a long term database, this transition is done in two steps, where Step 1, in 2008, will be a transition year, and Step 2 in 2009, will report River Vosso as a 'full member' of the 10 main rivers. More detailed,

- River Vosso, formerly one of the 36 tributary rivers is in the process of being 'upgraded' to a main river and is now monitored 12 times a year (11 times in 2008 since the decision to change came in February). In the overview of pollutant inputs from main and tributary rivers in 2008, however, River Vosso still ranks as a tributary river. This is done to be able to compare the category "main rivers" with former years.
- River Suldalslågen, which up to now has been one of the main rivers, is in the process of becoming a tributary river and will only be monitored four times a year from now on (in 2008 5 times). In the overview of inputs from main and tributary rivers in 2008, however, River Suldalslågen still counts as a main river, for the same reason as above.

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 monthly or more often	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 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., 2008).

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 was 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 located close. This programme only analyses for total organic carbon (TOC), total phosphorus, NO_3-N and total nitrogen. An individual study was done 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 can be included in the RID reporting.

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

*Table 2. Sampling frequency and dates in 2008 in the 10 main rivers, for all substances, except for yellow dates which only are for TOC, total phosphorus (TP), NO3-N and total nitrogen (TN). Dates for analyses of PCB7 and lindane below. *not PCB7. **not metals or SiO_2.*

River	Glomma	Drammen	Numedals -lågen	Skiens-elva	Otra	Orre	Vosso[1]	Orkla	Vefsna	Altaelva
Date ddmm	07.01**	09.01	10.01	08.01	07.01	08.01	-	08.01	08.01	09.01
	21.01									
	11.02	07.02	12.02	06.02	06.02	05.02	18.02	06.02	07.02	05.02
	25.02									
	10.03	05.03	04.03	03.03	05.03	03.03	03.03	05.03	03.03	07.03
	25.03									
	07.04	08.04	09.04	07.04	09.04	07.04	01.04	07.04	02.04	07.04
	21.04									
	05.05	07.05	06.05	08.05	14.05	06.05	05.05	05.05	05.05	05.05
	05.05									
	15.05	16.05								
	26.05	27.05								
	02.06									
	06.06	04.06	04.06	02.06	12.06	02.06	02.06	05.06	02.06	04.06
	16.06	12.06								
	17.06									
	26.06	25.06								
	07.07	02.07	02.07	30.06	02.07	01.07	08.07	08.07	04.07	07.07
	15.07									
	04.08	06.08	06.08	05.08	05.08	11.08	05.08	06.08	15.08	04.08
	06.08									
	11.08									
	08.09	02.09	04.09	04.09	09.09	02.09	02.09	10.09	03.09	04.09
	09.09									
	06.10	08.10	08.10	06.10	16.10	07.10	13.10	07.10	06.10	08.10
	03.11									
	09.11	05.11	06.11	04.11	06.11	04.11	17.11	05.11	04.11	06.11
	02.12									
	08.12	04.12	03.12	02.12	18.12	09.12	03.12	08.12	02.12	07.12
	29.12									
sum	30	16	12	12	12	12	11	12	12	12

River	Glomma	Drammen	Nume-dalslågen	Skiens-elva	Otra	Orre	Vosso	Suldals-lågen[2]	Orkla	Vefsna	Altaelva
PCB7 and Lindane	11.02	07.02	12.02	06.02	06.02	05.02		11.02	06.02	07.02	05.02
	05.05	07.05	06.05	08.05	14.05	06.05	05.05		05.05	05.05	05.05
	04.08	06.08	06.08	05.08	05.08	11.08	05.08		06.08	15.08	04.08
	06.10*	08.10	08.10	06.10	16.10	07.10	13.10		07.10	06.10	08.10
No.	4	4	4	4	4	4	3	1	4	4	4

[1] River Vosso is now being phased in as a main river.
[2] River Suldalslågen is being phased out as a main river and will be transferred to the 36 tributary rivers monitored four times a year.

Table 3. Sampling frequency and dates in 2008 in the 36 tributary rivers. ** not Hg*

River	Tista	Tokkeelva	Nidelv (south)	Tovdalselva	Mandalselva	Lyngdalselva
Date ddmmyyy	11.02.2008	12.02.2008	12.02.2008	06.02.2008	16.02.2008	16.02.2008
	05.05.2008	06.05.2008	06.05.2008	01.05.2008	05.05.2008	05.05.2008
	04.08.2008	27.08.2008	27.08.2008	05.08.2008	09.08.2008	09.08.2008
	06.10.2008	14.10.2008	14.10.2008	16.10.2008	22.10.2008	22.10.2008
River	Kvina	Sira	Bjerkreimselva	Figgjoelva	Lyseelva	Årdalselva
Date ddmmyy	16.02.2008	16.02.2008	26.02.2008	30.01.2008	04.02.2008	12.02.2008
	05.05.2008	05.05.2008	22.05.2008	06.05.2008	04.05.2008	13.05.2008
	09.08.2008	09.08.2008	05.08.2008	11.08.2008	03.08.2008	19.09.2008
	22.10.2008	22.10.2008	13.10.2008	07.10.2008	13.10.2008	04.11.2008
River	Ulla	Sauda	Vikedalselva	Suldalslågen	Jostedøla	Gaular
				10.01.2008		
Date ddmmyy	12.02.2008	12.02.2008	12.02.2008	11.02.2008*	12.02.2008	22.02.2008
	14.05.2008	14.05.2008	18.06.2008	08.05.2008	06.05.2008	06.05.2008
	19.09.2008	12.09.2008	12.09.2008	19.08.2008	05.08.2008	17.08.2008
		28.10.2008	28.10.2008	29.10.2008	22.10.2008	21.10.2008
River	Jølstra	Nausta	Breimselva	Driva	Surna	Gaula
Date ddmmyy	08.02.2008	08.02.2008	21.02.2008	03.03.2008	12.02.2008	26.02.2008
	06.05.2008	06.05.2008	13.05.2008	13.05.2008	05.05.2008	08.05.2008
	05.08.2008	05.08.2008	13.08.2008	04.08.2008	07.08.2008	21.08.2008
	22.10.2008	22.10.2008	12.10.2008	16.10.2008	08.10.2008	28.10.2008
River	Nidelva	Stjørdalselva.	Verdalselva.	Snåsa	Namsen	Røssåga
Date ddmmyy	26.02.2008	27.02.2008	27.02.2008	27.02.2008	27.02.2008	07.02.2008
	08.05.2008	07.05.2008	07.05.2008	07.05.2008	05.06.2008	06.05.2008
	21.08.2008	22.08.2008	22.08.2008	22.08.2008	19.08.2008	15.08.2008
	28.10.2008	28.10.2008	28.10.2008	28.10.2008	20.10.2008	06.10.2008
River	Ranaelva	Beiarelva	Målselv	Barduelva	Tanaelva	Pasvikelva
Date ddmmyy	07.02.2008	06.03.2008	03.02.2008	03.02.2008	07.02.2008	07.02.2008
	06.05.2008	20.05.2008	06.05.2008	06.05.2008	07.05.2008	07.05.2008
	15.08.2008	05.08.2008	04.08.2008	04.08.2008	11.08.2008	11.08.2008
	06.10.2008	15.10.2008	07.10.2008	07.10.2008	10.10.2008	12.10.2008

2.3 Chemical parameters – detection limits and analytical methods

The parameters monitored in 2008 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 2007-programme (Skarbøvik et al., 2008).

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 2008. As previously, PCB7 compounds and Lindane were 100% below the detection limit with one exception for a sample of PCB (CB118-V). As the analytical methods used have acceptable low detection limits, the data indicates that the concentrations of these compounds were low in Norwegian river waters in 2008.

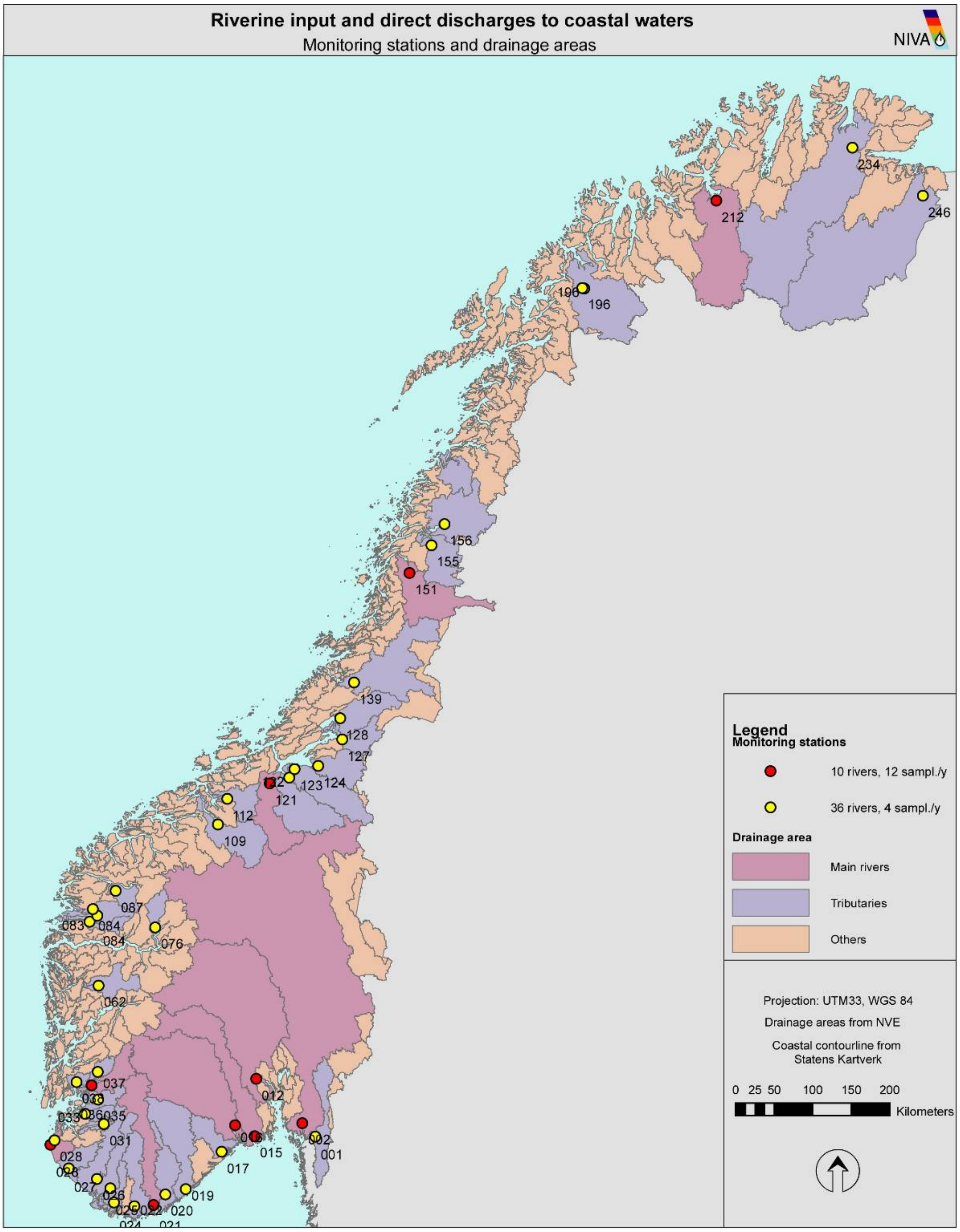

Figure 5. River sampling sites in the Norwegian RID programme[3]. Red dots represent the 10 main rivers. Yellow dots represent the 36 'tributary' rivers. Numbers next to the dots refer to the national river register (REGINE; www.nve.no).

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

Table 4. Proportion of analyses below detection limit for all parameters included in the sampling programme in 2008. Detection limits are shown in Appendix IV.

Parameter	Unit	% below detection limit	Total no of samples	No of samples below detection limit
pH		0	272	0
Conductivity	mS/m	0	272	0
SPM	mg/l	1	272	2
TOC	mg/l C	0	286	0
TP	µg/l P	2	286	6
PO_4-P	µg/l P	48	272	130
TN	µg/l N	0	286	0
NO_3-N	µg/l N	1	286	3
NH_4-N	µg/l N	14	272	37
SiO_2	mg/l SiO_2	0	269	0
Pb	µg/l	0	272	1
Cd	µg/l	27	272	74
Cu	µg/l	0	272	1
Zn	µg/l	0	272	1
As	µg/l	24	272	64
Hg	ng/l	80	272	217
Cr	µg/l	36	272	99
Ni	µg/l	3	272	9
Lindane (g-HCH)	ng/l	100	40	40
PCB (CB101-V)	ng/l	100	40	40
PCB (CB118-V)	ng/l	98	40	39
PCB (CB138-V)	ng/l	100	39	39
PCB (CB153-V)	ng/l	100	40	40
PCB (CB180-V)	ng/l	100	40	40
PCB (CB28-V)	ng/l	100	40	40
PCB (CB52-V)	ng/l	100	40	40

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. Whenever any anomalies were found, the samples were re-analysed. When this quality assurance was done, the data were transferred to NIVA's web pages, where an on-line system was established early in 2004. The system allows the 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[4]. Since the stations for water discharge are not located at the same site

[4] River Suldalslågen is here regarded as a main river; the water discharge in River Vosso was modelled in 2008.

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 from the former RID studies, 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 method since last year's reporting (Skarbøvik et al. 2008). In addition, water discharge for unmonitored areas has been calculated. This will then comprise the unmonitored rivers (92 remaining rivers draining to the sea) and the areas downstream the sampling locations of the monitored rivers.

For each of the 46 rivers that have been monitored in 2008, 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

In 2008, the RID calculation formula was slightly modified[5]. The formula previously used in the programme expressed the annual load as the product of a flow-weighted estimate of annual mean concentration and annual flow (see e.g. Skarbøvik et al. 2008). This formula was, however, very sensitive to flood samples, especially for the load calculation of substances where concentration is positively correlated with water discharge. Sampling during high floods is, however, very important, as in many rivers the majority of the load is transported during the highest water discharges. In addition, the previous formula did not handle well months without data (e.g. for the tributaries that are only monitored four times a year; or if a sample or parameter for some reason was missing in one of the main rivers).

Thus, it was deemed necessary to adjust the formula. Whereas the former formula only weighed each sample in terms of water discharge, the new formula also weights each sample according to the time period that each sample represents. This time period is defined as the midpoint between each sample. As an example, if sample 1 is taken on the 15th of January; and sample 2 on the 14th of February; the midpoint date between these two samples will be January 30th. The concentration of Sample 1 then represents the concentration every day from January 1st to January 30th; and the concentration of Sample 2 represents the concentration every day from January 31st and to the midpoint to the next date and so forth. Note that the formula is only used within one single 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;
C_i the concentration at day i;
t_i the half number of days between the previous and next sampling; and

[5] At the same time, all loads were recalculated for former years (1990-2007) by the modified formula; cf. Stålnacke et al. (2009).

Q_r the annual water volume.

If the samples have been collected at regular intervals during the year, the modified formula will give almost the same result as the previous. However, for rivers with irregular sampling frequency, the differences can be significant, especially when extra flood samples are collected. In those cases, the previous method overestimated the annual load. The modified method, on the other hand, handles irregular sampling frequency in a better way and therefore 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 done as follows:

- For nutrients, sediments, silica and total organic carbon, the modelled average water discharge in 2008 was multiplied with average concentration for the period 1990-2003.
- For metals, the modelled average water discharge in 2008 was multiplied with average concentration for the period 2000-2003 (earlier data were not used due to high detection limits).

For the remaining area (includes those 92 remaining rivers that drain to the sea, but not included in either this or former RID studies as well as areas downstream of the sampling points), the nutrient loads were calculated by means of the TEOTIL model (e.g. Tjomsland and Bratli 1996; Hindar and Tjomsland 2007; Bakken et al. 2006). The model was used to assemble 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, effluent treatment, as well as industrial and agricultural point sources. Losses from agricultural fields and natural run-off from forest and mountain areas are based on an export coefficient approach.

All direct discharges of metals in these unmonitored areas were considered to be 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 Norwegian Pollution Control Authority - SFT/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 amount is almost stable from 2007 to 2008, but there has been a general increase in the period 2004-2007 (see Figure 6). Increased production lead to increased discharges of nutrients despite improvements in production procedures over the years.

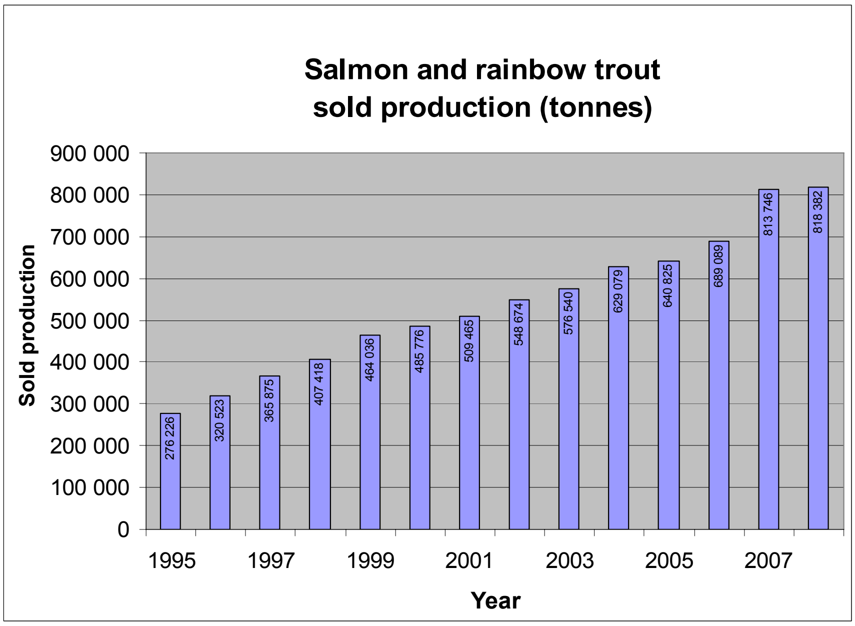

Figure 6. Quantities of sold trout and salmon for the period 1995-2008 (based on SSB data).

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). SFT 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 2008, the copper discharges in 2008 have been estimated on the basis of a factor for the loss of copper per tonn nutrient discharge in the last year. 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.

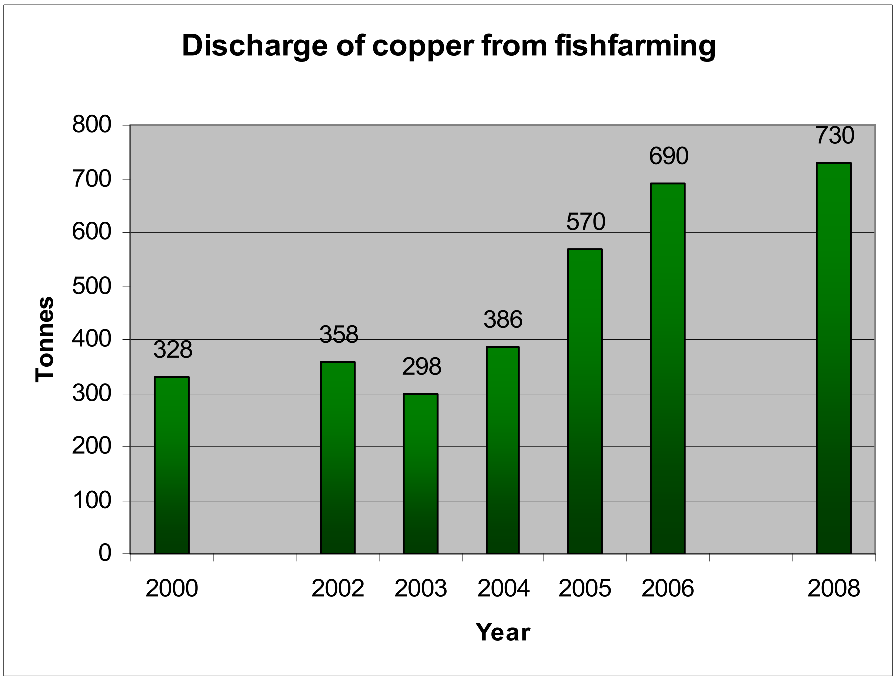

Figure 7. Discharge of copper from fish farming, caused by cleaning of net cages, in the period 1995-2008. Data for 2008 are estimated based on production data.

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, since the tributary rivers have had only 1-4 samples a year. The partial Mann-Kendall test (Libiseller and Grimvall, 2002) has been used to test for long-term changes in solute concentrations measured in 9 of the ten main rivers[6]. 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 the both the lower and upper estimates of concentrations: i.e., if the concentration of the sample was below the detection limit, the concentration was set to zero and equal to the value of the detection limit for the lower and upper estimates, respectively.

In addition, a multivariate test based on Loftis et al. (1991) and further developed by Wahlin and Grimwall (2008) has been applied for all rivers. This implies that the trends in individual rivers are statistically 'weighted' to determine the summary 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.

All these methods use tests for monotonic[7] 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 statistically significant at the 5%-level (double-sided test)[8]. P-values between 5% and 10% were defined as 'significant' and should be interpreted as a tendency or indication of a trend over time. This is different to the reporting last year (Skarbøvik et al., 2008) where 20 % was used as the limit.

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 estimating trends in riverine inputs

Long-term trends in riverine pollutant inputs are discussed in Chapter 4, but the methodology is given here. Only main rivers are included in these trend analyses, since the tributary rivers have had only 1-4 samples a year.

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.

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[6] River Suldalslågen was not included in the long-term trend analyses this year; cf. Section 1.4.

[7] 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.

[8] 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 difference; it does not mean the difference is necessarily 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.

All annual loads were recalculated during the work of Stålnacke et al (2009). For the trend analyses, two important changes should be noticed as compared to former years:

- Total phosphorus and mercury loads in the period 1999-2003 has been based on estimated annual concentrations, as the actual measured concentrations deviated significantly from the years before and after; the new loads have been calculated by a trend-line interpolation;
- The new method for estimating annual river loads (cf. section 2.6) has been used both for 2008 data and for all former years.

The trend assessment of 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 estimated 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.

The following values were removed when calculating the smoother: For Cu; Numedalslågen in 1993, Skienselva in 1990 and Otra in 1990; and for NH_4-N; Orreelva in 2008. This was due to high flow-normalised loads in these years that affected the trend-smoother and overestimated the trend.

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 level 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 2008, and presents the main results of the 2008 monitoring and modelling of riverine inputs and direct discharges.

3.1 Climatic conditions in 2008

Mean annual temperature in Norway in 2008 was 1.4 °C above the long-term normal (1961-1990), which makes 2008 the 7th warmest year registered in Norway since 1961 (met.no 2009). The mean temperature was higher than normal in all parts of the country, but the eastern parts of the country were particularly warm; here the mean temperature was as much as 2.6 °C above normal in some stations (Figure 8).

In terms of actual temperatures, the warmest region was the land draining to Skagerrak. The coldest temperatures were measured in the mountain areas in Southern Norway (which feed rivers that may drain into both Skagerrak, the North Sea and Norwegian Sea) and at Finnmarksvidda (draining to the Barents Sea).

High air temperatures influence runoff conditions in Norway, as temperatures determine the extent of snowmelt and glacial melting. In spite of the high temperatures, high snowfall during winter resulted in a net increase in many glaciers in the southern parts of the country.

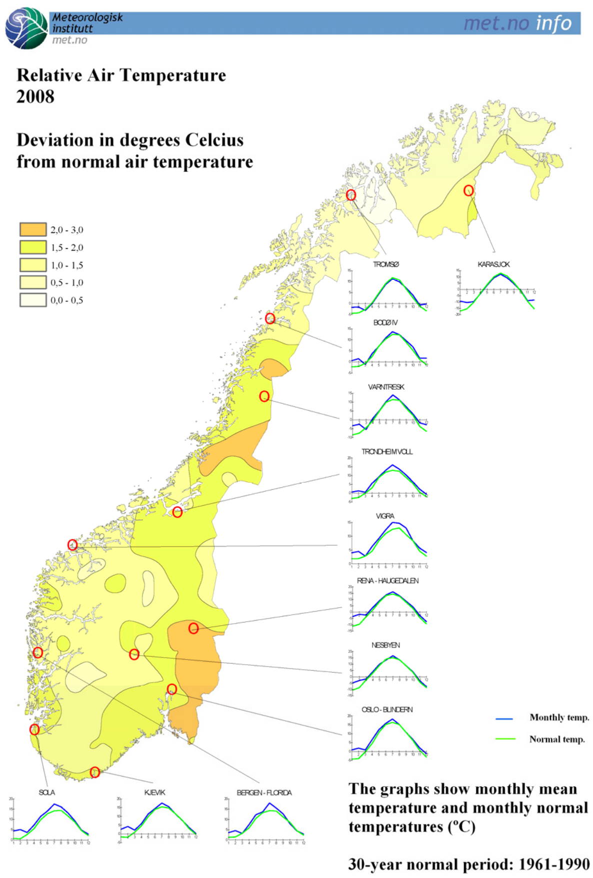


Figure 8. Air temperature in Norway in 2008 relative to the long-term normal of 1961-1990. Source: Norwegian Meteorological Institute (met.no).

Water temperatures were close to normal in the entire country, except in the northernmost county, Finnmark, where the temperatures in river waters during summertime were 1-3 °C colder than normal.

Precipitation was 5% higher than the 30-year normal in Norway as a whole. The southern part of the country was considerably wetter than normal, and areas draining to the Skagerrak maritime area received 25-50% more than the 30-year normal (Figure 9). The areas draining to the North Sea received 0-25% more precipitation than normal, whereas it rained and snowed less than normal in the areas draining to the Norwegian Sea. In Finnmark, a county that is draining to the Barents Sea, the precipitation was about 25 % higher than normal.

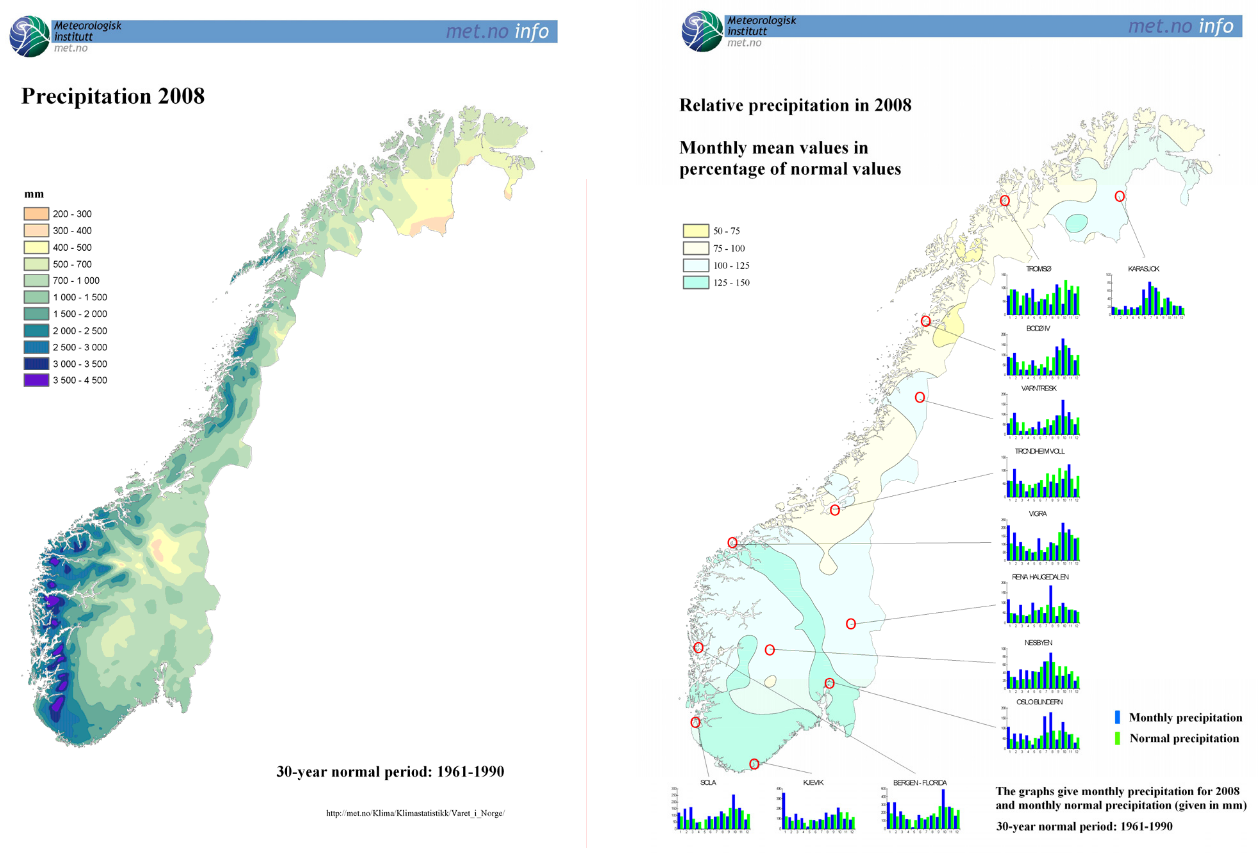


Figure 9. Precipitation in 2008 (left panel) and precipitation in 2008 relative to the long-term normal of 1961-1990 (right panel). Source: The Norwegian Meteorological Institute (met.no).

3.2 Water discharges in 2008

In spite of some unusual weather events in 2008, the total runoff for the year was relatively close to average values for Norway (NVE 2009). However, water discharges were higher than normal in the southern parts (draining to the Skagerrak) and lower than normal in Trøndelag (draining to the Norwegian Sea). In the western part of the country, which drains to the North Sea, the storm “Ulrik” caused high water discharges in the fall.

For eight of the ten main rivers the monthly mean water discharge in 2008 has been compared to mean water discharge during the 30-year period of 1978-2007 (“long-term mean”) in Figure 10. 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) the spring flood came in May and the average water flow during this month was significantly higher than normal. In the latter river, Otra, there were higher water discharges also in the fall, due to the storms in the western part of the country. In all these five rivers, the annual average water discharge was consequently 19-32 % higher than normal (Table 5).

On the other hand, the water flow in Rivers Orkla and Vefsna (draining to the Norwegian Sea) were 13-14 % *lower* than normal values. Spring flow in River Orkla followed a normal progression with a peak in May, and the flow was in general lower than average values for the rest of the year. Similarly, River Vefsna (Norwegian Sea) had a lower than average water discharge. May had the highest water flow in this river, and the flow in June was much lower than usual. The storms in October gave higher than average flow values in this month.

In the north of the country, the annual average flow in River Alta (Barents Sea) was about 9 % higher than normal, mainly caused by high water discharges in June.

Table 5. Average annual water discharges in the period 1971-2000 and in 2008.

Station	Average 1971-2000	2008	Difference	Maritime area
	m^3/s	m^3/s	%	
Solbergfoss in Glomma	678.0	808.8	19.29	Skagerrak
Døvikfoss in Drammenselva	281.3	372.7	32.49	
Holmsfoss in Numedalslågen	104.7	126.8	21.14	
Norsjø in Skienselva	259.5	324.7	25.13	
Heisel in Otra	145.6	183.7	26.20	
Syrstad in Orkla	48.5	42.0	-13.42	Norwegian Sea
Laksfors in Vefsna	150.0	129.0	-14.03	
Kista in Alta	75.4	82.0	8.74	Barents Sea

Water discharges calculated as input to the four different maritime areas as shown in Table 6. Here, the discharges are also compared with the average discharges in the years 2004-2007. Clearly, the flow in 2008 was much higher in the Skagerrak region than in the four past years, whereas both in the Norwegian and the Barents Sea the flow was lower than the former years. In the North Sea, the flow in 2008 was only 7 % higher than in the last years.

Table 6. River water discharges (1000 m^3/d) to the Norwegian coast in 2004-2007 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
2004-2007	576 799	171 632	160 902	185 680	58 586
2008	592 268	211 602	172 507	159 820	48 338
% change	3	23	7	-14	-17

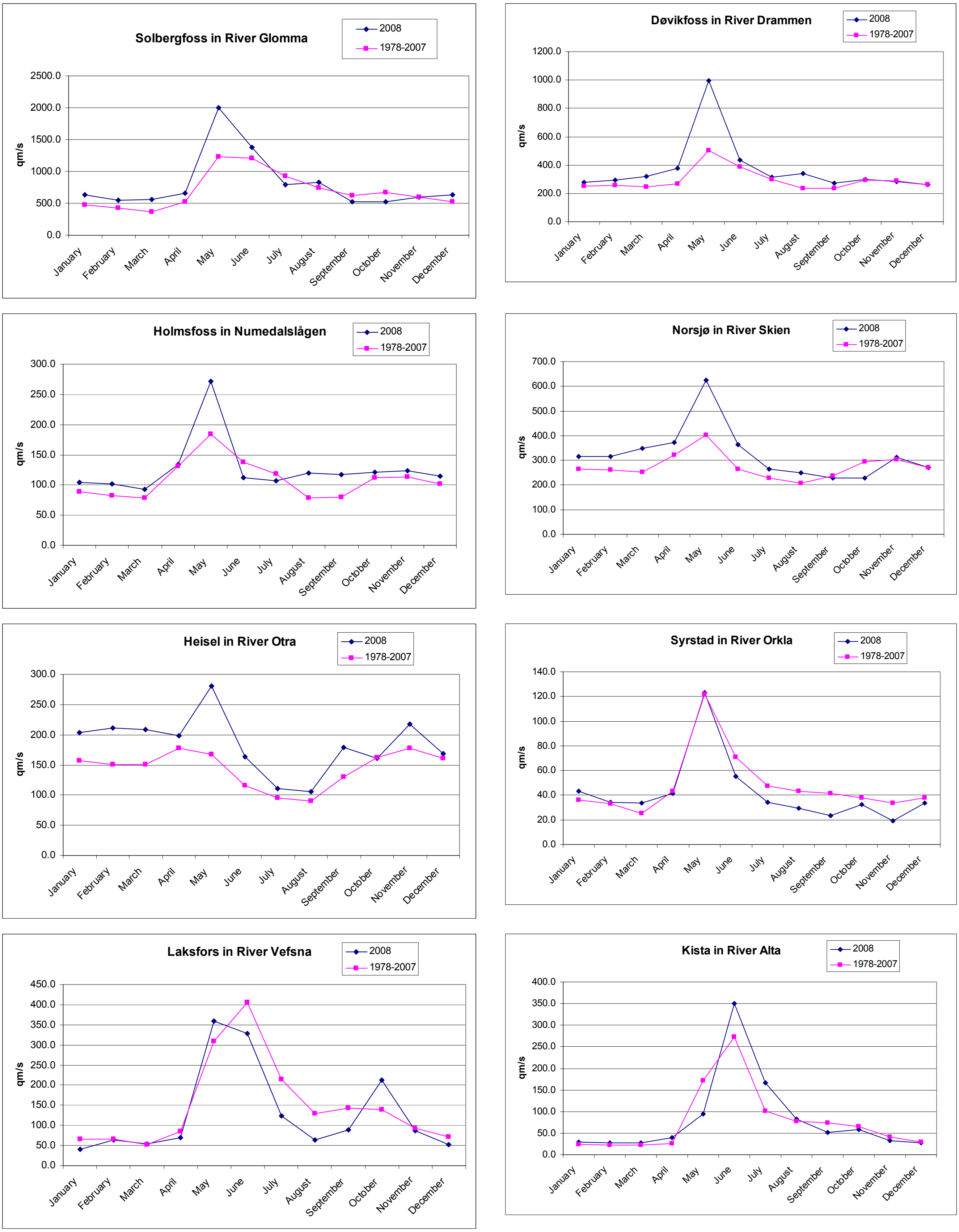


Figure 10. Monthly mean water discharge in 2008 and as a mean of 30 years (1978-2007), derived from hydrological stations (named) in 8 of the rivers monitored monthly (data from the Norwegian Water Resources and Energy Directorate, NVE).

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).

The calculations of direct discharges is only done for land areas that are not covered by the RID sampling programme, since direct discharges upstream of the sampling locations will be covered by the monitoring programme. Thus, direct discharges have been calculated for the following land areas:

- Downstream sampling sites in the 10+36 rivers monitored in 2008.
- Downstream former sampling sites in the 109 rivers monitored earlier.
- For the total catchment areas of the 92 rivers which have never been monitored.

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 2008.

	TN (tonnes)	TP (tonnes)	SPM (tonnes)	TOC (tonnes)
Sewage effluents	11 534	912	8 174	3 922
Industrial effluents	2 610	338	31 230	633
Fish farming	41 428	8 581		
Total	55 572	9 831	39 404	4 554

Table 8. Direct discharges of metals in 2008.

	Cd (tonnes)	Hg (kg)	Cu (tonnes)	Zn (tonnes)	Pb (tonnes)	As (tonnes)	Cr (tonnes)	Ni (tonnes)
Sewage effluents	0.023	21	8	14.3	0.6	0.3	0.9	2.6
Industrial effluents	0.149	13	9	19.9	2.9	0.4	0.8	9.3
Fish farming			724					
Total	0.172	34	742	34.2	3.5	0.7	1.7	11.8

Fish farming is the most important direct source for nutrients, especially along the coasts of the North and Norwegian Seas. Sewage treatment plants contribute with about 20 % of the nitrogen and about 10 % of the phosphorus from all point sources.

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 in general most.

Figure 14 and Figure 15 illustrate the relative importance of different sources for phosphorus and nitrogen, respectively.

Figure 11. Industrial units reporting discharges of nitrogen and phosphorus to freshwater systems in 2008. Co-ordinates on industry from SFT (INKOSYS).

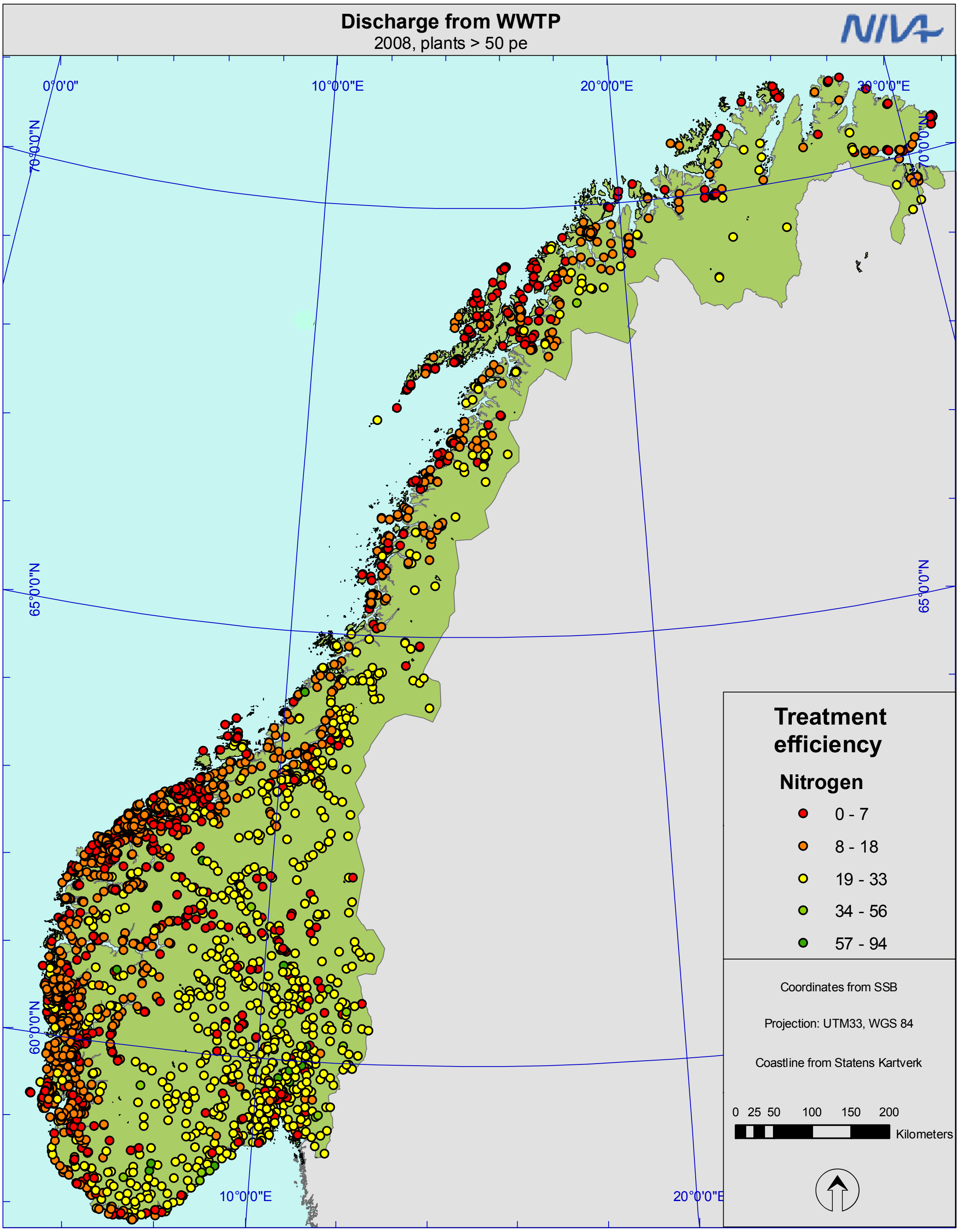


Figure 12. Sewage treatment plants in Norway 2008 and nitrogen treatment efficiency. Coordinates from KOSTRA/SSB.

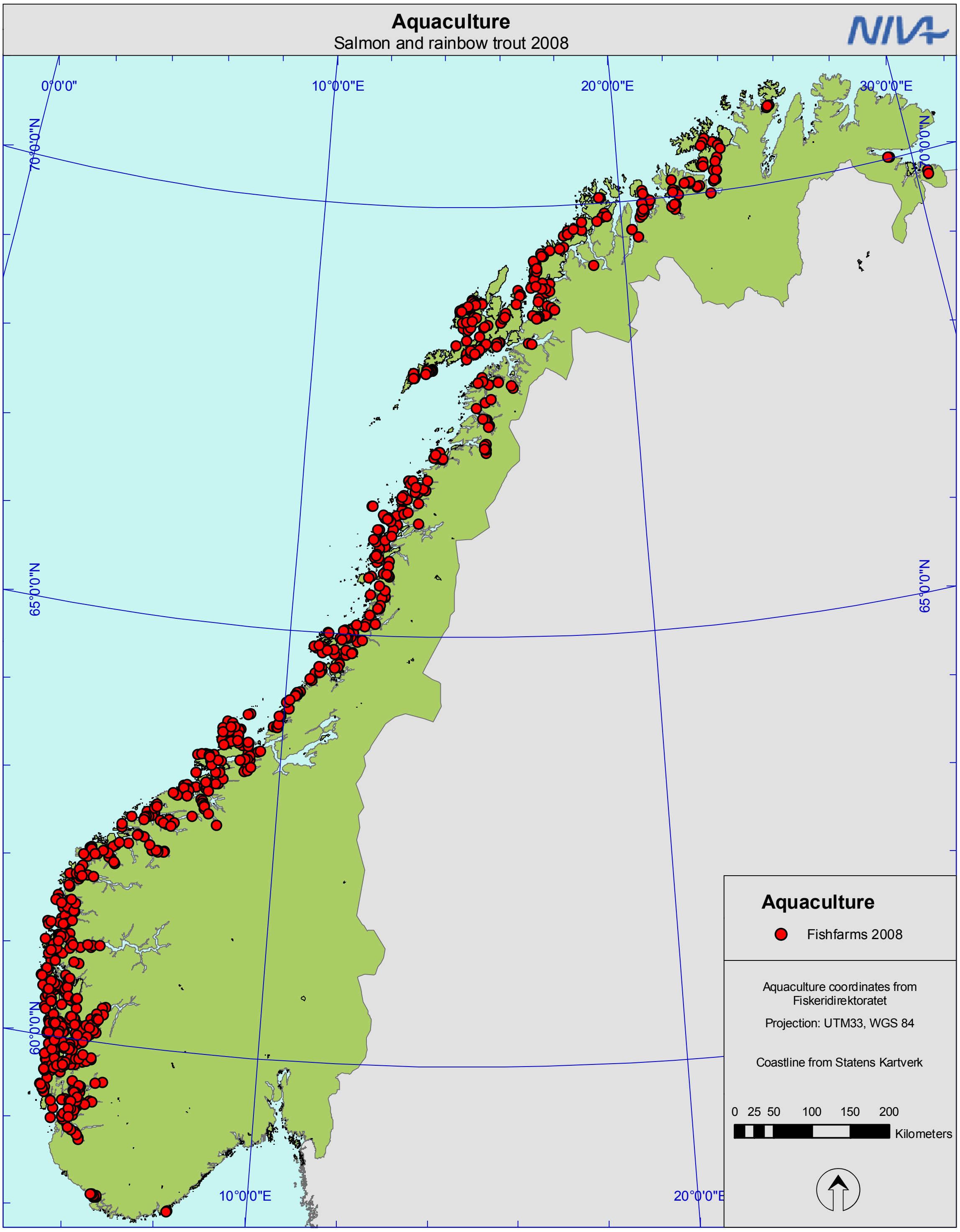


Figure 13. Fish farms in Norway in 2008. Based on data from the Directorate of Fisheries/ALTINN.

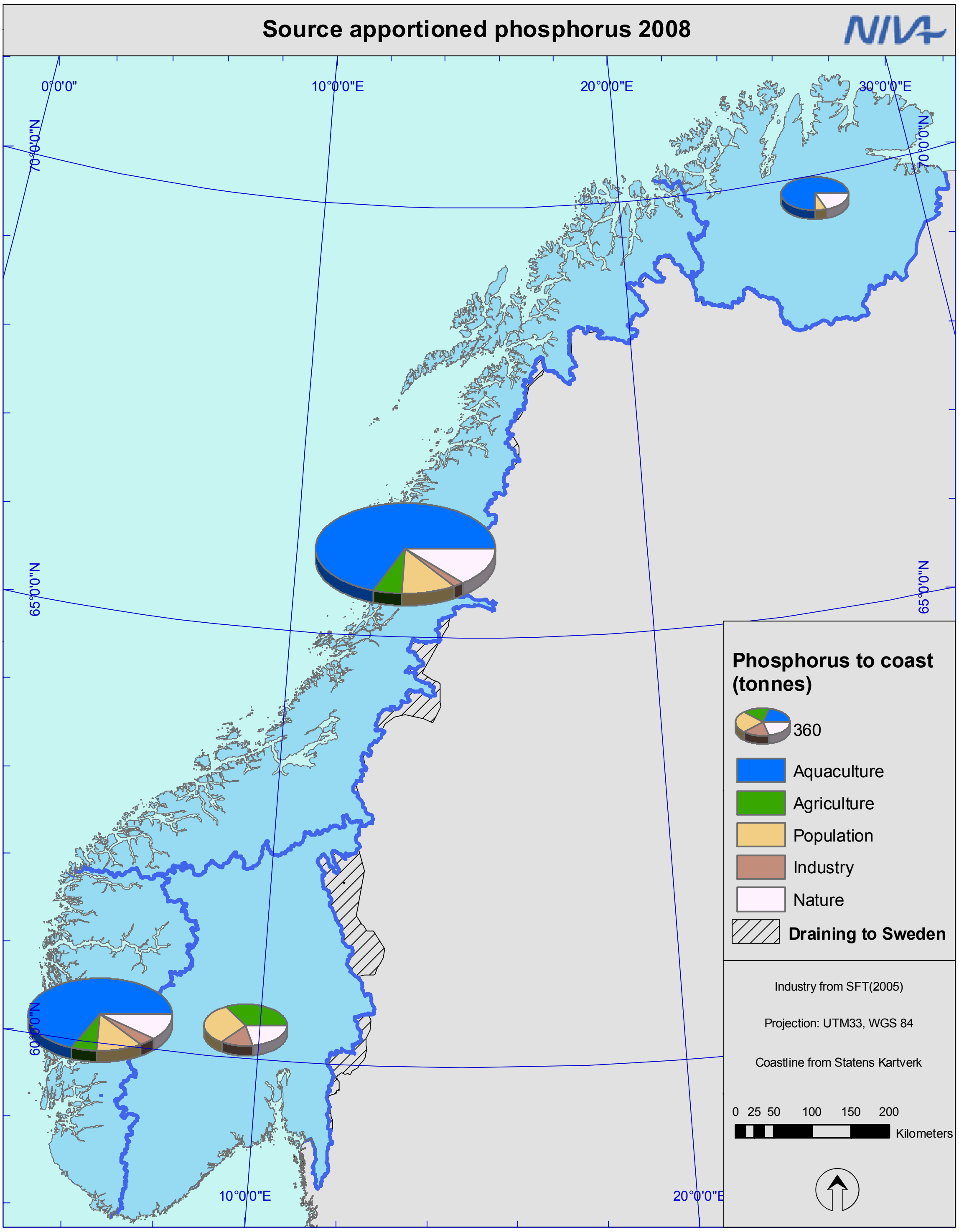


Figure 14. The relative importance of the five phosphorus sources to total inputs to the four coastal areas - (Source Orientated Approach, incl. marine salmon/trout farming). The size of the circles indicates the total amount (tonnes).

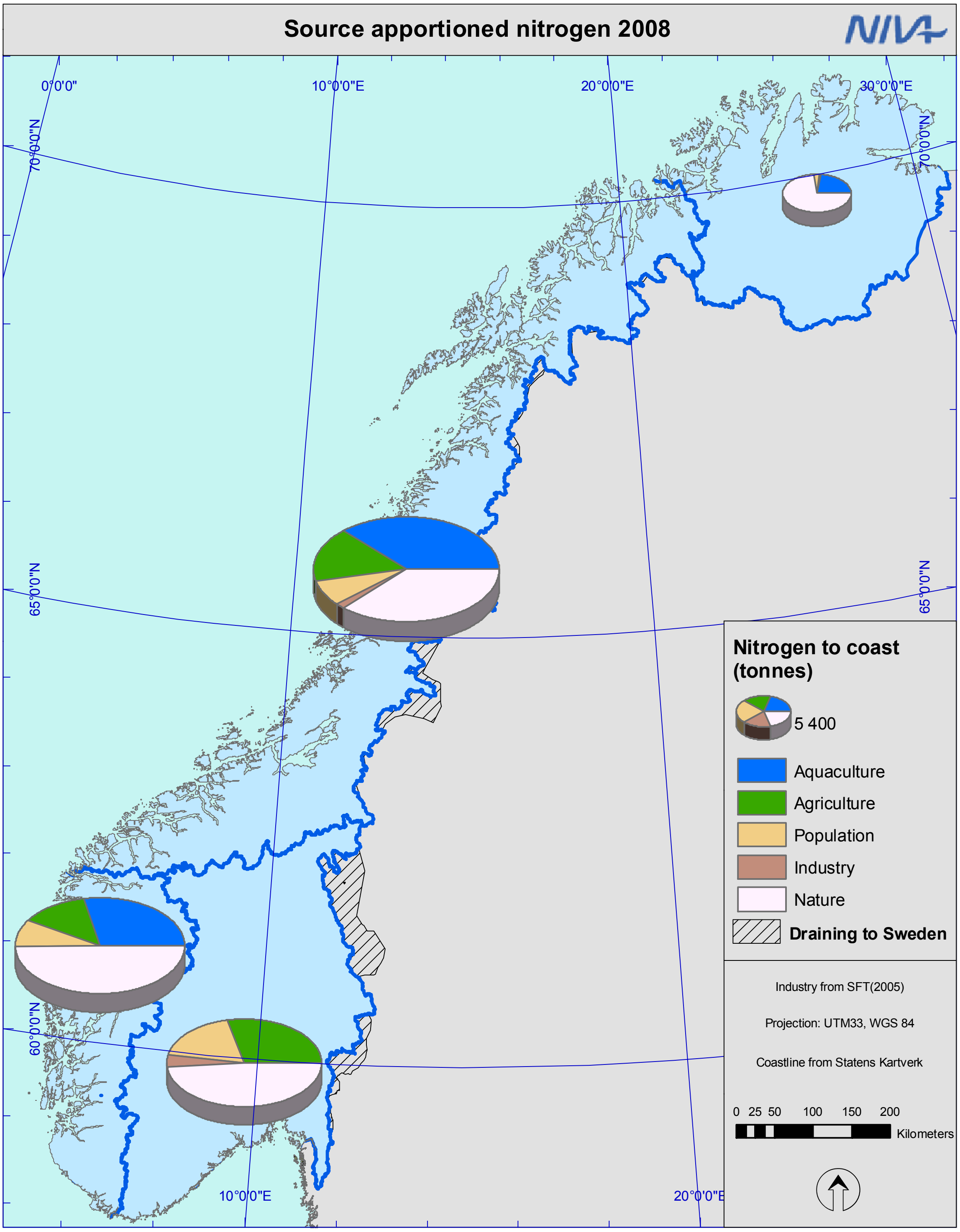


Figure 15. The relative importance of the five nitrogen sources to total inputs to the four coastal areas (Source Orientated Approach, incl. marine salmon/trout farming). The size of the circles indicates the total amount (tonnes).

3.4 Total nutrient and particle input in 2008

The total nutrient input to coastal waters from land based sources in Norway in 2008 was estimated to about[9] 12 200 tonnes of phosphorus and about 157 500 tonnes of nitrogen (Figure 16). Total silicate inputs was estimated to about 500 000 tonnes and total organic carbon (TOC) to about 540 000 tonnes. The input of suspended particulate matter amounted to about 970 000 tonnes.

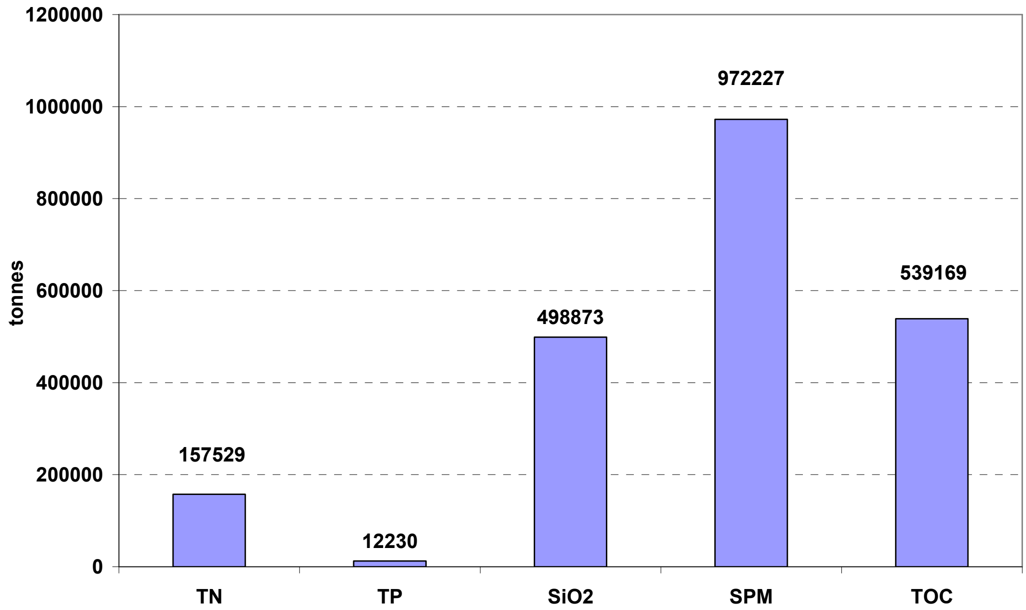


Figure 16. Total input of total nitrogen (TN), total phosphorus (TP), silicate (SiO2), suspended particulate matter (SPM) and total organic carbon (TOC) to Norwegian coastal waters in 2008 (lower estimates).

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 in the North Sea and Norwegian Sea derive from fish farming. In Skagerrak and the Barents Sea there is less fish farming, and in Skagerrak, sewage treatment plants are the most important nutrient sources of the direct discharges. Nutrient inputs are highest to the Norwegian Sea, and lowest to the Barents Sea.

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

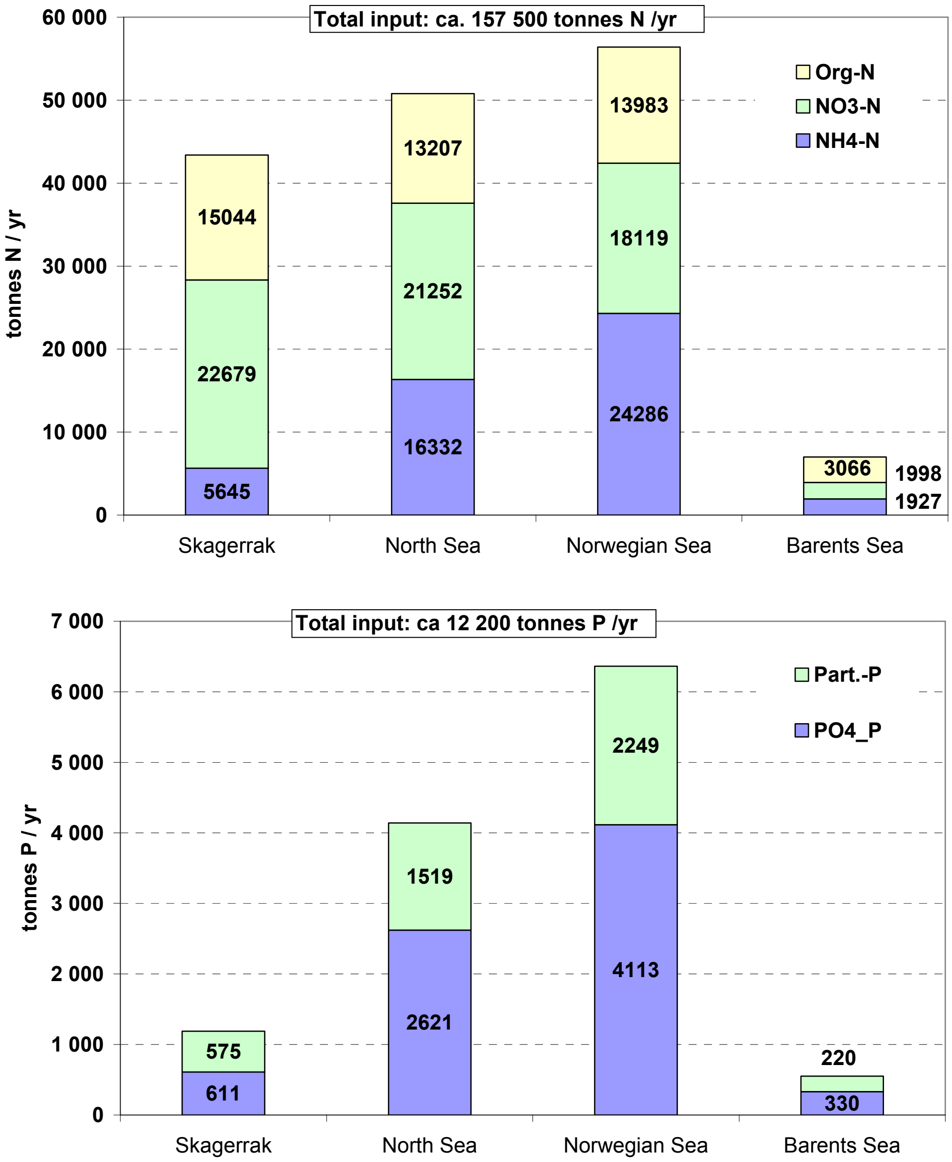


Figure 17. Inputs of total nitrogen (upper panel) and total phosphorus (lower panel) divided into different fractions for the four Norwegian maritime areas (lower estimates).

The sources of suspended particulate matter are shown in Figure 18. Riverine inputs are the major source, with about 930 000 tonnes, of which the main rivers contribute about 545 000 tonnes. Of the direct discharges, industrial effluents contribute most, with about 30 000 tonnes[10].

[10] Two major industrial sources of sediments were removed from the dataset in 2008, cf. Section 1.4.

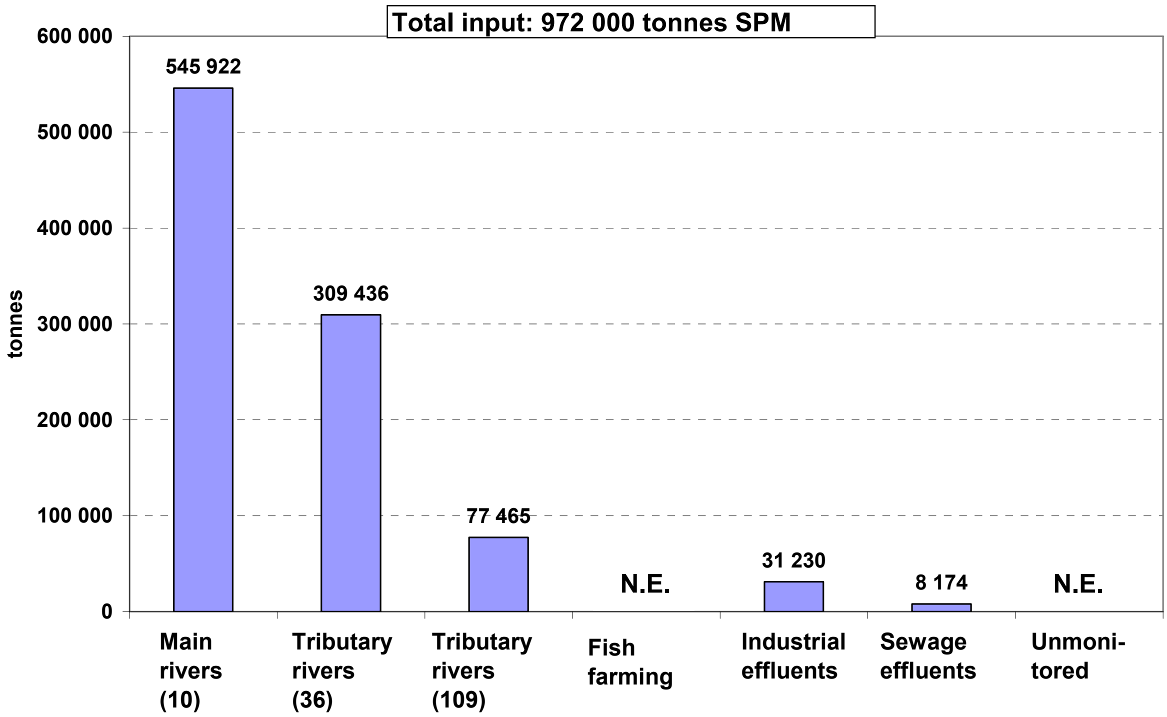


Figure 18. Inputs of particulate matter (SPM) from rivers and direct discharges in 2008 (lower estimates).

The proportion of sources of particulate matter and nutrients is further illustrated in Figure 19. In general, the 46 monitored rivers account for between 80-90% 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, nitrate and particulate matter, although the latter is not reported for fish farms and unmonitored areas.

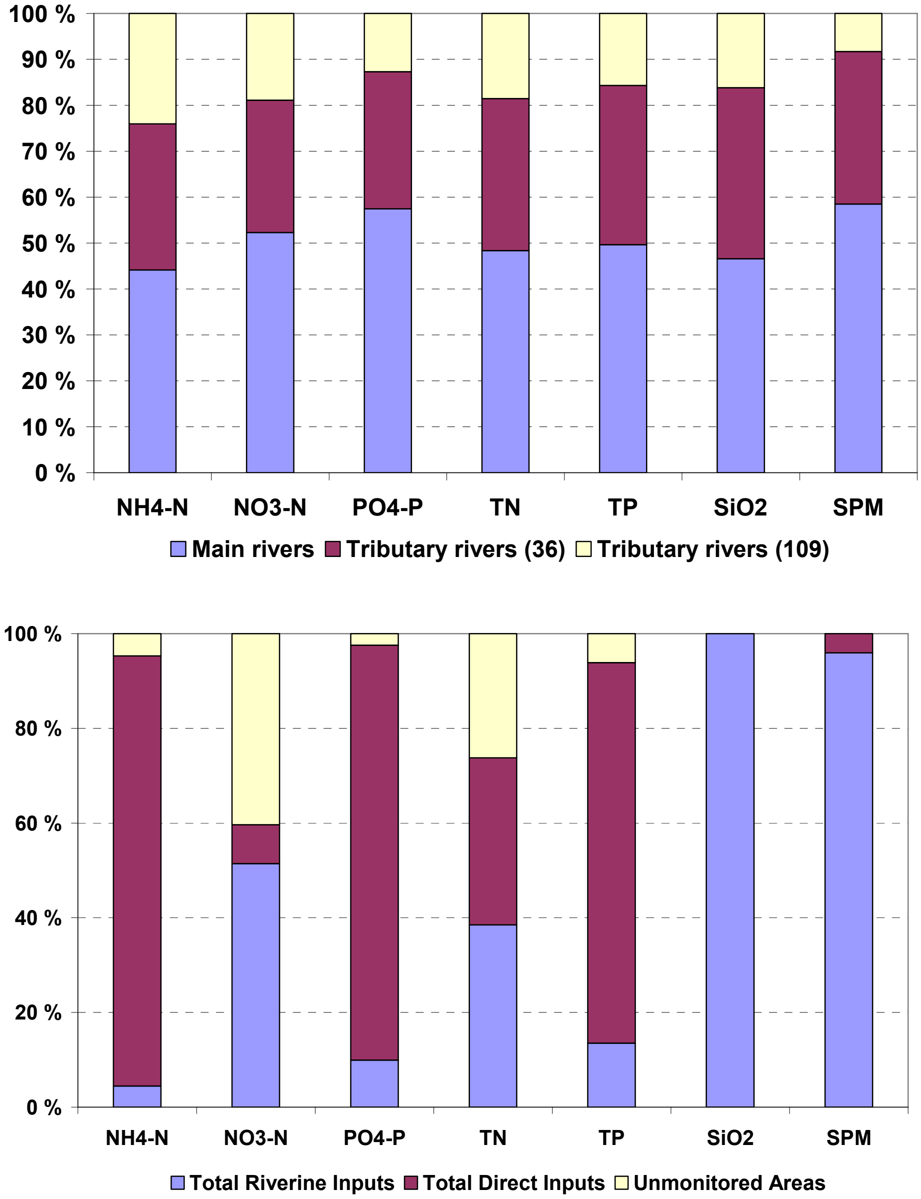


Figure 19 Main sources for nutrients, silicate and suspended particulate matter (SPM) divided into riverine contribution only (top panel) and the proportion between riverine, direct inputs and unmonitored areas (lower panel). Note that for SPM there are no estimates of inputs from fish farming and unmonitored 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 three other coastal areas, where aquaculture is responsible for a very high proportion of the total nutrient inputs. In Skagerrak, on the other hand, discharges from sewage treatment plants have a proportionally larger impact than in the other areas.

Totally in Norway, the nutrient loading from fish farming contributes to 70 % of the total phosphorus inputs and 26 % of the total nitrogen inputs. In terms of nutrient fractions, 69 % of the ammonium and 77 % of orthophosphate derives from fish farming.

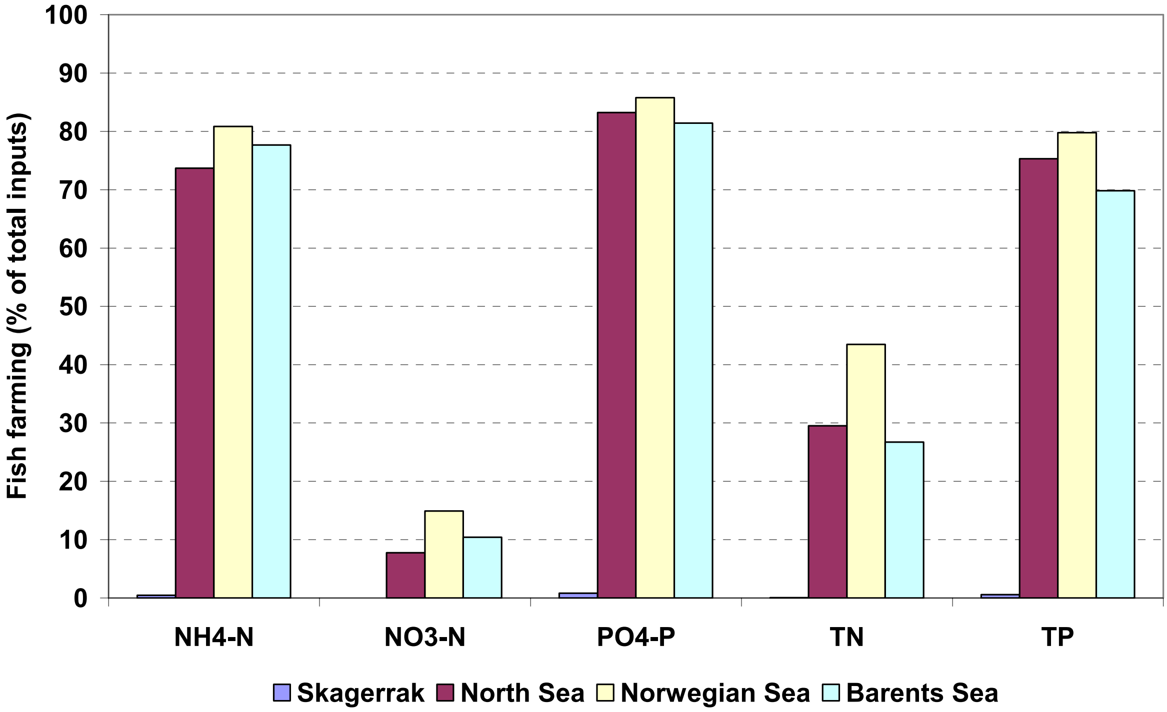


Figure 20. The relative share of nutrient inputs from fish-farming to the total inputs in 2008 for the 4 coastal areas.

3.5 Total metal inputs in 2008

In 2008, the total inputs of metals to coastal areas ranged from 0.15 tonnes of mercury to 960 tonnes of copper (lower estimates; Figure 21).

Inputs of cadmium were estimated to 2.6 tonnes, arsenic to about 26 tonnes, lead to about 45 tonnes, chromium to about 59 tonnes and nickel to about 127 tonnes. Copper and zinc comprised the largest inputs of heavy metals, which in 2008 amounted to about 960 and 679 tonnes, respectively.

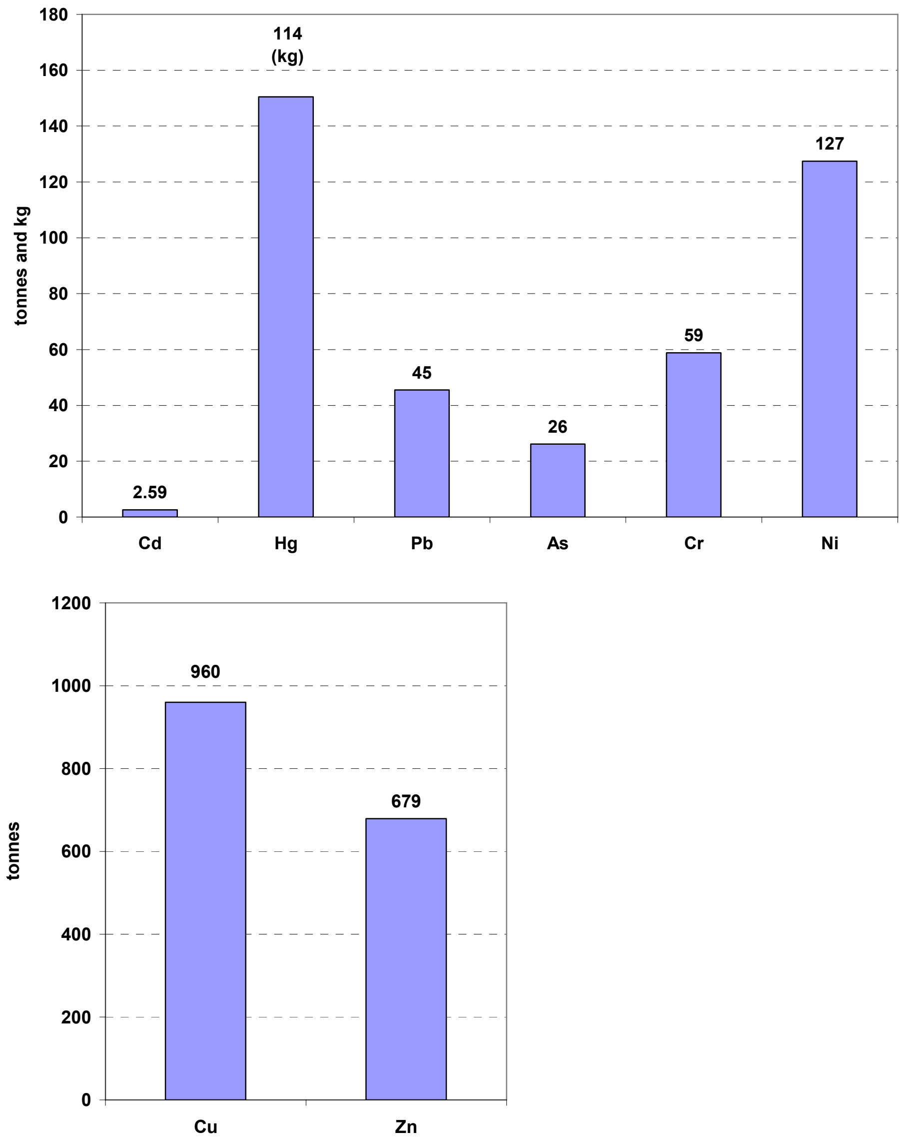


Figure 21 . Total inputs of metals in 2008 (lower estimates). Upper panel: Cadmium (Cd), mercury (Hg), lead (Pb), arsenic (As), chromium (Cr) and nickel (Ni). Note that mercury (Hg) is given in kg whereas the other metals are given in tonnes. Lower panel: Copper (Cu) and Zinc (Zn).

For all metals except mercury and 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 high proportion of mercury in the direct discharges (about 30 %) is due to industry and sewage effluents in the Skagerrak and North Sea areas. The metal inputs per sub-region and other details are given in the Addendum (Table 3).

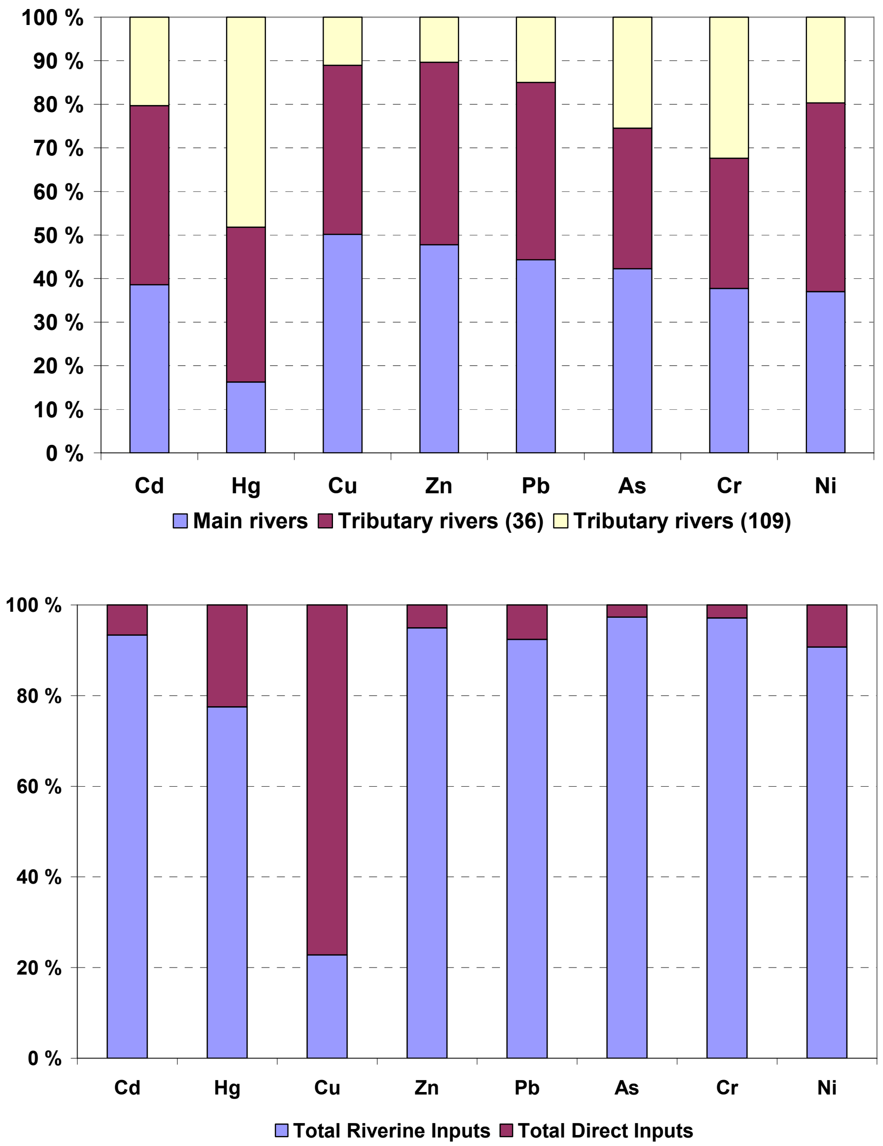


Figure 22. Relative share of riverine and direct discharges of the total inputs of metals to the Norwegian coastal waters in 2008 (lower estimates).

3.6 Total lindane and PCB7 inputs in 2008

For lindane and PCB7, only inputs from the main rivers have been estimated this year. This is because no measurements have been done in the other rivers, and the analyses are almost always below the LOD (level of detection). Any interpolation by using former years' data will therefore mainly be an interpolation of the detection limits.

The inputs of lindane in the main rivers were estimated to 0-15 kg depending on whether lower or upper estimates are used (Figure 23).

Similarly, the inputs of PCB7 from the main rivers to the sea were in 2008 calculated to 1.3-107 kg.

In 2008, estimates of both lindane and PCB7 inputs mainly reflect the detection limits, since all except one sample (PCB CB118-V) were below the detection limits. The lower estimate is therefore zero for lindane and 1.33 kg for PCB, whereas the upper estimate is based on the concentration at the detection limit, in accordance with the RID principles.

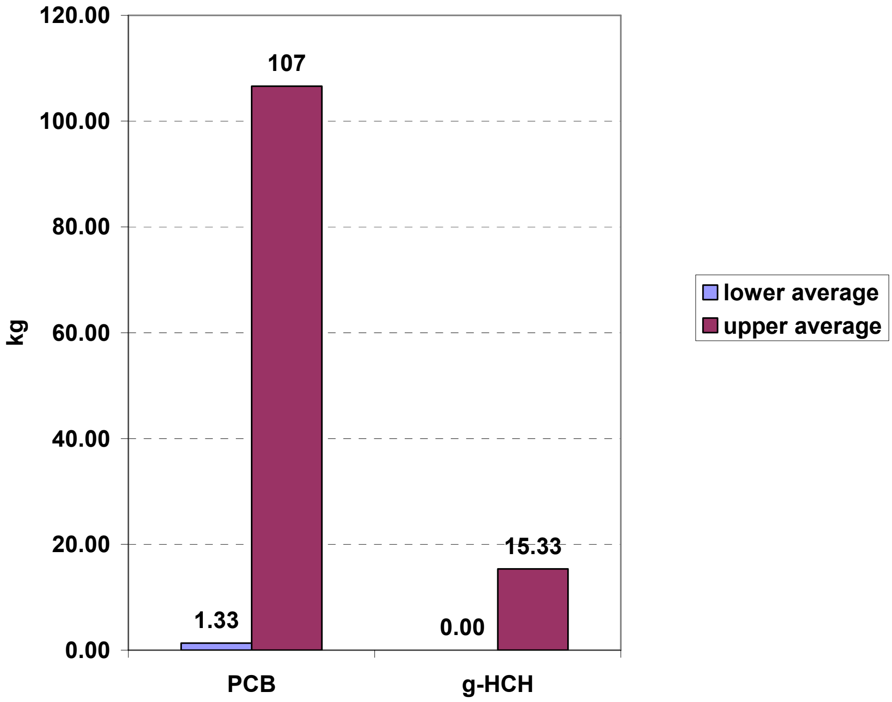


Figure 23. Riverine inputs (lower and upper averages) of PCB7 and lindane (g-HCH) in 2008.

4. Discussion

The riverine inputs and direct discharges in 2008 are compared with inputs the prior four years (2004-2007). In addition, long term trends in both pollutant concentrations and riverine inputs are discussed for the main rivers.

4.1 Comparison of 2008 riverine inputs with previous years

The inputs in 2008 are here compared to the average inputs in the 4-year period 2004-2007. The choice of this period is partly due to the change of laboratory in the period 1999-2003 and the implications this had for the overall time series of several parameters (cf. Stålnacke et al. 2009), and partly due to the fact that detection limits have improved since the 1990ies.

The discussion is based on the data for the 10 main rivers[11], 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 in the discussions of this chapter. 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 gives an overview of the water discharges in 2008, with comparisons of the average flows in the 2004-2007 time period.

In terms of nutrients, the loads to the Skagerrak maritime area have increased slightly as compared to the average value of 2004-2007, but this is mainly due to the higher water discharges in 2008 (Table 9). Loads in the rest of the maritime areas have been stable or reduced, and the net result is an insignificant increase in total nitrogen and a 10% increase of total phosphorus. Loads of sediments (SPM) increased in the rivers in both the Skagerrak, Norwegian Sea and Barents Sea regions. Whereas in Skagerrak this is explained by higher water discharges, the high suspended sediment inputs in the Norwegian Sea are mainly due to a high sediment load in River Bardu in March 2008. The slight increase in the Barents Sea region is mainly due to high loads in River Alta during snowmelt in June; and the slight decrease in the North Sea region is mainly due to high loads in Jostedøla during the 2007 snowmelt, which was not detected in 2008.

Table 9. Total riverine load of total nitrogen (TN), total phosphorus (TP) and suspended particulate matter (SPM) in 2004-2007 and 2008. Increases in loads shown in orange, decreases in green, whereas relatively small changes (<10 %) are not highlighted.

Maritime area	Nitrogen (tonnes)		Phosphorus (tonnes)		SPM (1000 tonnes)	
	2004-07	2008	2004-07	2008	2004-07	2008
Skagerrak	29 983	34 288	724	919	354	541
North Sea	14 895	14 176	328	330	170	98
Norwegian Sea	10 675	9 378	311	315	205	252
Barents Sea	3 806	2 770	133	96	34	41
Total Norway	59 359	60 611	1 497	1 660	764	932

[11] As explained in Section 1.4, River Suldalslågen is here treated as a main river in order not to disrupt the data series.

Metal variations in the riverine loads from year-to-year 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. In general, riverine loads of metals did not change much from the period 2004-07 to 2008, but some changes include (Figure 24),

- Increase in chromium in the main rivers from about 17 tonnes in the period 2004-07 to about 24 tonnes in 2008. The main reason is a major increase in River Glomma, which drains to the Skagerrak area; this is primarily due to one sample with high concentrations in November. There was at the same time a decrease in the tributary rivers, but for all 155 rivers this increase in River Glomma resulted in a net increase of 8 %, from about 49 tonnes in 2005-07 to about 53 tonnes in 2008.
- Decreases in copper and nickel in the River Pasvikelva (one of the 36 tributaries draining to the Barents Sea) have resulted in an overall reduction of these two metals to the sea. Most likely, this decrease is just a random effect that may occur when sampling only four times a year. The overall decrease in copper for the 36 tributary rivers is from about 94 tonnes in 2004-07 to about 85 tonnes in 2008; whereas the respective decrease in nickel is from 173 tonnes to 113 tonnes.
- A small increase in lead in both main and tributary rivers, resulting in an overall increase of 12 %, from 36 tonnes in 2004-07 to 40 tonnes in 2008.
- A small increase in zinc of 15 % in both the main and the 36 tributary rivers.

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.

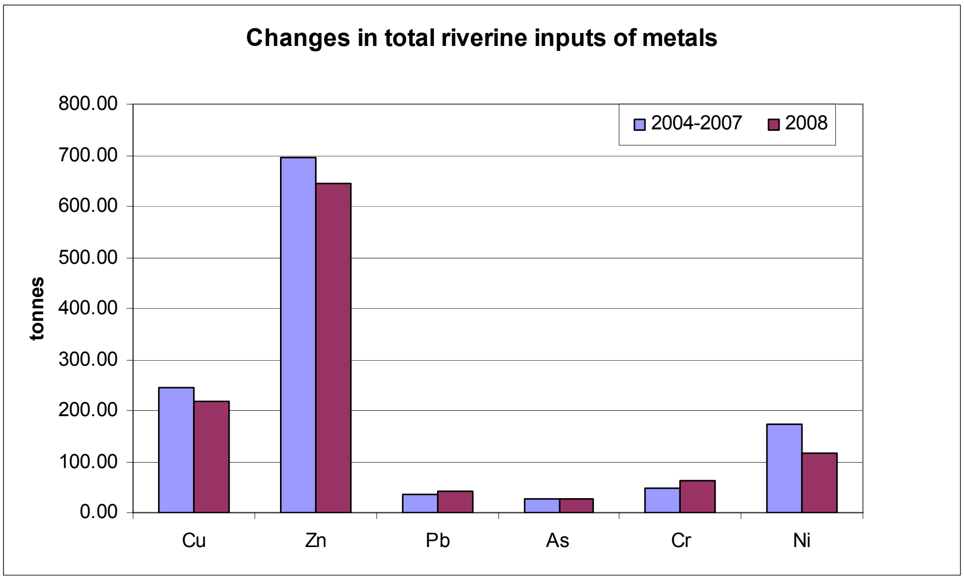


Figure 24. Changes in riverine inputs of metals from 2004-2007 to 2008, for all of Norway.

4.2 Comparison of 2008 direct discharges with recent years

In former years, the comparisons of direct discharges with earlier years were hampered by a rather unsystematic reporting of the direct discharges. This has been vastly improved by the revision of the historical RID data (Stålnacke et al. 2009), and the new dataset on direct discharges now makes it easier to detect actual differences from year to year, instead of merely detecting differences in reporting.

In terms of nutrients, the direct discharges of both total phosphorus and total nitrogen have increased for all three sectors (Table 10). The highest increase is in fish farming, where a steady increase of production from this sector has resulted in 36 % higher discharges of both phosphorus and total nitrogen. Fish farms are most common in the North and Norwegian Seas; direct discharges from fish farming in the North Sea constitute 36% of the national discharges from fish farming for both total nitrogen and total phosphorus in 2008. The corresponding number for the Norwegian Sea is 59% (cf. Addendum, Table 3).

Table 10. Discharges of nutrients from three sectors to the Norwegian coast in 2004-2007, 2007 and 2008. Totals for all four maritime areas. The percentage and actual differences are based on the data from 2004-07 and 2008. (STP: Sewage treatment plants)

Sector	2004-2007	2007	2008	% difference	Actual difference
Total nitrogen (tonnes)					
Fish farming	30 502	38 548	41 428	36	10 926
Industry	2 548	2 580	2 610	2	63
STP	11 244	11 584	11 534	3	290
Total phosphorus (tonnes)					
Fish farming	6 295	7 978	8 581	36	2 287
Industry	238	248	338	42	100
STP	883	919	912	3	29

For metals, there is a general decrease in direct discharges from industry and sewage treatment plants, as shown in Figure 25. On the other hand, copper continues to increase from the fish farms. The main differences from the period 2004-07 to 2008 include:

- An increase in copper from fish farming, due to an overall increase in this sector. However, from 2007 to 2008 there is only a slight increase, the main increase therefore occurred between 2004 and 2007;
- An overall decrease in direct discharges of mercury of 68 kg (26 kg reduced from industries and 42 kg reduced from sewage). In the Norwegian Sea, however, there was a marked increase as compared to earlier years but in actual load this just amounted to 1.77 kg;
- A reduction of nickel discharges from both industry and sewage to all maritime areas, although most of these reductions occurred in the period before 2007.
- A reduction of lead discharges from industry in the North Sea and Skagerrak areas, resulting in an overall discharge reduction of 40 %, or 1.9 tonnes.
- A reduction of zinc from industry in the Norwegian and North Sea areas gave an overall decrease of 30 % or 8.5 tonnes for all of Norway, in spite of an increase in Skagerrak. Since the discharge of zinc from sewage treatment plants is also 1.3 tonnes less in 2008, the overall reduction from direct discharges amount to about 10 tonnes.
- A small increase in arsenic from sewage treatment plants is outweighed by a decrease of more than 50% from industry, and the net result is therefore a decrease of about 0.5 tonnes.

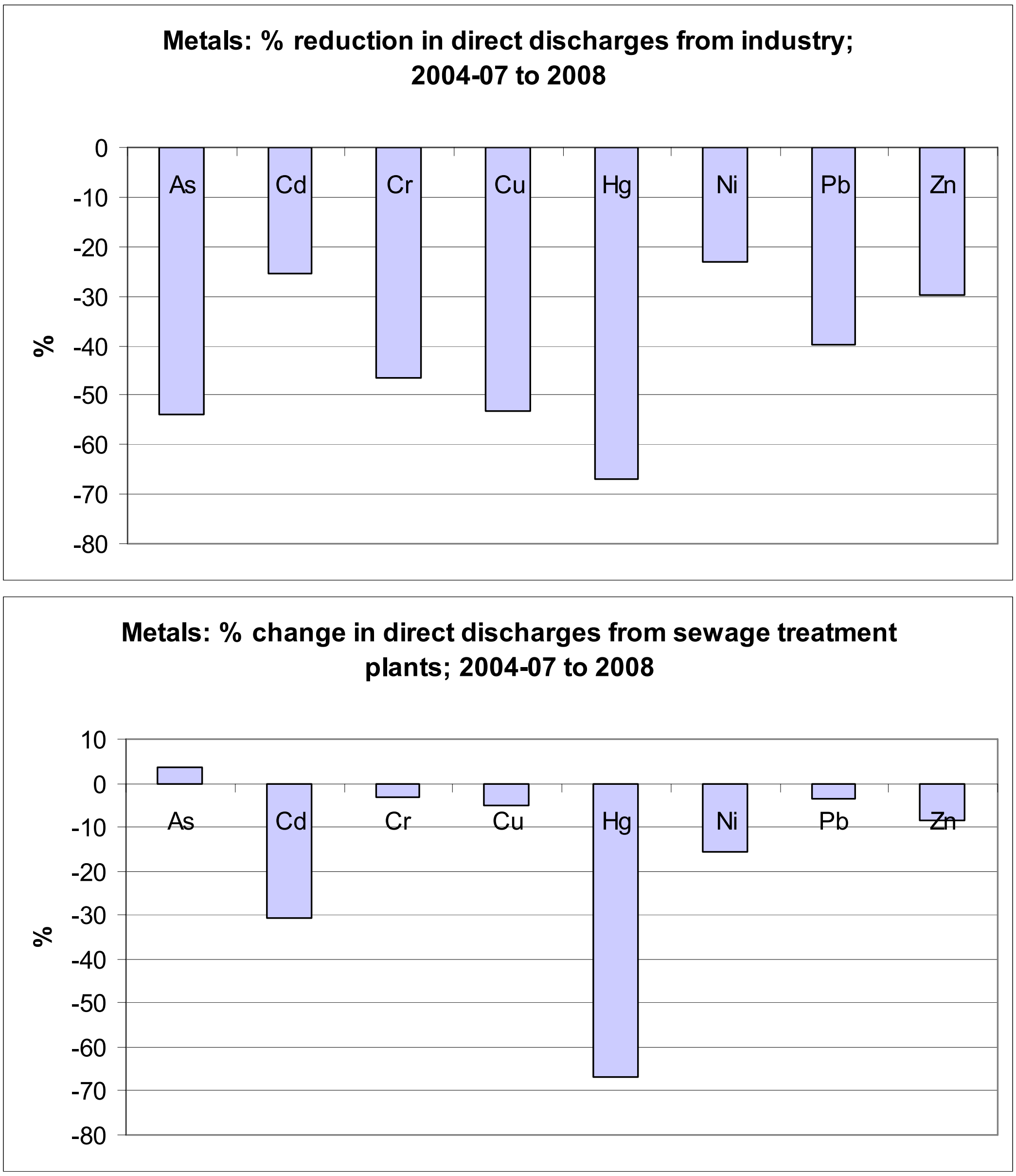


Figure 25. Differences in direct discharges of metals to the Norwegian coast from 2004-2007 to 2008; Upper panel: industry; Lower panel: sewage treatment plants.

4.3 Long-term trends in main rivers' pollutant concentrations 1990-2008

The methodology for this section was given 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 main rivers for the period 1990-2008.

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 and/or gaps in the series include arsenic (As), cobalt (Co), chromium (Cr), total organic carbon (TOC), Silica (SiO_2), PCB7 and lindane (g-HCH).

Some important facts on the long-term database include:

- River Alta was sampled less than 12 times a year during the period 1990-1998.
- There are rivers in single years with increased sampling frequency during flooding (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.
- Total phosphorus and mercury data 1999-2003 was excluded from the analysis (see 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 contain 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 of nutrient and particle concentrations in the nine main Norwegian RID rivers. Figures showing the development in nutrient and SPM concentrations for all rivers are given in Appendix V. The trends of the different substances are discussed below.

Table 11. Long-term trends for water discharge (estimated at the day of water quality sampling), nutrient and particle concentrations (upper estimates, upper and lower estimates given for orthophosphate) in nine Norwegian main rivers 1990- 2008. The table shows the p-value which indicates significance, see legend.

River	Q	NH_4-N	NO_3-N	TN	PO_4-P(1)	PO_4-P(2)	TP	SPM
Glomma	0.189	0.010	0.209	0.089	0.422	0.433	0.833	0.445
Drammenselva	0.035	0.502	0.152	0.073	0.569	0.413	0.678	0.861
Numedalslågen	0.152	0.156	0.052	0.064	0.550	0.491	0.366	0.458
Skienselva	0.057	0.141	0.000	0.000	0.159	0.291	0.871	0.536
Otra	0.801	0.791	0.037	0.160	0.127	0.017	0.003	0.003
Orreelva	0.438	0.193	0.629	0.868	0.670	0.664	0.278	0.266
Orkla	0.574	0.039	0.624	0.961	0.365	0.017	0.002	0.027
Vefsna	0.770	0.000	0.000	0.010	0.127	0.003	0.019	0.026
Altaelva	0.412	0.005	0.011	0.004	0.025	0.015	0.009	0.174
All rivers	0.121	0.016	0.013	0.159	0.652	0.026	0.040	0.169

Significant downward ($p<0.05$)
Downward but not significant ($0.05<p<0.1$)
Significant upward ($p<0.05$)
Upward but not significant ($0.05<p<0.1$)

PO_4-P(1) – upper estimates
PO_4-P(2) – lower estimates

Water discharge
Trends in water flow in the nine main rivers were here assessed for the specific sampling dates for chemical analyses, and not as trends in general hydrological conditions. As shown in Figure 26, 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 ($p <0.06$). River Orreelva shows a tendency of elevated water discharges from 2004 and onwards (Appendix V).

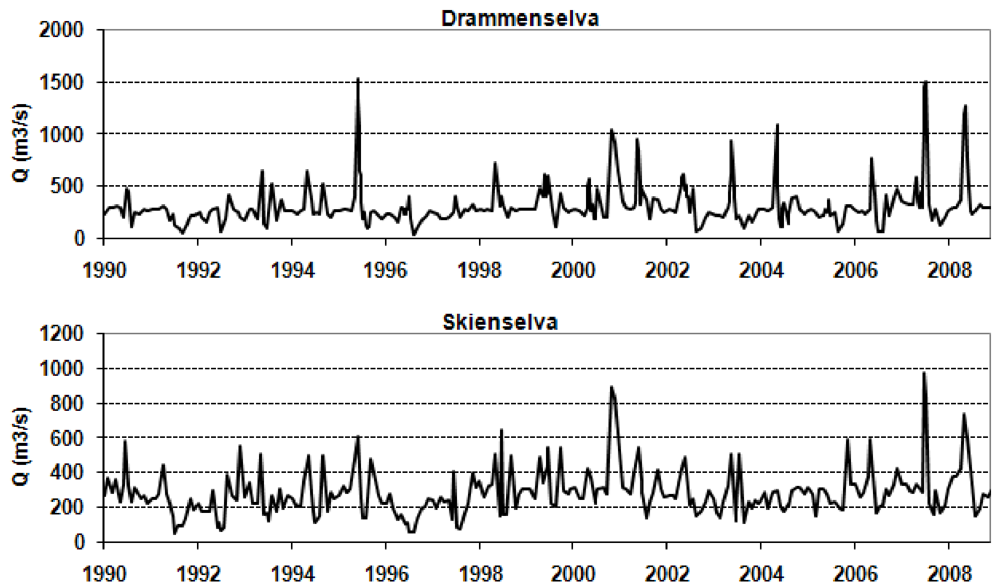


Figure 26. Water discharge (based only on data at the day of water quality sampling) in River Drammenselva (upper panel) and River Skienselva (lower panel), 1990-2008.

Nitrogen

For total nitrogen, three statistically significant downward trends were detected (p<0.05) in 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 detected in River Otra. Ammonium showed statistically downward trends in four rivers (Glomma, Orkla, Vefsna and Altaelva; p<0.05).

No statistically significant upward trends were found for total nitrogen, but Rivers Glomma, Drammenselva and Numedalslågen all show tendencies of increased concentrations 0.05<p<0.1.

The multivariate test for all the rivers combined, showed a statistically significant downward trend for nitrate and ammonium (p<0.02).

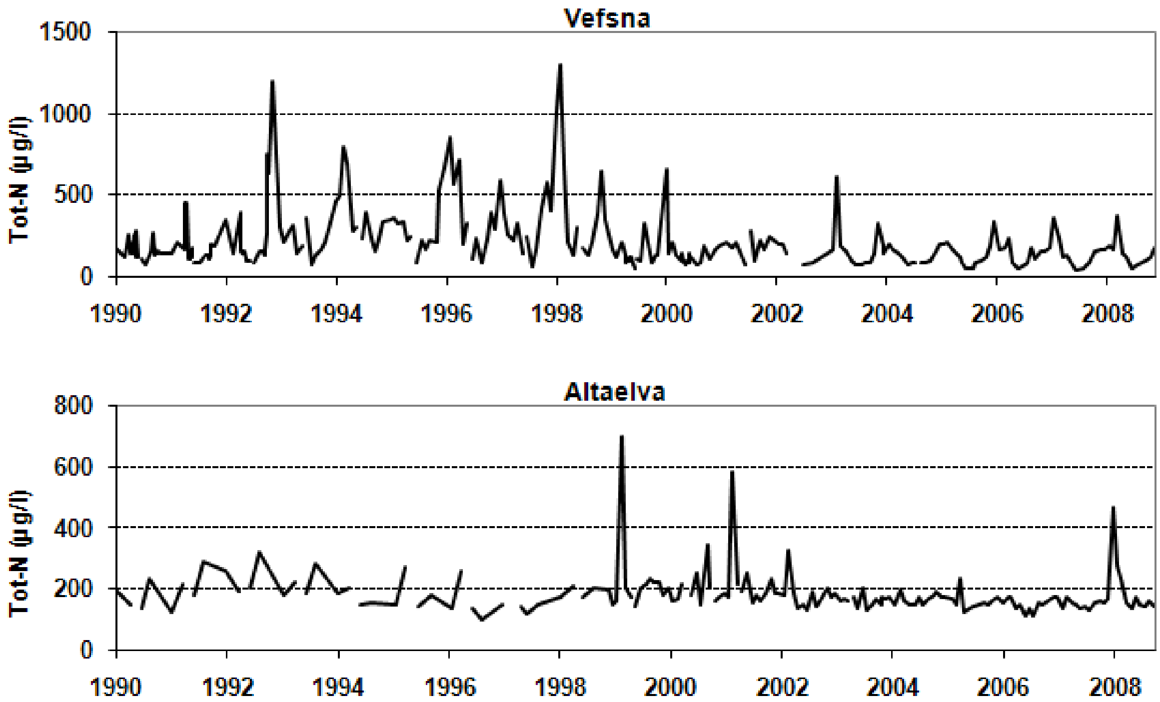


Figure 27. Total nitrogen concentrations in River Vefsna (upper panel) and River Altaelva (lower panel), 1990-2008.

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 last year's RID report (Skarbøvik et al., 2008) only River Altaelva showed a significant downward trend. This new development is most likely due to the exclusion of the 1999 to 2003 data in this study.

River Altaelva is the only river with a significant downward trend for orthophosphate (Figure 28). However when the lower estimates were used, the same rivers as for total phosphorus were statistically significant. The difference in results for the lower and upper estimates for orthophosphate indicates a problem to detect trends since many values are around LOD.

The multivariate test for all the rivers combined, showed a significant downward trend for total phosphorus and orthophosphate (Table 11).

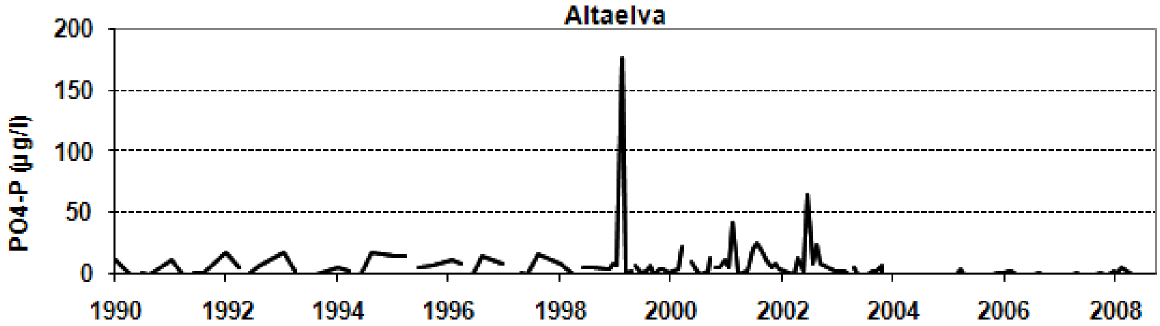


Figure 28. Monthly orthophosphate concentrations in River Altaelva, 1990-2008.

Suspended particulate matter (SPM) shows the same trend pattern as the phosphorus data. More precisely, downward trends in SPM were detected in Rivers Altaelva, Orkla and Vefsna). In addition, the more detailed exploratory analysis revealed that peak SPM values above 40 mg/l in River Glomma have been rare after year 2000. The only exception observed was in early 2005. 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. In the year 2000, high autumn concentrations were detected in Rivers Glomma, Drammenselva, Numedalslågen and Skienselva, which corroborated well with the peaks in water flow during the same period. 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. 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 1990-2008. The table shows the p-value which indicates significance, see legend.

Upper estimates:

River	Q	Cd	Cu	Ni	Pb	Zn
Glomma	0.189	0.003	0.151	0.004	0.006	0.004
Drammenselva	0.035	0.000	0.594	0.670	0.044	0.325
Numedalslågen	0.152	0.001	0.052	0.003	0.015	0.013
Skienselva	0.057	0.000	0.044	0.001	0.006	0.001
Otra	0.801	0.001	0.543	0.017	0.001	0.000
Orreelva	0.438	0.000	0.337	0.000	0.015	0.701
Orkla	0.574	0.009	0.007	0.000	0.002	0.002
Vefsna	0.770	0.000	0.000	0.000	0.000	0.000
Altaelva	0.412	0.000	0.004	0.000	0.000	0.009
All rivers	0.121	0.000	0.015	0.000	0.001	0.000

Lower estimates:

River	Q	Cd	Cu	Ni	Pb	Zn
Glomma	0.189	0.015	0.151	0.004	0.022	0.004
Drammenselva	0.035	0.110	0.594	0.944	0.450	0.323
Numedalslågen	0.152	0.352	0.052	0.105	0.055	0.013
Skienselva	0.057	0.064	0.044	0.326	0.140	0.001
Otra	0.801	0.539	0.543	0.028	0.108	0,000
Orreelva	0.438	0.826	0.337	0.000	0.069	0.652
Orkla	0.574	0.381	0.007	0.000	0.210	0.002
Vefsna	0.770	0.001	0.000	0.000	0.006	0.000
Altaelva	0.412	0.002	0.004	0.002	0.269	0.007
All rivers	0.121	0.124	0.015	0.001	0.045	0.000

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

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, 37 of 45 metal trend tests revealed a statistically significant downward trend for the upper estimates. When the LOD-values were set to zero concentrations, i.e. lower estimates, 22 of 45 metal trends revealed a statistically significant downward trend. The trend test for the lower estimates might be regarded as a more conservative estimate of the metal trend.

Copper and zinc had relatively few analyses below detection limits. Downward trends in four out of nine rivers could statistically be detected, as well as tendencies of decreased concentrations in one more river, i.e., River Numedalslågen. River Vefsna showed the highest significance (i.e., lowest p-value) of reduced copper concentrations (Figure 29).

For zinc, seven statistically downward trends were found. This is illustrated in Figure 29 for River 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 19 years with monitoring.

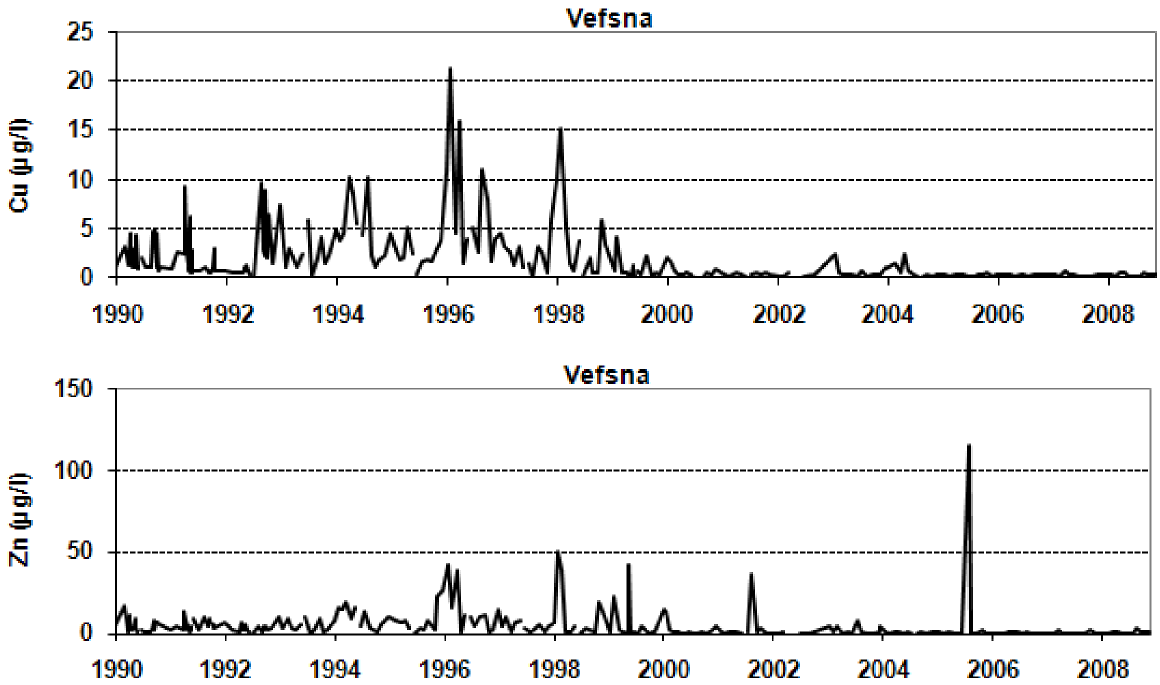


Figure 29. Monthly copper (upper panel) and zinc (lower panel) concentrations in the River Vefsna, 1990-2008.

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 1990-2008 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 downward statistically significant trends were detected:
  - In Rivers Skienselva, Vefsna and Altaelva, for both total nitrogen and nitrate nitrogen;
  - In Rivers Glomma, Orkla, Vefsna and Altaelva, in ammonium nitrogen;
  - In River Otra a downward trend in nitrate nitrogen.
- Tendencies ($0.05<p<0.1$) of upward trends in total nitrogen could be noted in the three rivers in south-east Norway, i.e., Rivers Glomma, 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 we could detect statistically downward trends in Rivers Skienselva, Orkla, Vefsna and Altaelva and tendencies of decreased concentrations also in Numedalslågen.
- For zinc, seven out of nine rivers showed statistically significant downward trends.
- For the concentration of three other metals (Cd, Ni and Pb), no firm conclusions can be drawn on long-term changes and the statistically significant downward trends in 11 out of 27 cases for lower estimates (i.e., 9 rivers and 3 metals) are not necessarily explained by 'real' changes in concentrations. This is due to many values at LOD and that large changes in LOD values over the monitoring period have occurred. Thus, results and interpretations should be used with great caution and should solely be used as an indication of the magnitude of concentration changes.

4.4 Long-term trends in loads in main rivers 1990-2008

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

4.4.1 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). This is mainly due to variations in runoff from year to year.

The time series figures of actual[12] annual water discharges are presented in Appendix VI. The most interesting observations made in the water discharge series were:

- The water discharge can differ with a factor of two between years. This has been observed in all main rivers expect River Vefsna.
- In the five Skagerrak rivers, the water discharge was particularly high in the year 2000, due to heavy and long-lasting rainfall in autumn 2000.
- For the two rivers in northern Norway, Rivers 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.
- The year 2008 had high discharges in all Skagerrak rivers; in fact this was the year with the second highest discharges in Rivers Glomma, Drammenselva and Skienselva in the entire period 1990-2008.
- A serial correlation between years can be noted in all Skagerrak rivers, particularly accentuated in Rivers Drammenselva, Numedalslågen and Skienselva
- No obvious upward or downward trends in annual water discharge 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.

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

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 of 2000, and thus, less available material for river transport in 2001.

The slight tendency of an upward trend in River Drammenselva ("trend smoother") was mainly due to low concentrations and loads during the period 1990-1993.

After flow-normalisation, a clear downward trend can be seen in River Skienselva and also in River Vefsna a rather abrupt change in loads before and after 1999 can be noted (Figure 30). This was also seen for concentrations in the formal trend analysis (cf. Section 4.3). For River Vefsna, the same pattern was also noted for lead and copper (Figure 30) and to some extent also ammonium, in addition to relative high concentration levels compared to the other rivers in the regions (cf. Section 4.3). This might indicate industrial discharges or sewage treatment effluents. One argument that supports this was the fact that high concentrations before 1999 were observed almost solely at low water discharge when dilution is at a minimum. However, no examples of industrial or sewage treatment plants with reduced effluents or units that have ceased to exist have been found. Similarly, the downward trend in River Skienselva may be caused by a number of different changes and measures in the river basin, but no concrete explanation has yet been found.

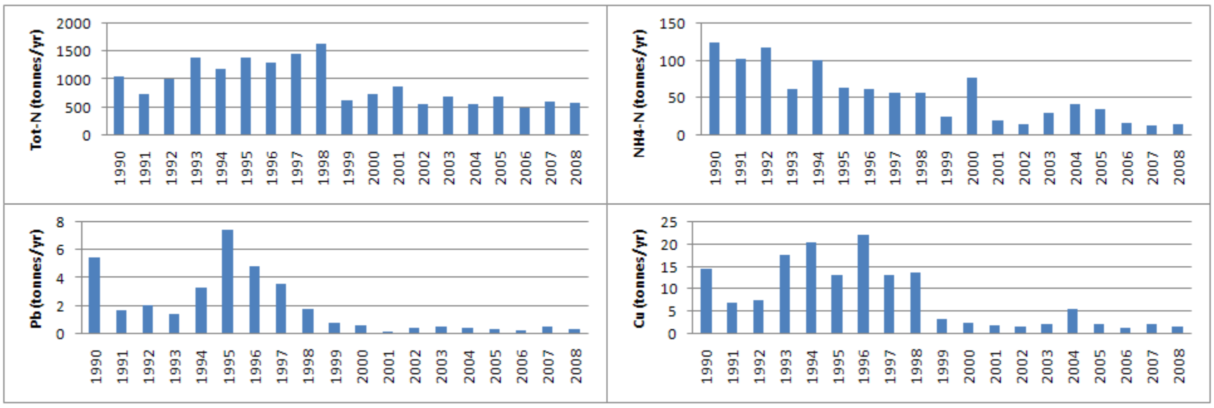


Figure 30. Annual riverine loads in River Vefsna of total nitrogen, ammonium, lead and copper in 1990-2008. Loads shown are the upper estimates.

In River Orreelva, elevated loads for total nitrogen in the period 2004-2007, with the highest load ever observed in 2007 (Figure 31), have resulted in a trend smoother line pointing upwards although the loads in 2008 were back at average levels. The high loads in recent years were examined in more detail in Skarbøvik et al. (2007; 2008).

Also phosphorus showed elevated loads 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 hydrology in combination with sudden changes in emissions from agricultural sources. However, 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 indicate decreased phosphorous emissions at the source between 1995 and 2007.

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

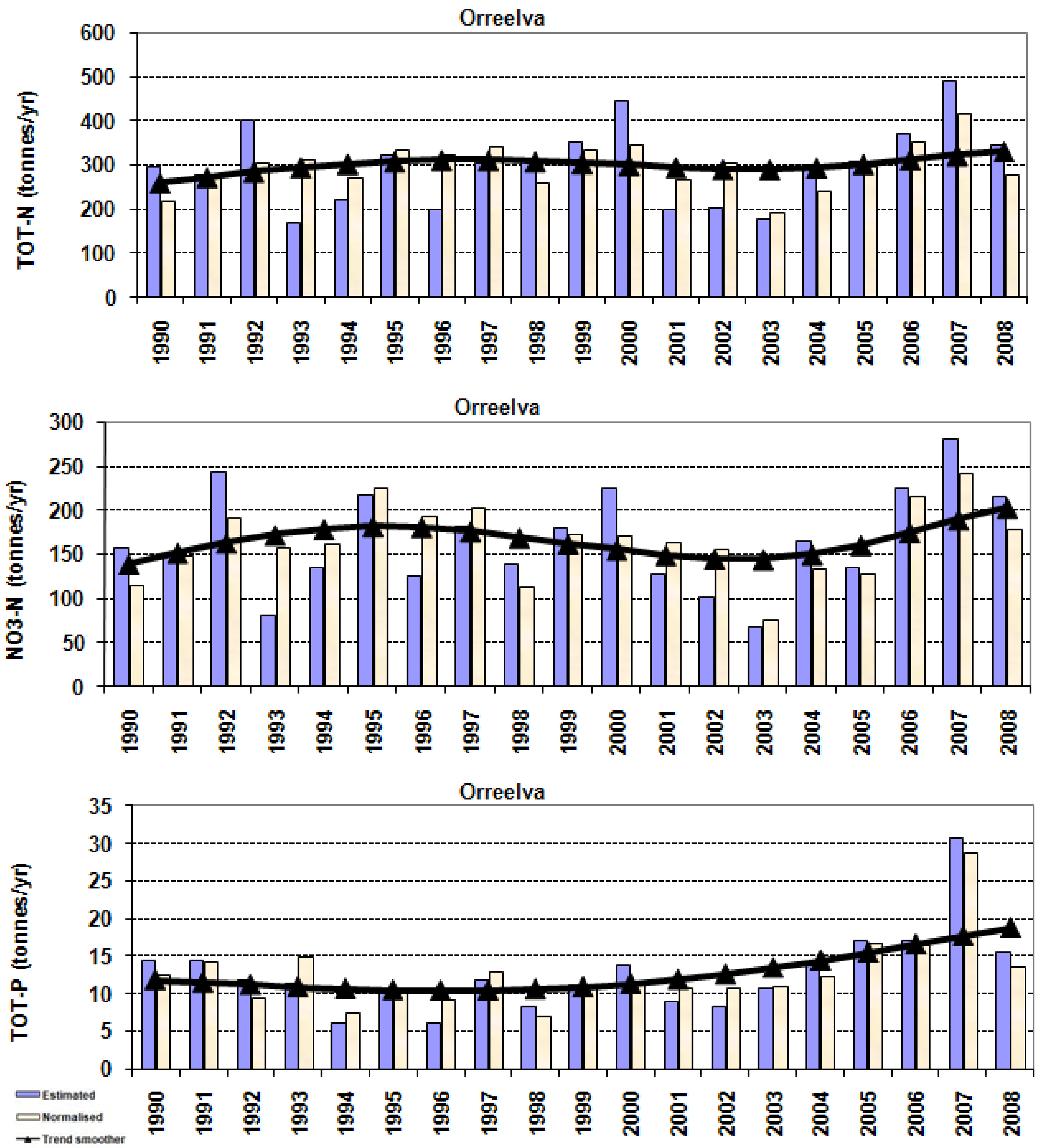


Figure 31. Annual riverine loads in River Orreelva of total nitrogen, nitrate nitrogen and total phosphorus, 1990-2008.

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 thus a less informative parameter for long-term trend assessments.

Phosphorus

The total phosphorus loads generally show a large inter-annual variability which in a majority of the nine rivers varied by a factor of three or more (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 can not be explained. Given this and especially 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 loads and SPM in the same years (Figure 32).

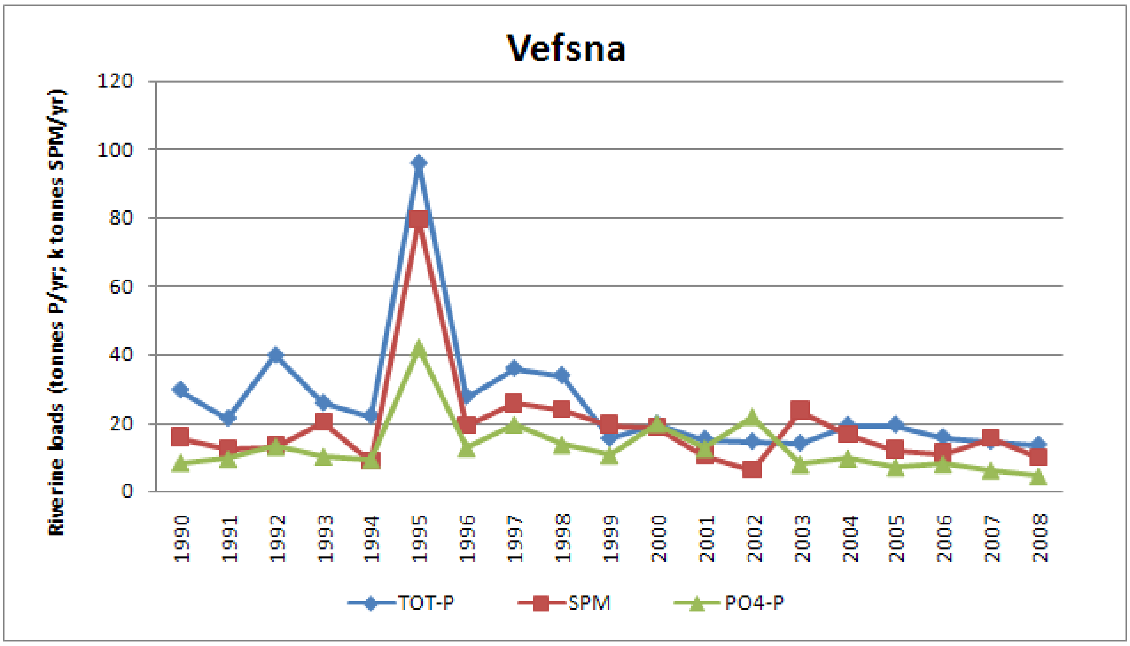


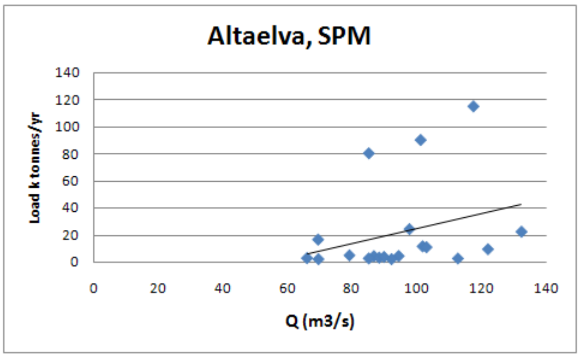
Figure 32. Observed riverine loads of total phosphorus (tot-P), orthophosphate (PO_4-P) and suspended particulate matter (SPM) in Vefsna 1990-2008. It should be noted that total phosphorus loads in 1999-2003 are calculated and not monitored (cf. Stålnacke et al. 2009).

The tendency of upward trends in River Orreelva was already discussed in the previous section as the same phenomena were also noted 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 loads of phosphorus and high runoff in 2008 but this is not seen in the SPM and orthophosphate loads. The reasons for the high total-P 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 a major inter-annual variability of 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 33). This might indicate that the sampling method (regular monthly sampling) might underestimate the true loads as well as the unpredictability in the estimation of event-based substances like suspended particulate matter.



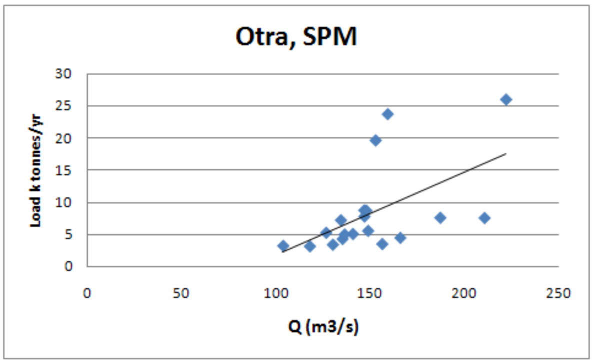


Figure 33. Scatter-plot of the relationship between annual load of suspended particulate matter and annual water discharge in River Altaelva (left panel) and River Otra (right panel) for the monitoring period 1990-2008.

Nevertheless, a common feature in the time series was the high particle loads in the year 2000 for all five Skagerrak rivers (less in River Glomma). This is obviously explained by the high water discharge this year. High runoff also explains the high SPM loads for River Glomma in 2008.

The high loads of SPM in 2007 for Rivers Drammenselva and Numedalslågen were due to increased sampling frequency due to campaign measurements during the summer flooding. This specific episode and other examples of the influence of single observations for annual loads are given in Skarbøvik et al. (2007; 2008). Also a more general discussion concerning sampling frequency in RID can be found in the same report.

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 1990-2008 are assessed. All figures are given in Appendix VI. The metals include:

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

Both lower and upper load estimates are given in Appendix VI. Lower load estimates have been calculated by setting all LOD values to zero concentration; whereas upper load estimates have been calculated by setting the concentration equal to the given LOD value.

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 (including the complementary figures 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 1990-2008. Long-term trends have, in general, been difficult to identify in a majority of the rivers. However, a sharp break in the trend in the River Vefsna is interesting. Here, the annual loads of copper during the years 1990-1998 amounted to around 12-17 tonnes, while it in the following period (1999-2008) dropped down to 2-5 tonnes. The same pattern is also noted in River Vefsna for lead, nitrogen and phosphorus. The reason for this is not known; the sampling site in Vefsna is located *upstream* of the major settlement (Mosjøen) and any large industries in the catchment area, and no trend of declined water discharge can be observed.

A decline in loads in Rivers Altaelva (Figure 34), 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 2000's.

A relatively steep increase since 2004 can be noted in River Otra.

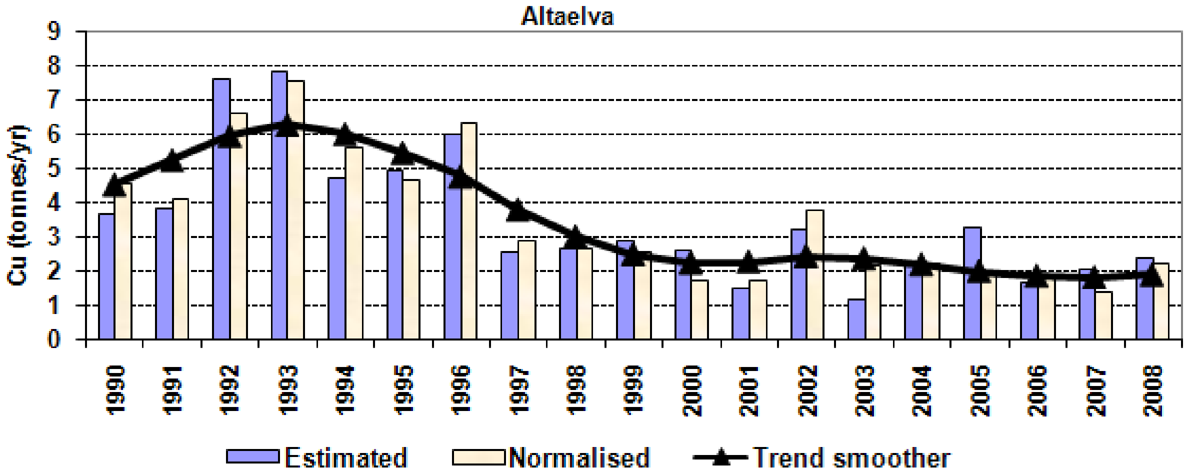


Figure 34. Annual riverine loads of copper in River Altaelva, 1990-2008.

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 load in River Numedalslågen in 1993 is explained by generally high values during the entire year, with e.g., 8 observations out of 13 with concentrations above 5 µg/l (Figure 35). In comparison, concentrations above 5 µg/l never occurred in the period 2000-2006.

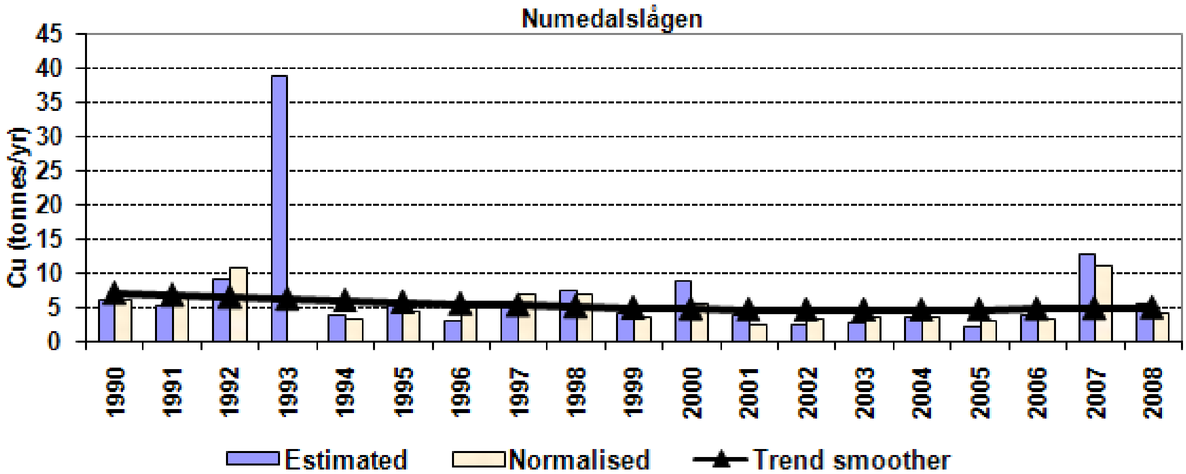


Figure 35. Annual riverine loads of copper in River Numedalslågen, 1990-2008. Data for 1993 has been removed before estimating the normalised values and trend smoother.

The high load in River Skienselva in 1990 is explained by 2 samples with high concentrations (17 µg/l and 20 µg/l), whereas 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 (6µg/l) in combination with several observations around or above 1 µg/l.

Zinc (Zn)

The zinc loads show a relatively low inter-annual variability as compared to many of the other metals. A visible downward trend could be detected in Orkla (Figure 36) and in Vefsna. But also Rivers Glomma, Numedalslågen and Skienselva 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 in River Altaelva in 2008).

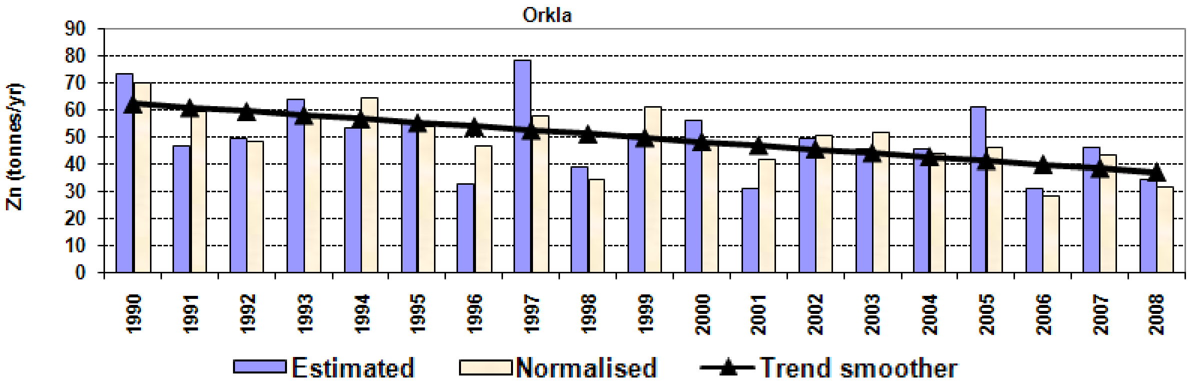


Figure 36. Annual riverine loads of zinc in River Orkla, 1990-2008.

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 (1990-2008). 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	2004-2008
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.

Cadmium (Cd)
More than 25% of the total number of observations of cadmium in the ten rivers was 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 2004-2008. 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 in loads.

Mercury (Hg)
For mercury, 50% of the total number of observations in the ten rivers was below LOD. The LODs have not changed to any particular degree 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 in loads. It should also be noted that the loads in 1999-2003 are based on estimated concentrations (cf. Section 1.4).

Arsenic (As)
Lower and upper load estimates given 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 was 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 in loads.

Some more detailed examples of variations in loads of these substances are given in Skarbøvik et al., 2008.

4.4.5 Overview of trends in riverine loads

The main conclusions of the trend analysis on loads include:

- There is a substantial inter-annual variability in loads primarily coupled to a corresponding variability in water discharge.
- Peaks in annual loads were primarily due to single peak concentrations which in most cases are due to flooding peaks.
- No obvious upward or downward trends in annual water discharge could be detected.
- For nutrients only very few trends could be detected:
  - In Rivers Skienselva and Vefsna, a downward trend in nitrogen;
  - In River Orreelva, particularly high loads of both nitrogen, phosphorus and to some extent suspended particles were observed in the period 2004-2007.
  - In River Vefsna, the phosphorus loads have declined somewhat during the 2000s compared to the ‘high-load period 1992-1998.
- For suspended particles, no long-term trends can be observed due to 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 elevated water discharge.
- For copper there was a downward trend in Rivers Vefsna, Orkla and Skienselva and Altaelva.
- For zinc, visible downward trends could be detected in Rivers Orkla and Vefsna and tendencies of decreased loads in Rivers Glomma, Numedalslågen and Skienselva.
- For other metal loads, no firm conclusions can be drawn about long-term changes and possible visual downward trends are not necessarily explained by ‘real’ changes in loads. This is due to many values below LOD and large changes in LOD values over the monitoring period. 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 its uncertainty.
- 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

In 2008, the total Norwegian inputs of nutrients, suspended solids, metals, one pesticide and PCB7s to coastal waters were estimated, as 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 2008; lower estimates. In tonnes for all parameters, except PCB7 and lindane (g-HCH) which are given in kg; flow rate in km3/d.

	Flow rate	Cd	Hg	Cu	Zn	Pb	As	Cr	Ni
Main Rivers	198 587	0.932	0.019	109	308	19	11	22	43
Tributary Rivers (36)	228 848	0.993	0.041	85	270	17	8	17	50
Tributary Rivers (109)	164 832	0.490	0.056	24	67	6	6	19	23
Total Riverine Inputs	592 268	2.415	0.117	218	645	42	25	57	116
Sewage Effluents		0.023	0.021	8.0	14.3	0.6	0.3	0.9	2.6
Industrial Effluents		0.149	0.013	9.4	19.9	2.9	0.4	0.8	9.3
Fish Farming				724.5					
Total Direct Inputs		0.172	0.034	741.8	34.2	3.5	0.7	1.7	11.8
Unmonitored Areas	397 355								
Total Norway	989 623	2.59	0.150	960	679	45	26	59	127

	NH_4-N	NO_3-N	PO_4-P	TN	TP	SiO_2	SPM	TOC	PCB	g-HCH
Main Rivers	946	17 225	434	29 299	819	232 376	545 922	234 787	1.33	0.00
Tributary Rivers (36)	681	9 486	226	20 052	572	185 874	309 436	199 136		
Tributary Rivers (109)	516	6 224	96	11 251	259	80 623	77 465	100 692		
Total Riverine Inputs	2 142	32 935	756	60 602	1 650	498 873	932 823	534 615		
Sewage Effluents	8 650	577	547	11 534	912		8 174	3 922		
Industrial Effluents	1 958	131	203	2 610	338		31 230	633		
Fish Farming	33 142	4 557	5 921	41 428	8 581					
Total Direct Inputs	43 750	5 264	6 671	55 572	9 831		39 404	4 554		
Unmonitored Areas	2 274	25 846	184	41 354	749					
REGION TOTAL	48 167	64 046	7611	157 529	12 230	498 873	972 227	539 169	1.33	0.00

The methodical work on the 1990-2007 RID database (Stålnacke et al. 2009) has resulted in a more complete and reliable dataset both for 2008 and for comparisons of 2008 data with former years.

Water discharge
In spite of some unusual weather events in 2008, the total runoff for the year was relatively close to average values for all of Norway. The flow was however much higher (23%) in the Skagerrak region than in the four past years, whereas both in the Norwegian and the Barents Sea the flow was lower than in the former years. In the North Sea, the flow in 2008 was only 7 % higher than in the last years.

Nutrients and suspended particulate matter
Nutrient loads to the Skagerrak maritime area have increased slightly as compared to the average value of 2004-2007, but this is mainly due to the higher water discharges in 2008. Loads in the rest of Norway have been stable or reduced during the last five years, and the net result is an insignificant increase in total nitrogen and a 10% increase of total phosphorus.

Loads of sediments (SPM) increased as compared to the 2004-2007 period in rivers in both the Skagerrak, Norwegian Sea and Barents Sea regions.

Analyses of long term trends (1990-2008) in nutrient inputs showed that there were some few trends:

- In Rivers Skienselva and Vefsna, a downward trend in nitrogen;
- In River Orreelva, particularly high loads of both nitrogen, phosphorus and to some extent suspended particles in the period 2004-2007.
- In River Vefsna, the phosphorus loads have declined somewhat during the 2000s compared to higher loads in 1992-1998.

For suspended particles, no long-term trends can be observed due to 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 discharges.

Data from 1990 to 2008 were also analysed for trends in nutrient concentrations, with the following results:

- Downward statistically significant trends of nitrogen in:
  - Rivers Skienselva, Vefsna and Altaelva for both total nitrogen and nitrate nitrogen;
  - Rivers Glomma, Orkla, Vefsna and Altaelva for ammonium nitrogen;
  - River Otra for nitrate nitrogen.
- Upward trends in total nitrogen in the three rivers in south-east Norway, i.e., Rivers Glomma, Drammenselva and Numedalslågen.
- Downward statistically significant trends for total phosphorus and orthophosphate concentrations in Rivers Otra, Orkla, Vefsna and Altaelva.
- Downward statistically significant trends for suspended particle concentrations in Rivers Otra, Orkla and Vefsna.

The direct discharges of both total phosphorus and total nitrogen have increased in the latter five years for all three sectors (industry, sewage treatment plants and fish farming). The highest increase is in fish farming, where a steady increase of production has resulted in 36 % more of both total phosphorus and total nitrogen since the average for 2004-2007. Fish farms are most common in the North and Norwegian Seas.

Metals

In general, riverine loads of metals did not change much from the period 2004-07 to 2008. Annual metal variations in riverine loads 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 is a typical example of this; and in 2008 inputs to the sea of copper and nickel went down in this river as compared to the four former years. In River Glomma, chromium loads increased significantly, mainly due to one sample with high concentrations in November. There is also a small increase in lead in several rivers, resulting in an overall increase of 12 % or 4 tonnes.

An analysis of long-term trends (1990-2008) in riverine inputs of metals revealed that

- For copper; a downward trend in Rivers Vefsna, Orkla and Skienselva and Altaelva.
- For zinc; visible downward trends in Rivers Orkla and Vefsna and tendencies of decreased inputs from Rivers Glomma, Numedalslågen and Skienselva.

Data from 1990 to 2008 were also analysed for trends in metal concentrations, with the following results:

- Downward statistically significant trends of copper in Rivers Skienselva, Orkla, Vefsna and Altaelva, with tendencies of decreased concentrations also in River Numedalslågen.
- Downward statistically significant trends of zinc in seven out of nine rivers.
- For other three metals (Cd, Ni and Pb), no firm conclusions can be drawn on long-term changes.

Direct discharges of copper continues to increase, these derive from fish farms. However, from 2007 to 2008 there is only a slight increase, the main increase therefore occurred between 2004 and 2007. Apart from copper, all other metals deriving from direct discharges show a clear decrease as compared to the period 2004-2007. The decreases in metal discharges include:

- A decrease in direct discharges of mercury of 68 kg
- A reduction of nickel discharges from both industry and sewage to all maritime areas, although most of these reductions occurred in the period before 2007.
- A reduction of lead discharges from industry in the North Sea and Skagerrak areas, resulting in an overall reduction of 40 %, or 1.9 tonnes.
- A reduction of zinc from industry in the Norwegian and North Sea areas resulting in an overall decrease of 30 % or 8.5 tonnes for all of Norway, in spite of an increase in Skagerrak. Since the sewage also discharged 1.3 tonnes less zinc in 2008, the overall reduction from direct discharges amounts to about 10 tonnes.
- A small increase in arsenic from sewage treatment plants is outweighed by a decrease of more than 50% from industry, and the net result is therefore a decrease of about 0.5 tonnes.

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

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 2008 is given below:

Personnel for water sampling in the 10 main rivers:

Nils Haakensen
Vibeke Svenne
Vebjørn Opdahl
Agnar Johnsen/Anders Bjordal
Joar Skauge
Turi Ottersland Tjøstheim (Suldalslågen)
Eskil Nerheim (after John Jastrey)
Geir Ove Henden (Vosso)
Eskild Henning Larsen
Anne Lise Ek/ Sverre Holm
Einar Helland
Ellen Grethe Ruud Åtland

Personnel for water sampling in the 36 rivers with quarterly sampling:

Olav Smestad
Marianne Lien
Svein Gitle Tangen
Leif Johnny Bogetveit
Hallgeir Hansen
Nils Haakensen
Vebjørn Opdahl
Erik Kårvatn
Harald Viken
Egil Moen
Helge Utby
Einar Pettersen
Ellen Grethe Ruud Åtland
Einar Helland
Maria Knagenhjelm
Turi Ottersland Tjøstheim (Suldalslågen)
Merete Stenseth
Geir Ove Henden (Vosso)
Asbjørn Bjerkan
Bjarne Stangvik

Appendix III
Catchment information

Catchment information for rivers monitored monthly - Main Rivers

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

The rivers Glomma, Drammenselva, Numedalslågen, Skienselva, and Otra drain into the Skagerrak area, the part of the North Sea which is considered to be most susceptible to pollution. These five rivers also represent the major load bearing rivers in Norway. Of these, the 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 also receive losses 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 of the rivers except Orreelva are to varying degrees regulated for hydropower production.

Catchment information for rivers monitored quarterly – Tributary Rivers

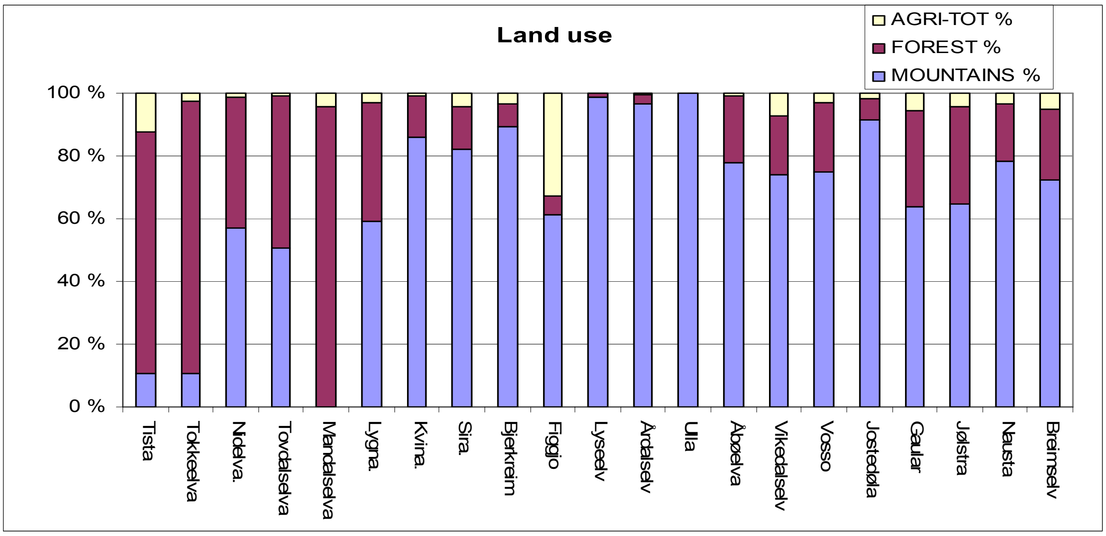
A list of the tributary rivers is given in Table A-III-2.

The average size of the catchment area of the tributary rivers[13] 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[14] 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,

[13] Note that River Vosso is still included in this figure.
[14] 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.



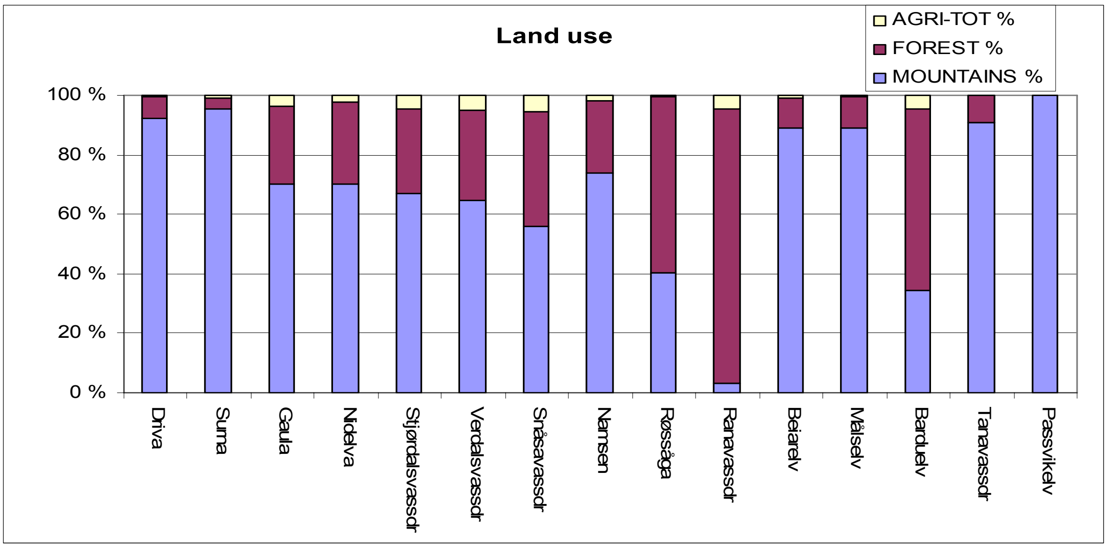


Figure A-III-1. Land use distribution in the catchment areas of the 36 rivers monitored quarterly. "Agri-tot" means total agricultural land. "Mountains" include moors and mountain plateaus not covered by forest.

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. On average, the 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.

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

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 comprise River Suldalslågen and River Alta, and are monitored at the same frequency. In these 10 rivers a number of studies have been carried out since 1990, and they have all been included in the National Monitoring Programme of Watercourses (www.sft.no). However, as described in Section 1.4, River Vosso is now replacing River Suldalslågen as a main river, and River Suldalslågen will be reported as a tributary river in the coming years.

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 focussed 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 related to 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 the industry and the municipal wastewater system are located downstream the sampling sites. These supplies are not included in the riverine inputs, but are included in the direct discharge estimates.

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

Table A-IV-2. Co-ordinates 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.

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 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 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 (see Section 4.6.4) 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 hydrological 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.

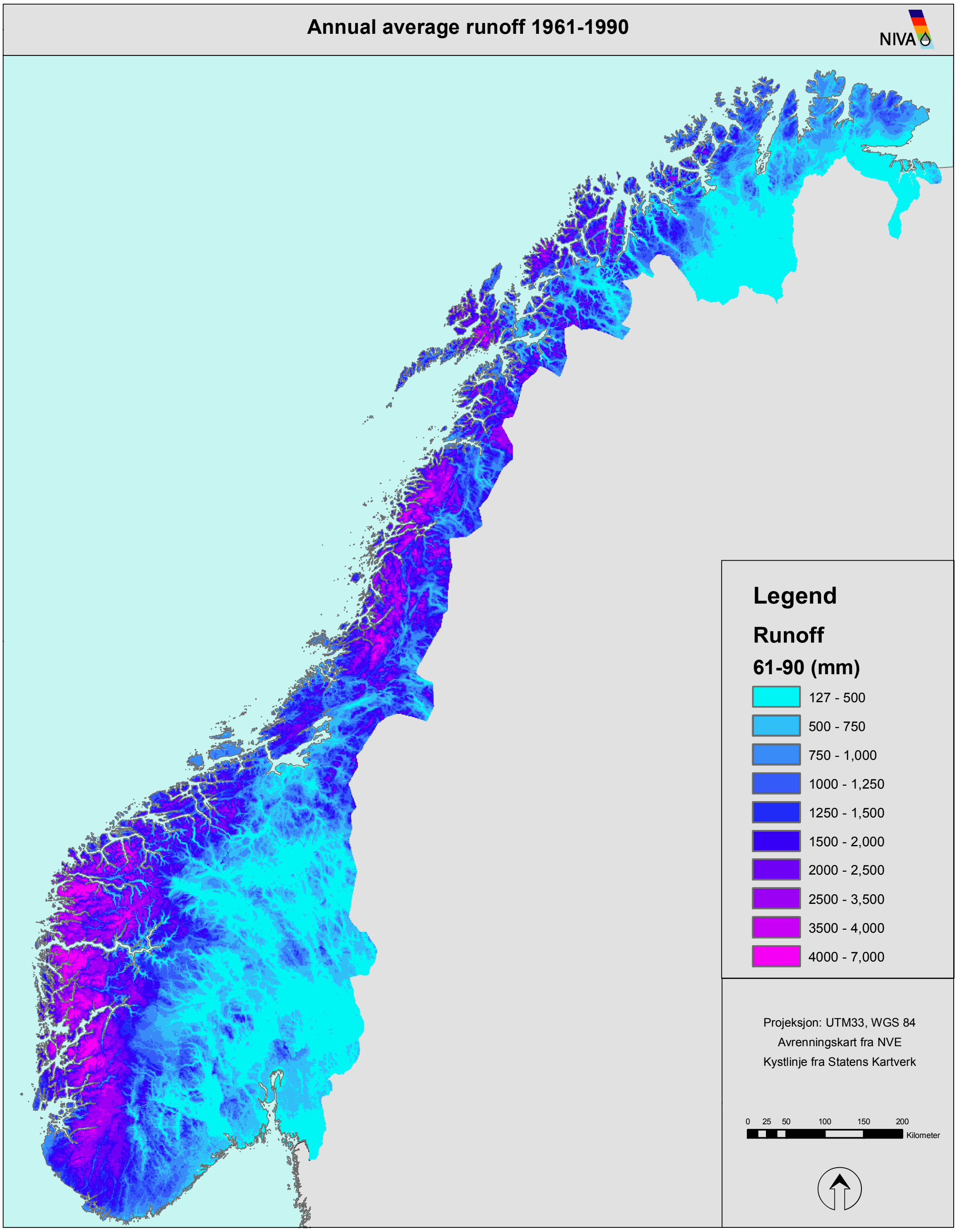


Figure A-IV-1. Annual average runoff (mm/year) for Norway for the period 1961-1990.

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 Norwegian Pollution Control Authority - SFT/INKOSYS)

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 %, primary treatment for 24%, chemical/biological treatment for 27%, direct discharges for 8%, biological treatment for 2% and others for 2% (2002 data). In the North Sea area of Norway, 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 discharges 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 discharges were estimated by multiplying the number of people with standard Norwegian per capita load figures reduced by 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 a portion of industrial effluents. The fraction of the total person equivalents (p.e.) is proportioned 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

<u>Metals from wastewater</u>
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 SFT's database INKOSYS.

<u>Nutrients from wastewater</u>
Statistics Norway (SSB) and the Norwegian Pollution Control Authority (SFT) jointly initiated annual registration of data of 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 the 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.

<u>Industrial effluents</u>
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 SFT's data base INKOSYS.

<u>Fish farming effluents</u>
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 phosphorus (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. Results from Enell (1987), Ackefors and Enell (1990) and Ackefors and Enell (1991) have shown that about 78% of the discharged N is in dissolved form and the rest (22%) in particulate form.

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Appendix V
Trend Analyses – Pollutant Concentrations. Complimentary 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 complimentary to Chapter 4.3.

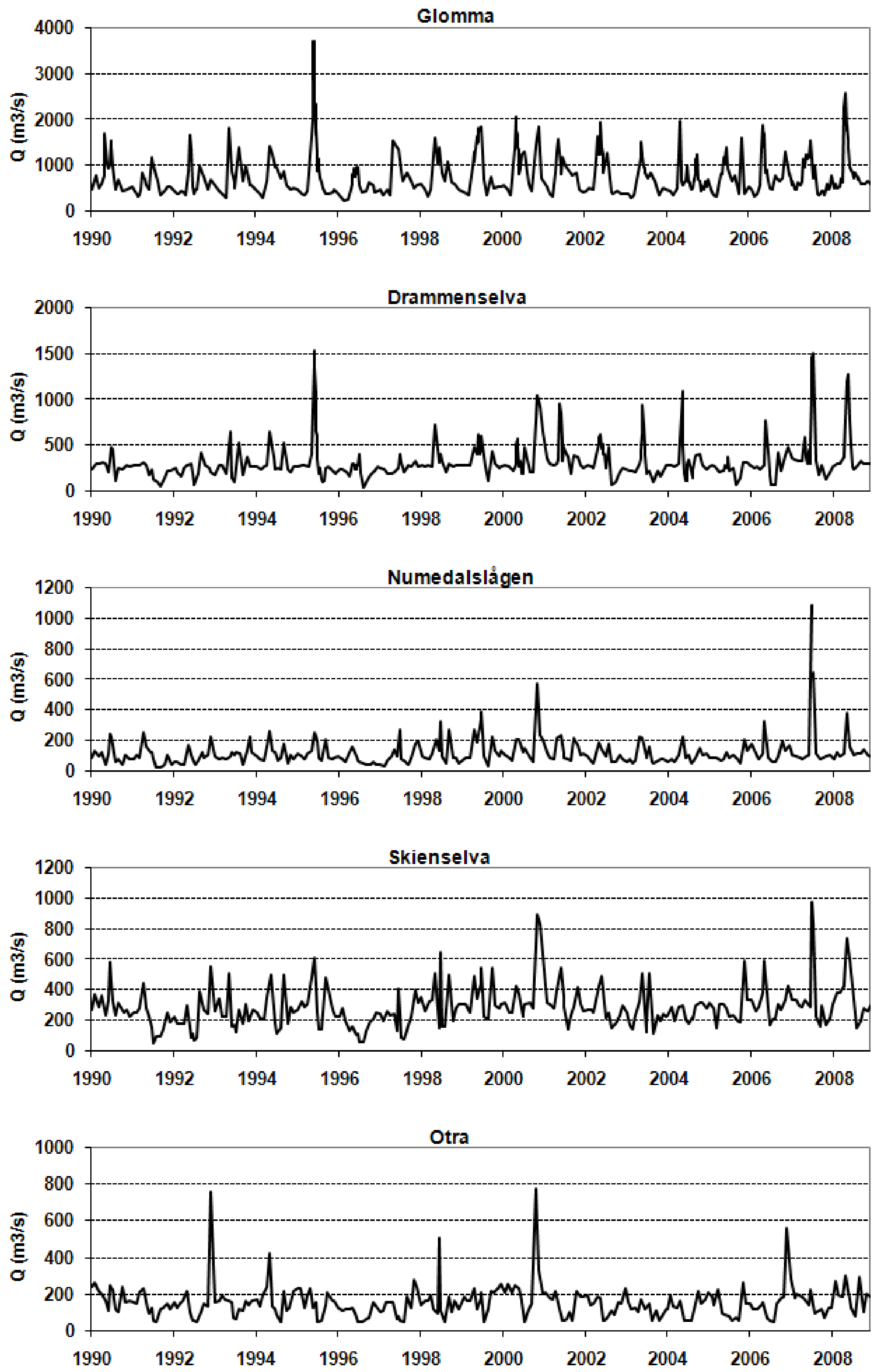


Figure A-V-1a. Monthly <u>water discharge</u> (based only on data at the day of water quality sampling) in the five main Norwegian Skagerrak rivers, 1990-2008.

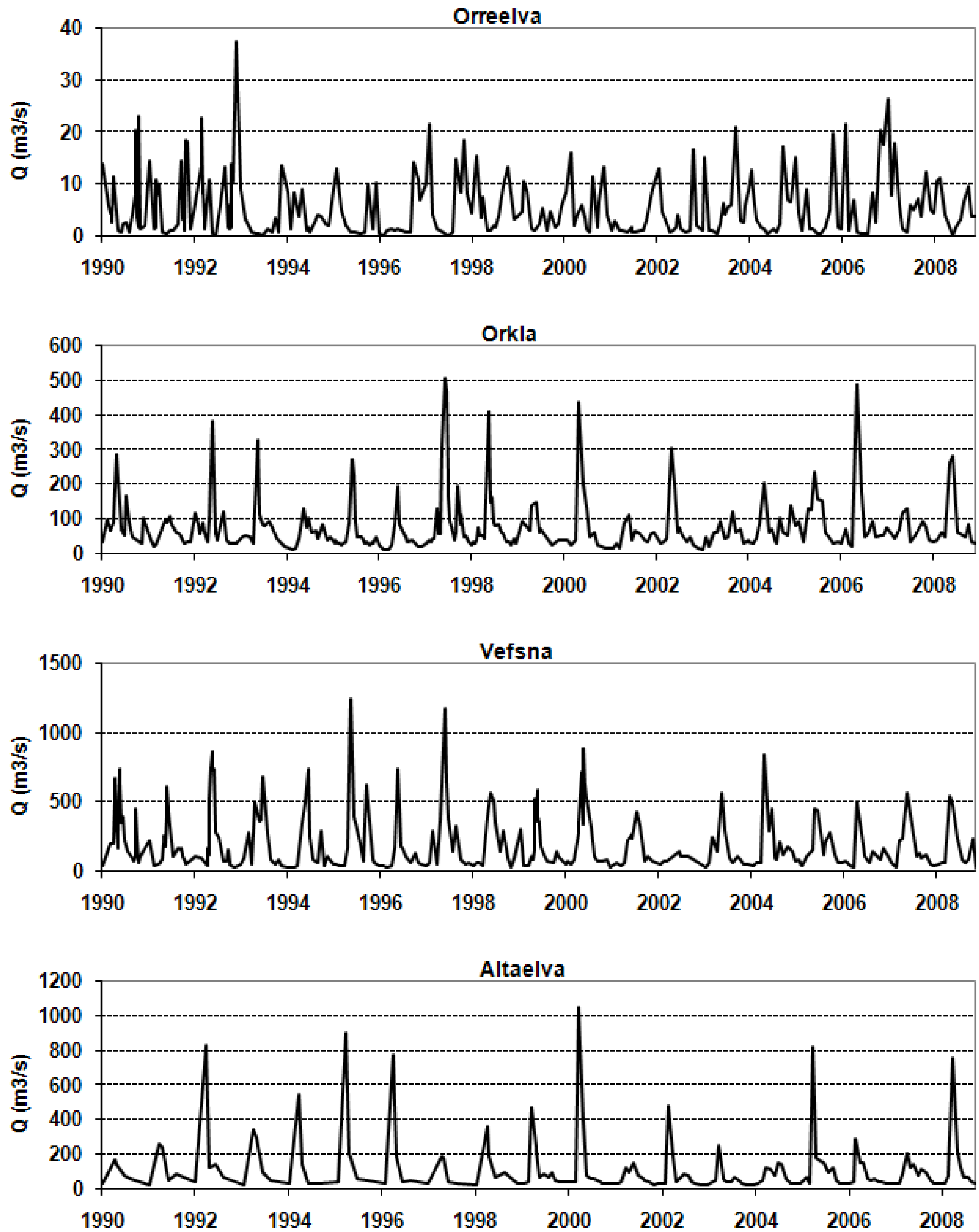


Figure A-V-1b. Monthly water discharge (based only on data at the day of water quality sampling) in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

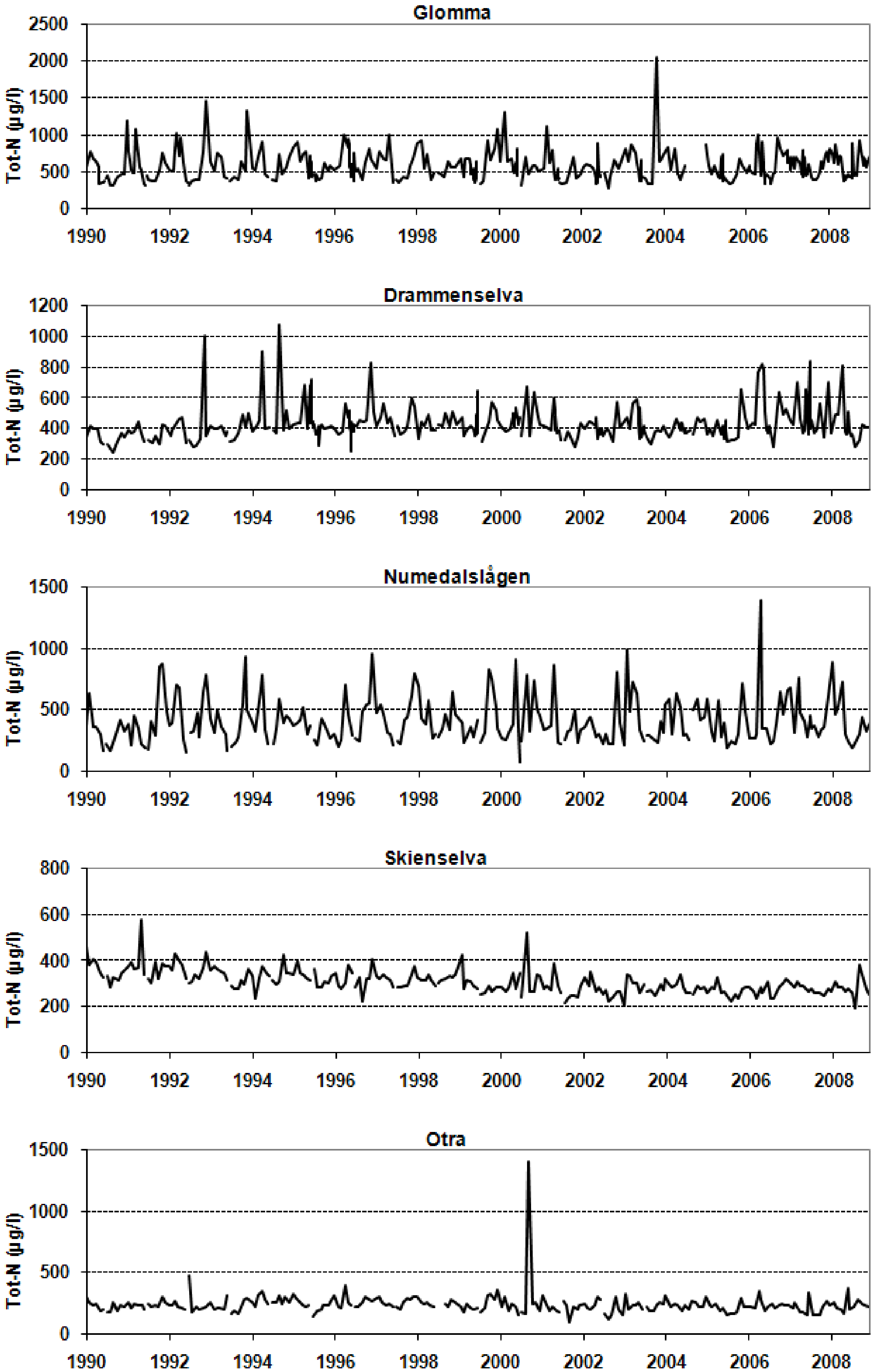


Figure A-V-2a. Monthly concentrations of <u>total nitrogen</u> in the five main Norwegian Skagerrak rivers, 1990-2008.

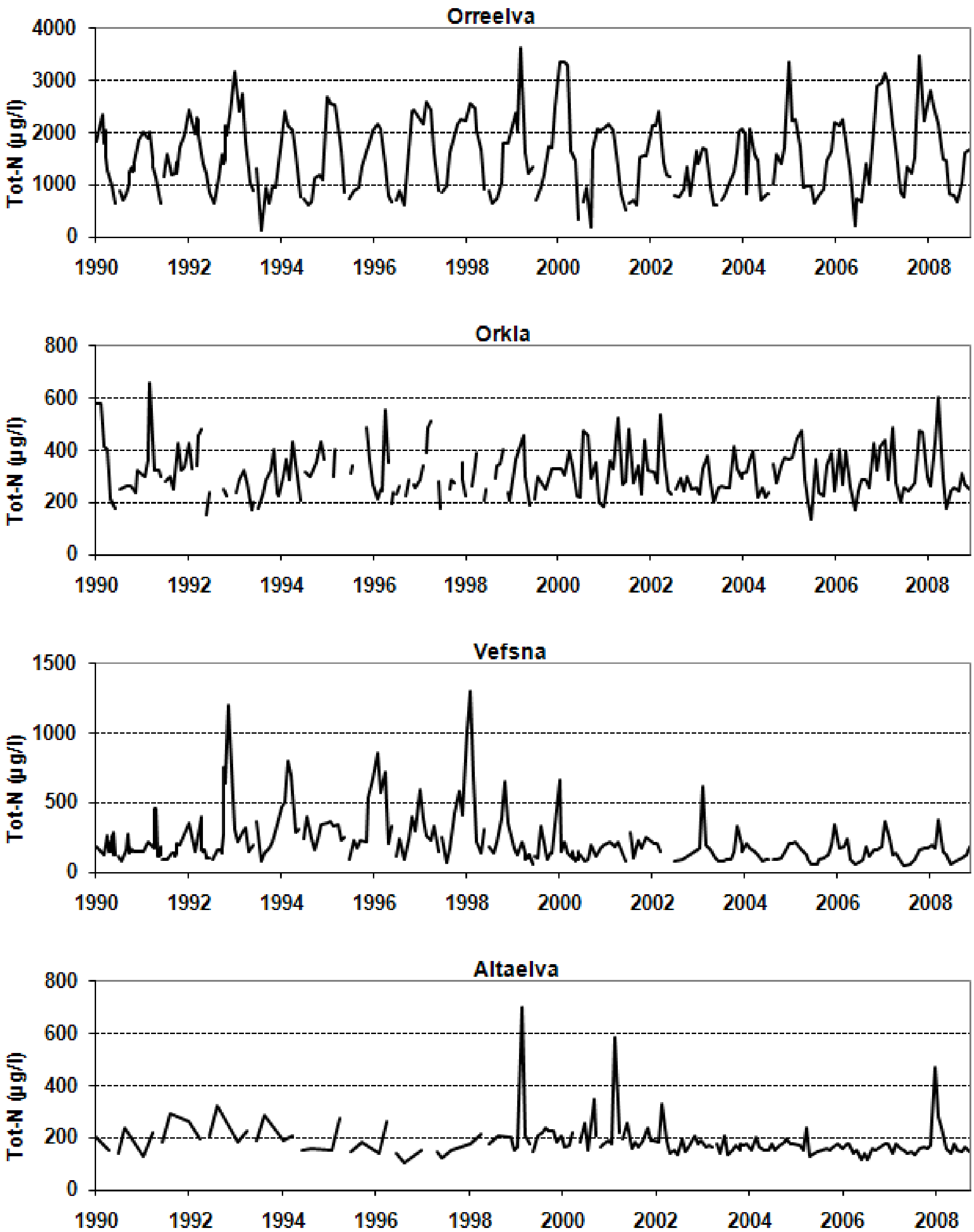


Figure A-V-2b. Monthly concentrations of *__total nitrogen__* *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.*

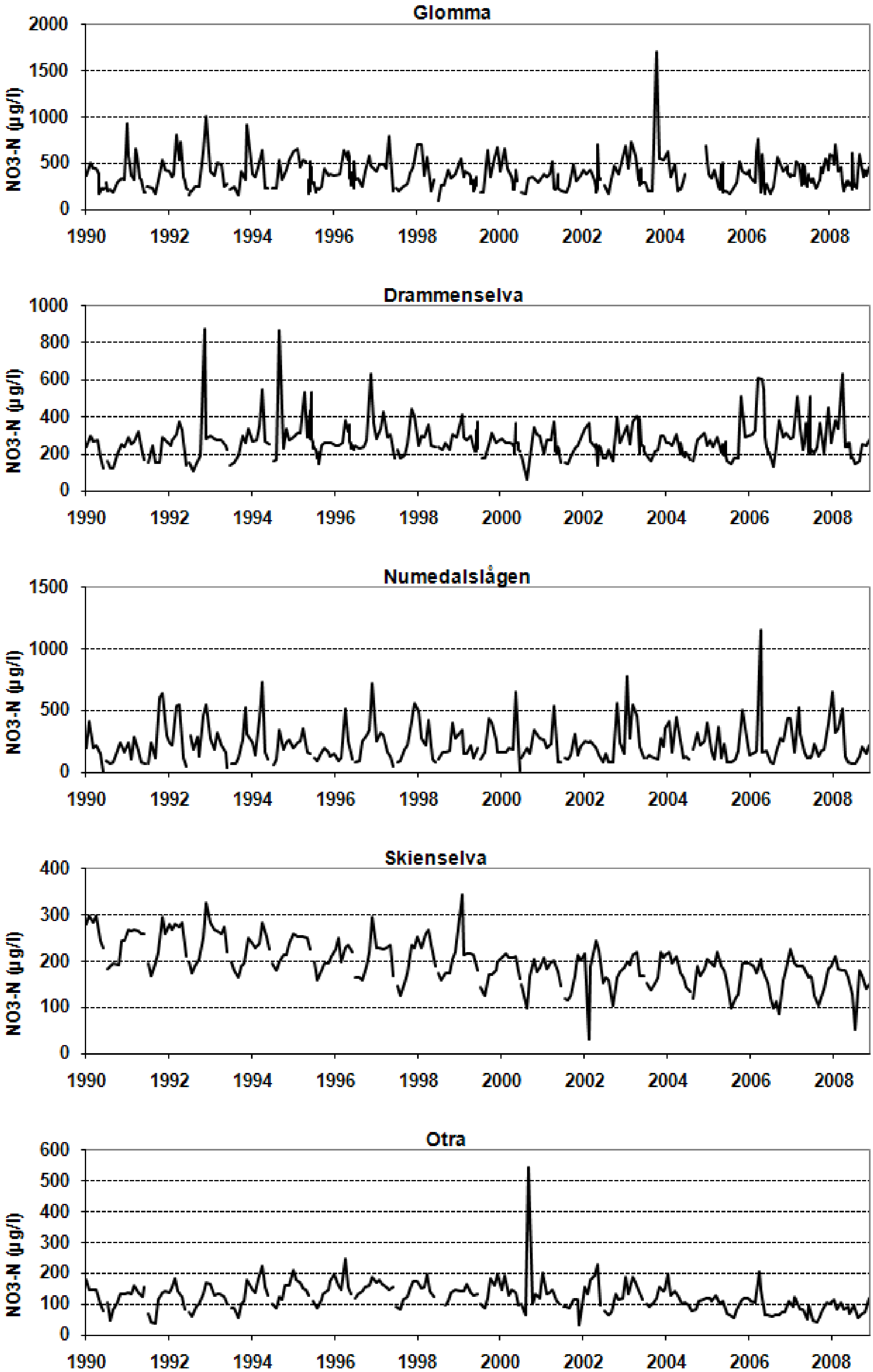


Figure A-V-3a. Monthly concentrations of <u>*nitrate nitrogen*</u> *in the five main Norwegian Skagerrak rivers, 1990-2008.*

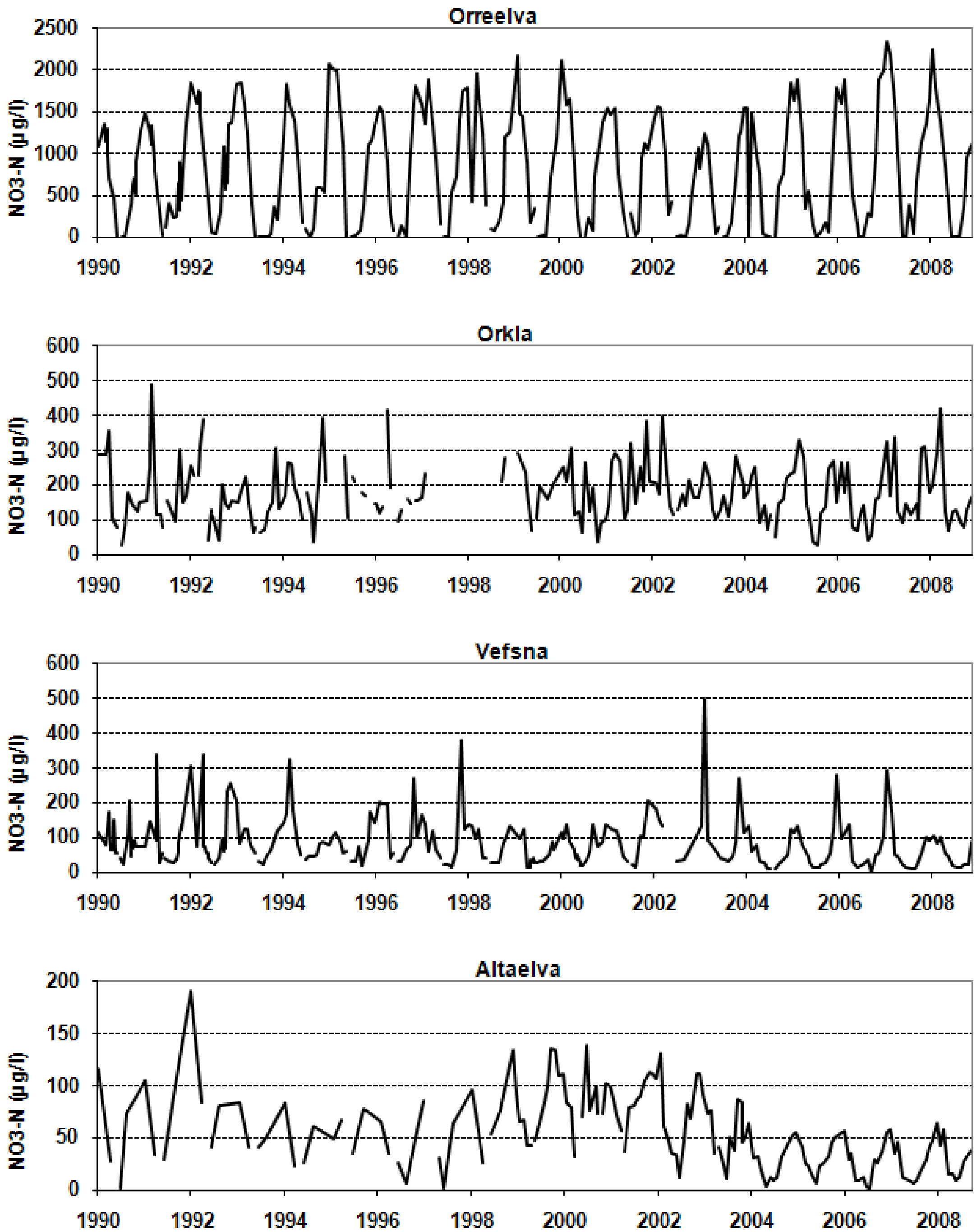


Figure A-V-3b. Monthly concentrations of <u>*nitrate nitrogen*</u> *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.*

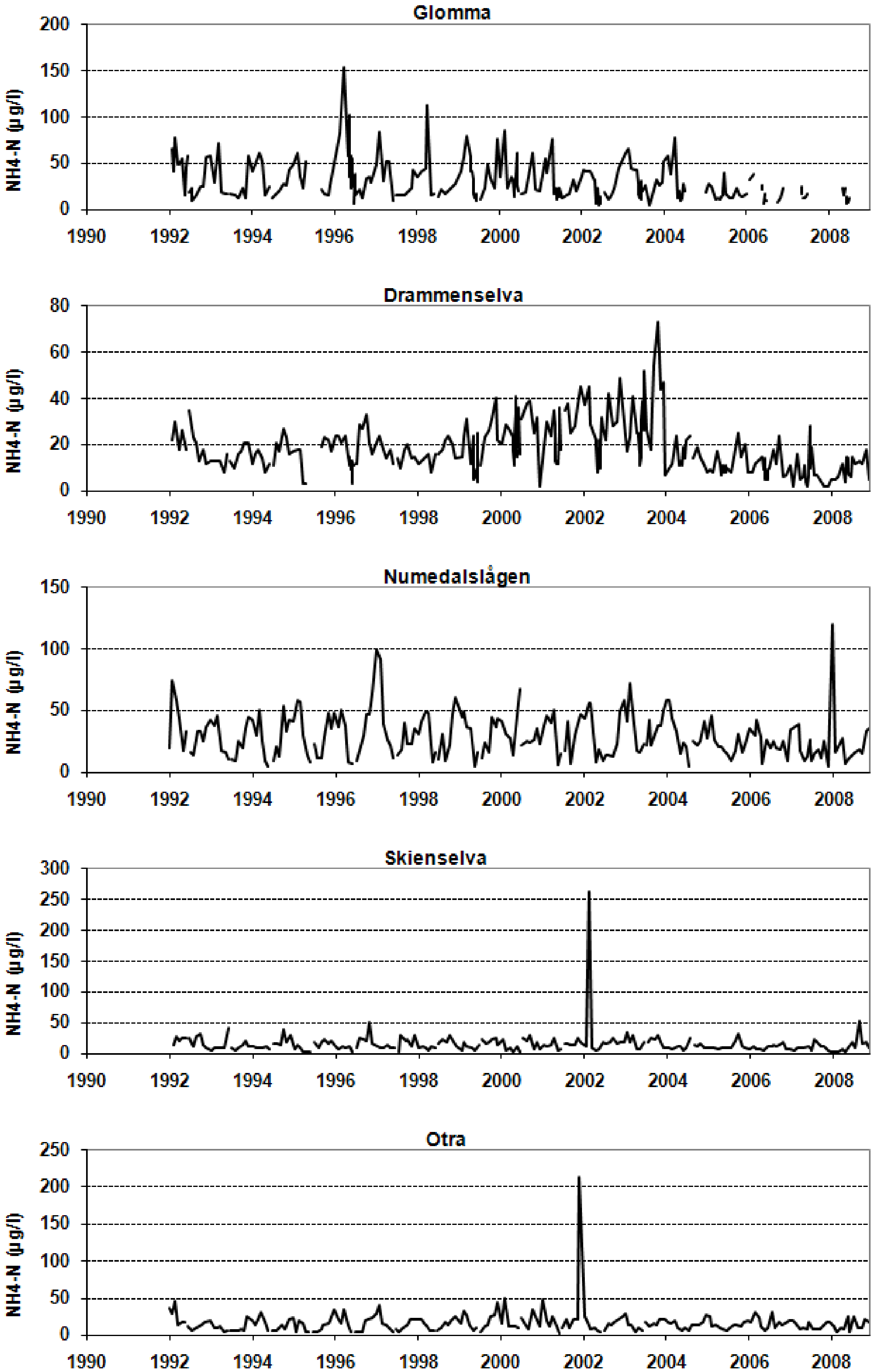


Figure A-V-4a. Monthly concentrations of <u>*NH_4-N*</u> *in the five main Norwegian Skagerrak rivers, 1990-2008.*

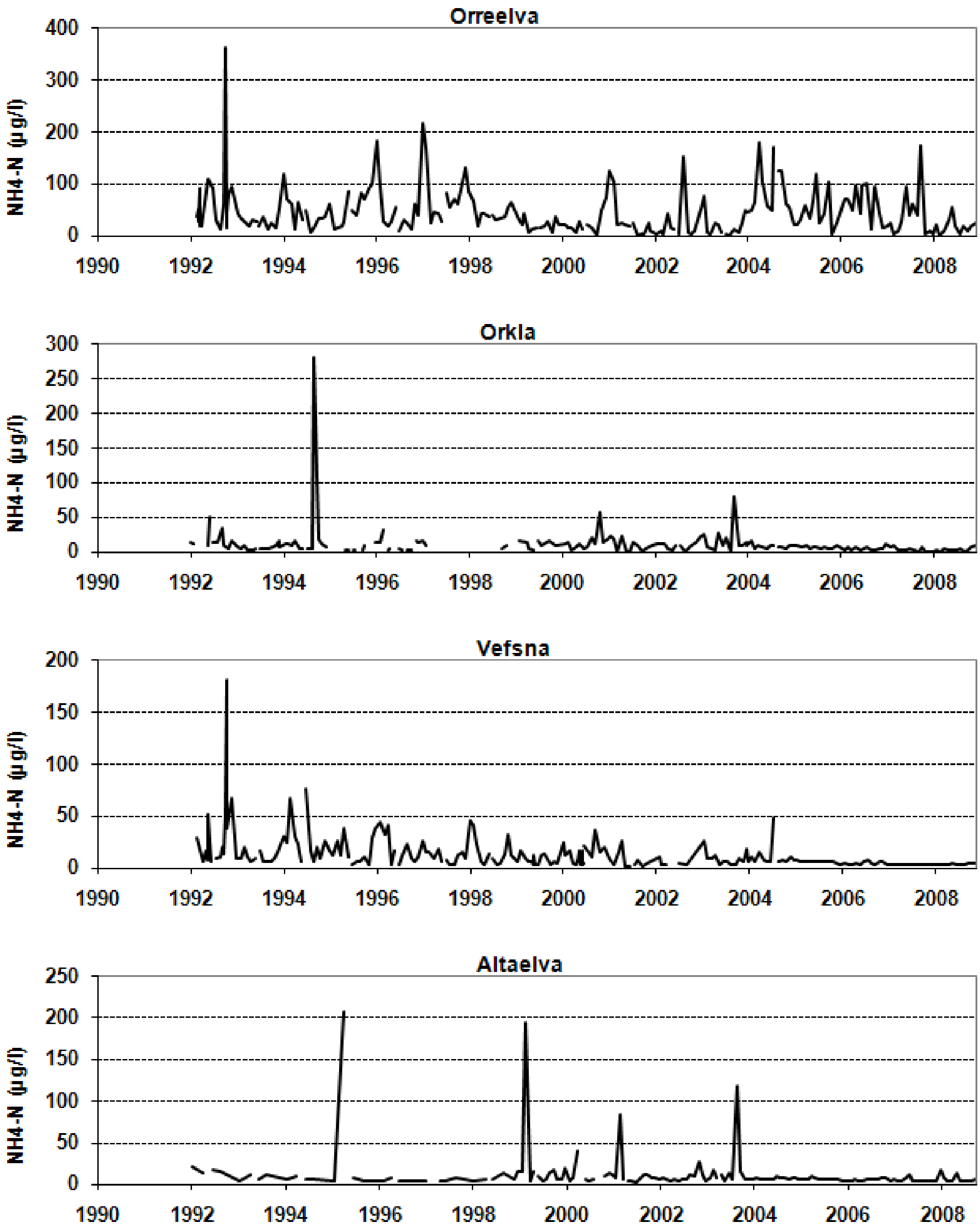


Figure A-V-4b. Monthly concentrations of NH_4-N in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

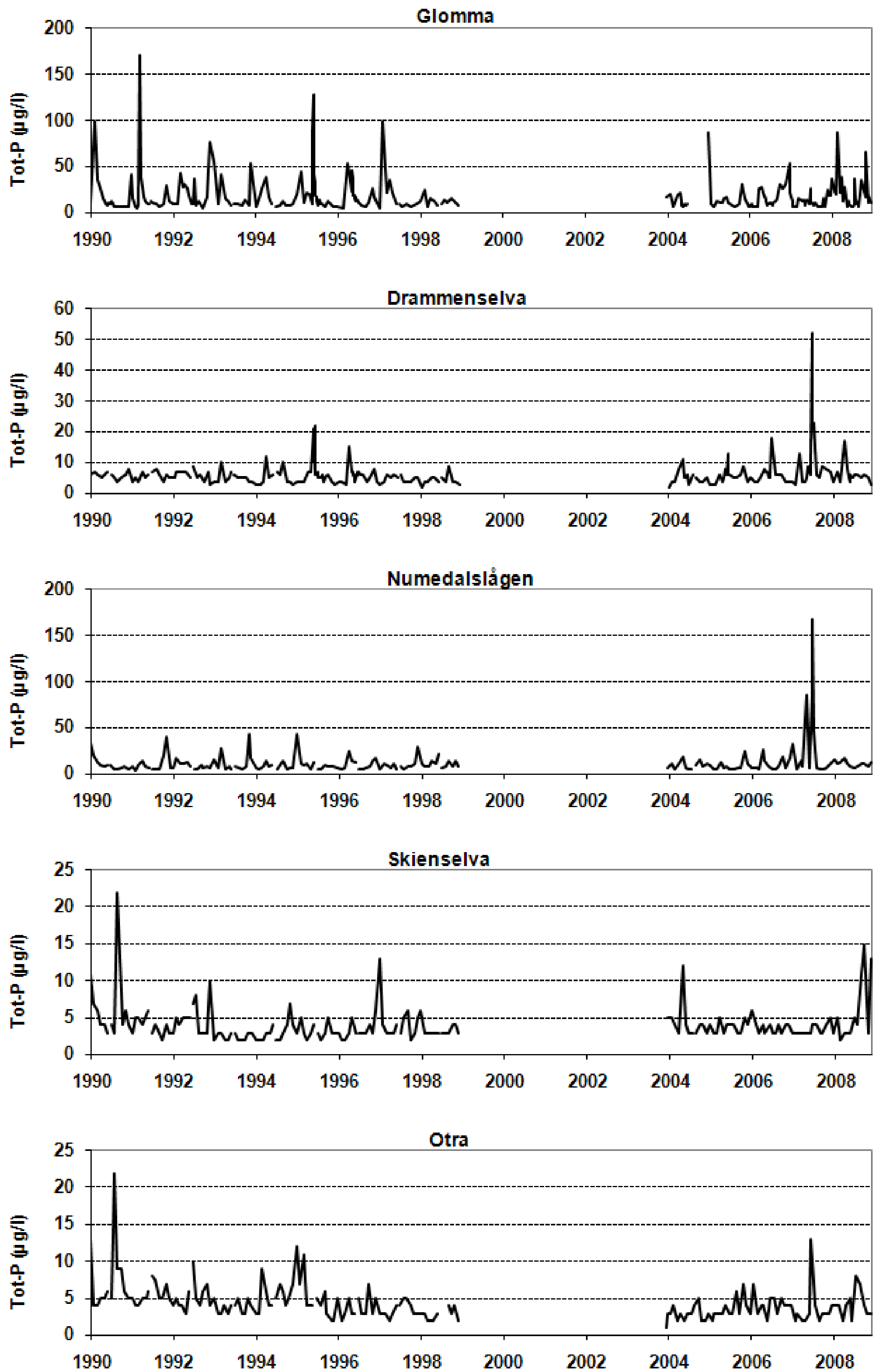


Figure A-V-5a. Monthly concentrations of *<u>total phosphorus</u>* *in the five main Norwegian Skagerrak rivers, 1990-2008.*

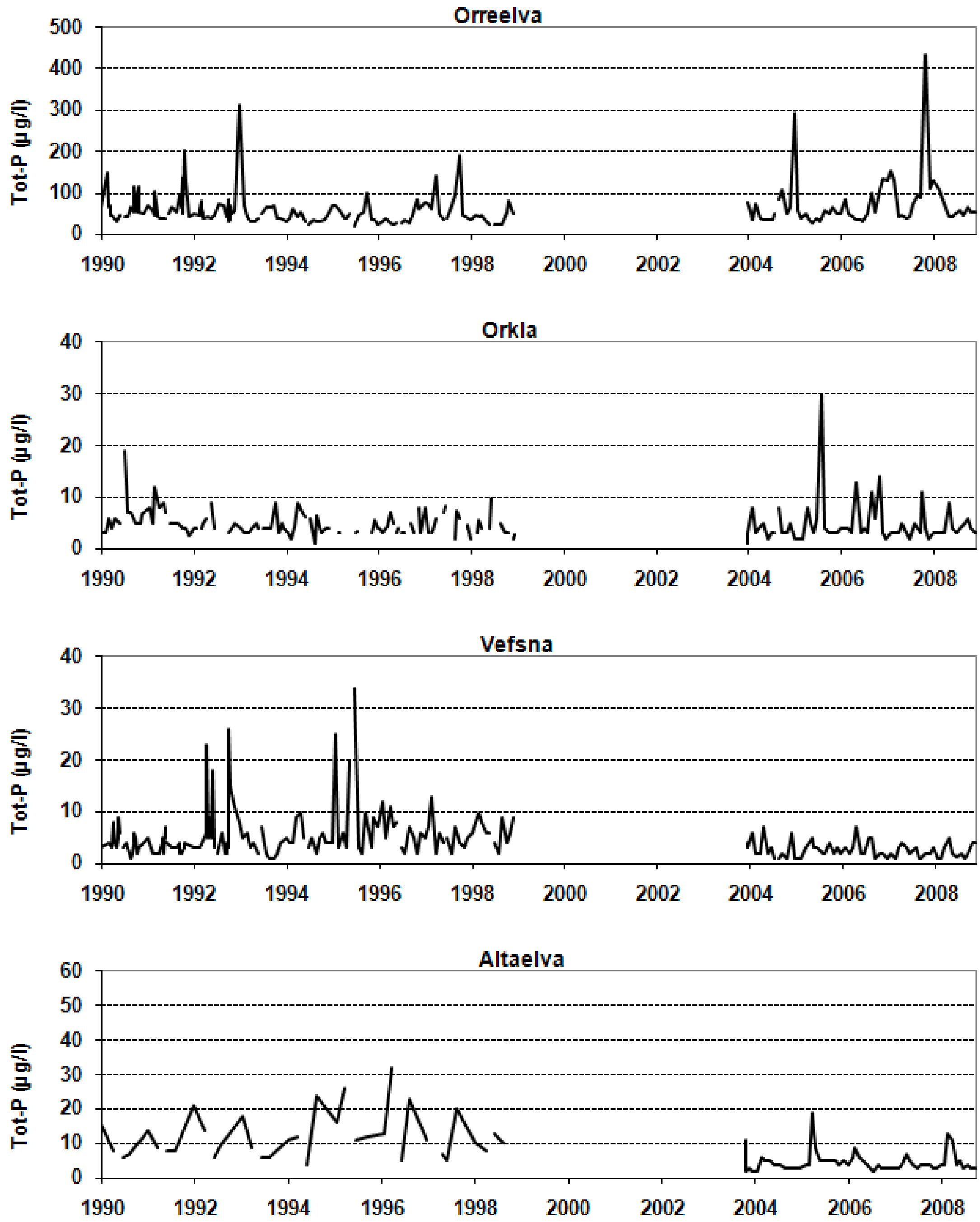


Figure A-V-5b. Monthly concentrations of total phosphorus in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

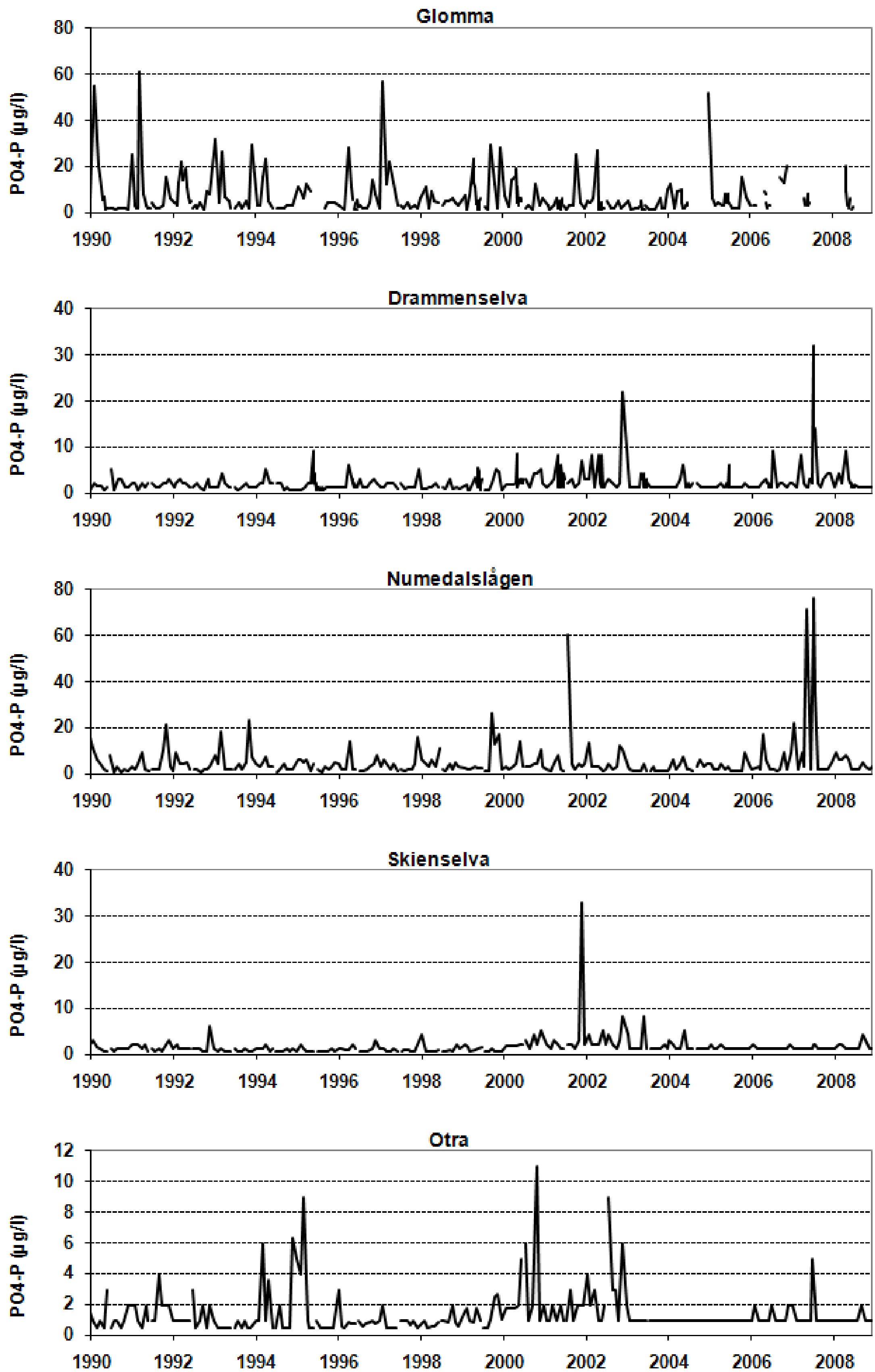


Figure A-V-6a. Monthly concentrations of PO_4-P *in the five main Norwegian Skagerrak rivers, 1990-2008.*

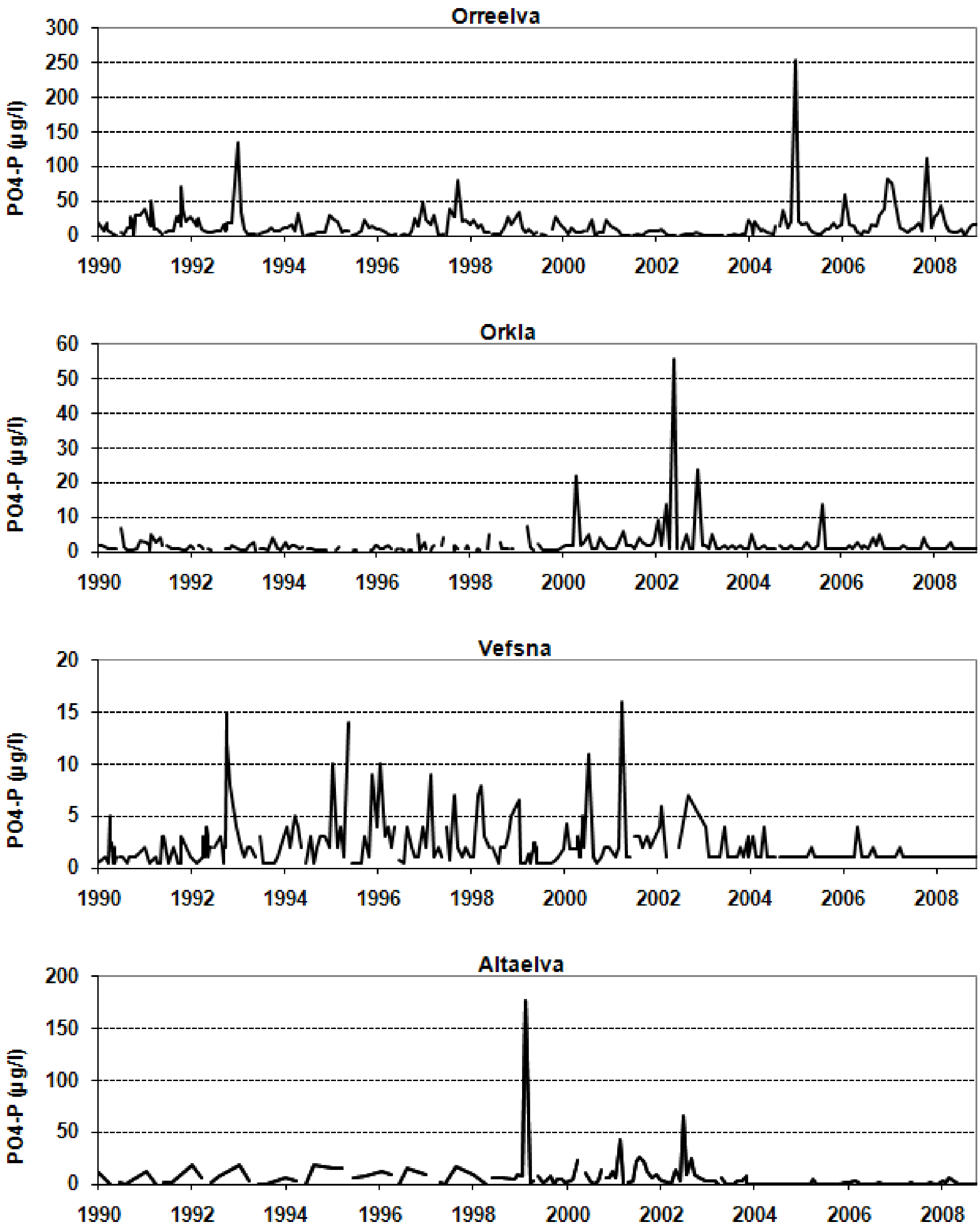


Figure A-V-6b. Monthly concentrations of PO_4*-P in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.*

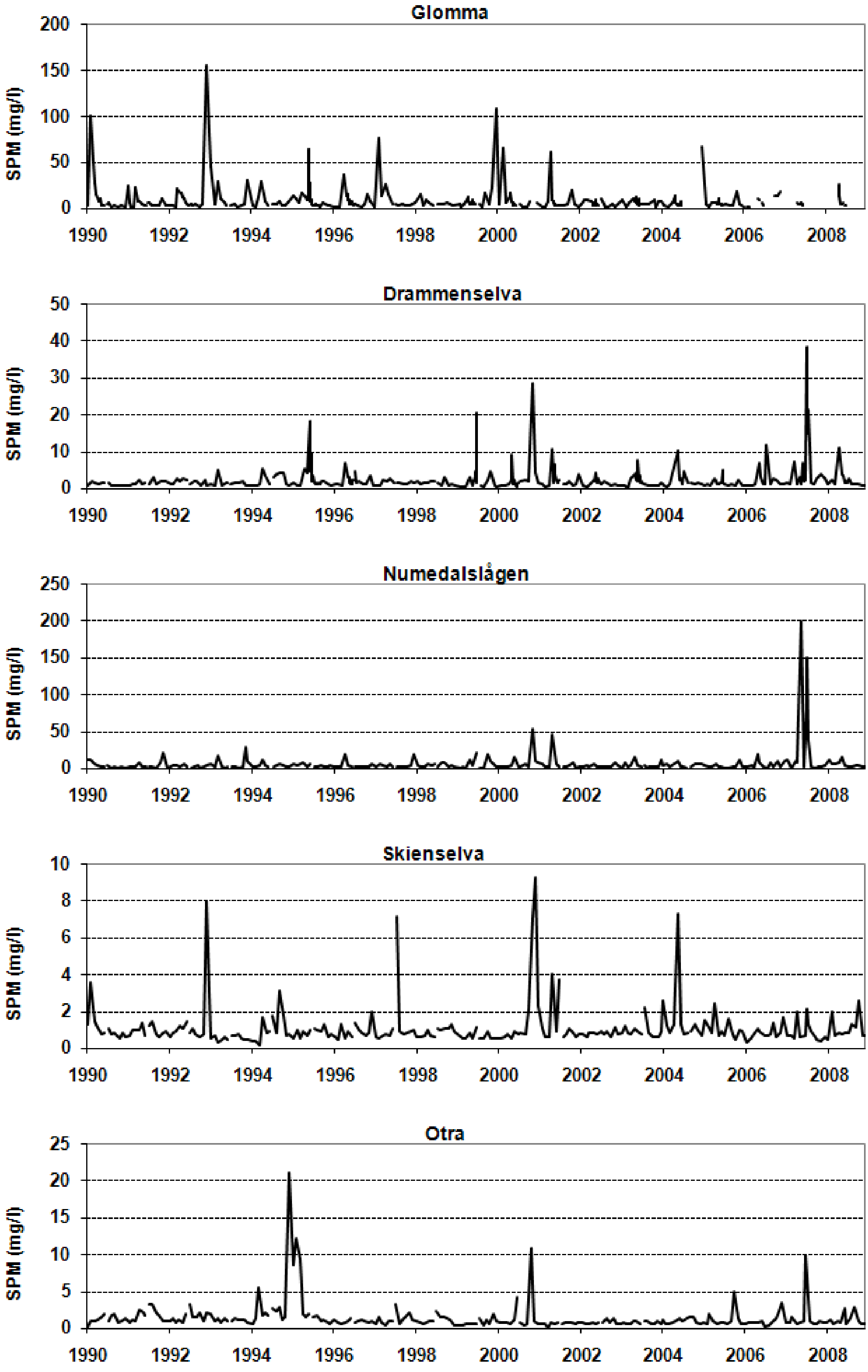


Figure A-V-7a. Monthly concentrations of suspended particulate matter in the five main Norwegian Skagerrak rivers, 1990-2008.

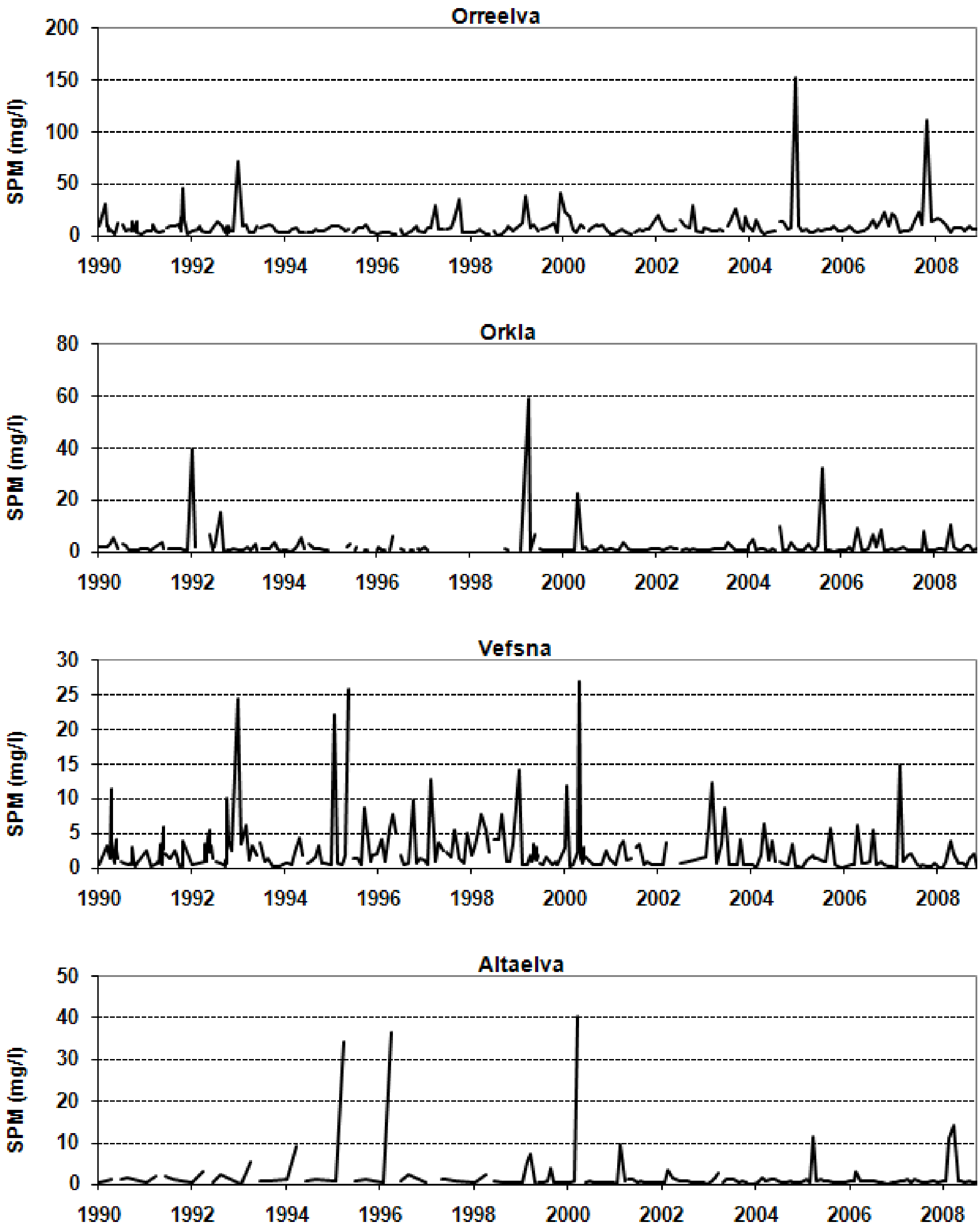


Figure A-V-7b. Monthly concentrations of suspended particulate matter in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

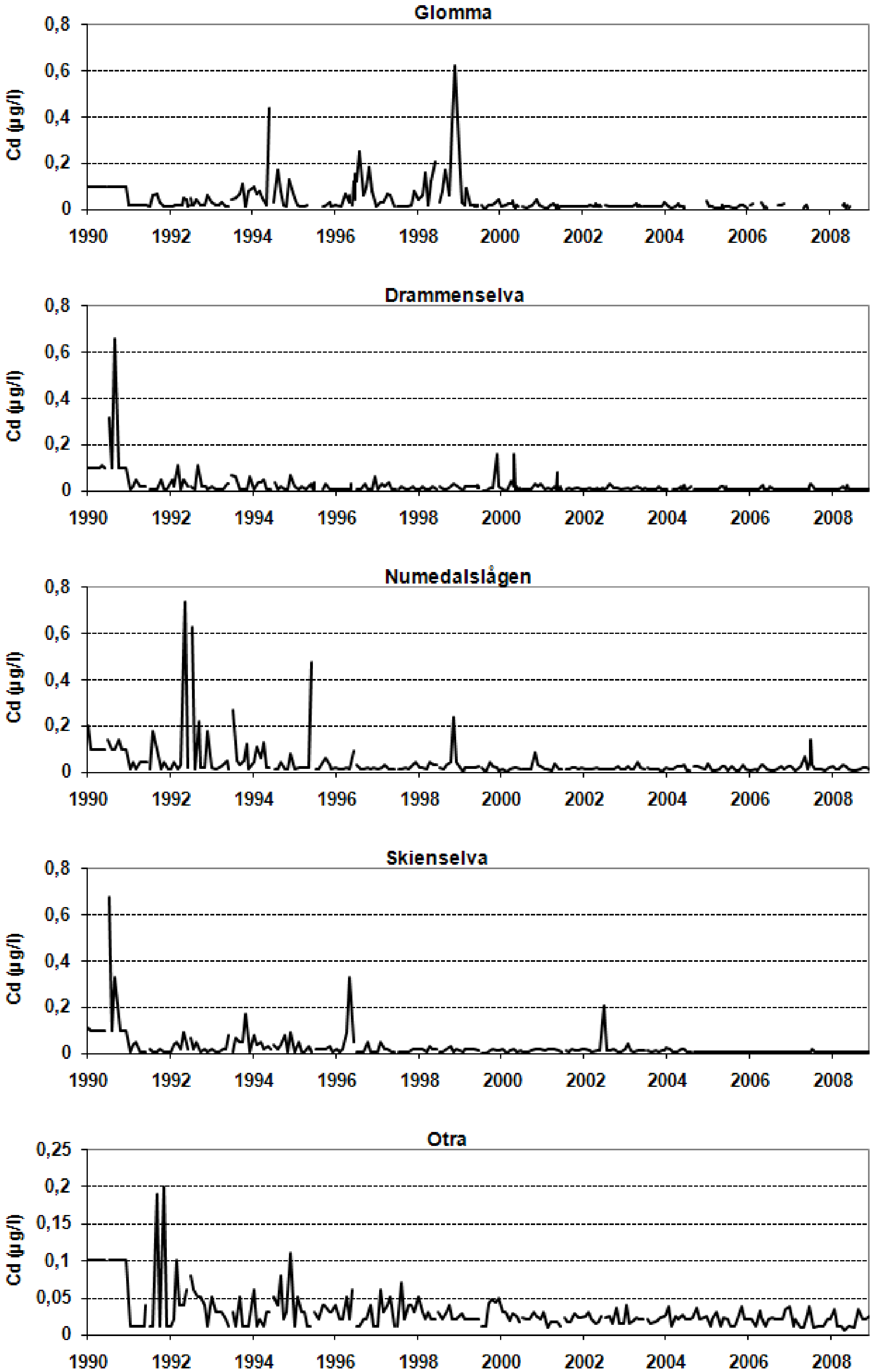


Figure A-V-8a. Monthly concentrations of <u>cadmium</u> in the five main Norwegian Skagerrak rivers, 1990-2008.

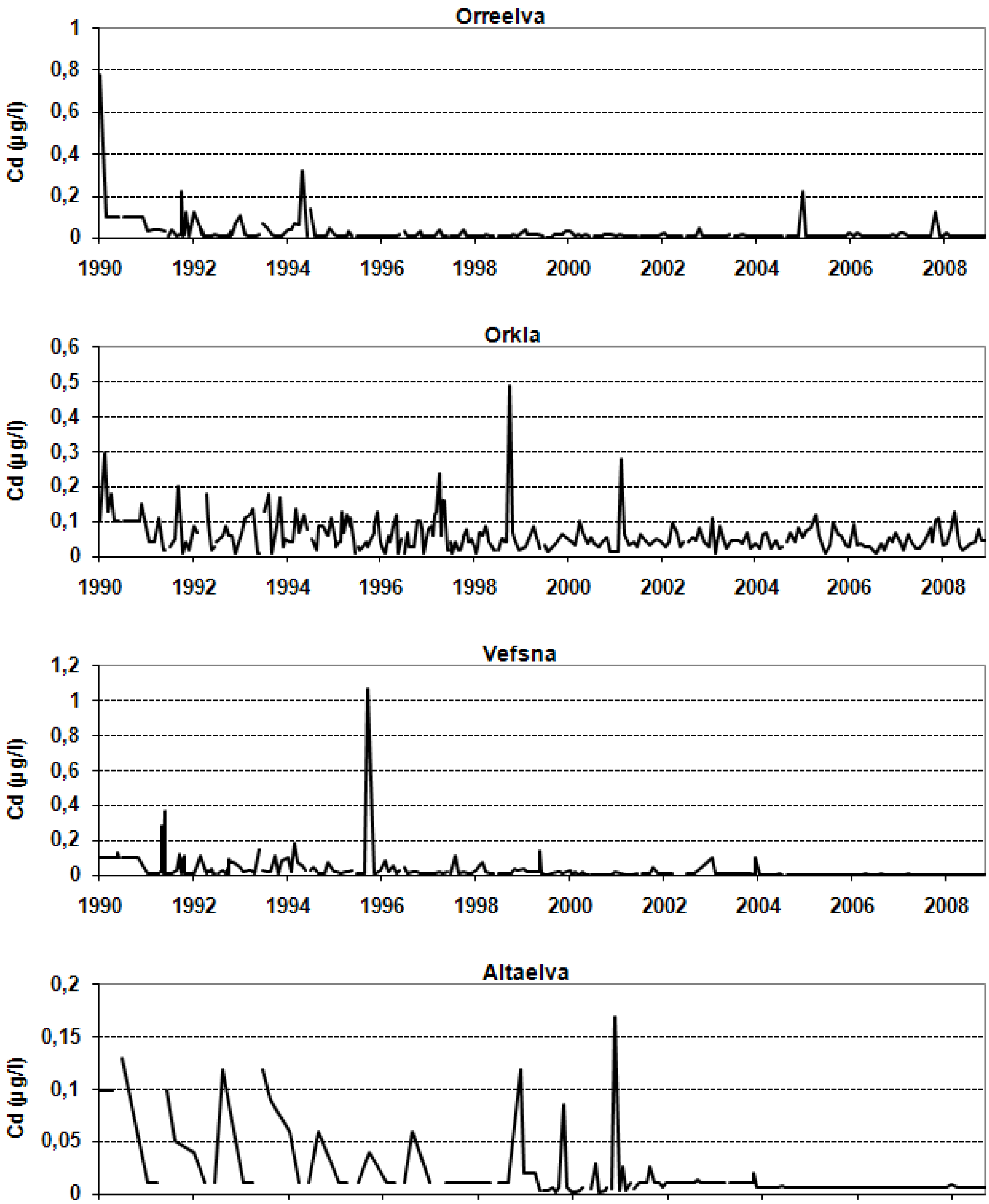


Figure A-V-8b. Monthly concentrations of <u>cadmium</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

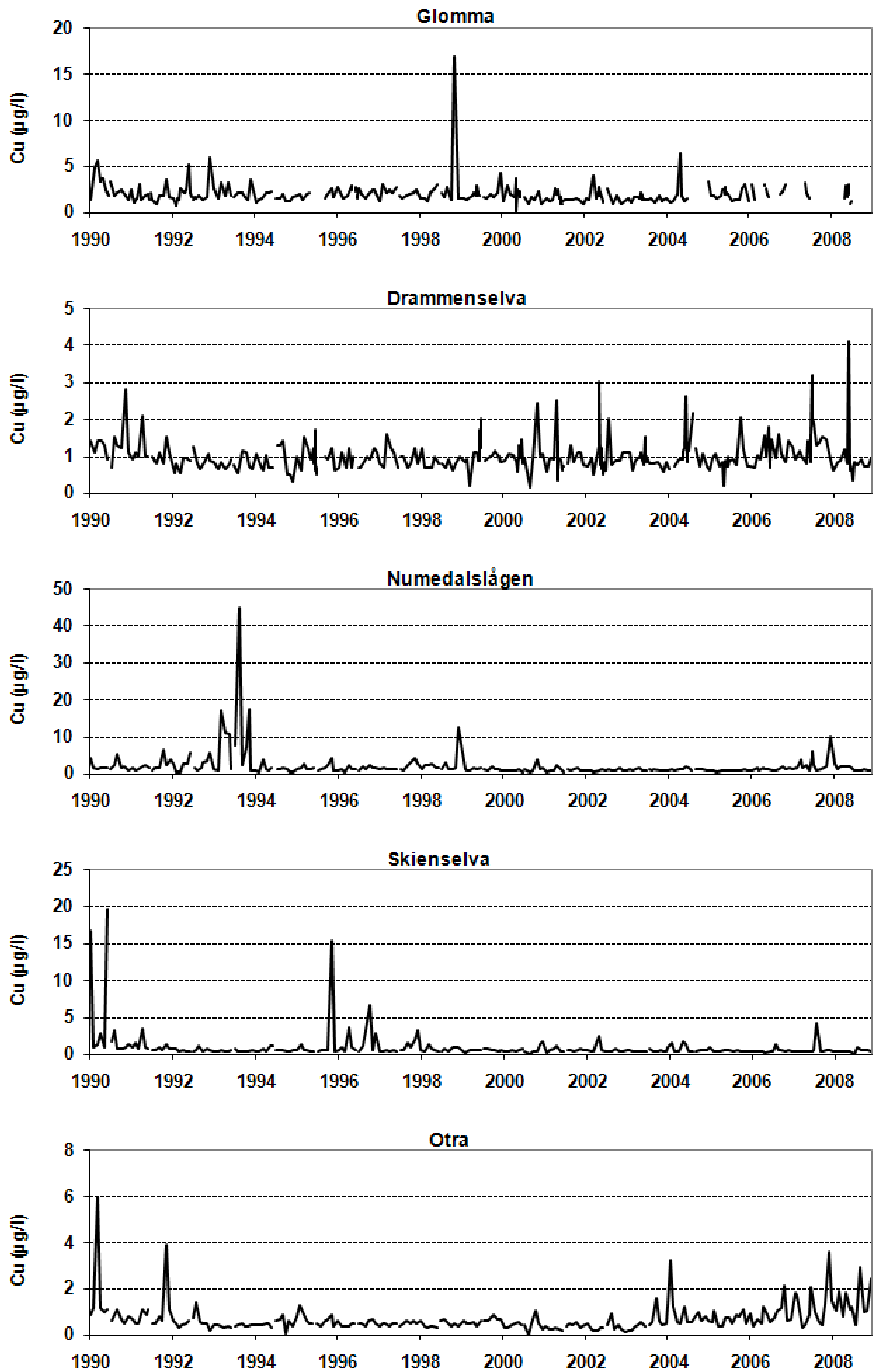


Figure A-V-9a. Monthly concentrations of copper in the five main Norwegian Skagerrak rivers, 1990-2008.

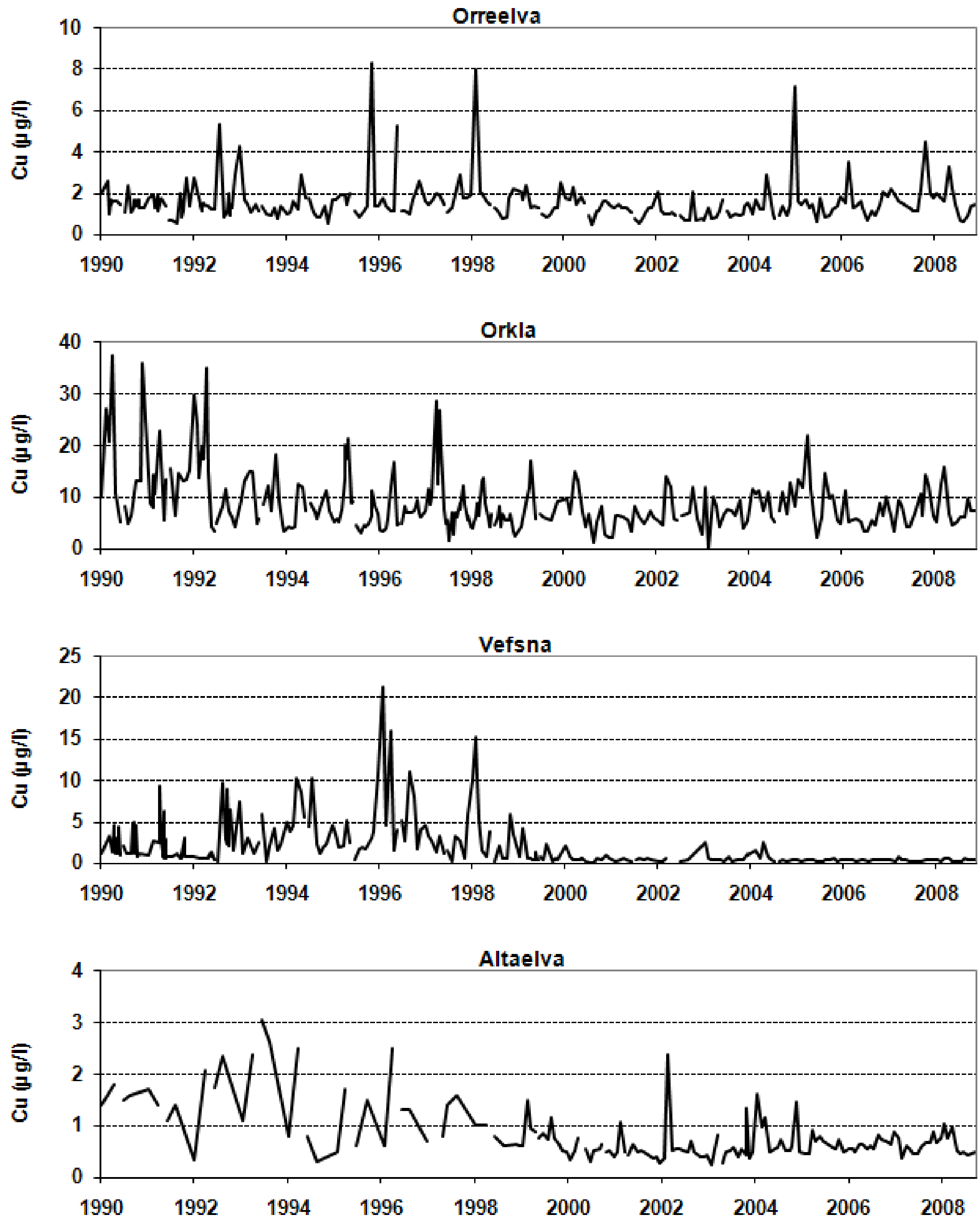


Figure A-V-9b. Monthly concentrations of copper in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

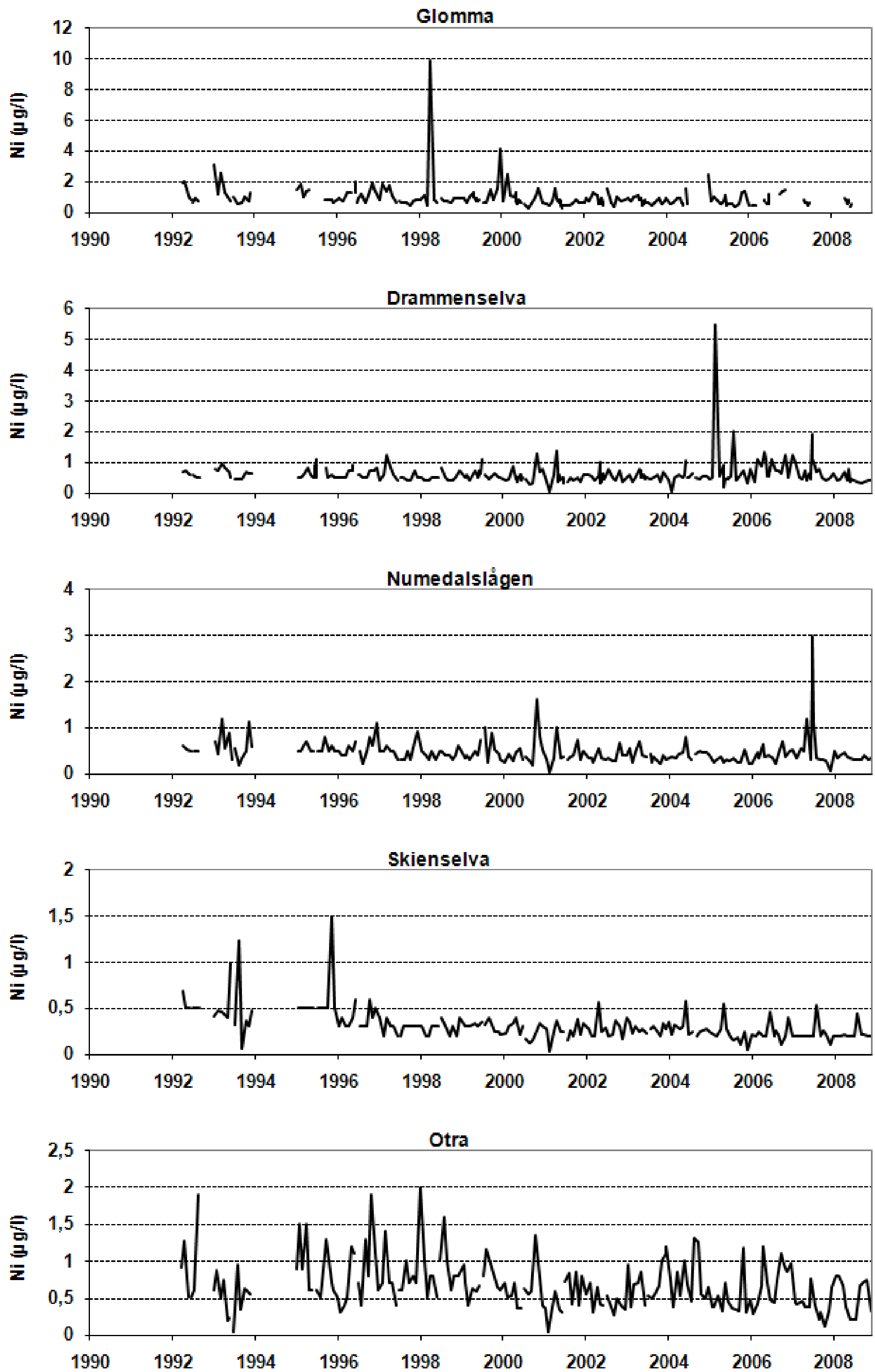


Figure A-V-10a. Monthly concentrations of nickel in the five main Norwegian Skagerrak rivers, 1990-2008.

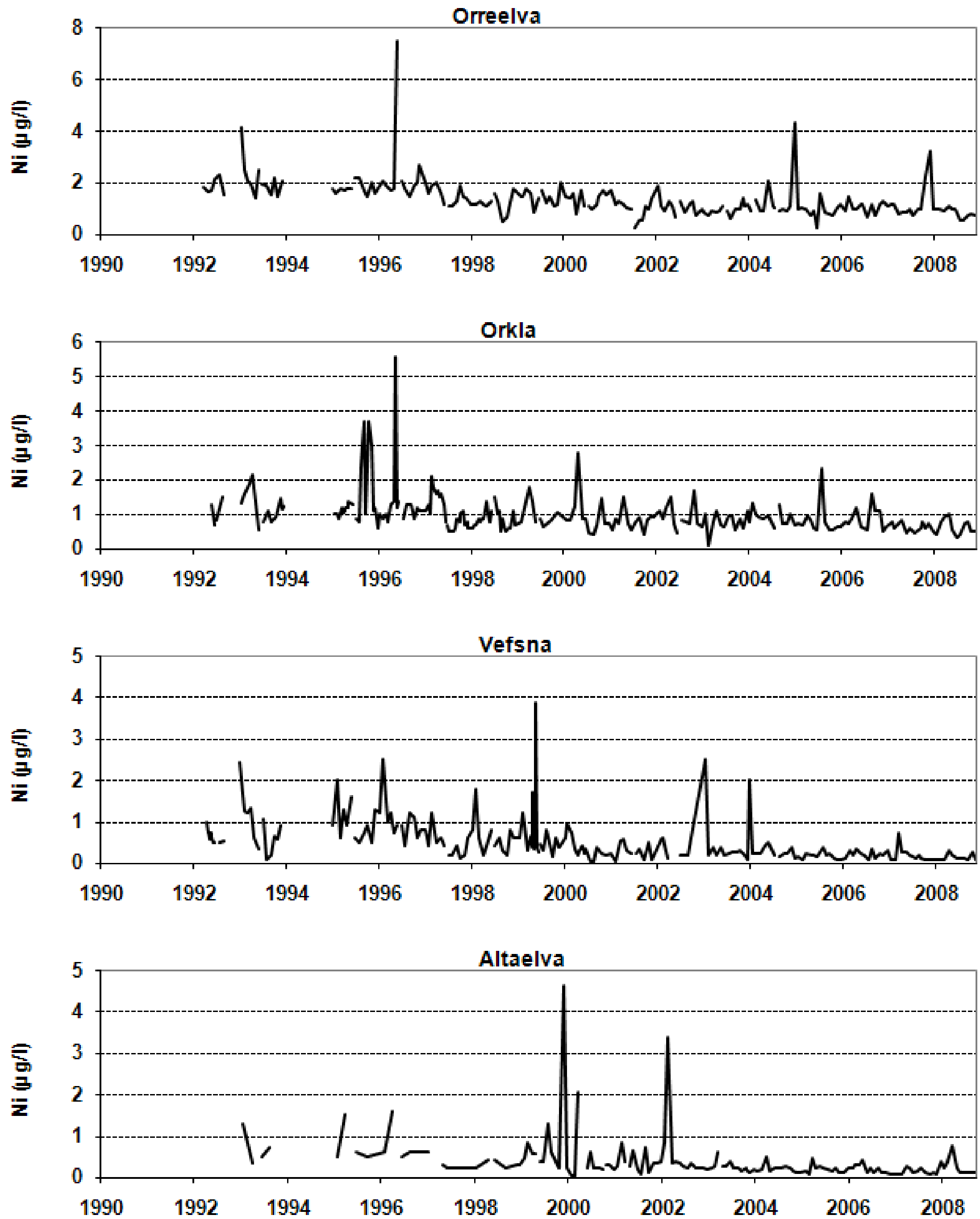


Figure A-V-10b. Monthly concentrations of *__nickel__* *in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.*

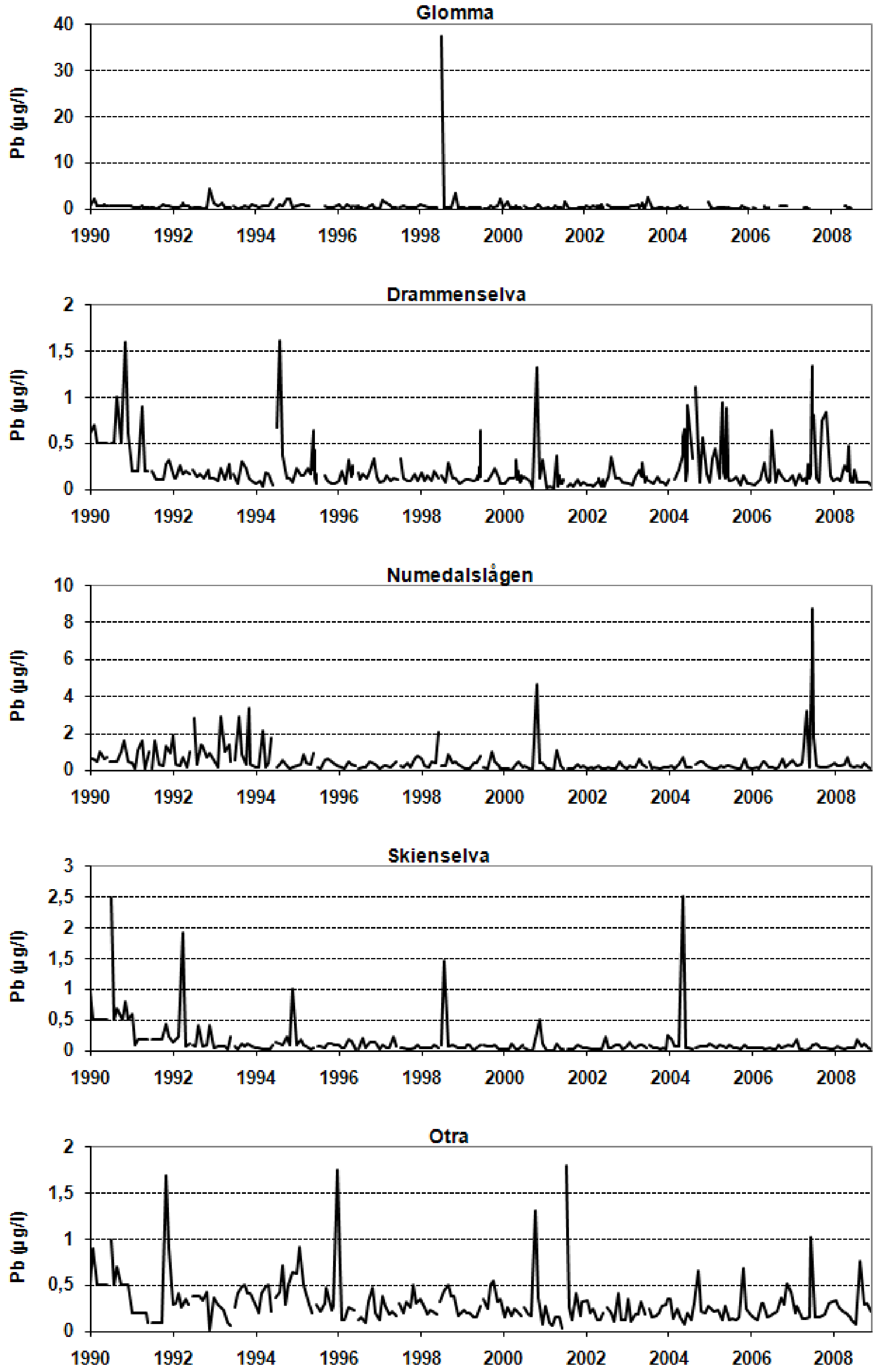


Figure A-V-11a. Monthly concentrations of lead in the five main Norwegian Skagerrak rivers, 1990-2008.

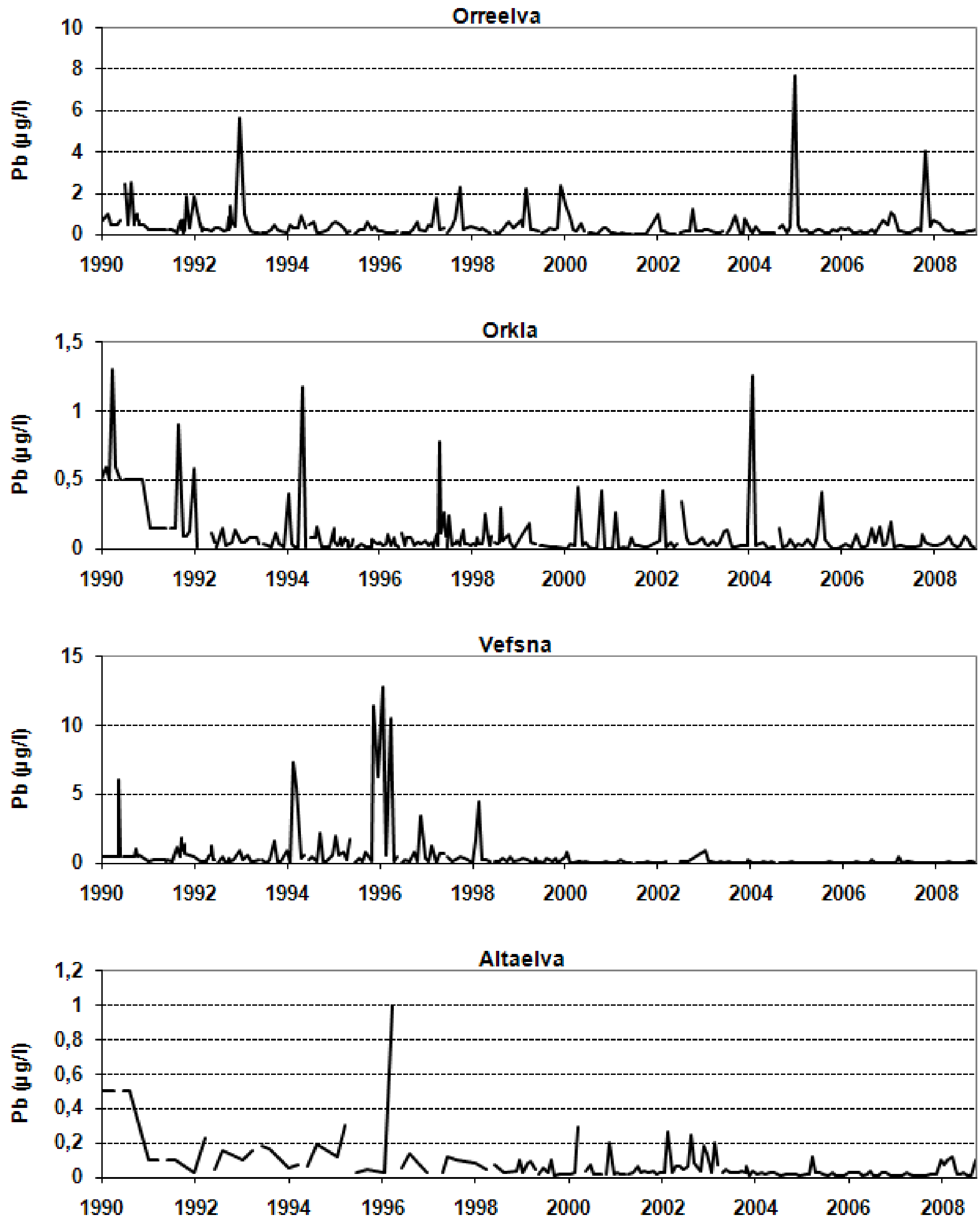


Figure A-V-11b. Monthly concentrations of lead in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

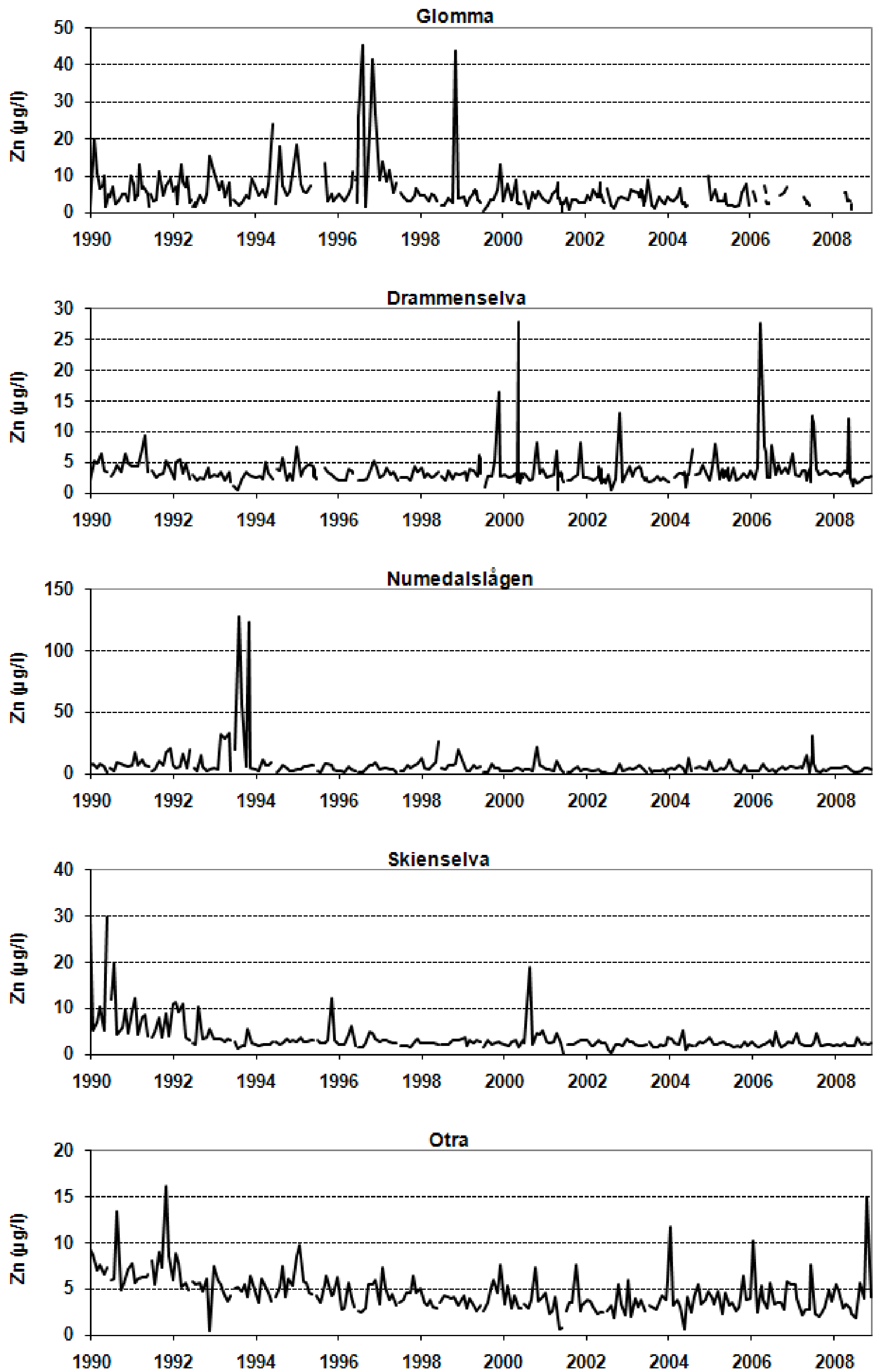


Figure A-V-12a. Monthly concentrations of zinc in the five main Norwegian Skagerrak rivers, 1990-2008.

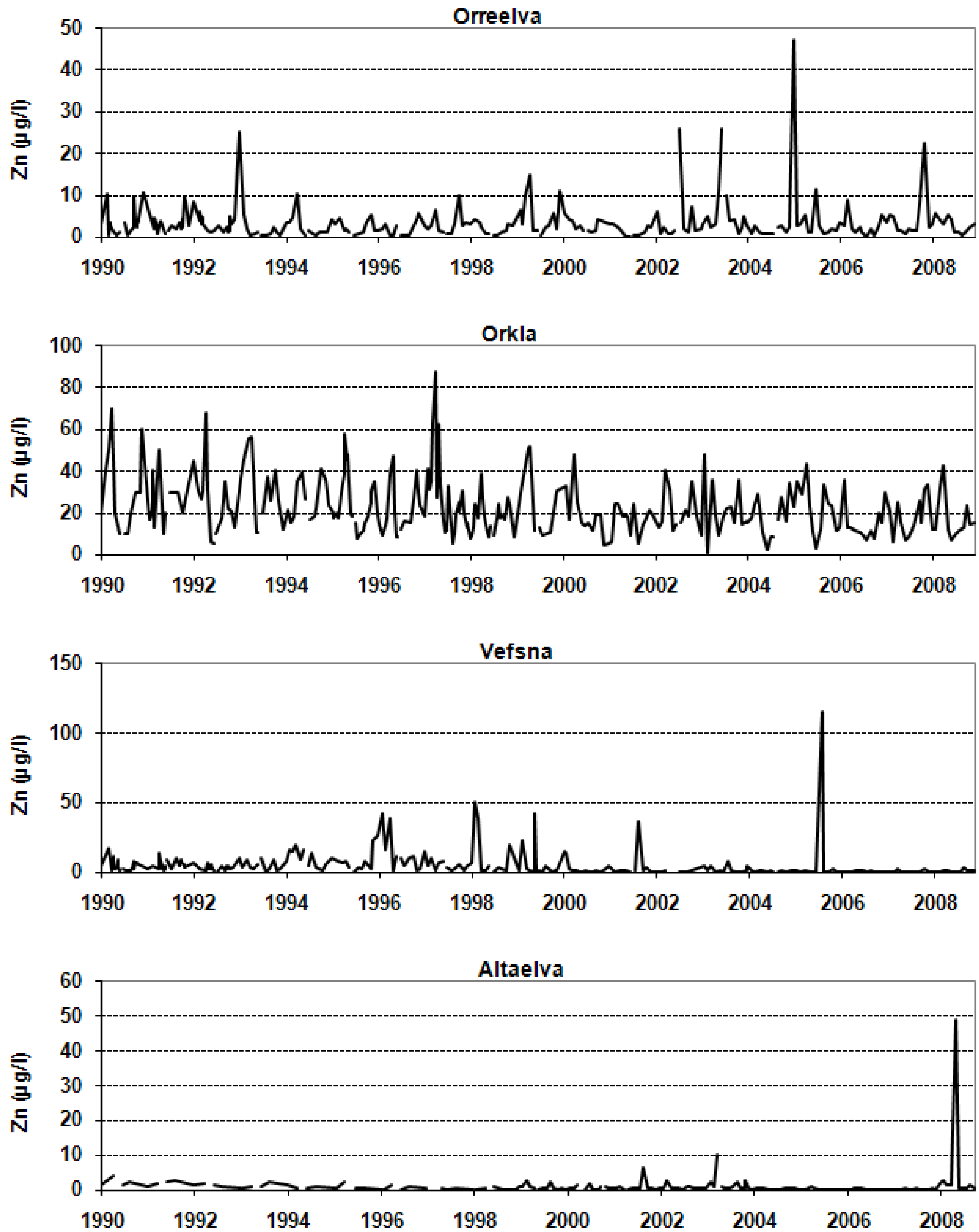


Figure A-V-12b. Monthly concentrations of zinc in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

Appendix VI
Long-term trends in riverine loads. Complimentary 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 complimentary to Chapter 4.4.

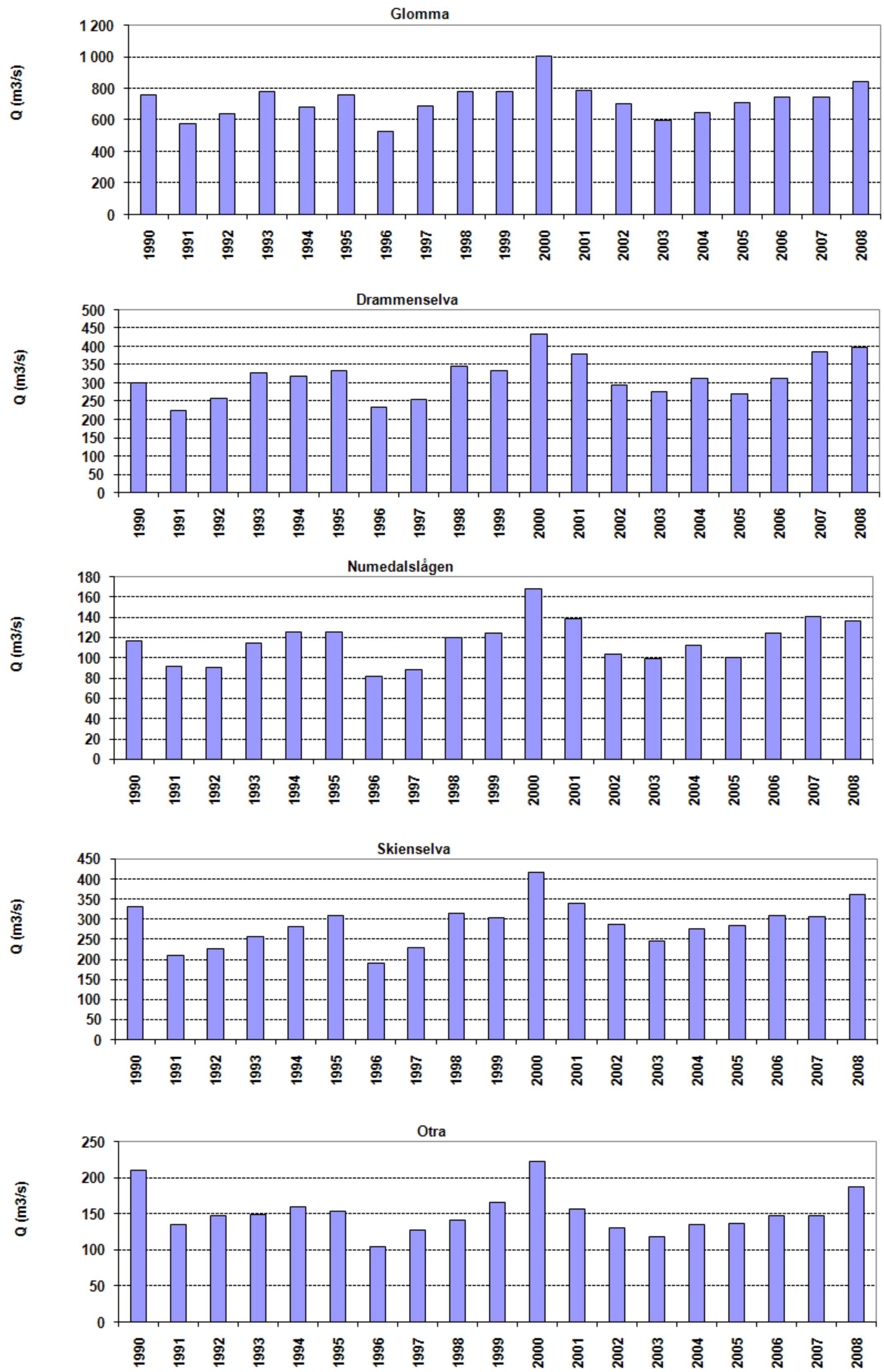


Figure A-VI-1a. Annual _water discharge_ *in five main rivers to Skagerrak in Norway, 1990-2008.*

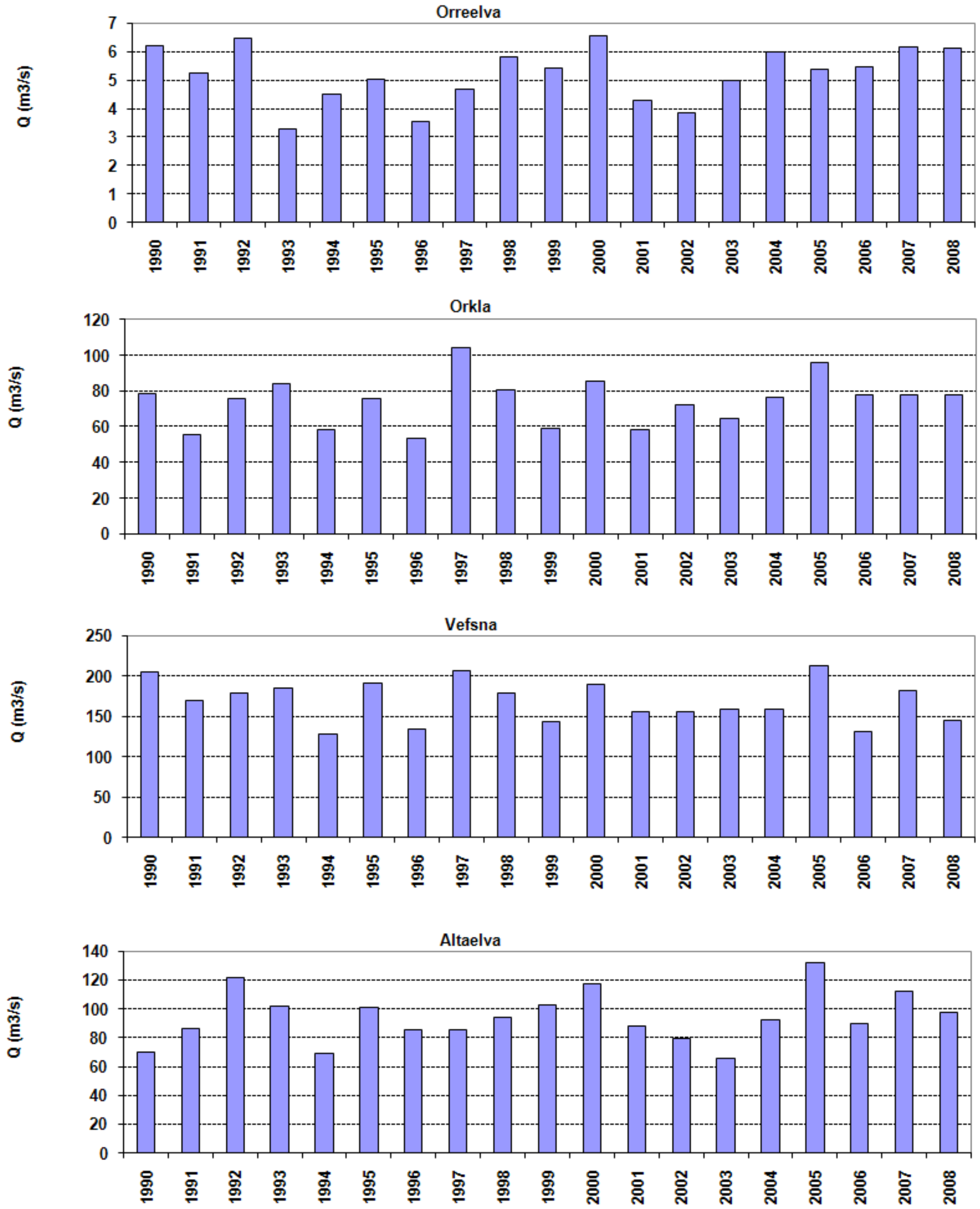
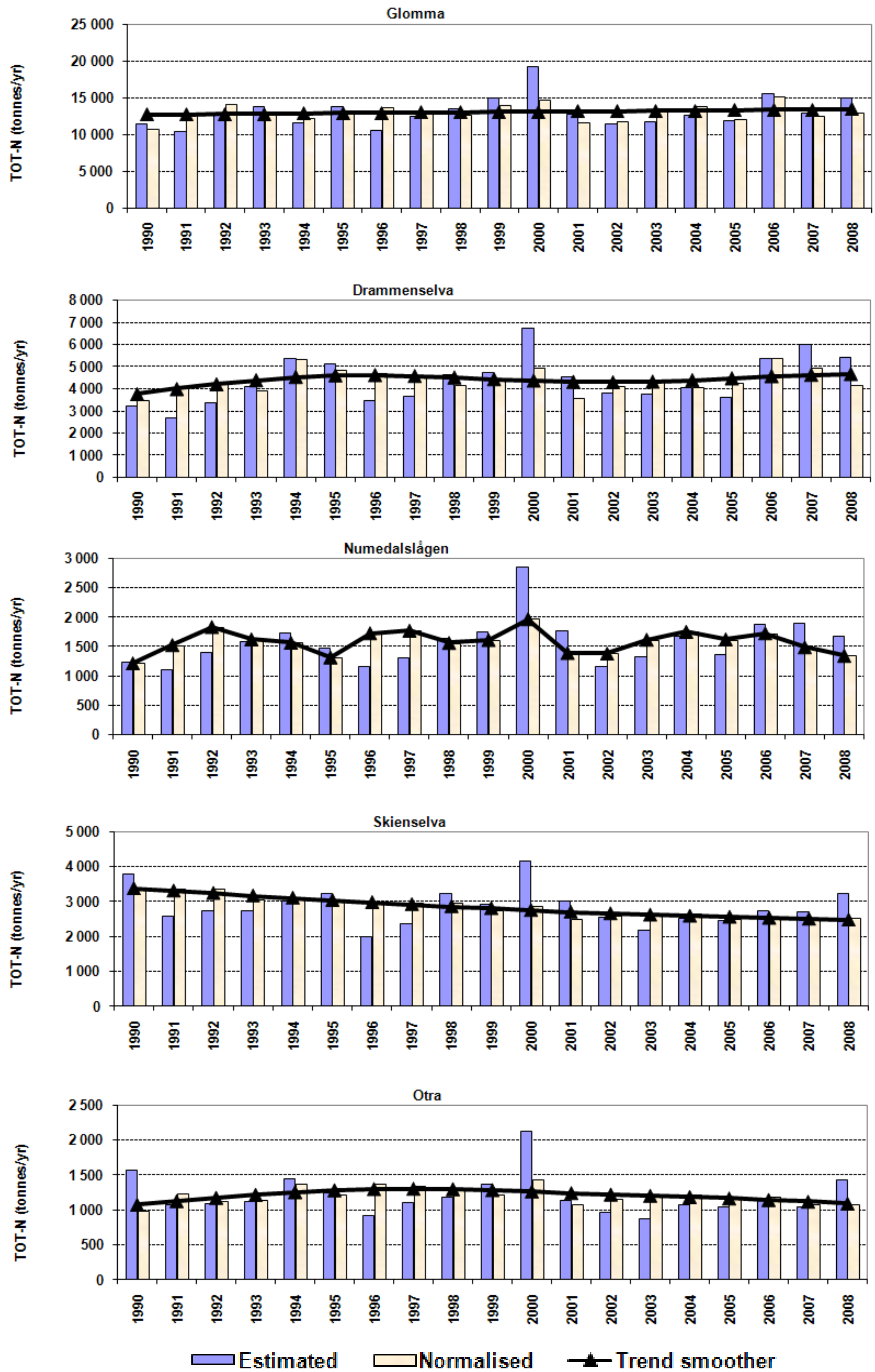


Figure A-VI-1b. Annual water discharge in four main rivers to the North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.



FigureA-VI-2a. Estimated, flow-normalised and trend line for annual riverine loads of <u>total nitrogen</u> in the five main Norwegian Skagerrak rivers, 1990-2008.

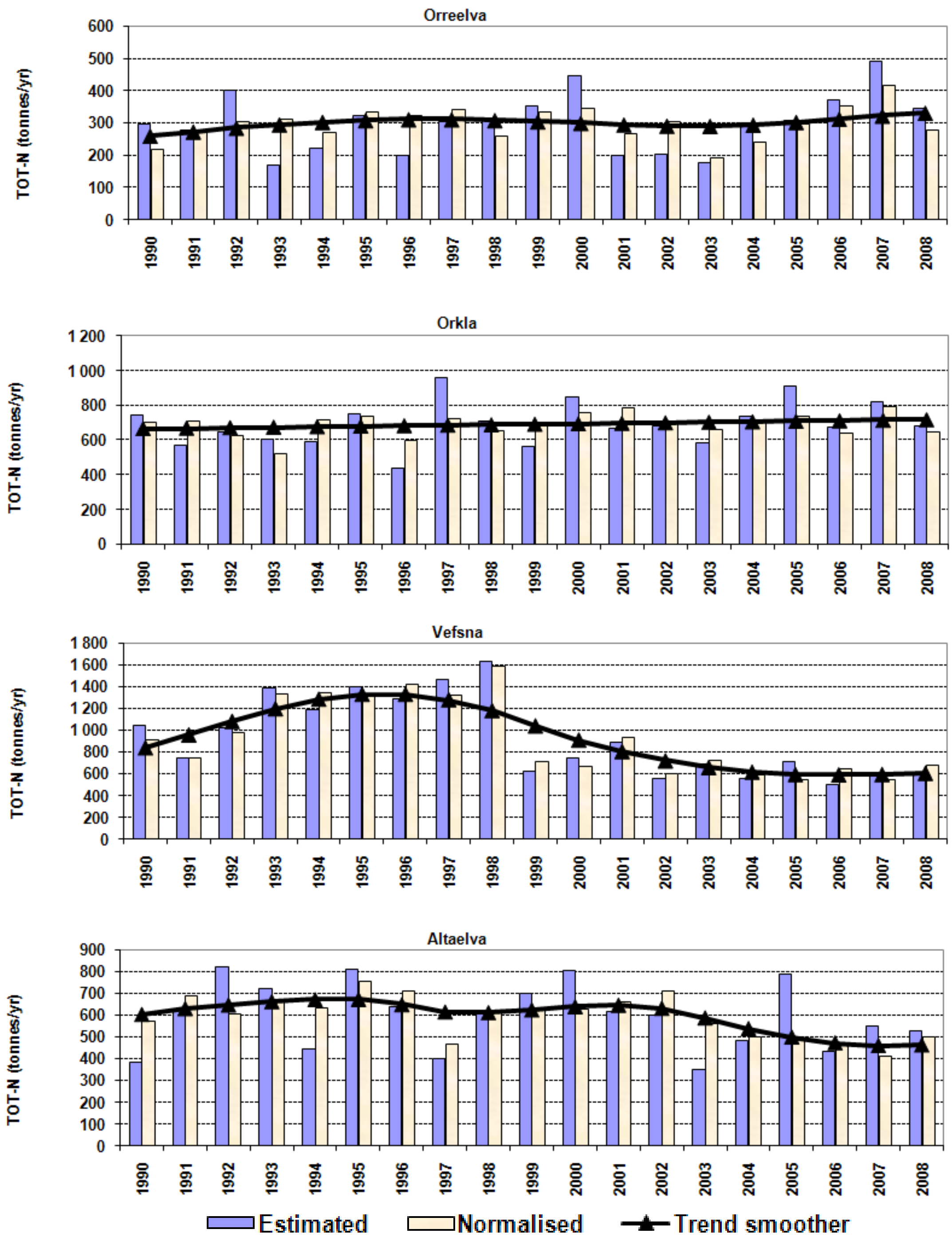


Figure A-VI-2b. Estimated, flow-normalised and trend line for annual riverine loads of <u>total nitrogen</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

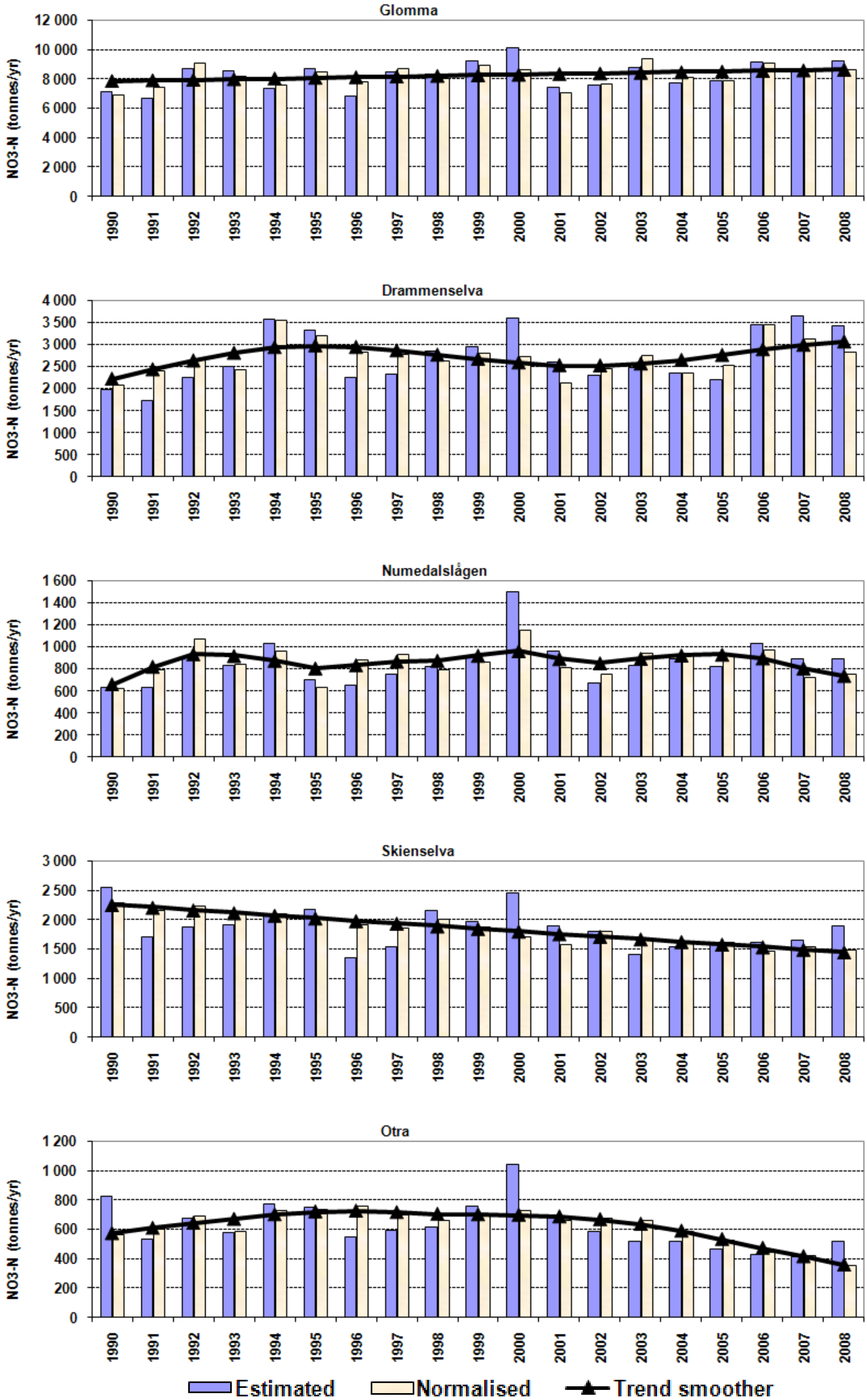


Figure A-VI-3a. Estimated, flow-normalised and trend line for annual riverine loads of nitrate nitrogen in the five main Norwegian Skagerrak rivers, 1990-2008.

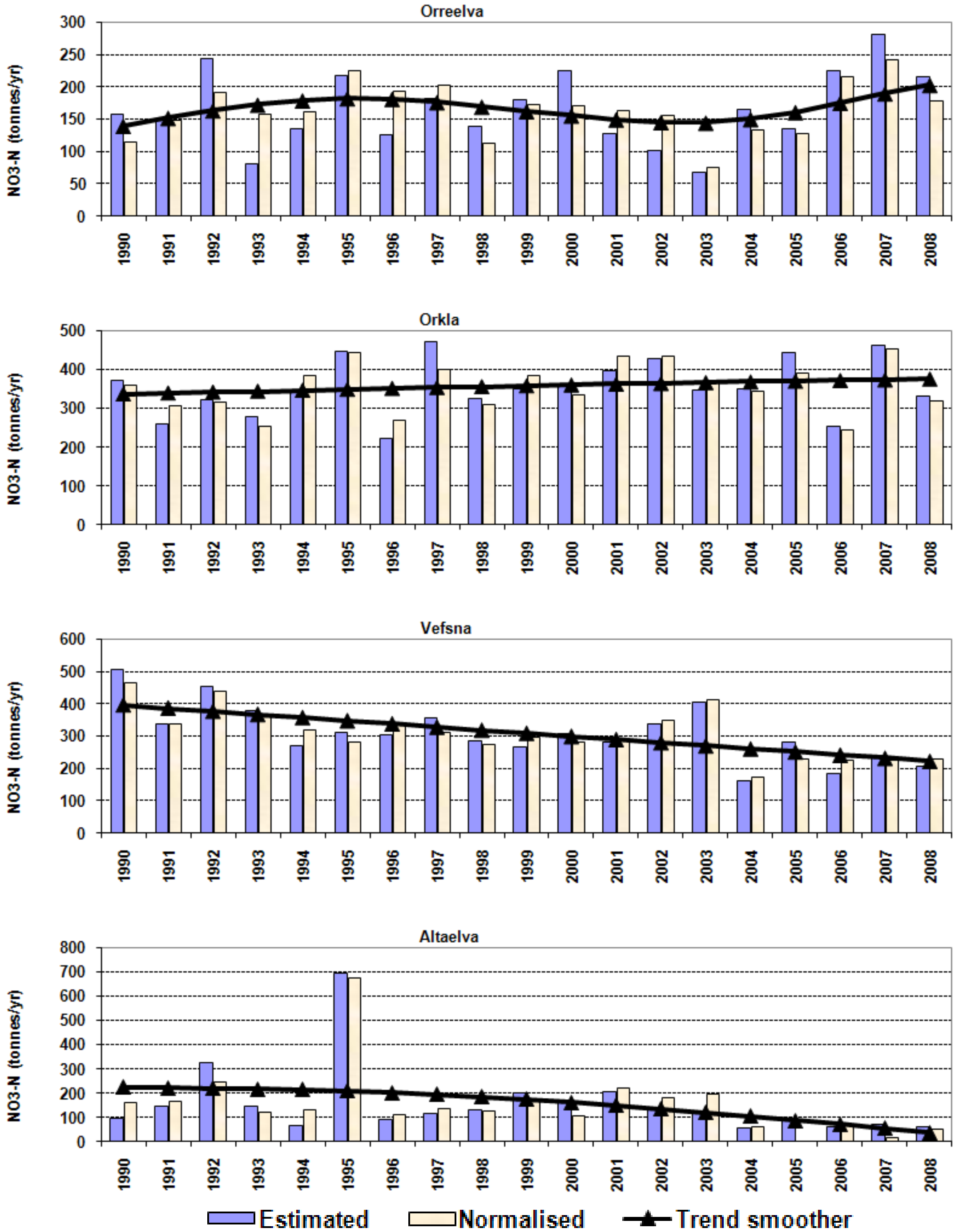


Figure A-VI-3b.Estimated, flow-normalised and trend line for annual riverine loads of <u>nitrate nitrogen</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

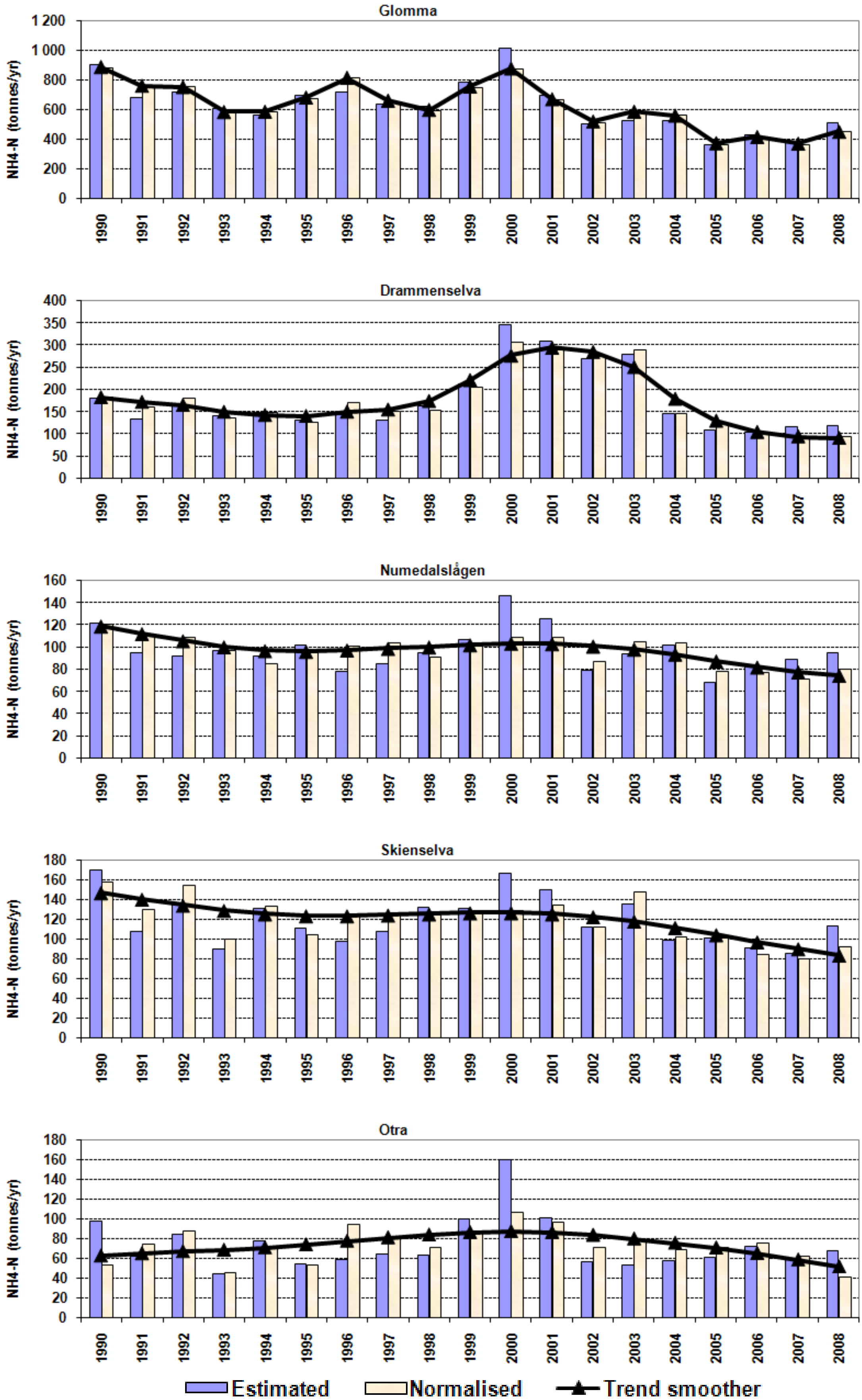


Figure A-VI-4a.Estimated, flow-normalised and trend line for annual riverine loads of <u>*NH_4-N*</u> *in the five main Norwegian Skagerrak rivers, 1990-2008.*

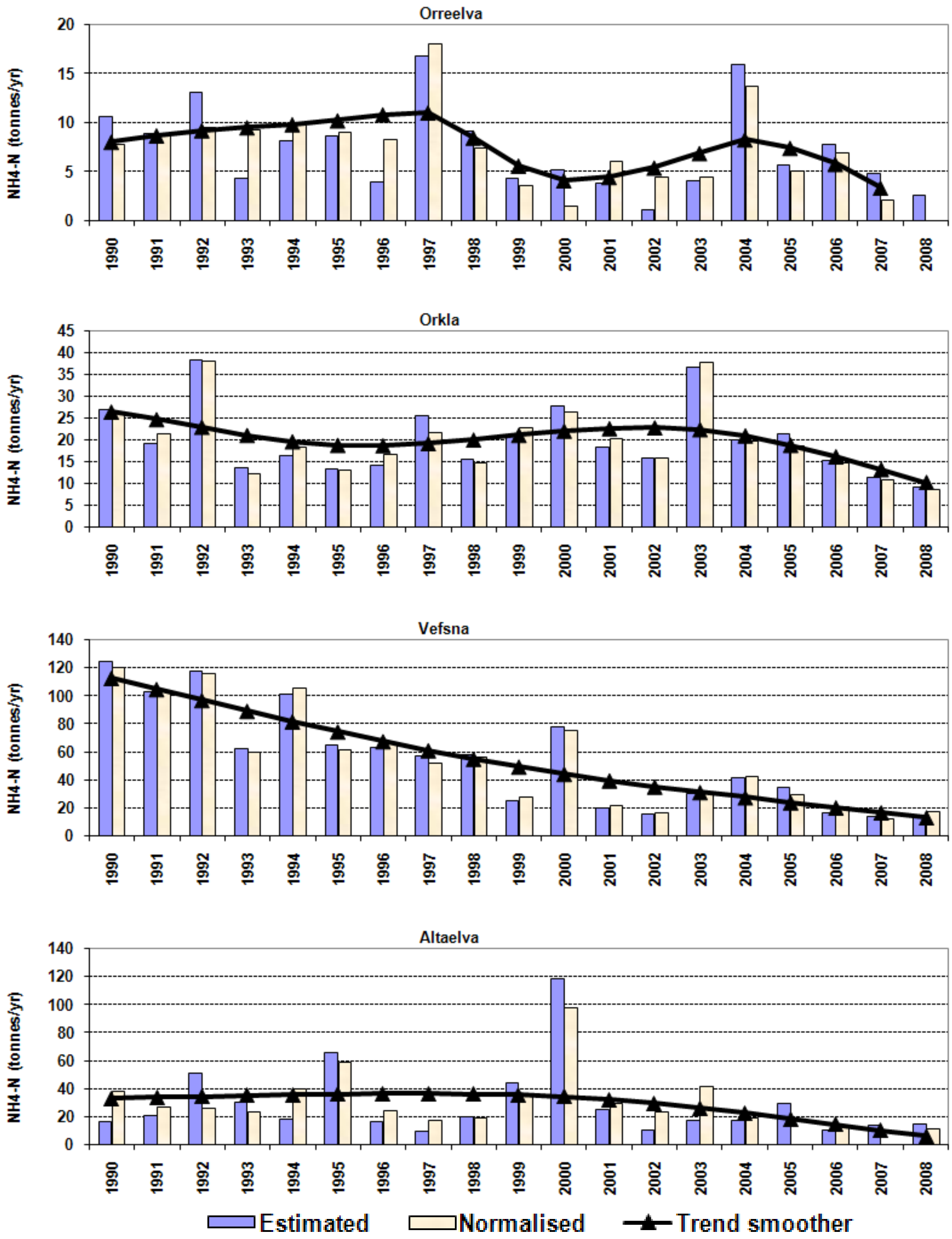


Figure A-VI-4b. Estimated, flow-normalised and trend line for annual riverine loads of NH_4-N in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

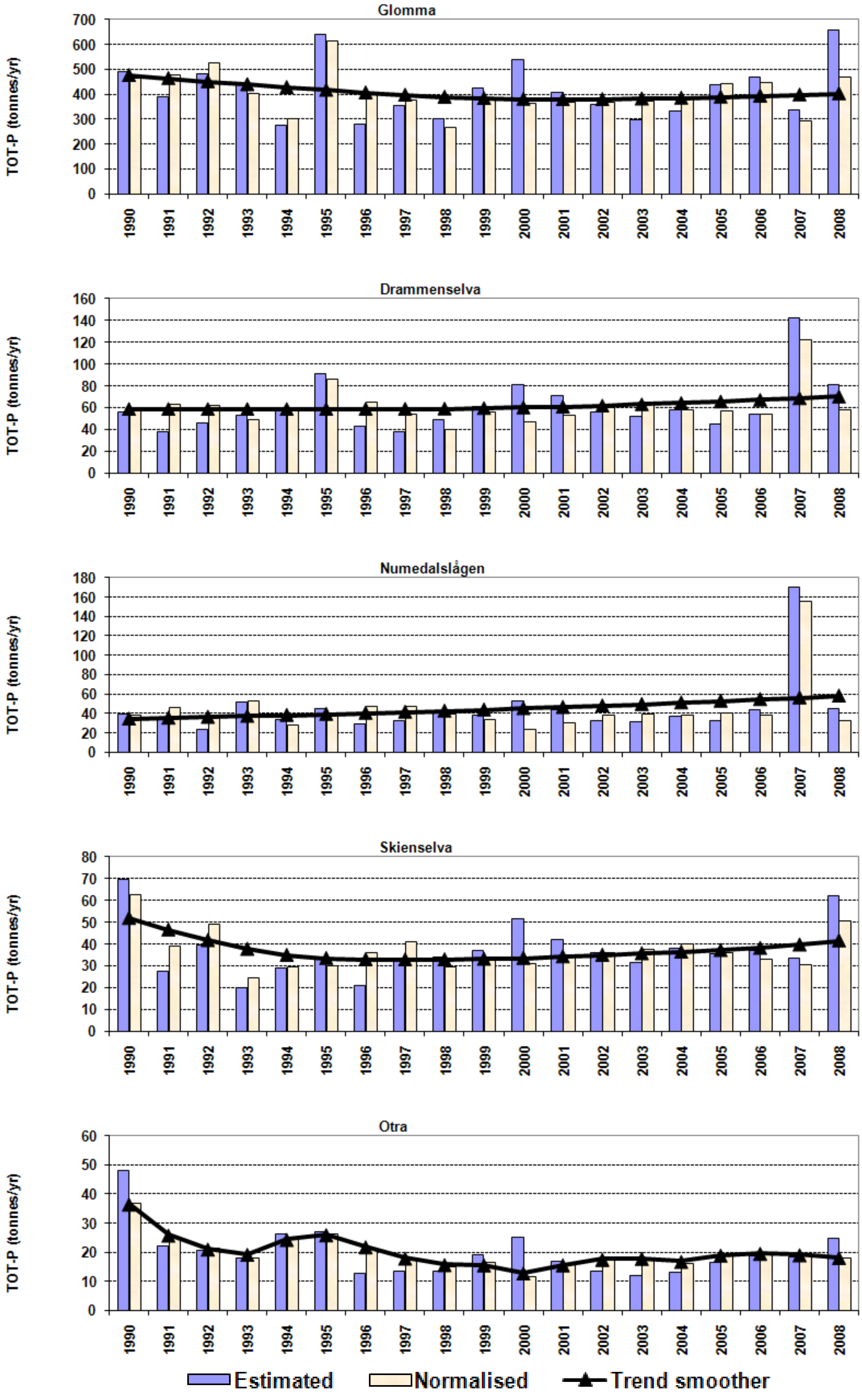


Figure A-VI-5a. Estimated, flow-normalised and trend line for annual riverine loads of ***total phosphorus*** *in the five main Norwegian Skagerrak rivers, 1990-2008.*

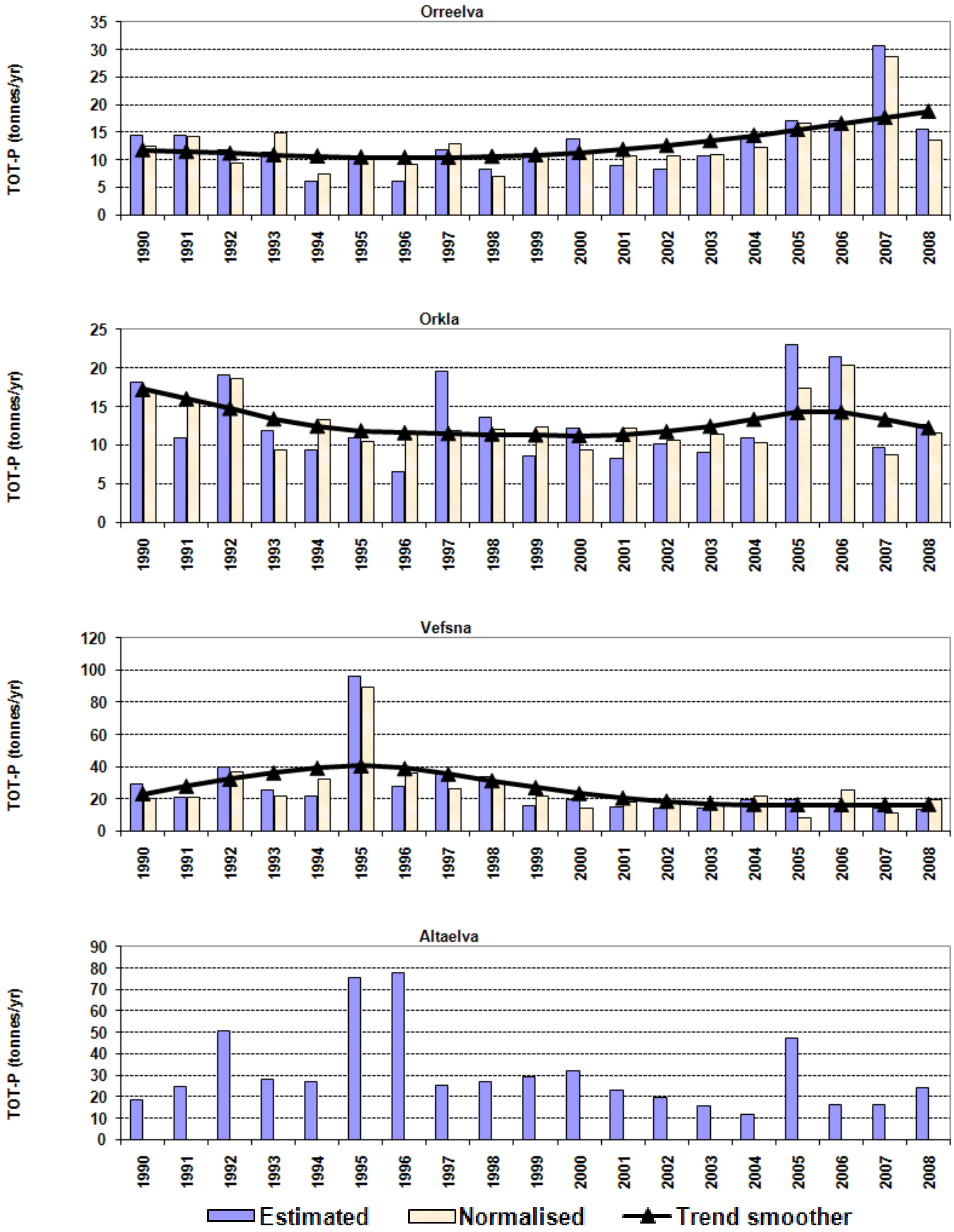


Figure A-VI- 5b. Estimated, flow-normalised and trend line for annual riverine loads of <u>total phosphorus</u> in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

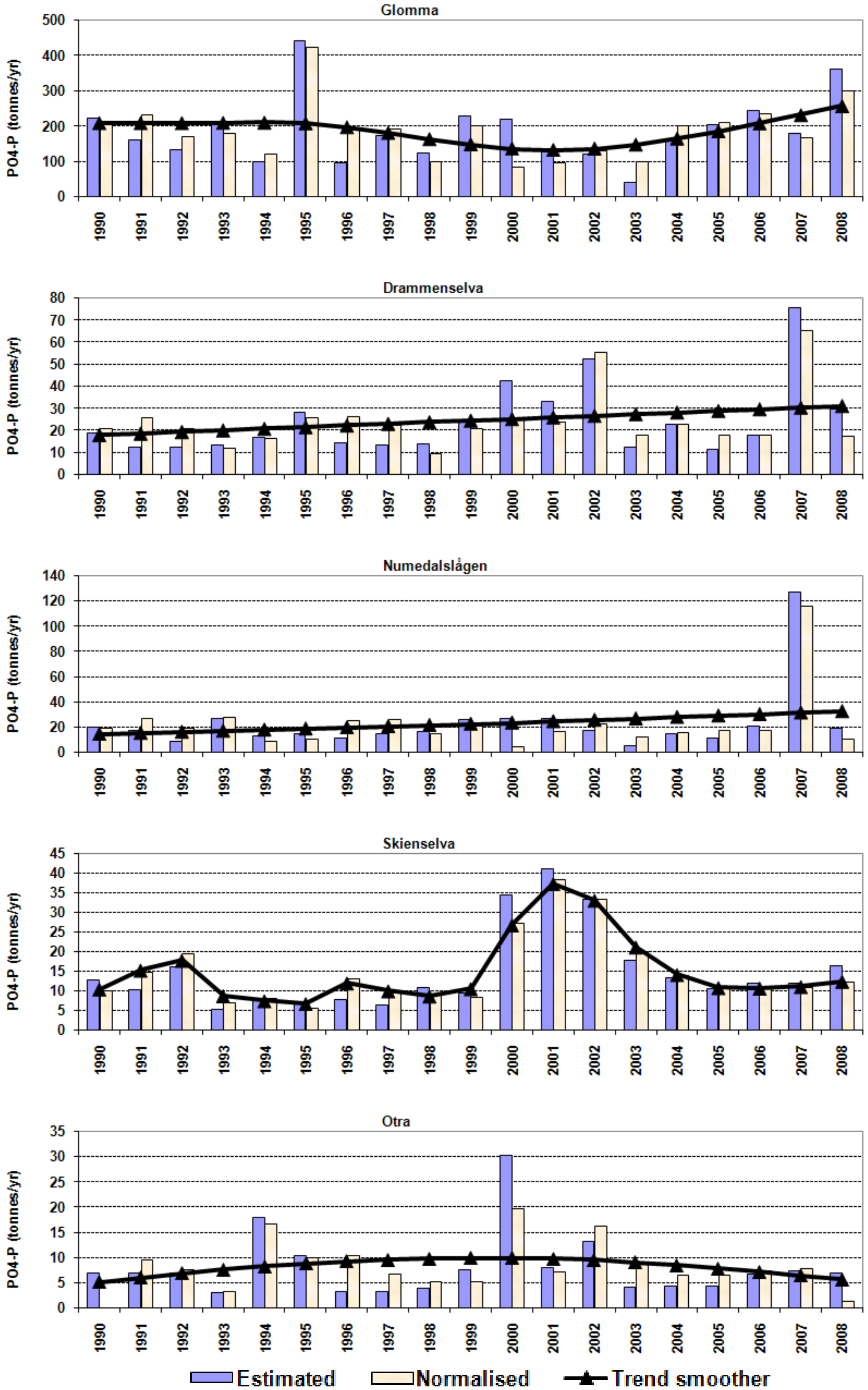


Figure A-VI-6a. Estimated, flow-normalised and trend line for annual riverine loads of <u>*PO4-P*</u> *in the five main Norwegian Skagerrak rivers, 1990-2008.*

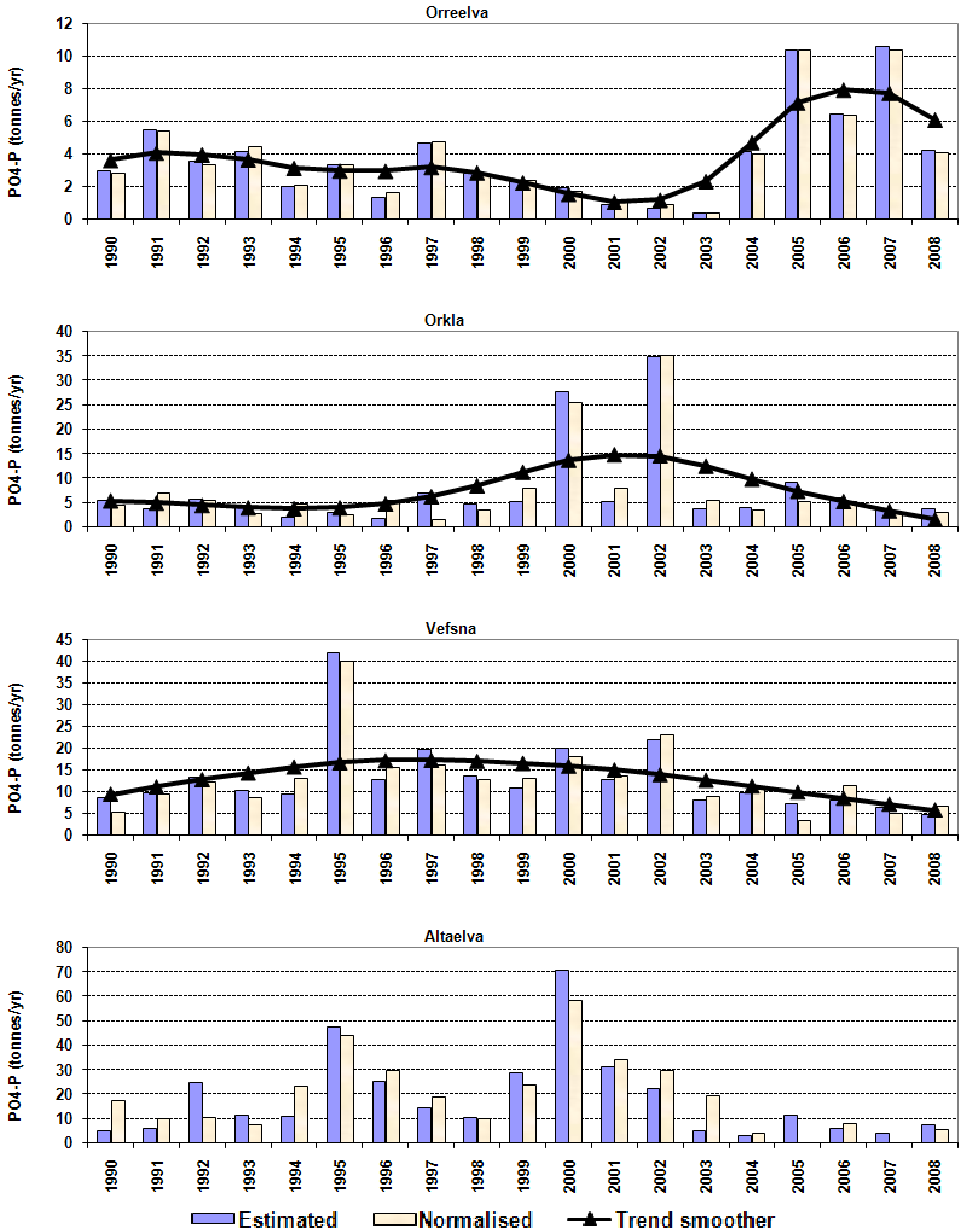


Figure A-VI-6b. Estimated, flow-normalised and trend line for annual riverine loads of PO$_4$-P in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

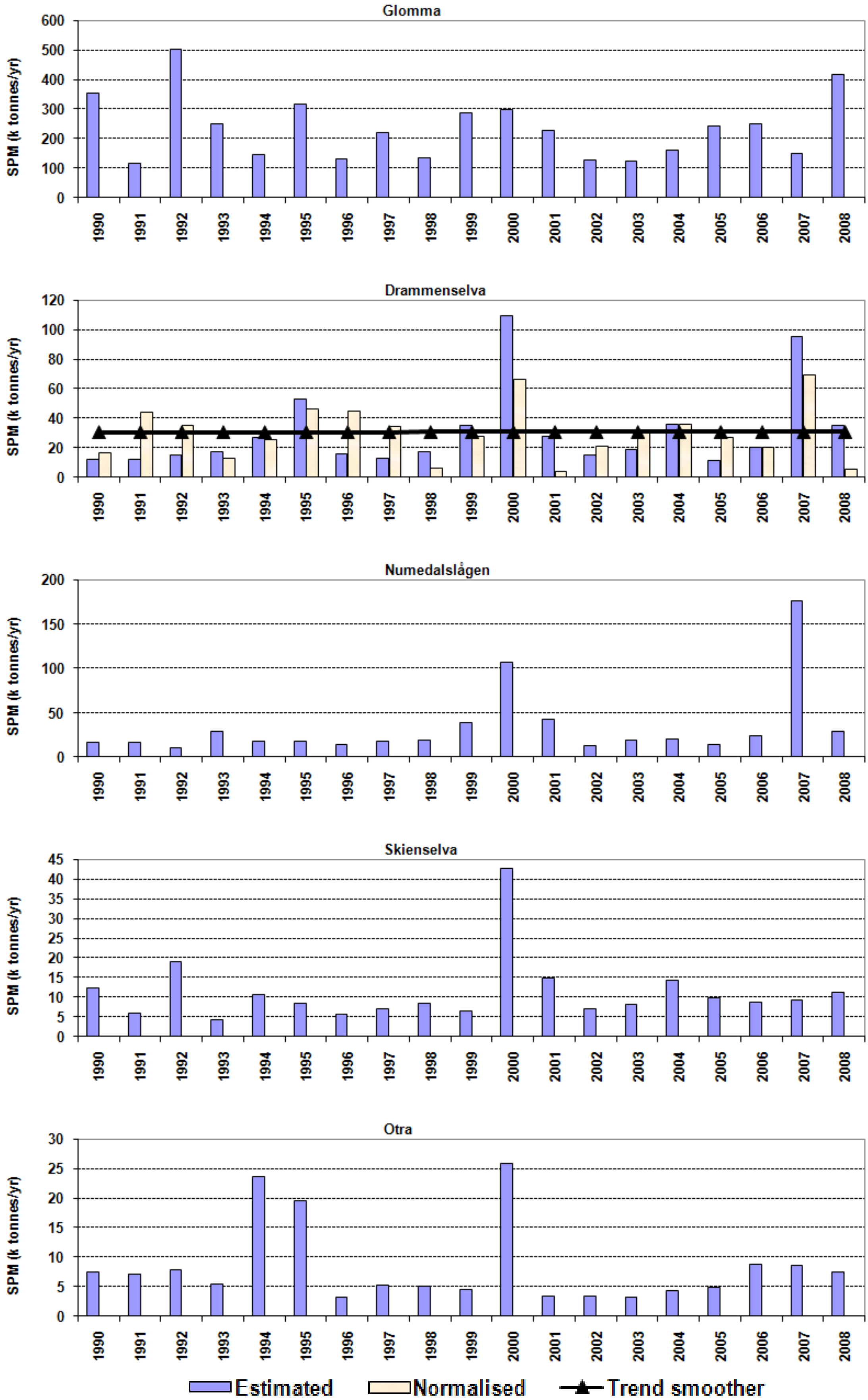


Figure A-VI-7a. Estimated, flow-normalised and trend line for annual riverine loads of <u>suspended particulate matter</u> in in the five main Norwegian Skagerrak rivers, 1990-2008.

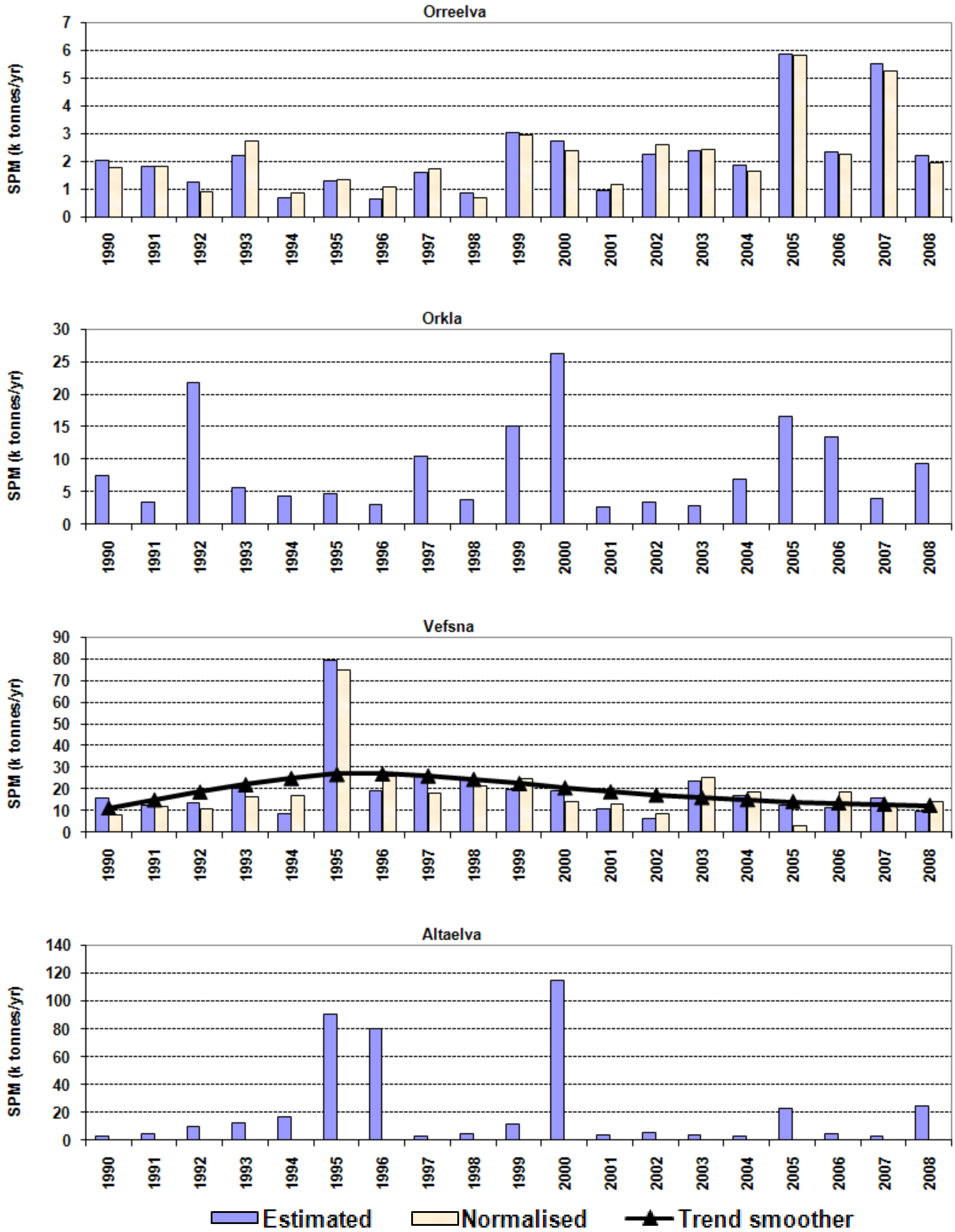


Figure A-VI-7b. Estimated, flow-normalised and trend line for annual riverine loads of suspended particulate matter in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

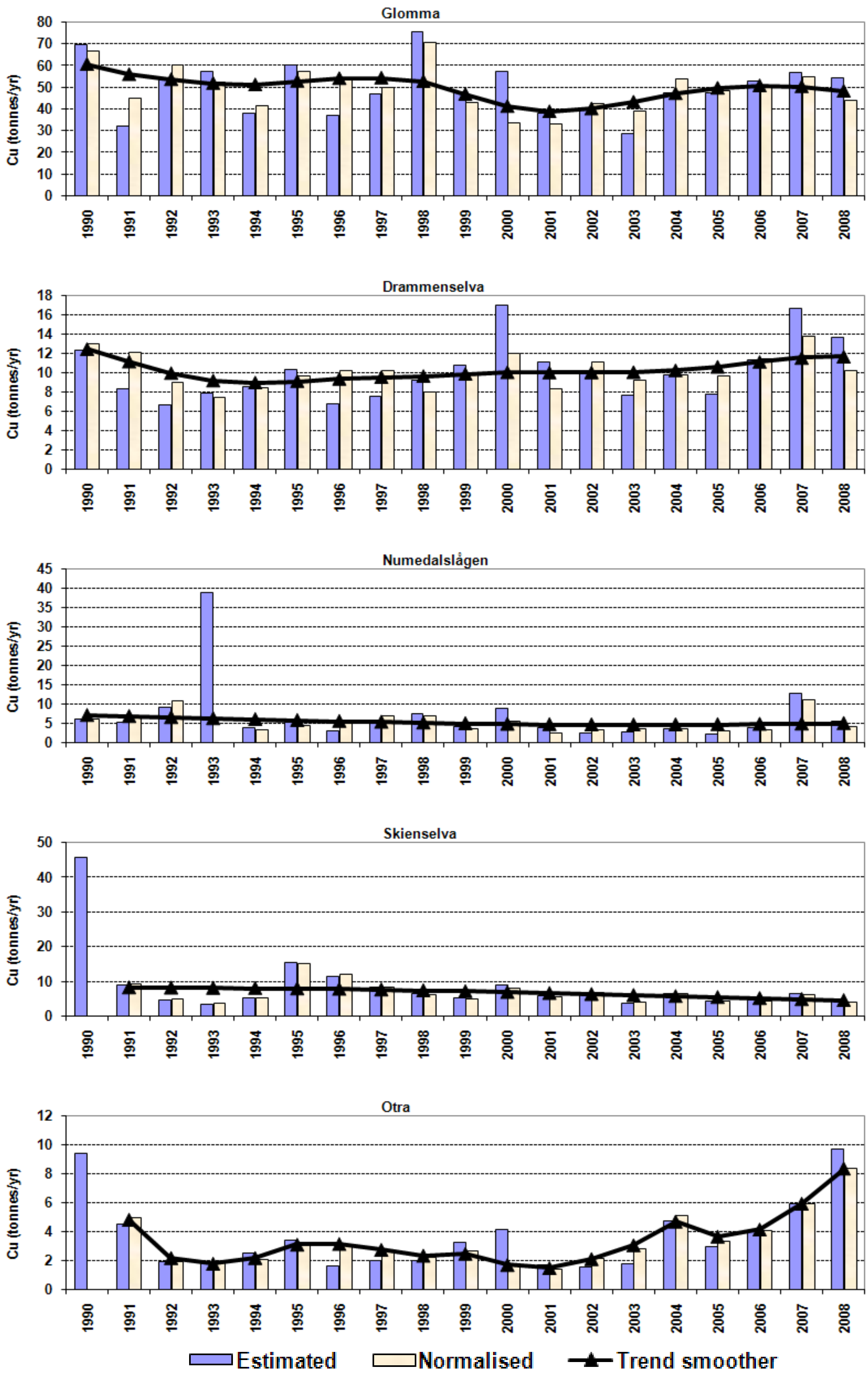


Figure A-VI-8a.Estimated, flow-normalised and trend line for annual riverine loads of <u>*Copper*</u> *in the five main Norwegian Skagerrak rivers, 1990-2008. The following values have been removed before calculating normalized and trend smoother: Numedalslågen in 1993, Skienselva & Otra in 1990.*

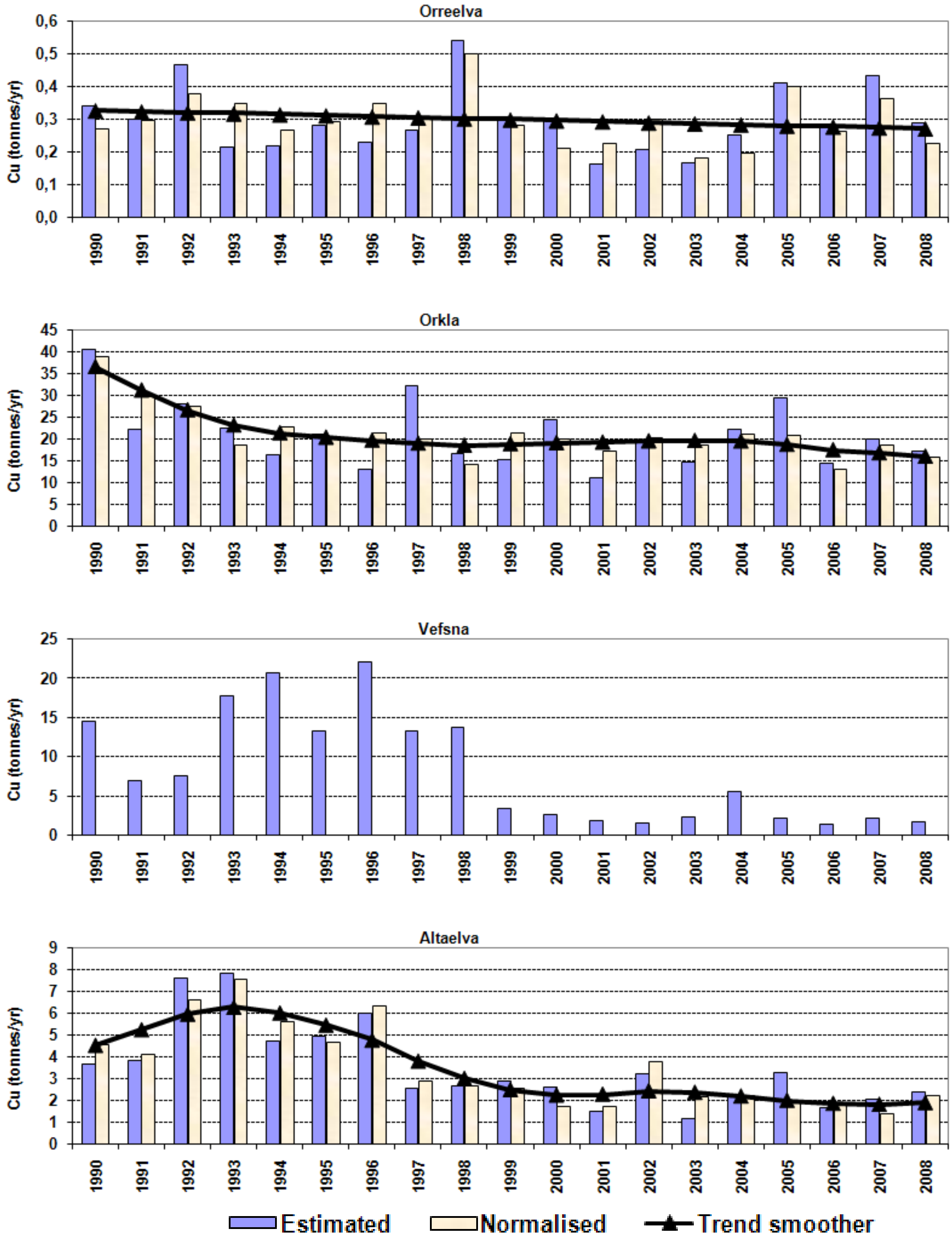


Figure A-VI-8b. Estimated, flow-normalised and trend line for annual riverine loads of Copper in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

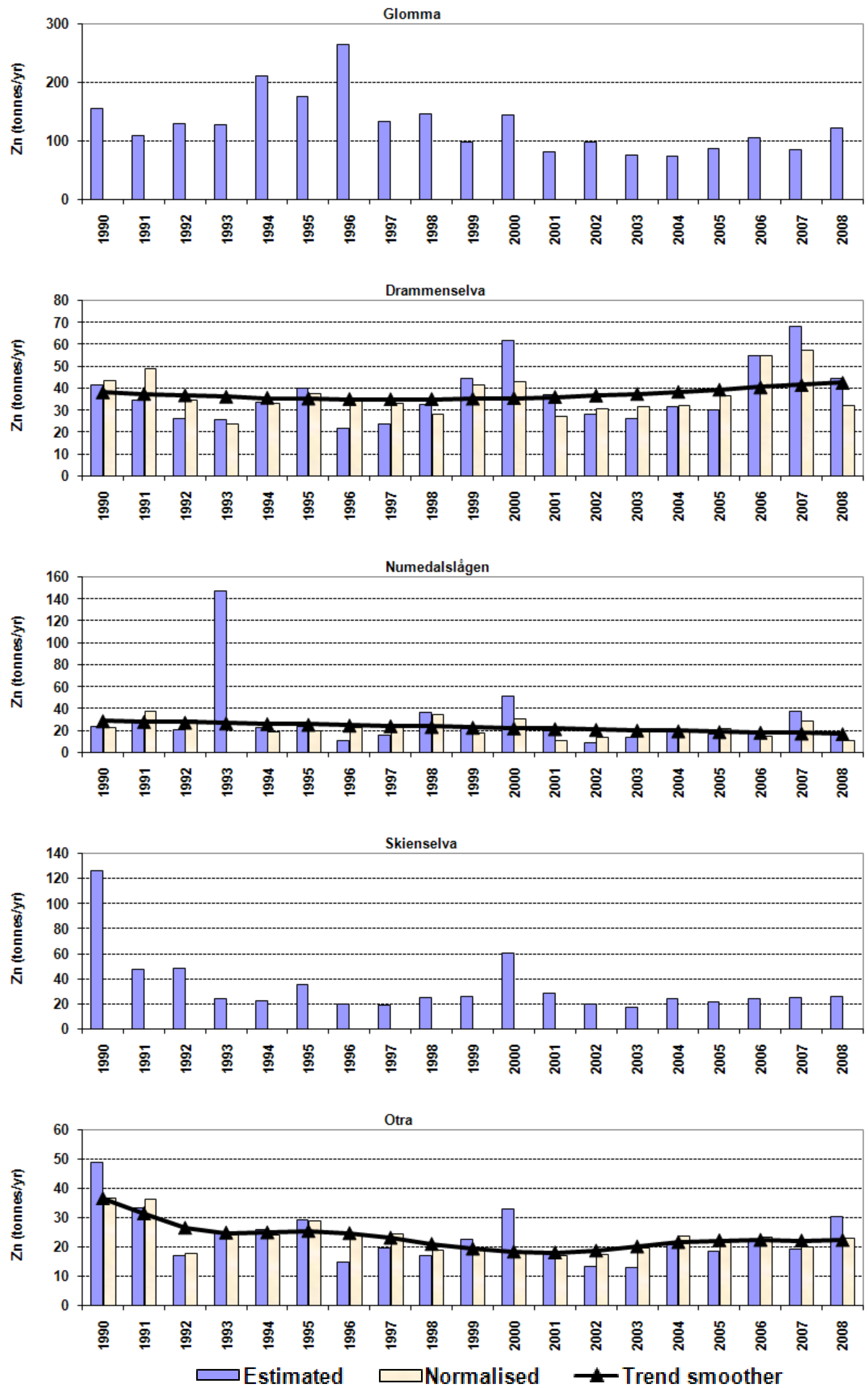


Figure A-VI-9a. Estimated, flow-normalised and trend line for annual riverine loads of Zinc in five main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008. In the calculation of normalized and trend smoother for Numedalslågen has 1993 been removed.

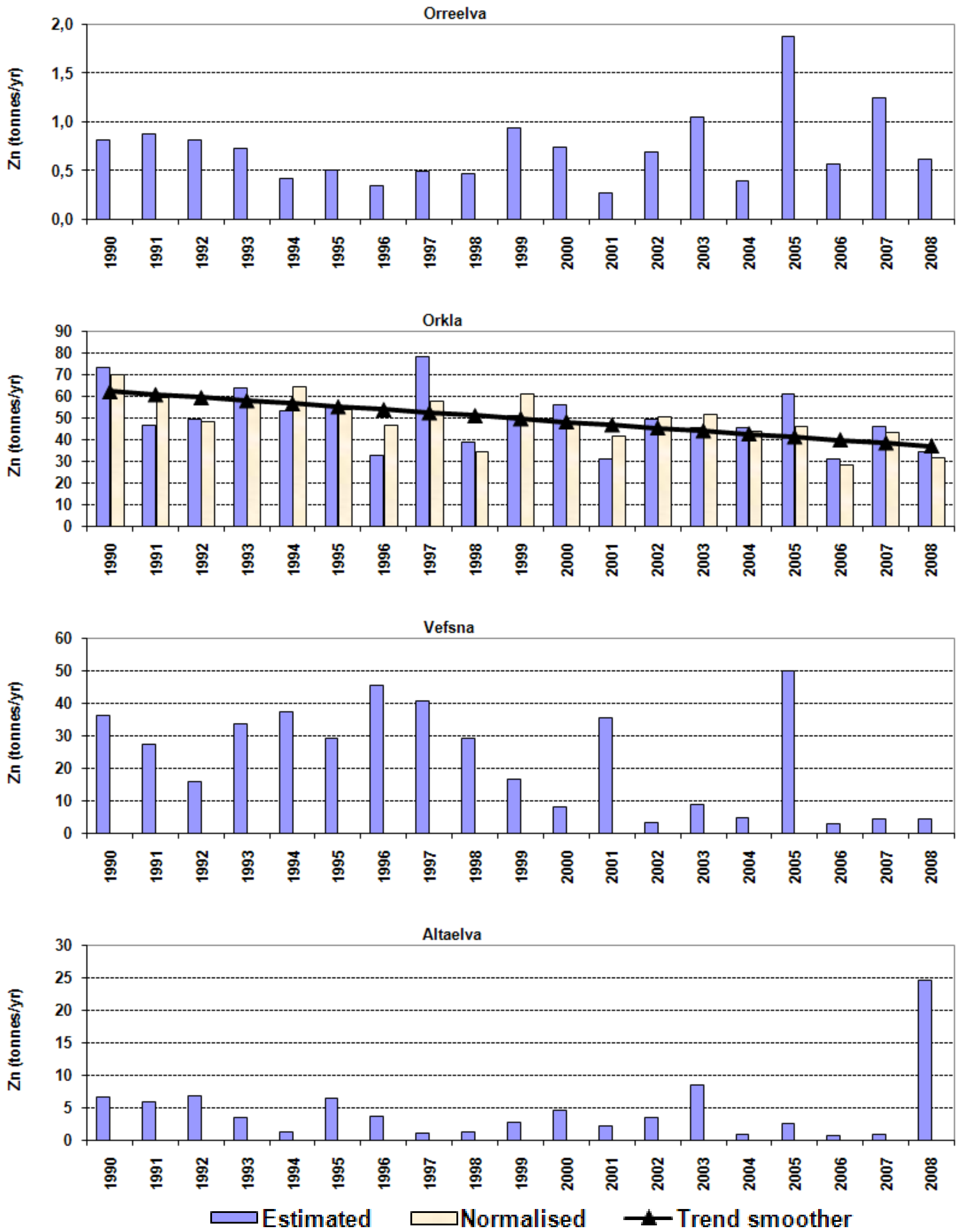


Figure A-VI-9b. Estimated, flow-normalised and trend line for annual riverine loads of Zinc in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

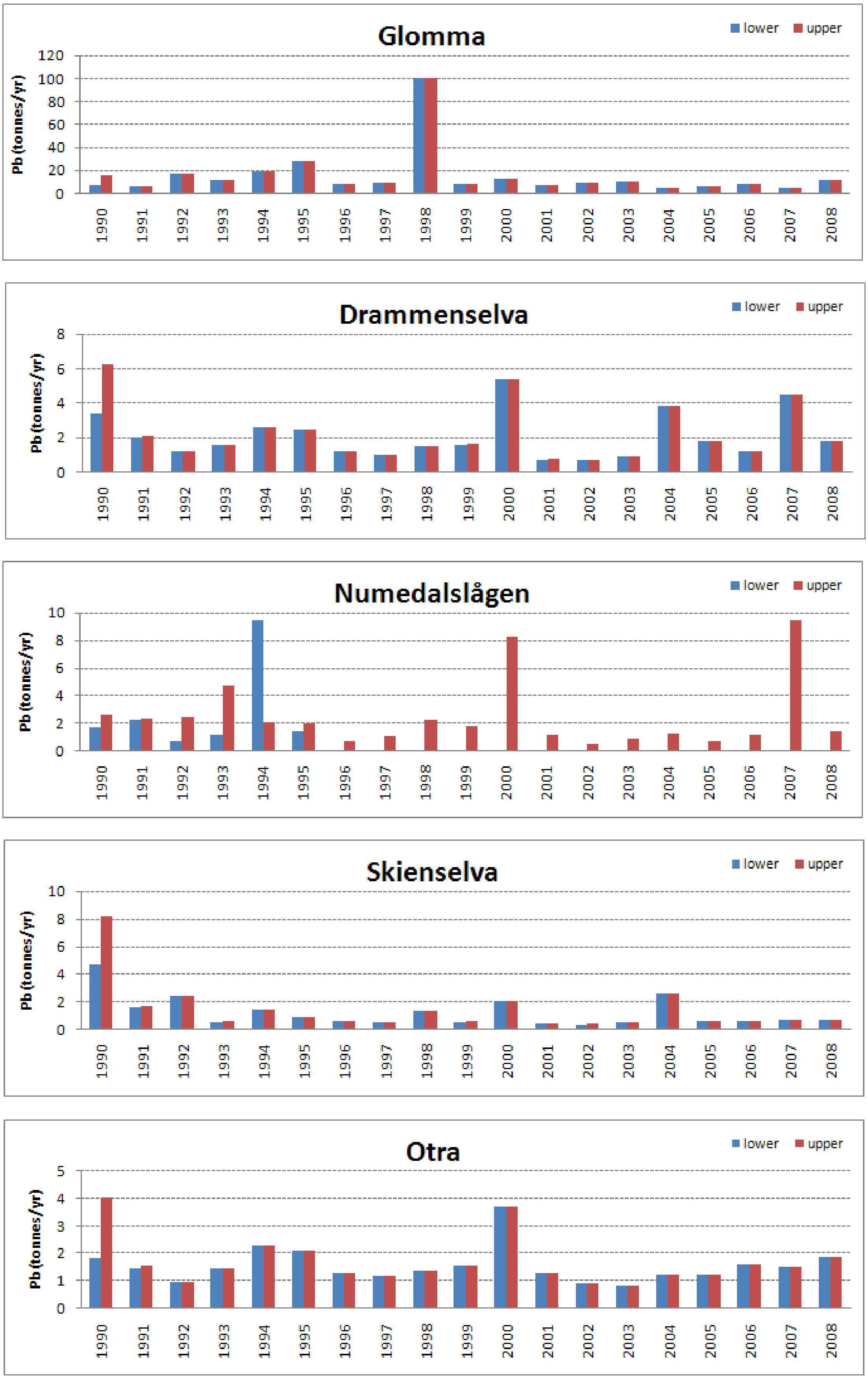


Figure A-VI-10a. Annual riverine loads (upper and lower estimates) of Lead in the five main Skagerrak rivers in Norway, 1990-2008.

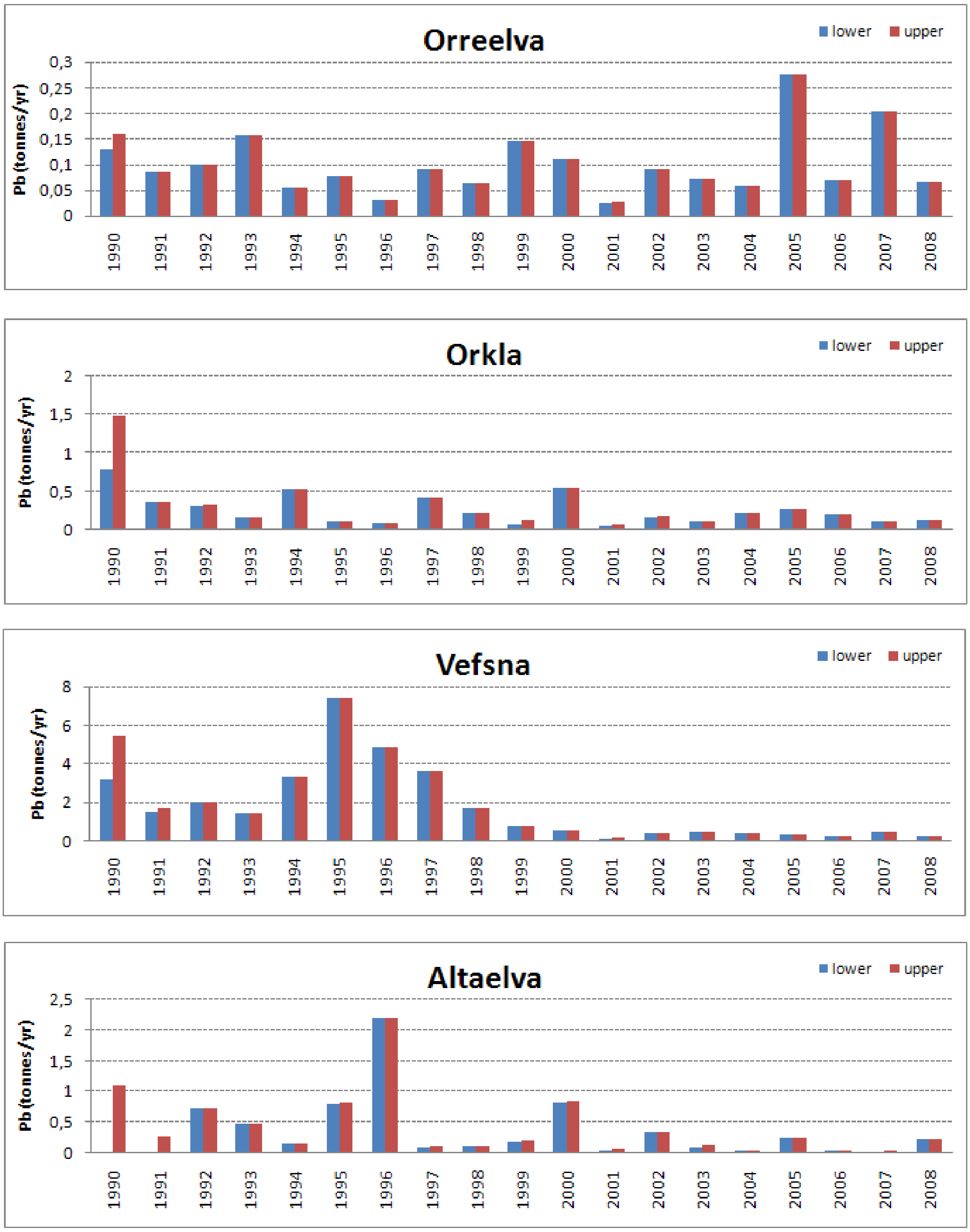


Figure A-VI-10b.Annual riverine loads (upper and lowe estimates) of ***Lead*** *in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.*

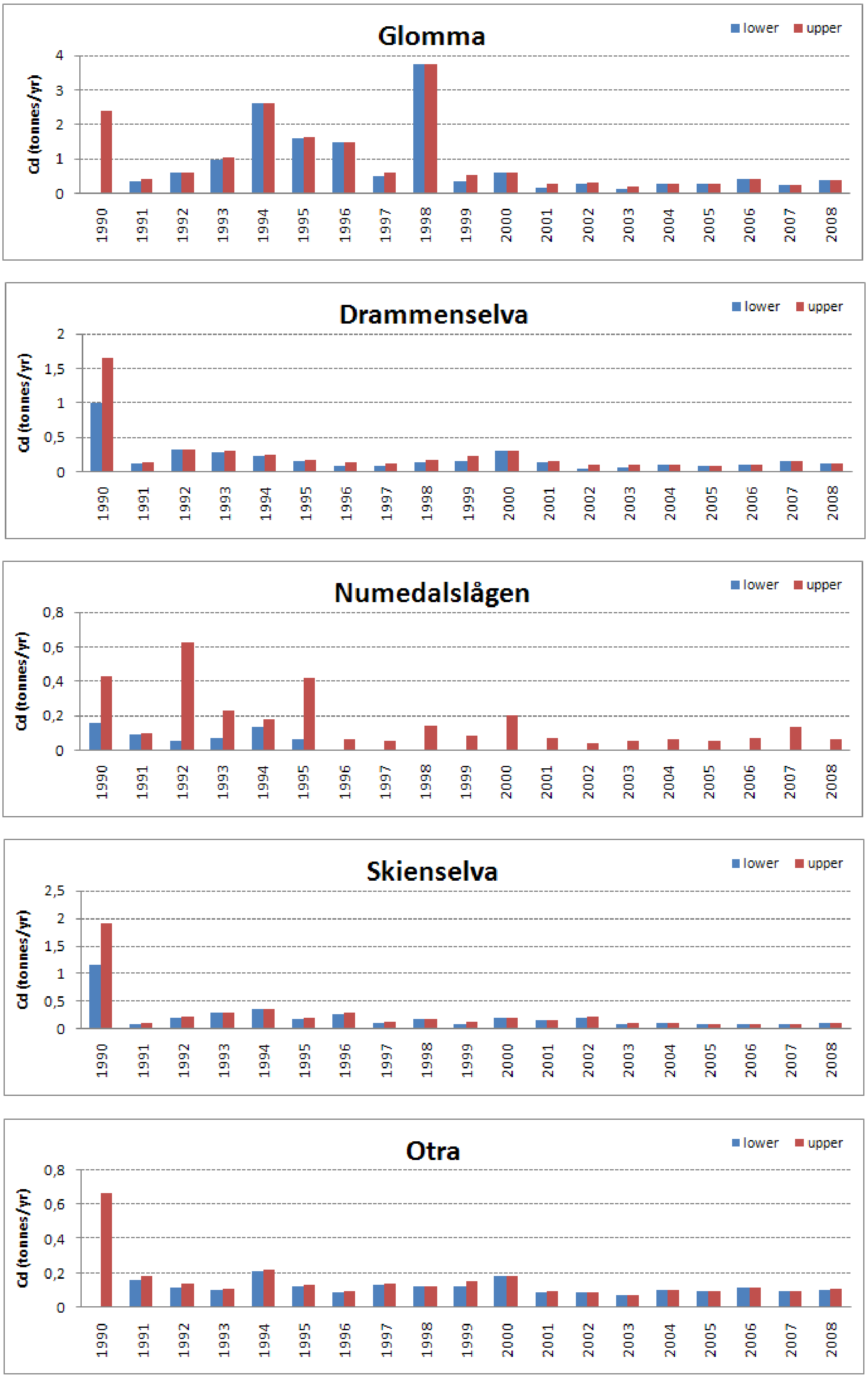


Figure A-VI-11a. Annual riverine loads (upper and lower estimates) of Cadmium in the five main Skagerrak rivers in Norway, 1990-2008.

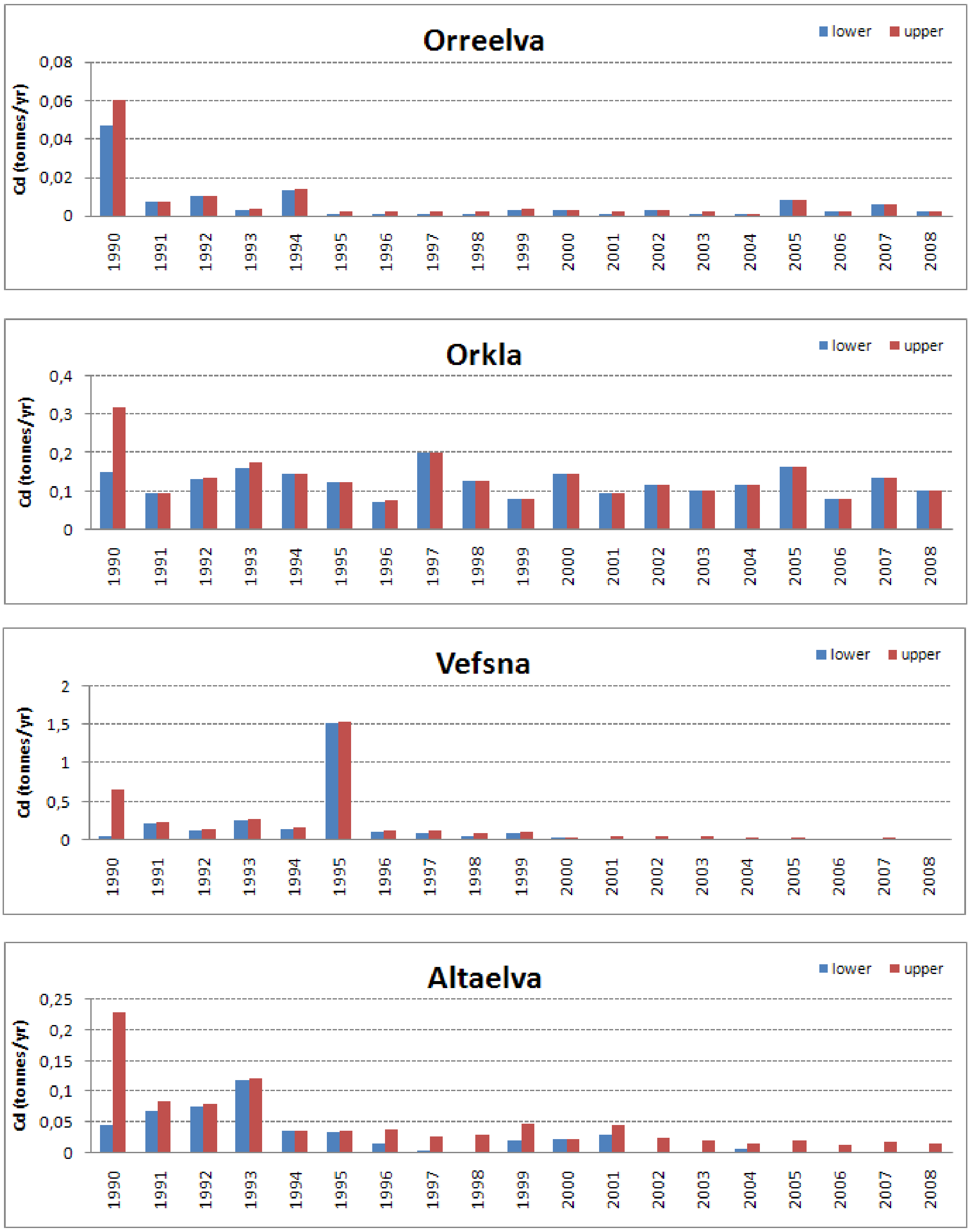


Figure A-VI-11b. Annual riverine loads (upper and lowe estimates) of Cadmium in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

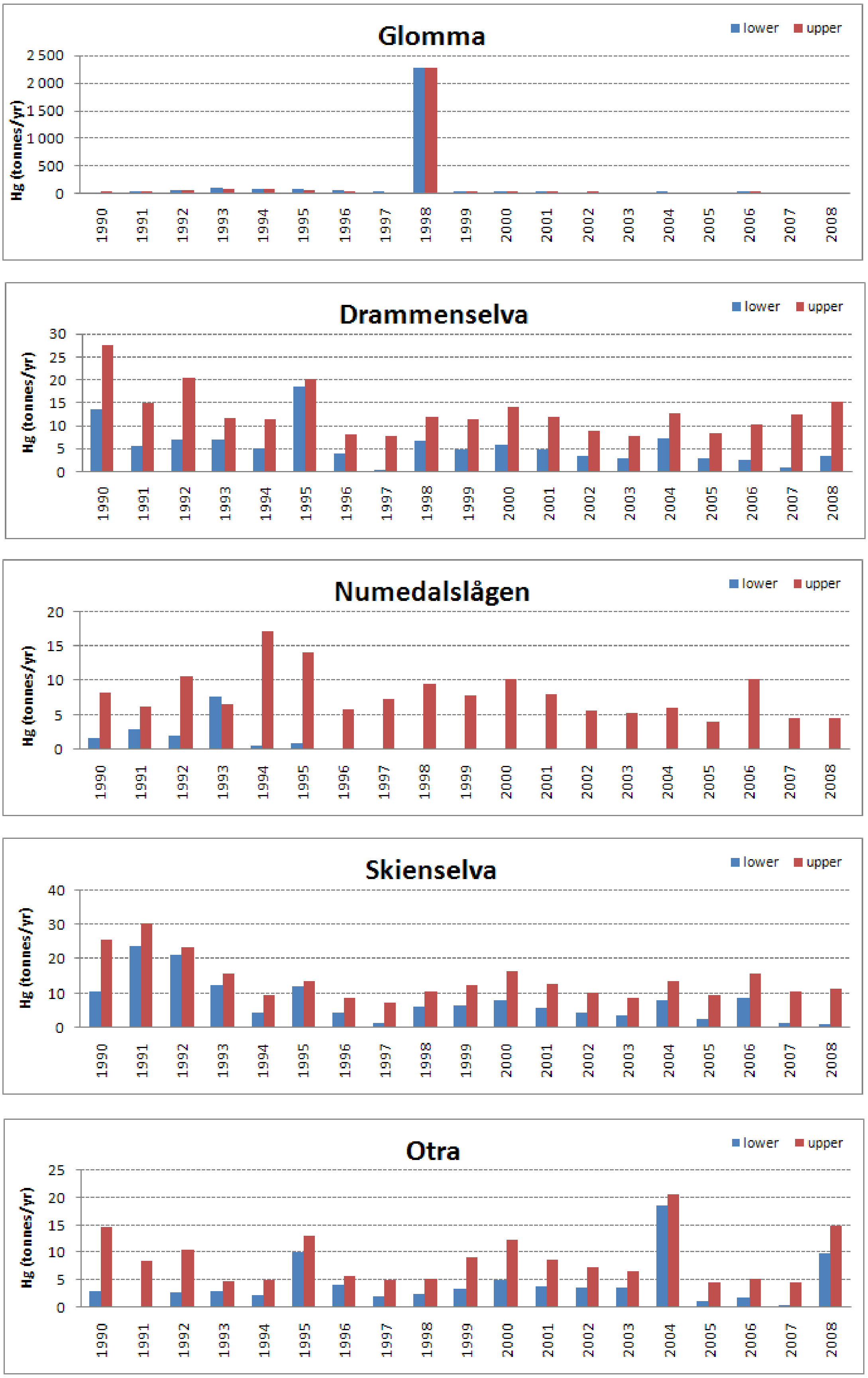


Figure A-VI-12a. Annual riverine loads (upper and lower estimates) of Mercury in the five main Skagerrak rivers in Norway, 1990-2008.

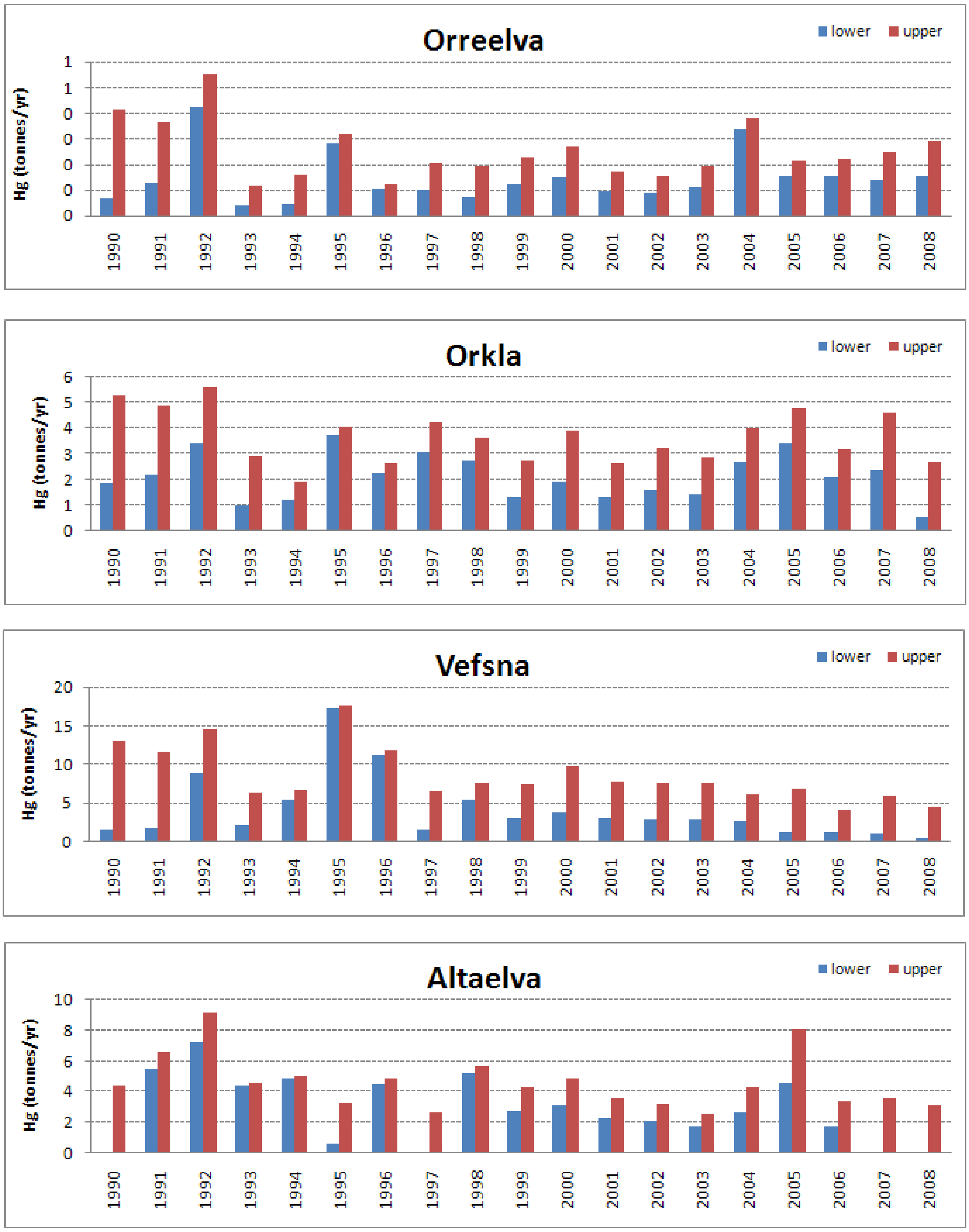


Figure A-VI-12b. Annual riverine loads (upper and lowe estimates) of Mercury in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

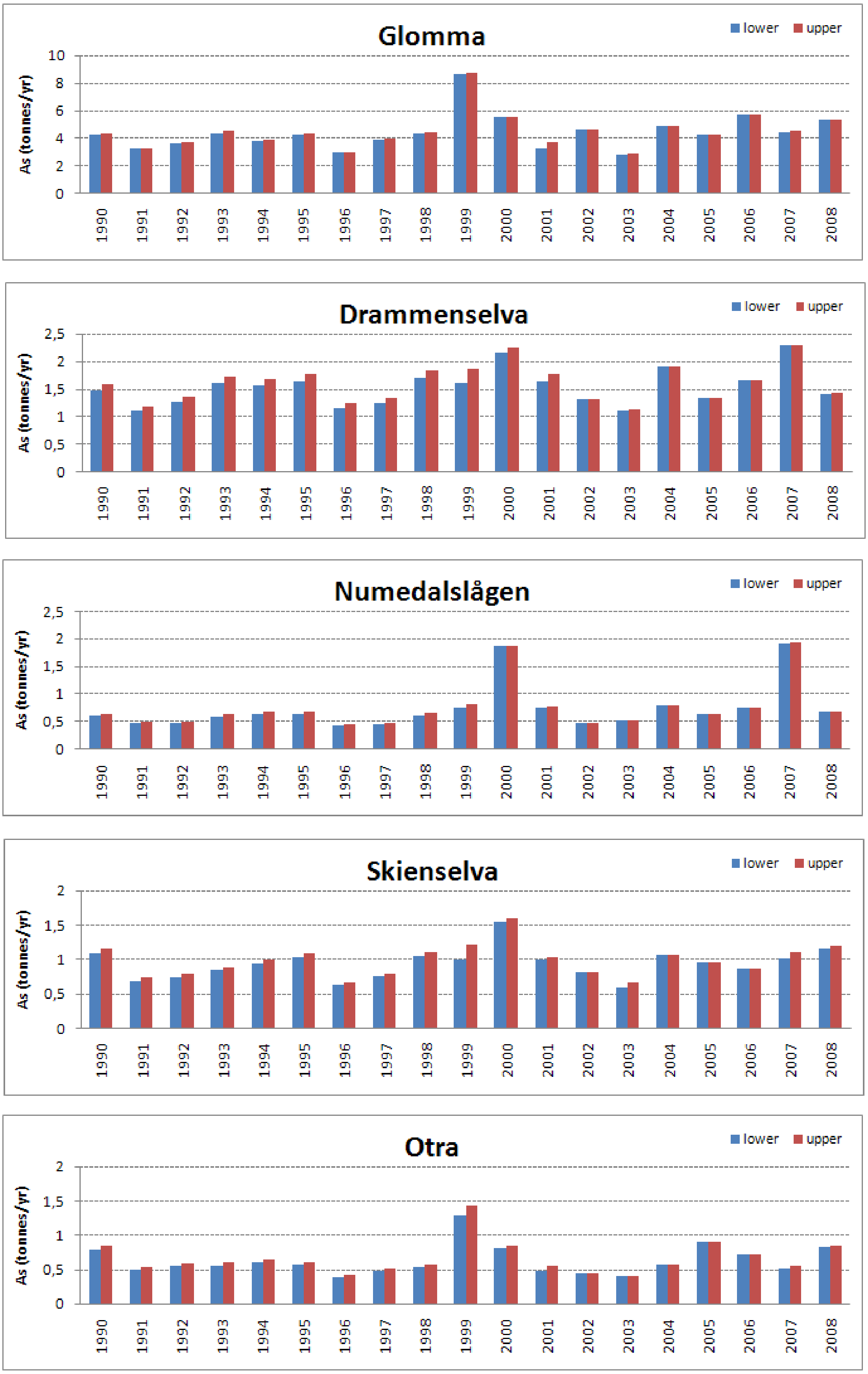


Figure A-VI-13a. Annual riverine loads (upper and lower estimates) of Arsenic in the five main Skagerrak rivers in Norway, 1990-2008. NB! 1990-1998 are calculated values.

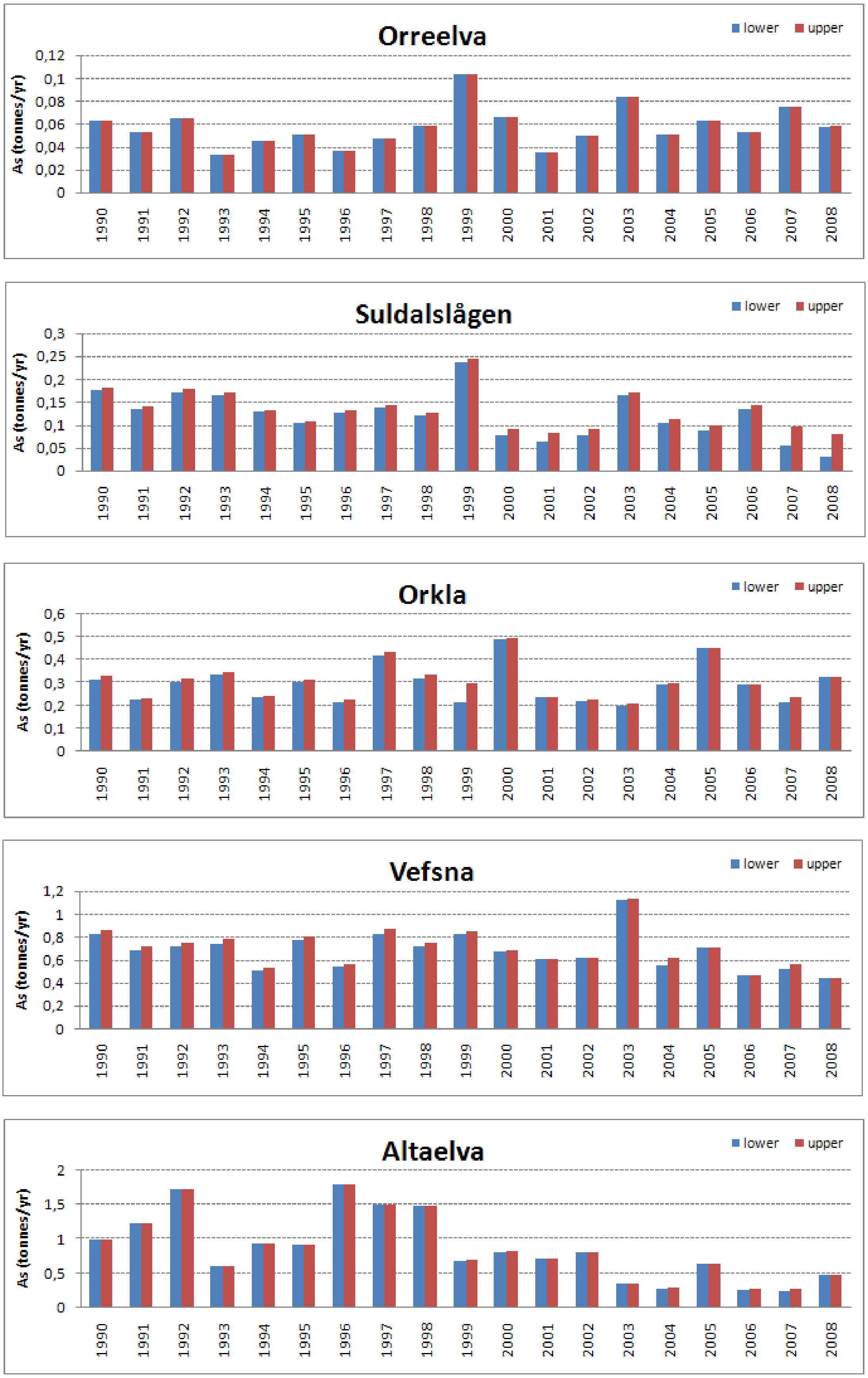


Figure A-VI-13b. Annual riverine loads (upper and lower estimates) of Arsenic in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

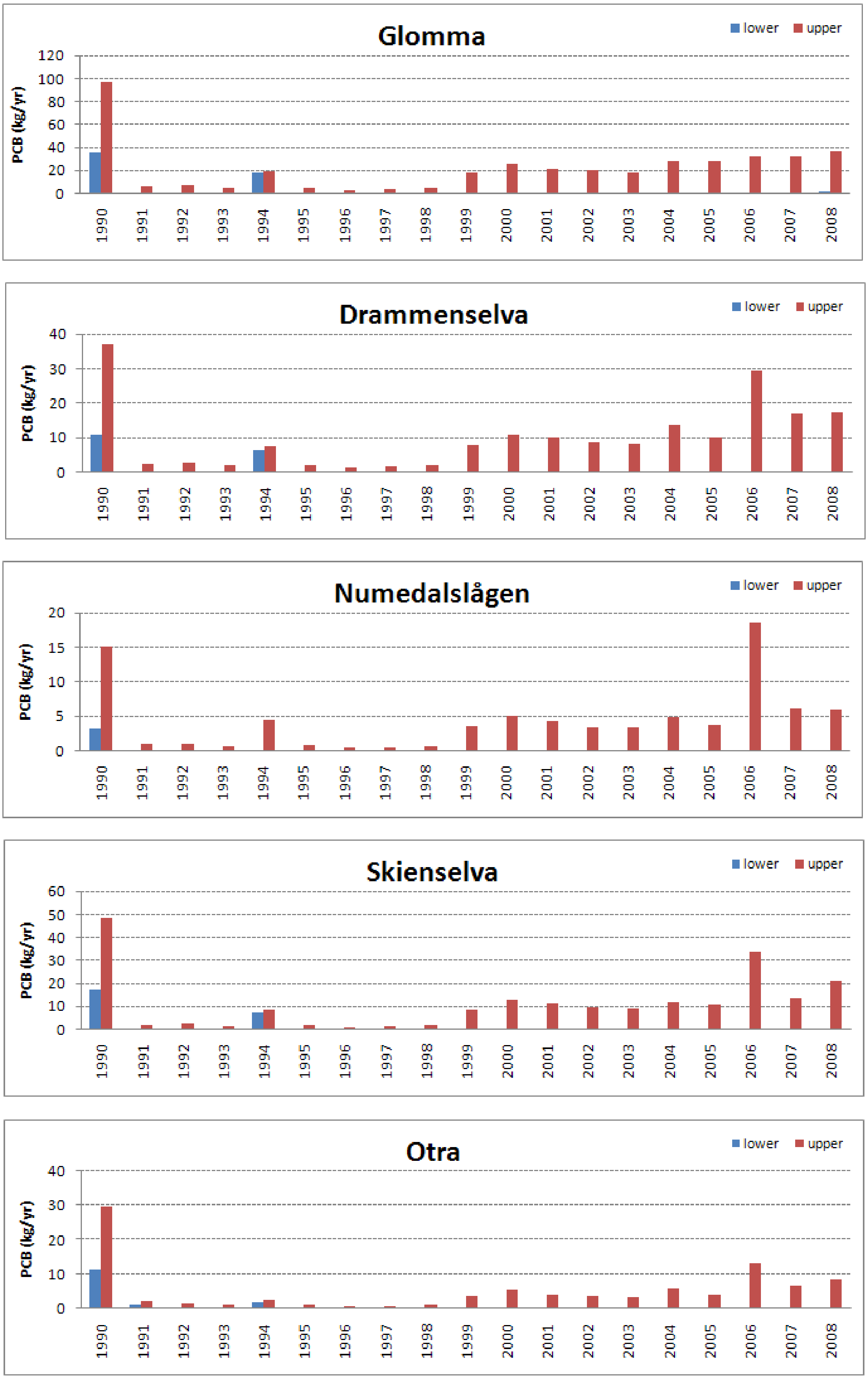


Figure A-VI-14a. Annual riverine loads (upper and lower estimates) of PCB in the five main Skagerrak rivers in Norway, 1990-2008.

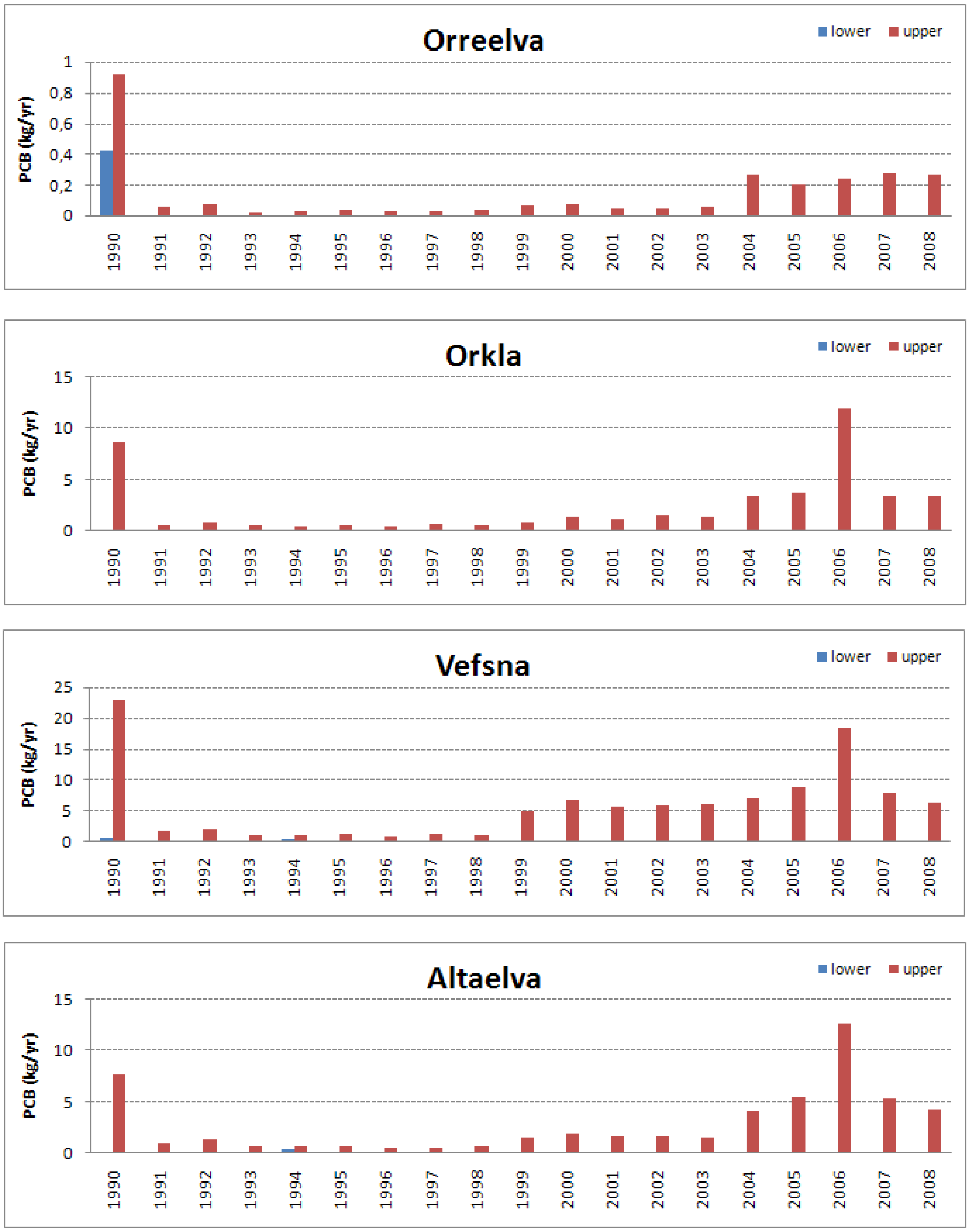


Figure A-VI-14b. Annual riverine loads (upper and lower estimates) of <u>PCB</u> in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

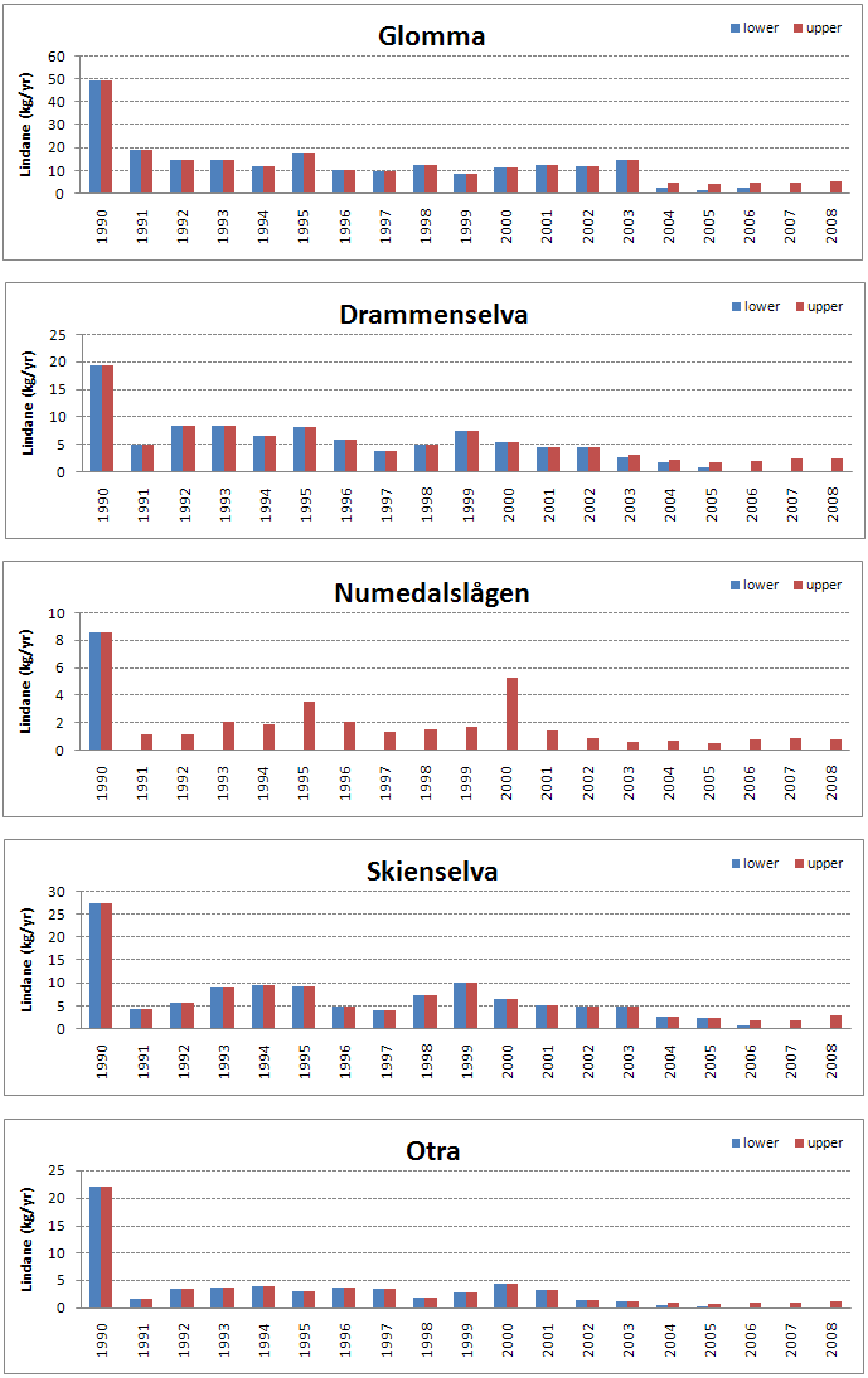


Figure A-VI-15a. Annual riverine loads (upper and lower estimates) of <u>Lindane</u> in the five main Skagerrak rivers in Norway, 1990-2008.

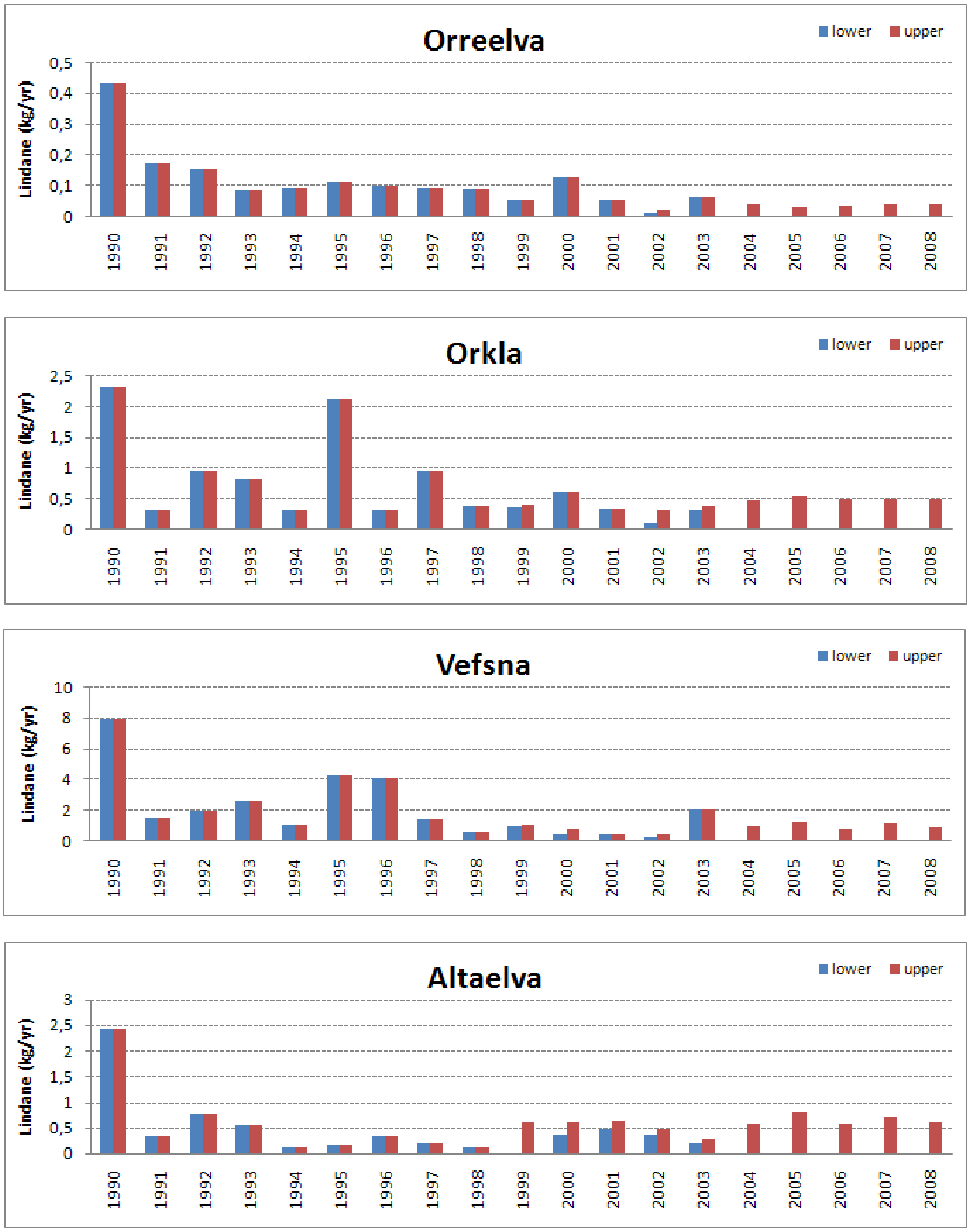


Figure A-VI-15b. Annual riverine loads (upper and lowe estimates) of Lindane in the in four main rivers to North Sea, Norwegian Sea and Barents Sea, Norway, 1990-2008.

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Title – English and Norwegian
Riverine inputs and direct discharges to Norwegian coastal waters – 2008
Elvetilførsler og direkte tilførsler til norske kystområder – 2008

Summary
Riverine inputs and direct discharges to Norwegian seas in 2008 have been estimated, in accordance with the requirements of the OSPAR Commission. Nutrient inputs from both rivers and point sources (industry, sewage treatment plants and fish farming) have increased slightly compared to the previous four years. In some rivers, however, nutrient concentrations have decreased since 1990. The direct discharges of metals from industry and sewage treatment plants have decreased significantly in recent years, and there are also examples of reductions of metal loads in rivers. Copper discharges from fish farming have increased since 2000, but in several rivers the concentrations of copper have been reduced. Inputs of PCBs and the pesticide lindane are insignificant.

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

Addendum

Data from the 2008 RID Programme

Table 1.
Raw data and summary statistics for the 10 main and 36 tributary rivers in Norway in 2008.

Glomma	Figures in red are additional samples from a parallel monitoring programme.																				
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.01.2008	547	7.01	5.10	10.50	3.90	12	19	430	20	650									<1.00		
21.01.2008	782				4.80		37	590		810											
11.02.2008	521	6.92	5.14	11.50	4.80	16	24	575	7	745	4.88	0.26	0.43	0.01	1.54	4.65	1.00	0.38	<1.00	<0.20	1.40
25.02.2008	589				3.80		20	485		625											
10.03.2008	500	7.09	5.74	82.60	4.30	60	88	695	37	870	18.93	0.32	1.26	0.02	2.43	6.56	1.40	0.89	<1.00		
25.03.2008	547				4.60		21	415		610											
07.04.2008	730	7.18	5.22	26.90	4.50	24	38	425	49	725	5.88	0.21	0.70	0.02	1.79	6.89	1.20	0.74	<1.00		
21.04.2008	625				4.50		13	450		700											
05.05.2008	2293	6.88	3.78	26.50	5.80	20	30	275	22	515	4.73	0.21	0.54	0.02	1.53	5.49	0.89	0.43	<1.00	<0.20	1.40
05.05.2008	2293				5.80		27	280		530											
15.05.2008	2605	6.78	3.11	13.10	4.40	9	17	195	15	370	3.40	0.20	0.47	0.02	2.92	5.43	0.78	0.20	<1.00		
26.05.2008	1772	6.94	3.74	4.81	3.70	3	7	280	22	440	3.14	0.10	0.17	0.01	1.68	3.08	0.53	0.10	<1.00		
02.06.2008	1772				4.00		10	245		450											
06.06.2008	1876	7.10	3.73	4.24	3.20	2	7	250	6	400	2.97	0.10	0.20	0.01	1.97	3.48	0.65	0.20	<1.00		
16.06.2008	1563	7.20	4.01	5.50	2.80	6	12	305	13	445	2.78	0.10	0.18	0.02	3.06	2.95	0.85	0.10	<1.00		
17.06.2008	1407				3.00		9	265		440											
26.06.2008	964	7.19	4.17	3.38	2.60	<1	8	300	7	470	2.87	0.10	0.10	0.01	0.87	0.76	0.41	<0.10	<1.00		
07.07.2008	912	7.20	4.36	3.54	2.20	2	7	265	12	440	2.70	0.09	0.12	0.01	1.27	2.17	0.57	0.30	<1.00		
15.07.2008	860				2.50		7	285		460											
04.08.2008	730	7.37	5.20	3.95	2.50	3	10	210	14	420	2.44	0.10	0.13	0.01	4.02	2.95	0.43	0.20	<1.00	<0.20	1.40
06.08.2008	860				4.40		37	615		885											
11.08.2008	860				2.60		10	245		460											
08.09.2008	703	7.07	4.28	4.51	4.20	5	13	275	10	500	3.00	0.20	0.20	0.01	1.31	2.21	0.57	<0.10	<1.00		
09.09.2008	745				3.40		7	230		450											
06.10.2008	599	7.14	5.55	12.70	4.70	18	36	600	20	925	4.17	0.24	0.48	0.02	1.62	3.40	1.50	0.73	<1.00	<0.20	
03.11.2008	610				5.40		17	355		595											
09.11.2008	610	7.14	5.03	31.80	5.60	31	66	425	18	705	5.24	0.52	1.53	0.02	3.25	11.80	2.94	2.90	1.50		
02.12.2008	657				4.90		11	405		635											
08.12.2008	657	7.39	5.40	5.64	4.40	7	19	360	27	570	4.90	0.20	0.21	0.01	1.31	4.21	0.81	0.42	<1.00		
29.12.2008	610				4.00		11	450		700											
Lower avg.	1027	7.10	4.60	15.70	4.04	14	21	373	19	585	4.80	0.20	0.45	0.01	2.04	4.40	0.97	0.51	0.09	0.38	1.40
Upper avg..	1027	7.10	4.60	15.70	4.04	14	21	373	19	585	4.80	0.20	0.45	0.01	2.04	4.40	0.97	0.52	1.03	0.20	1.40
Minimum	500	6.78	3.11	3.38	2.20	1	7	195	6	370	2.44	0.09	0.10	0.01	0.87	0.76	0.41	0.10	1.00	0.20	1.40
Maximum	2605	7.39	5.74	82.60	5.80	60	88	695	49	925	18.93	0.52	1.53	0.02	4.02	11.80	2.94	2.90	1.50	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	30	16	16	16	30	16	30	30	16	30	15	15	15	15	15	15	15	15	16	4	3
St.dev	610	0.17	0.79	20.09	1.02	15	18	137	11	157	4.06	0.12	0.43	0.01	0.90	2.66	0.64	0.71	0.13	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]
09.01.2008	287	7.04	4.15	1.13	2.60	<1	4	255	5	375	2.70	<0.05	0.08	0.01	0.61	3.15	0.64	0.20	<1.00		
07.02.2008	313	6.96	4.60	2.47	2.80	4	7	375	5	495	3.06	0.10	0.11	0.01	0.83	3.31	0.38	0.20	<1.00	<0.20	1.40
05.03.2008	308	7.16	4.33	1.27	2.70	2	4	335	6	495	2.97	0.10	0.08	0.01	0.88	2.81	0.42	0.30	<1.00		
08.04.2008	396	7.31	5.78	11.20	3.80	9	17	630	12	810	4.21	0.21	0.25	0.02	1.18	3.78	0.67	0.38	<1.00		
07.05.2008	1211	7.00	3.27	4.05	3.40	3	8	235	4	380	2.89	0.10	0.19	0.01	0.79	3.26	0.39	<0.10	<1.00	<0.20	1.40
16.05.2008	1287	6.76	3.19	3.41	3.00	2	5	230	15	365	2.67	0.10	0.47	0.02	4.10	12.10	0.74	<0.10	<1.00		
27.05.2008	782	6.97	3.69	1.75	3.30	2	4	260	14	395	2.78	0.10	0.09	0.01	0.60	2.50	0.37	<0.10	<1.00		
04.06.2008	782	6.94	3.42	2.52	3.60	1	6	230	8	515	2.82	0.20	0.14	0.01	0.81	2.66	0.37	0.20	<1.00		
12.06.2008	508	6.95	3.45	1.48	3.50	<1	5	255	7	390	2.80	0.20	0.08	0.01	0.66	2.18	0.45	0.10	<1.00		
25.06.2008	276	7.13	3.39	1.47	3.20	<1	5	175	6	355	2.55	0.10	0.07	0.01	0.35	1.30	0.39	<0.10	<1.00		
02.07.2008	255	7.04	3.45	2.64	2.80	2	6	180	15	365	2.61	0.10	0.21	0.01	0.83	2.44	0.40	0.10	<1.00		
06.08.2008	286	7.05	3.00	1.25	3.30	<1	6	140	12	285	2.20	0.10	0.07	0.01	0.74	1.70	0.37	<0.10	<1.00	<0.20	1.40
02.09.2008	346	7.09	3.32	1.14	3.20	<1	<5	155	13	330	2.29	0.10	0.07	<0.01	0.93	2.01	0.29	0.20	4.00		
08.10.2008	308	7.14	3.64	1.25	3.80	1	6	250	12	425	2.85	0.10	0.08	0.01	0.71	2.53	0.36	0.30	<1.00	<0.20	1.40
05.11.2008	307	6.86	3.57	0.87	3.10	1	5	240	18	410	2.85	0.10	0.07	0.01	0.73	2.66	0.38	<0.10	<1.00		
04.12.2008	305	7.26	4.20	0.88	3.10	<1	3	275	5	410	2.95	0.10	0.05	0.01	0.94	2.76	0.40	0.20	<1.00		
Lower avg.	497	7.04	3.78	2.42	3.20	2	6	264	10	425	2.83	0.11	0.13	0.01	0.98	3.20	0.44	0.14	0.25	0.00	1.40
Upper avg..	497	7.04	3.78	2.42	3.20	2	6	264	10	425	2.83	0.12	0.13	0.01	0.98	3.20	0.44	0.17	1.19	0.20	1.40
Minimum	255	6.76	3.00	0.87	2.60	1	3	140	4	285	2.20	0.05	0.05	0.01	0.35	1.30	0.29	0.10	1.00	0.20	1.40
Maximum	1287	7.31	5.78	11.20	3.80	9	17	630	18	810	4.21	0.21	0.47	0.02	4.10	12.10	0.74	0.38	4.00	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	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	4
St.dev	337	0.14	0.70	2.52	0.37	2	3	115	5	119	0.44	0.05	0.11	0.01	0.85	2.45	0.13	0.09	0.75	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]
10.01.2008	82	6.73	4.31	12.40	3.30	9	15	645	120	895	4.24	<0.05	0.37	0.03	2.48	5.01	0.49	0.51	<1.00		
12.02.2008	121	6.70	3.37	5.18	2.80	6	10	325	16	465	3.89	0.10	0.22	0.01	1.02	4.48	0.32	0.10	<1.00	<0.20	1.40
04.03.2008	96	6.77	3.87	5.74	3.60	6	12	355	21	540	4.54	0.20	0.23	0.01	1.84	4.92	0.39	0.20	<1.00		
09.04.2008	112	6.83	4.21	8.49	4.60	8	16	515	28	740	5.18	0.20	0.32	0.03	1.73	6.22	0.46	0.32	<1.00		
06.05.2008	383	6.56	1.86	14.90	4.90	6	11	125	7	305	3.08	0.20	0.67	0.02	1.87	5.67	0.38	<0.10	<1.00	<0.20	1.40
04.06.2008	164	6.63	1.69	4.06	3.50	2	7	86	11	250	2.70	0.20	0.26	0.01	1.76	3.70	0.33	0.10	<1.00		
02.07.2008	104	6.90	2.44	1.54	2.00	2	6	73	14	200	2.37	0.10	0.13	0.01	0.61	1.70	0.31	0.20	<1.00		
06.08.2008	112	6.95	2.14	2.89	3.20	2	7	64	16	235	2.25	0.10	0.23	<0.01	0.66	2.20	0.30	<0.10	<1.00	<0.20	1.40
04.09.2008	111	6.82	2.80	4.75	3.20	5	11	125	19	315	2.78	0.20	0.19	0.01	0.60	2.34	0.31	0.20	1.00		
08.10.2008	142	6.80	3.34	3.95	6.10	3	11	205	15	450	3.87	0.21	0.40	0.02	0.92	5.47	0.41	0.37	<1.00	<0.20	1.40
06.11.2008	106	6.72	2.75	1.75	2.90	2	7	150	34	330	3.23	0.10	0.20	0.02	0.77	5.42	0.29	<0.10	2.00		
03.12.2008	100	6.89	3.29	1.97	2.80	3	12	220	36	390	3.59	0.10	0.12	0.01	0.53	3.35	0.32	0.30	<1.00		
Lower avg.	136	6.78	3.01	5.64	3.57	5	10	241	28	426	3.48	0.14	0.28	0.01	1.23	4.21	0.36	0.19	0.25	0.00	1.40
Upper avg..	136	6.78	3.01	5.64	3.57	5	10	241	28	426	3.48	0.15	0.28	0.01	1.23	4.21	0.36	0.22	1.08	0.20	1.40
Minimum	82	6.56	1.69	1.54	2.00	2	6	64	7	200	2.25	0.05	0.12	0.01	0.53	1.70	0.29	0.10	1.00	0.20	1.40
Maximum	383	6.95	4.31	14.90	6.10	9	16	645	120	895	5.18	0.21	0.67	0.03	2.48	6.22	0.49	0.51	2.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	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	81	0.11	0.88	4.25	1.12	3	3	186	30	211	0.90	0.06	0.15	0.01	0.66	1.52	0.07	0.13	0.29	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]
08.01.2008	308	6.72	2.06	0.46	2.30	<1	3	190	<2	270	2.27	<0.05	0.03	0.01	0.39	1.90	0.20	0.43	<1.00		
06.02.2008	385	6.61	2.12	1.98	2.50	2	5	210	3	310	2.35	0.10	0.08	0.01	0.37	2.27	0.20	<0.10	<1.00	<0.20	1.40
03.03.2008	383	6.40	2.17	0.69	2.30	2	2	185	2	285	2.31	0.10	0.04	0.01	0.40	2.04	0.20	<0.10	<1.00		
07.04.2008	430	6.81	2.06	0.78	2.20	1	3	180	7	290	2.37	0.10	0.04	0.01	0.39	2.48	0.21	<0.10	<1.00		
08.05.2008	737	6.65	1.98	0.75	2.20	<1	3	180	3	270	2.27	0.10	0.06	0.01	0.37	2.04	0.20	<0.10	<1.00	<0.20	1.40
02.06.2008	607	6.59	1.92	0.81	2.30	1	3	165	8	280	2.16	0.09	0.06	0.01	0.34	2.06	0.20	0.10	<1.00		
30.06.2008	334	6.76	1.95	0.82	2.20	1	5	130	17	265	2.00	0.08	0.06	0.01	0.01	1.80	0.20	<0.10	<1.00		
05.08.2008	153	6.14	1.26	1.26	2.10	<1	4	54	9	195	0.94	0.10	0.20	0.01	1.01	3.67	0.45	<0.10	<1.00	<0.20	1.40
04.09.2008	205	6.89	3.41	1.15	2.40	4	11	180	52	385	2.14	0.10	0.09	<0.01	0.50	2.31	0.22	<0.10	1.00		
06.10.2008	283	6.78	2.34	2.58	2.60	3	15	170	16	345	2.29	0.10	0.12	0.01	0.56	2.68	0.21	0.30	<1.00	<0.50	3.50
04.11.2008	265	6.77	2.06	0.63	2.60	1	3	140	18	280	2.04	0.10	0.06	0.01	0.61	2.31	0.20	0.10	1.00		
02.12.2008	301	6.71	1.89	0.63	2.30	<1	13	150	9	255	2.13	0.20	0.04	0.01	0.38	2.50	0.20	0.20	<1.00		
Lower avg.	366	6.65	2.10	1.05	2.33	1	6	161	12	286	2.11	0.10	0.07	0.01	0.44	2.34	0.22	0.09	0.17	0.00	1.92
Upper avg..	366	6.65	2.10	1.05	2.33	2	6	161	12	286	2.11	0.10	0.07	0.01	0.44	2.34	0.22	0.15	1.00	0.28	1.92
Minimum	153	6.14	1.26	0.46	2.10	1	2	54	2	195	0.94	0.05	0.03	0.01	0.01	1.80	0.20	0.10	1.00	0.20	1.40
Maximum	737	6.89	3.41	2.58	2.60	4	15	210	52	385	2.38	0.20	0.20	0.01	1.01	3.67	0.45	0.43	1.00	0.50	3.50
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	165	0.21	0.49	0.63	0.16	1	4	40	14	47	0.39	0.03	0.05	0.00	0.23	0.49	0.07	0.11	0.00	0.15	1.05

Otra																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.01.2008	124	6.11	1.78	0.74	3.00	1	4	100	16	245	1.95	<0.05	0.33	0.02	1.46	3.68	0.64	0.53	<1.00		
06.02.2008	273	5.92	2.17	1.22	2.90	1	4	115	10	265	1.88	0.20	0.34	0.03	1.05	5.53	0.80	0.10	<1.00	<0.20	1.40
05.03.2008	199	5.98	1.86	0.61	2.30	<1	4	84	3	215	1.69	0.10	0.27	0.01	1.93	4.81	0.80	<0.10	<1.00		
09.04.2008	189	6.04	1.55	1.00	2.20	<1	2	105	9	210	1.62	0.10	0.22	0.01	0.83	2.89	0.67	0.20	<1.00		
14.05.2008	303	6.17	1.37	0.87	1.80	<1	4	81	7	175	1.50	0.10	0.21	<0.01	1.87	3.44	0.37	0.87	<1.00	<0.20	1.40
12.06.2008	175	7.08	1.27	2.63	2.20	1	5	90	25	380	1.37	0.09	0.16	0.01	1.09	2.96	0.20	0.10	<1.00		
02.07.2008	125	6.21	1.28	0.65	1.80	<1	2	69	3	205	1.09	0.08	0.12	0.01	1.22	2.42	0.20	0.20	<1.00		
05.08.2008	80	6.77	1.86	1.38	2.00	1	8	95	24	235	1.75	0.10	0.08	0.01	0.47	1.90	0.20	<0.10	38.50	<0.20	1.40
09.09.2008	293	5.76	1.68	2.82	5.70	2	7	55	8	290	1.63	0.26	0.77	0.03	2.92	5.76	0.67	0.10	<1.00		
16.10.2008	101	6.06	1.52	0.99	3.30	<1	4	68	9	250	1.51	0.10	0.29	0.02	0.99	4.04	0.71	<0.10	<1.00	<0.20	1.40
06.11.2008	203	6.05	1.45	0.61	2.70	<1	3	72	20	240	1.75	0.10	0.31	0.02	1.05	15.00	0.73	0.20	1.50		
18.12.2008	189	6.17	2.12	0.72	2.20	1	3	120	17	225	1.81	0.20	0.21	0.02	2.47	4.15	0.31	0.10	<1.00		
Lower avg.	188	6.19	1.66	1.19	2.68	1	4	88	13	245	1.63	0.12	0.27	0.02	1.45	4.72	0.52	0.20	3.33	0.00	1.40
Upper avg..	188	6.19	1.66	1.19	2.68	1	4	88	13	245	1.63	0.12	0.27	0.02	1.45	4.72	0.52	0.23	4.17	0.20	1.40
Minimum	80	5.76	1.27	0.61	1.80	1	2	55	3	175	1.09	0.05	0.08	0.01	0.47	1.90	0.20	0.10	1.00	0.20	1.40
Maximum	303	7.08	2.17	2.82	5.70	2	8	120	25	380	1.95	0.26	0.77	0.03	2.92	15.00	0.80	0.87	38.50	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	12	12	12	12	12	12	12	12	12	4	4
St.dev	73	0.37	0.31	0.76	1.07	0	2	20	8	52	0.24	0.06	0.18	0.01	0.72	3.45	0.25	0.24	10.81	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]
08.01.2008	4	7.63	19.14	16.20	5.70	28	132	1650	4	2530	4.02	<0.05	0.68	0.01	1.78	3.17	1.00	0.46	1.50		
05.02.2008	11	7.63	18.10	16.80	5.50	33	119	2250	23	2820	5.01	0.50	0.64	0.02	2.04	5.88	1.00	0.30	3.50	<0.20	1.40
03.03.2008	11	7.69	17.80	16.30	5.20	45	106	1800	<2	2490	1.63	0.28	0.53	0.01	1.85	4.57	1.00	0.30	<1.00		
07.04.2008	4	7.82	16.19	11.30	5.20	16	74	1400	9	2180	1.03	0.29	0.27	0.01	1.63	3.28	0.95	0.63	<1.00		
06.05.2008	2	7.72	18.30	4.28	5.40	7	42	860	30	1490	0.15	0.20	0.16	0.01	3.26	5.29	1.10	<0.20	1.50	<0.20	1.40
02.06.2008	0	8.53	20.30	7.59	5.80	6	44	440	57	1460	0.75	0.25	0.22	0.01	2.21	4.35	0.98	0.20	<1.00		
01.07.2008	2	7.92	20.00	8.54	6.00	6	50	9	19	815	0.73	0.26	0.11	0.01	1.46	1.20	0.99	0.41	<1.00		
11.08.2008	3	7.96	19.70	7.57	5.80	11	58	<1	3	790	3.21	0.24	0.12	0.01	0.75	1.10	0.57	0.53	<1.00	<0.20	1.40
02.09.2008	7	7.69	19.52	5.35	5.20	2	46	1	18	660	3.59	0.30	0.07	<0.01	0.65	0.62	0.57	0.20	<1.00		
07.10.2008	10	7.59	18.82	10.30	5.00	13	65	365	11	1040	2.44	0.28	0.17	0.01	0.96	1.50	0.72	0.34	<1.00	<0.20	1.40
04.11.2008	4	7.57	18.40	6.38	5.70	17	54	950	19	1610	2.65	0.25	0.19	0.01	1.39	2.50	0.80	0.10	2.00		
09.12.2008	4	7.48	18.61	6.80	5.50	17	53	1100	25	1690	2.70	0.30	0.20	0.01	1.49	3.18	0.77	0.53	<1.00		
Lower avg.	5	7.77	18.74	9.78	5.50	17	70	902	18	1631	2.33	0.26	0.28	0.01	1.62	3.05	0.87	0.33	0.71	0.00	1.40
Upper avg..	5	7.77	18.74	9.78	5.50	17	70	902	18	1631	2.33	0.27	0.28	0.01	1.62	3.05	0.87	0.35	1.38	0.20	1.40
Minimum	0	7.48	16.19	4.28	5.00	2	42	1	2	660	0.15	0.05	0.07	0.01	0.65	0.62	0.57	0.10	1.00	0.20	1.40
Maximum	11	8.53	20.30	16.80	6.00	45	132	2250	57	2820	5.01	0.50	0.68	0.02	3.26	5.88	1.10	0.63	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	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	4	0.28	1.12	4.44	0.31	13	31	763	15	737	1.50	0.10	0.21	0.00	0.71	1.73	0.18	0.16	0.74	0.00	0.00

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]
10.01.2008	32	6.35	2.77	1.23	1.80	3	6	200	<2	260	1.30	<0.05	0.13	0.02	0.33	2.47	0.25	0.30	<1.00		
11.02.2008	22	6.47	2.55	0.24	0.93	<1	<1	240	<2	270	1.44	<0.05	0.06	0.01	0.28	2.45	0.20	<0.10		<0.20	1.40
08.05.2008	31	6.54	1.66	1.04	0.81	<1	2	110	<2	180	0.88	<0.05	0.05	0.01	0.19	1.30	0.20	<0.10	<1.00		
19.08.2008	62	6.58	1.31	0.36	0.58	<1	1	105	3	155	0.73	<0.05	0.04	0.01	<0.01	0.69	0.20	<0.10	<1.00		
29.10.2008	51	6.34	1.97	0.42	1.40	<1	2	180	<2	260	1.22	0.06	0.09	0.01	0.28	1.80	0.20	<0.10	<1.00		
Lower avg.	39	6.46	2.05	0.66	1.10	1	2	167	1	225	1.11	0.01	0.07	0.01	0.22	1.74	0.21	0.06	0.00	0.00	1.40
Upper avg..	39	6.46	2.05	0.66	1.10	1	2	167	2	225	1.11	0.05	0.07	0.01	0.22	1.74	0.21	0.14	1.00	0.20	1.40
Minimum	22	6.34	1.31	0.24	0.58	1	1	105	2	155	0.73	0.05	0.04	0.01	0.01	0.69	0.20	0.10	1.00	0.20	1.40
Maximum	62	6.58	2.77	1.23	1.80	3	6	240	3	270	1.44	0.06	0.13	0.02	0.33	2.47	0.25	0.30	1.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	no	no	no	yes
n	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	1	1
St.dev	16	0.11	0.61	0.45	0.49	1	2	58	0	53	0.30	0.00	0.04	0.01	0.13	0.76	0.02	0.09	0.00	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]
08.01.2008	38	7.43	7.12	0.50	1.80	<1	3	180	<2	300	3.19	<0.05	0.03	0.03	6.39	12.10	0.53	0.55	<1.00		
06.02.2008	39	7.34	6.27	1.13	1.70	<1	3	195	4	265	3.12	0.07	0.03	0.04	5.28	11.80	0.43	0.10	<1.00	<0.20	1.40
05.03.2008	63	7.38	7.15	1.11	2.30	<1	3	295	<2	430	3.74	0.09	0.04	0.08	12.40	31.80	0.79	0.20	<1.00		
07.04.2008	49	7.66	9.28	1.05	2.70	1	3	420	5	600	3.83	0.20	0.05	0.13	16.00	42.30	0.94	0.31	<1.00		
05.05.2008	263	6.92	3.62	10.60	4.20	3	9	125	3	295	2.57	0.20	0.10	0.03	6.89	12.30	1.00	0.41	<1.00	<0.20	1.40
05.06.2008	284	7.24	3.43	2.03	2.00	<1	4	70	3	180	1.72	0.10	0.04	0.02	4.75	6.55	0.55	0.20	<1.00		
08.07.2008	62	7.44	4.70	0.70	1.70	<1	3	125	4	245	2.04	0.10	0.02	0.03	5.27	9.98	0.35	2.10	<1.00		
06.08.2008	59	7.44	5.16	0.76	2.10	<1	4	130	6	255	2.14	0.10	0.02	0.04	6.09	11.30	0.41	0.10	<1.00	<0.20	1.40
10.09.2008	50	7.55	5.53	2.70	2.50	<1	5	93	2	245	2.31	0.10	0.09	0.04	6.05	12.90	0.75	0.41	1.50		
07.10.2008	86	7.24	5.23	2.78	6.70	1	6	77	4	310	2.85	0.20	0.07	0.08	9.72	23.80	0.79	0.53	2.00	<0.20	1.40
05.11.2008	38	7.41	5.97	0.96	2.60	<1	4	130	7	270	2.85	0.10	0.03	0.05	7.21	14.30	0.53	0.20	<1.00		
08.12.2008	34	7.65	7.14	1.24	2.00	<1	3	165	9	250	3.00	0.08	0.01	0.05	7.24	14.90	0.49	0.30	<1.00		
Lower avg.	89	7.39	5.88	2.13	2.69	0	4	167	4	304	2.78	0.11	0.04	0.05	7.77	17.00	0.63	0.45	0.29	0.00	1.40
Upper avg..	89	7.39	5.88	2.13	2.69	1	4	167	4	304	2.78	0.12	0.04	0.05	7.77	17.00	0.63	0.45	1.12	0.20	1.40
Minimum	34	6.92	3.43	0.50	1.70	1	3	70	2	180	1.72	0.05	0.01	0.02	4.75	6.55	0.35	0.10	1.00	0.20	1.40
Maximum	284	7.66	9.28	10.60	6.70	3	9	420	9	600	3.83	0.20	0.10	0.13	16.00	42.30	1.00	2.10	2.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	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	88	0.20	1.65	2.77	1.43	1	2	100	2	110	0.66	0.05	0.03	0.03	3.35	10.44	0.22	0.54	0.31	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]
08.01.2008	39	7.54	7.96	0.69	1.70	<1	3	93	<2	175	2.04	<0.05	0.03	<0.01	0.33	0.48	<0.05	0.47	<1.00		
07.02.2008	55	7.52	9.00	0.18	1.40	<1	<1	105	<2	195	2.00	0.09	0.03	0.01	0.31	0.26	<0.05	0.10	<1.00	<0.20	1.40
03.03.2008	70	7.61	8.56	0.12	1.40	<1	1	85	<2	175	1.91	0.10	0.01	<0.01	0.28	0.28	0.07	0.10	<1.00		
02.04.2008	61	7.20	8.99	0.93	1.50	<1	3	100	2	375	1.99	0.07	0.05	<0.01	0.59	1.20	0.06	0.37	<1.00		
05.05.2008	547	7.31	5.46	3.88	1.80	1	5	55	3	144	1.35	0.10	0.10	<0.01	0.51	1.50	0.29	<0.20	<1.00	<0.20	1.40
02.06.2008	477	7.24	3.61	2.24	0.95	<1	2	45	4	120	1.09	0.10	0.06	<0.01	0.26	0.57	0.20	<0.10	<1.00		
04.07.2008	233	7.30	3.05	0.83	0.67	<1	1	17	3	62	0.75	0.10	0.04	<0.01	0.22	0.24	0.10	0.45	<1.00		
15.08.2008	85	7.51	4.12	0.70	0.67	<1	2	13	2	75	0.88	0.10	0.04	<0.01	0.23	0.39	0.10	<0.10	<1.00	<0.20	1.40
03.09.2008	63	7.44	4.85	0.28	0.95	<1	1	14	2	87	1.01	0.10	0.03	0.01	0.60	3.04	0.10	<0.10	<1.00		
06.10.2008	89	7.59	6.09	1.57	1.30	<1	2	26	4	98	1.45	0.10	0.07	<0.01	0.36	1.10	0.06	0.34	<1.00	<0.20	1.40
04.11.2008	237	7.13	4.73	2.07	2.30	<1	4	24	4	125	1.49	0.10	0.13	<0.01	0.42	1.70	0.26	0.30	1.00		
02.12.2008	34	7.57	7.91	0.14	1.40	<1	4	89	4	180	1.90	0.10	0.01	<0.01	0.48	0.91	0.05	0.20	<1.00		
Lower avg.	166	7.41	6.19	1.14	1.34	0	2	56	2	151	1.49	0.09	0.05	0.00	0.38	0.97	0.11	0.19	0.08	0.00	1.40
Upper avg..	166	7.41	6.19	1.14	1.34	1	2	56	3	151	1.49	0.09	0.05	0.00	0.38	0.97	0.12	0.24	1.00	0.20	1.40
Minimum	34	7.13	3.05	0.12	0.67	1	1	13	2	62	0.75	0.05	0.01	0.01	0.22	0.24	0.05	0.10	1.00	0.20	1.40
Maximum	547	7.61	9.00	3.88	2.30	1	5	105	4	375	2.04	0.10	0.13	0.01	0.60	3.04	0.29	0.47	1.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	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	176	0.17	2.19	1.13	0.48	0	1	37	1	83	0.48	0.02	0.04	0.00	0.14	0.82	0.09	0.14	0.00	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]
09.01.2008	35	7.26	6.87	0.83	2.90	<1	3	40	<2	160	5.84	<0.05	0.01	<0.01	0.87	0.38	0.08	0.32	<1.00		
05.02.2008	34	7.32	7.14	0.43	2.70	1	3	47	<2	170	5.86	0.20	0.01	<0.01	0.66	0.21	<0.05	0.30	<1.00	<0.20	1.40
07.03.2008	32	7.27	7.68	0.99	3.20	3	4	63	17	470	6.29	0.08	0.09	0.01	0.78	1.90	0.36	0.54	<1.00		
07.04.2008	32	7.40	8.07	0.91	2.70	2	4	42	7	280	6.57	0.10	0.07	0.01	1.05	2.74	0.20	0.30	<1.00		
05.05.2008	82	7.27	5.94	11.00	4.40	6	13	57	3	240	4.51	0.10	0.10	<0.01	0.77	1.40	0.37	0.41	<1.00	<0.20	1.40
04.06.2008	761	7.07	3.71	14.00	2.90	3	11	15	3	160	3.17	0.20	0.12	<0.01	0.96	1.50	0.75	0.74	<1.00		
07.07.2008	219	7.21	4.19	0.67	2.70	<1	4	14	12	143	3.21	0.09	0.01	<0.01	0.51	49.10	0.20	1.10	<1.00		
04.08.2008	129	7.47	4.80	0.94	3.70	1	5	9	3	175	3.59	0.10	0.01	<0.01	0.45	0.61	0.10	0.53	<1.00	<0.20	1.40
04.09.2008	68	7.48	5.28	0.45	3.10	<1	3	12	3	155	3.40	0.10	0.02	<0.01	0.49	0.37	0.10	0.20	<1.00		
08.10.2008	69	7.42	5.39	0.81	3.00	<1	4	27	3	147	3.94	0.10	0.01	<0.01	0.43	0.32	0.10	0.31	<1.00	<0.20	1.40
06.11.2008	40	7.36	6.09	0.35	3.00	<1	3	32	2	165	4.13	0.08	0.01	<0.01	0.46	1.40	0.10	0.10	<1.00		
07.12.2008	36	7.35	6.34	0.44	2.80	<1	3	38	4	144	4.64	0.24	0.10	<0.01	0.49	0.69	0.10	0.32	<1.00		
Lower avg.	128	7.32	5.96	2.65	3.09	1	5	33	5	201	4.60	0.12	0.05	0.00	0.66	5.05	0.21	0.43	0.00	0.00	1.40
Upper avg..	128	7.32	5.96	2.65	3.09	2	5	33	5	201	4.60	0.12	0.05	0.01	0.66	5.05	0.21	0.43	1.00	0.20	1.40
Minimum	32	7.07	3.71	0.35	2.70	1	3	9	2	143	3.17	0.05	0.01	0.01	0.43	0.21	0.05	0.10	1.00	0.20	1.40
Maximum	761	7.48	8.07	14.00	4.40	6	13	63	17	470	6.57	0.24	0.12	0.01	1.05	49.10	0.75	1.10	1.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	207	0.12	1.35	4.65	0.50	2	3	18	5	94	1.24	0.06	0.05	0.00	0.22	13.89	0.20	0.27	0.00	0.00	0.00

Tista utløp Femsjøen																				
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
11.02.2008	53	6.68	5.27	6.30	8.30	7	15	675	<2	885	5.03	0.29	0.35	0.02	1.09	3.94	0.68	0.30	2.00		
05.05.2008	27	6.67	5.27	4.44	8.10	8	18	585	4	880	4.24	0.37	0.34	0.02	1.22	4.14	0.71	0.68	<1.00		
04.08.2008	17	6.88	5.39	6.03	7.80	3	18	470	21	870	2.55	0.29	0.34	0.02	2.50	5.43	0.65	0.44	<1.00		
06.10.2008	29	6.76	5.21	2.07	8.20	2	12	505	6	825	2.80	0.30	0.19	0.02	1.18	3.36	0.83	0.54	<1.00		
Lower avg.	32	6.75	5.28	4.71	8.10	5	16	559	8	865	3.65	0.31	0.30	0.02	1.50	4.22	0.72	0.49	0.50		
Upper avg..	32	6.75	5.28	4.71	8.10	5	16	559	8	865	3.65	0.31	0.30	0.02	1.50	4.22	0.72	0.49	1.25		
Minimum	17	6.67	5.21	2.07	7.80	2	12	470	2	825	2.55	0.29	0.19	0.02	1.09	3.36	0.65	0.30	1.00		
Maximum	53	6.88	5.39	6.30	8.30	8	18	675	21	885	5.03	0.37	0.35	0.02	2.50	5.43	0.83	0.68	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	15	0.10	0.08	1.94	0.22	3	3	91	9	27	1.18	0.04	0.08	0.00	0.67	0.87	0.08	0.16	0.50		

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]
12.02.2008	53	6.00	2.28	1.74	5.90	1	4	200	7	375	3.14	0.20	0.31	0.04	0.50	6.93	0.42	<0.10	<1.00		
06.05.2008	37	6.24	2.07	1.01	5.10	<1	4	185	8	355	3.06	0.23	0.23	0.03	0.48	5.57	0.41	<0.20	<1.00		
27.08.2008	33	6.51	2.21	1.92	4.80	<1	6	115	5	295	2.55	0.20	0.15	0.04	0.56	4.64	0.48	0.10	<1.00		
14.10.2008	25	6.32	2.00	1.34	5.50	<1	5	115	2	325	2.57	0.20	0.16	0.03	0.51	5.07	0.43	<0.10	<1.00		
Lower avg.	37	6.27	2.14	1.50	5.32	0	5	154	6	338	2.83	0.21	0.21	0.04	0.51	5.55	0.44	0.02	0.00		
Upper avg..	37	6.27	2.14	1.50	5.32	1	5	154	6	338	2.83	0.21	0.21	0.04	0.51	5.55	0.44	0.12	1.00		
Minimum	25	6.00	2.00	1.01	4.80	1	4	115	2	295	2.55	0.20	0.15	0.03	0.48	4.64	0.41	0.10	1.00		
Maximum	53	6.51	2.28	1.92	5.90	1	6	200	8	375	3.15	0.23	0.31	0.04	0.56	6.93	0.48	0.20	1.00		
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	12	0.21	0.13	0.41	0.48	0	1	45	3	35	0.32	0.02	0.07	0.01	0.04	0.99	0.03	0.05	0.00		

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]
12.02.2008	197	6.43	3.27	1.91	3.80	3	5	300	8	465	3.10	0.10	0.38	0.05	1.19	10.40	0.39	0.10	<1.00		
06.05.2008	234	6.36	1.87	1.04	3.50	<1	4	155	23	325	2.03	0.20	0.37	0.03	0.63	5.09	0.21	<0.20	<1.00		
27.08.2008	110	6.49	2.27	1.46	4.50	<1	5	105	11	295	1.99	0.22	0.28	0.03	0.73	5.12	0.33	0.10	<1.00		
14.10.2008	104	6.11	1.51	0.82	3.70	<1	3	115	9	260	2.12	0.20	0.26	0.03	0.66	4.31	0.24	<0.10	<1.00		
Lower avg.	161	6.35	2.23	1.31	3.88	1	4	169	13	336	2.31	0.18	0.32	0.04	0.80	6.23	0.29	0.05	0.00		
Upper avg..	161	6.35	2.23	1.31	3.88	2	4	169	13	336	2.31	0.18	0.32	0.04	0.80	6.23	0.29	0.12	1.00		
Minimum	104	6.11	1.51	0.82	3.50	1	3	105	8	260	1.99	0.10	0.26	0.03	0.63	4.31	0.21	0.10	1.00		
Maximum	234	6.49	3.27	1.91	4.50	3	5	300	23	465	3.10	0.22	0.38	0.05	1.19	10.40	0.39	0.20	1.00		
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	65	0.17	0.76	0.48	0.44	1	1	90	7	90	0.53	0.05	0.06	0.01	0.26	2.81	0.08	0.05	0.00		

Tovdalselva																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
06.02.2008	218	5.83	2.33	0.90	4.20	<1	3	175	7	330	1.92	0.20	0.57	0.07	0.93	9.67	0.46	0.20	<1.00		
01.05.2008	218	6.17	2.17	2.03	4.50	<1	5	125	14	315	1.94	0.23	0.60	0.04	2.20	5.92	0.33	0.20	<1.00		
05.08.2008	41	6.67	1.85	0.92	3.60	<1	4	41	6	235	0.64	0.20	0.19	0.02	0.38	2.34	0.27	<0.10	<1.00		
16.10.2008	50	6.27	1.88	2.50	5.30	<1	7	67	13	320	1.87	0.24	0.49	0.04	1.82	5.64	0.36	<0.10	1.50		
Lower avg.	132	6.24	2.06	1.59	4.40	0	5	102	10	300	1.59	0.22	0.46	0.04	1.33	5.89	0.36	0.10	0.38		
Upper avg..	132	6.24	2.06	1.59	4.40	1	5	102	10	300	1.59	0.22	0.46	0.04	1.33	5.89	0.36	0.15	1.12		
Minimum	41	5.83	1.85	0.90	3.60	1	3	41	6	235	0.64	0.20	0.19	0.02	0.38	2.34	0.27	0.10	1.00		
Maximum	218	6.67	2.33	2.50	5.30	1	7	175	14	330	1.94	0.24	0.60	0.07	2.20	9.67	0.46	0.20	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	100	0.35	0.23	0.81	0.71	0	2	60	4	44	0.64	0.02	0.19	0.02	0.83	3.00	0.08	0.06	0.25		

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]
16.02.2008	82	6.19	2.08	1.07	3.50	<1	5	120	5	280	1.56	0.10	0.55	0.02	0.90	4.51	0.20	0.10	<1.00		
05.05.2008	177	6.32	1.92	1.26	3.60	<1	5	130	15	300	1.43	0.20	0.51	0.03	1.02	4.06	0.10	<0.20	<1.00		
09.08.2008	65	6.46	1.42	1.59	2.70	<1	4	110	10	275	0.81	0.10	0.29	0.02	0.39	2.57	0.10	0.30	<1.00		
22.10.2008	179	6.03	1.88	2.50	5.40	1	7	88	21	355	1.59	0.20	0.62	0.03	0.56	4.74	0.25	0.20	3.00		
Lower avg.	126	6.25	1.82	1.60	3.80	0	5	112	13	303	1.35	0.15	0.49	0.02	0.72	3.97	0.16	0.15	0.75		
Upper avg..	126	6.25	1.82	1.60	3.80	1	5	112	13	303	1.35	0.15	0.49	0.02	0.72	3.97	0.16	0.20	1.50		
Minimum	65	6.03	1.42	1.07	2.70	1	4	88	5	275	0.81	0.10	0.29	0.02	0.39	2.57	0.10	0.10	1.00		
Maximum	179	6.46	2.08	2.50	5.40	1	7	130	21	355	1.59	0.20	0.62	0.03	1.02	4.74	0.25	0.30	3.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	60	0.18	0.28	0.63	1.14	0	1	18	7	37	0.36	0.06	0.14	0.00	0.30	0.98	0.08	0.08	1.00		

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]
16.02.2008	30	6.20	3.14	0.86	2.80	<1	6	205	<2	310	1.91	0.10	0.37	0.03	1.31	5.47	0.10	<0.10	<1.00		
05.05.2008	48	6.59	2.81	2.24	3.30	3	7	160	5	320	1.43	0.20	0.54	0.02	0.70	4.18	0.10	<0.20	<1.00		
09.08.2008	22	6.62	2.22	5.10	4.10	3	12	82	2	330	0.77	0.21	0.29	0.01	0.31	2.40	0.10	0.33	<1.00		
22.10.2008	68	6.15	2.36	2.69	4.90	2	8	110	13	355	1.54	0.24	0.70	0.03	0.58	4.91	0.20	0.30	1.50		
Lower avg.	42	6.39	2.63	2.72	3.78	2	8	139	5	329	1.41	0.19	0.48	0.02	0.73	4.24	0.12	0.16	0.38		
Upper avg..	42	6.39	2.63	2.72	3.78	2	8	139	6	329	1.41	0.19	0.48	0.02	0.73	4.24	0.12	0.23	1.12		
Minimum	22	6.15	2.22	0.86	2.80	1	6	82	2	310	0.77	0.10	0.29	0.01	0.31	2.40	0.10	0.10	1.00		
Maximum	68	6.62	3.14	5.10	4.90	3	12	205	13	355	1.91	0.24	0.70	0.03	1.31	5.47	0.20	0.33	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	20	0.25	0.42	1.77	0.92	1	3	54	5	19	0.48	0.06	0.18	0.01	0.42	1.34	0.05	0.10	0.25		

Kvina																				
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
16.02.2008	53	5.72	3.43	0.78	2.50	<1	3	180	<2	255	1.72	0.10	0.45	0.04	0.89	6.18	0.10	<0.10	1.00		
05.05.2008	108	5.98	1.96	2.46	4.00	1	6	185	5	360	0.88	0.21	0.55	0.01	0.88	3.23	0.23	<0.20	<1.00		
09.08.2008	53	6.66	2.35	2.10	5.50	2	10	45	5	375	1.09	0.29	0.96	0.02	0.99	4.07	0.10	0.43	<1.00		
22.10.2008	179	5.76	2.37	2.63	6.80	3	11	87	6	355	1.84	0.25	0.90	0.03	1.28	4.76	0.20	0.10	4.50		
Lower avg.	98	6.03	2.53	1.99	4.70	2	8	124	4	336	1.38	0.21	0.71	0.02	1.01	4.56	0.16	0.13	1.38		
Upper avg..	98	6.03	2.53	1.99	4.70	2	8	124	5	336	1.38	0.21	0.71	0.02	1.01	4.56	0.16	0.21	1.88		
Minimum	53	5.72	1.96	0.78	2.50	1	3	45	2	255	0.88	0.10	0.45	0.01	0.88	3.23	0.10	0.10	1.00		
Maximum	179	6.66	3.43	2.63	6.80	3	11	185	6	375	1.84	0.29	0.96	0.04	1.28	6.18	0.23	0.43	4.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	60	0.44	0.63	0.84	1.86	1	4	69	2	55	0.47	0.08	0.25	0.01	0.19	1.25	0.07	0.16	1.75		

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]
16.02.2008	113	5.43	1.60	0.49	1.60	<1	3	81	6	160	0.92	0.10	0.28	0.01	0.31	2.27	0.10	<0.10	1.00		
05.05.2008	196	5.41	1.66	0.43	1.50	<1	4	90	25	235	0.90	0.09	0.25	0.02	0.98	2.76	0.09	<0.20	<1.00		
09.08.2008	124	5.76	1.38	0.87	1.80	<1	3	92	11	225	0.73	0.10	0.30	0.01	0.64	3.19	0.10	0.38	<1.00		
22.10.2008	349	5.62	1.34	0.82	1.90	<1	4	80	36	240	0.79	0.08	0.27	0.01	0.90	2.52	0.10	0.50	1.00		
Lower avg.	196	5.56	1.50	0.65	1.70	0	4	86	20	215	0.83	0.09	0.27	0.01	0.71	2.68	0.10	0.22	0.50		
Upper avg..	196	5.56	1.50	0.65	1.70	1	4	86	20	215	0.83	0.09	0.27	0.01	0.71	2.68	0.10	0.30	1.00		
Minimum	113	5.41	1.34	0.43	1.50	1	3	80	6	160	0.73	0.08	0.25	0.01	0.31	2.27	0.09	0.10	1.00		
Maximum	349	5.76	1.66	0.87	1.90	1	4	92	36	240	0.92	0.10	0.30	0.02	0.98	3.19	0.10	0.50	1.00		
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	109	0.17	0.16	0.23	0.18	0	1	6	14	37	0.09	0.01	0.02	0.01	0.31	0.39	0.01	0.18	0.00		

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]
26.02.2008	111	6.26	3.49	0.92	1.20	2	12	335	<2	405	1.48	<0.05	0.26	0.02	0.23	3.22	<0.05	0.10	1.00		
22.05.2008	34	6.49	3.08	0.74	1.20	<1	5	270	5	350	1.28	0.10	0.15	0.02	0.16	2.06	0.10	0.38	<1.00		
05.08.2008	40	6.68	3.33	0.75	1.40	<1	6	285	11	425	1.20	0.09	0.19	0.02	0.20	1.70	0.10	<0.10	<1.00		
13.10.2008	61	6.38	3.27	0.37	1.60	<1	5	270	4	370	1.35	0.10	0.17	0.02	0.21	2.47	0.10	<0.10	1.50		
Lower avg.	62	6.45	3.29	0.70	1.35	1	7	290	5	388	1.33	0.07	0.19	0.02	0.20	2.36	0.08	0.12	0.62		
Upper avg..	62	6.45	3.29	0.70	1.35	1	7	290	6	388	1.33	0.08	0.19	0.02	0.20	2.36	0.09	0.17	1.12		
Minimum	34	6.26	3.08	0.37	1.20	1	5	270	2	350	1.20	0.05	0.15	0.02	0.16	1.70	0.05	0.10	1.00		
Maximum	111	6.68	3.49	0.92	1.60	2	12	335	11	425	1.48	0.10	0.26	0.02	0.23	3.22	0.10	0.38	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	35	0.18	0.17	0.23	0.19	1	3	31	4	34	0.12	0.02	0.05	0.00	0.03	0.65	0.03	0.14	0.25		

Figgjoelva																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
30.01.2008	8	6.76	9.25	3.80	2.60	10	18	1095	4	1300	3.27	<0.05	0.44	0.02	2.58	10.20	0.60	0.10	14.00		
06.05.2008	5	7.24	11.50	2.45	2.50	11	23	840	7	1140	2.09	0.20	0.34	0.01	1.53	5.55	0.35	<0.20	<1.00		
11.08.2008	7	7.32	8.76	1.79	3.10	4	15	505	7	900	1.73	0.10	0.29	0.01	0.95	4.56	0.25	0.35	1.00		
07.10.2008	11	6.93	8.86	3.22	3.30	8	23	940	4	1250	2.31	0.10	0.41	0.01	1.06	5.16	0.43	0.42	1.50		
Lower avg.	8	7.06	9.59	2.82	2.88	8	20	845	6	1148	2.35	0.10	0.37	0.01	1.53	6.37	0.41	0.22	4.12		
Upper avg..	8	7.06	9.59	2.82	2.88	8	20	845	6	1148	2.35	0.11	0.37	0.01	1.53	6.37	0.41	0.27	4.38		
Minimum	5	6.76	8.76	1.79	2.50	4	15	505	4	900	1.73	0.05	0.29	0.01	0.95	4.56	0.25	0.10	1.00		
Maximum	11	7.32	11.50	3.80	3.30	11	23	1095	7	1300	3.27	0.20	0.44	0.02	2.58	10.20	0.60	0.42	14.00		
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	3	0.26	1.29	0.88	0.39	3	4	250	2	178	0.66	0.06	0.07	0.01	0.74	2.59	0.15	0.15	6.42		

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]
04.02.2008	27	6.00	2.86	0.12	0.86	<1	<1	83	<2	121	1.55	0.09	0.11	0.02	0.15	2.66	0.10	<0.10	2.00		
04.05.2008	25	6.53	2.13	0.21	0.82	<1	2	155	3	190	0.90	0.07	0.17	0.01	0.15	1.30	0.05	<0.20	1.00		
03.08.2008	8	6.71	1.43	0.30	0.84	<1	2	155	3	220	1.07	<0.05	0.09	0.01	0.16	0.58	<0.05	<0.10	7.50		
13.10.2008	15	6.43	1.53	1.33	1.70	<1	4	32	<2	96	1.41	0.06	0.19	0.02	0.25	4.08	0.08	<0.10	1.50		
Lower avg.	19	6.42	1.99	0.49	1.06	0	2	106	2	157	1.23	0.06	0.14	0.01	0.18	2.16	0.06	0.00	3.00		
Upper avg..	19	6.42	1.99	0.49	1.06	1	2	106	3	157	1.23	0.07	0.14	0.01	0.18	2.16	0.07	0.12	3.00		
Minimum	8	6.00	1.43	0.12	0.82	1	1	32	2	96	0.90	0.05	0.09	0.01	0.15	0.58	0.05	0.10	1.00		
Maximum	27	6.71	2.86	1.33	1.70	1	4	155	3	220	1.55	0.09	0.19	0.02	0.25	4.08	0.10	0.20	7.50		
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	4		
St.dev	9	0.30	0.66	0.57	0.43	0	1	60	1	58	0.30	0.02	0.05	0.01	0.05	1.55	0.02	0.05	3.03		

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]
12.02.2008	49	6.50	5.59	1.27	1.10	<1	3	1550	<2	1555	2.85	<0.05	0.07	0.01	0.38	2.17	0.08	<0.10	<1.00		
13.05.2008	70	6.31	1.94	0.32	0.96	<1	1	84	13	160	0.92	<0.05	0.11	0.01	0.19	1.60	0.10	<0.10	<1.00		
19.09.2008	16	6.40	2.28	0.57	1.00	<1	1	195	5	255	1.11	<0.05	0.09	0.01	0.17	1.30	0.07	<0.10	<1.00		
04.11.2008	57	6.31	2.28	0.62	1.10	<1	4	170	7	265	1.20	<0.05	0.11	0.01	0.32	3.73	0.10	<0.10	1.00		
Lower avg.	48	6.38	3.02	0.70	1.04	0	2	500	6	559	1.52	0.00	0.09	0.01	0.26	2.20	0.09	0.00	0.25		
Upper avg..	48	6.38	3.02	0.70	1.04	1	2	500	7	559	1.52	0.05	0.09	0.01	0.26	2.20	0.09	0.10	1.00		
Minimum	16	6.31	1.94	0.32	0.96	1	1	84	2	160	0.92	0.05	0.07	0.01	0.17	1.30	0.07	0.10	1.00		
Maximum	71	6.50	5.59	1.27	1.10	1	4	1550	13	1555	2.85	0.05	0.11	0.01	0.38	3.73	0.10	0.10	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	23	0.09	1.72	0.41	0.07	0	2	702	5	666	0.89	0.00	0.02	0.00	0.10	1.08	0.02	0.00	0.00		

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]
12.02.2008	36	6.32	2.77	<0.10	0.66	<1	1	72	<2	89	1.53	<0.05	0.05	0.01	0.13	2.01	0.07	<0.10	<1.00		
14.05.2008	40	6.38	1.41	0.34	1.30	<1	2	9	3	70	0.94	<0.05	0.08	0.01	0.25	1.20	0.33	<0.10	<1.00		
19.09.2008	14	6.78	2.64	1.11	1.60	2	4	170	6	265	1.99	<0.05	0.09	0.01	0.26	1.40	0.25	0.20	<1.00		
04.11.2008	40	6.73	2.61	0.24	0.95	<1	3	66	14	160	1.83	<0.05	0.07	0.02	0.95	5.22	0.39	<0.10	1.50		
Lower avg.	32	6.55	2.36	0.42	1.13	1	3	79	6	146	1.57	0.00	0.07	0.01	0.40	2.46	0.26	0.05	0.38		
Upper avg..	32	6.55	2.36	0.45	1.13	1	3	79	6	146	1.57	0.05	0.07	0.01	0.40	2.46	0.26	0.12	1.12		
Minimum	14	6.32	1.41	0.10	0.66	1	1	9	2	70	0.94	0.05	0.05	0.01	0.13	1.20	0.07	0.10	1.00		
Maximum	40	6.78	2.77	1.11	1.60	2	4	170	14	265	1.99	0.05	0.09	0.02	0.95	5.22	0.39	0.20	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	13	0.24	0.64	0.45	0.41	1	1	67	5	88	0.46	0.00	0.02	0.01	0.37	1.87	0.14	0.05	0.25		

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]
12.02.2008	33	6.08	2.67	<0.10	0.51	<1	2	235	<2	260	1.22	<0.05	0.06	0.02	0.26	3.49	0.21	<0.10	2.00		
14.05.2008	51	5.91	1.52	0.26	0.53	<1	<1	110	3	160	0.62	<0.05	0.10	0.01	0.14	1.30	0.10	<0.10	<1.00		
12.09.2008	15	6.46	1.52	0.22	0.69	<1	1	195	4	255	0.94	0.06	0.10	0.03	0.59	8.63	0.10	0.60	<1.00		
28.10.2008	140	6.18	1.77	0.13	0.82	1	2	115	2	190	1.13	<0.05	0.08	0.01	0.72	2.47	0.10	<0.10	<1.00		
Lower avg.	60	6.16	1.87	0.15	0.64	0	1	164	2	216	0.98	0.02	0.08	0.02	0.43	3.97	0.13	0.15	0.50		
Upper avg..	60	6.16	1.87	0.18	0.64	1	2	164	3	216	0.98	0.05	0.08	0.02	0.43	3.97	0.13	0.22	1.25		
Minimum	15	5.91	1.52	0.10	0.51	1	1	110	2	160	0.62	0.05	0.06	0.01	0.14	1.30	0.10	0.10	1.00		
Maximum	140	6.46	2.67	0.26	0.82	1	2	235	4	260	1.22	0.06	0.10	0.03	0.72	8.63	0.21	0.60	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	56	0.23	0.55	0.08	0.15	0	1	61	1	49	0.27	0.01	0.02	0.01	0.27	3.23	0.06	0.25	0.50		

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]
12.02.2008	11	6.24	2.95	0.41	0.85	<1	3	215	<2	250	1.05	0.08	0.13	0.02	0.29	3.95	0.36	<0.10	1.50		
18.06.2008	4	6.24	3.11	2.92	1.00	1	9	170	46	350	1.33	0.27	0.75	0.02	1.05	4.68	0.40	0.20	<1.00		
12.09.2008	5	6.98	223.00	0.38	1.10	<1	3	170	30	285	0.81	<0.05	0.11	0.01	1.60	1.30	0.10	0.30	<1.00		
28.10.2008	31	6.43	2.75	0.89	1.30	1	10	155	19	290	1.01	0.20	0.20	0.02	0.69	3.67	0.41	<0.10	1.00		
Lower avg.	13	6.47	57.95	1.15	1.06	1	6	178	24	294	1.05	0.14	0.30	0.02	0.91	3.40	0.32	0.12	0.62		
Upper avg..	13	6.47	57.95	1.15	1.06	1	6	178	24	294	1.05	0.15	0.30	0.02	0.91	3.40	0.32	0.18	1.12		
Minimum	4	6.24	2.75	0.38	0.85	1	3	155	2	250	0.81	0.05	0.11	0.01	0.29	1.30	0.10	0.10	1.00		
Maximum	31	6.98	223.00	2.92	1.30	1	10	215	46	350	1.33	0.27	0.75	0.02	1.60	4.68	0.41	0.30	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	12	0.35	110.03	1.20	0.19	0	4	26	19	42	0.21	0.10	0.31	0.01	0.56	1.46	0.15	0.10	0.25		

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]
18.02.2008	195	6.25	1.95	0.43	1.00	1	5	155	4	205	1.13	0.07	0.04	<0.01	0.30	1.30	0.32	<0.10	1.50		
03.03.2008	167	6.70	2.05	0.47	1.10	3	4	165	6	235	1.24	0.10	0.05	0.01	0.34	1.60	0.39	<0.10	<1.00		
01.04.2008	78	6.34	2.04	0.96	1.10	<1	6	155	8	280	1.20	<0.05	0.12	0.01	2.15	5.23	0.31	0.10	<1.00		
05.05.2008	157	6.51	2.34	0.59	1.10	<1	4	170	16	260	1.30	0.06	0.06	0.01	0.35	1.50	0.32	<0.20	2.00	<0.20	1.40
02.06.2008	229	6.41	1.59	0.59	0.79	<1	5	115	5	165	0.98	0.06	0.06	<0.01	0.23	1.30	0.23	<0.10	<1.00		
08.07.2008	144	6.39	0.98	0.48	0.56	<1	2	47	2	104	0.62	0.09	0.06	0.01	0.33	1.40	0.25	<0.10	<1.00		
05.08.2008	70	6.43	0.93	0.72	0.61	<1	4	38	4	103	0.56	<0.05	0.06	0.01	0.44	1.70	0.30	<0.10	2.50	<0.20	1.40
02.09.2008	47	6.58	1.02	0.46	0.80	<1	<1	34	3	113	0.62	0.07	0.04	<0.01	0.36	2.49	0.23	<0.10	<1.00		
13.10.2008	135	6.27	1.21	0.68	1.30	<1	4	50	11	230	0.92	0.08	0.09	0.01	0.38	1.80	0.27	<0.10	<1.00	<0.20	1.40
17.11.2008	249	6.59	1.64	0.73	1.10	<1	5	115	9	195	1.05	0.06	0.08	0.01	0.39	4.33	0.33	<0.10	<1.00		
03.12.2008	100	6.46	1.62	0.79	1.30	1	7	120	9	210	1.18	0.10	0.07	0.01	0.43	2.55	0.45	0.30	<1.00		
Lower avg.	143	6.45	1.58	0.63	0.98	0	4	106	7	191	0.98	0.06	0.07	0.01	0.52	2.29	0.31	0.04	0.55	0.00	1.40
Upper avg..	143	6.45	1.58	0.63	0.98	1	4	106	7	191	0.98	0.07	0.07	0.01	0.52	2.29	0.31	0.13	1.27	0.20	1.40
Minimum	47	6.25	0.93	0.43	0.56	1	1	34	2	103	0.56	0.05	0.04	0.01	0.23	1.30	0.23	0.10	1.00	0.20	1.40
Maximum	249	6.70	2.34	0.96	1.30	3	7	170	16	280	1.31	0.10	0.12	0.01	2.15	5.23	0.45	0.30	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	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	11	3	3
St.dev	65	0.14	0.49	0.17	0.25	1	2	54	4	62	0.27	0.02	0.02	0.00	0.55	1.32	0.07	0.07	0.52	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]
12.02.2008	27	6.73	2.94	1.47	1.10	2	2	230	<2	275	3.89	<0.05	0.05	<0.01	0.55	1.10	0.09	<0.10	<1.00		
06.05.2008	74	6.62	2.10	3.99	1.30	2	4	140	7	225	2.25	0.10	0.17	<0.01	2.20	5.26	0.27	0.30	<1.00		
05.08.2008	204	6.38	0.69	29.90	0.21	45	56	32	4	55	2.57	<0.05	0.30	<0.01	0.68	2.70	0.53	0.74	<1.00		
22.10.2008	115	6.38	1.62	5.80	1.90	10	14	89	9	205	2.93	<0.05	0.19	0.01	1.28	2.24	0.29	0.30	1.50		
Lower avg.	105	6.53	1.84	10.29	1.13	15	19	123	5	190	2.91	0.02	0.18	0.00	1.18	2.82	0.30	0.34	0.38		
Upper avg..	105	6.53	1.84	10.29	1.13	15	19	123	6	190	2.91	0.06	0.18	0.01	1.18	2.82	0.30	0.36	1.12		
Minimum	27	6.38	0.69	1.47	0.21	2	2	32	2	55	2.25	0.05	0.05	0.01	0.55	1.10	0.09	0.10	1.00		
Maximum	204	6.73	2.94	29.90	1.90	45	56	230	9	275	3.89	0.10	0.30	0.01	2.20	5.26	0.53	0.74	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	75	0.18	0.94	13.19	0.70	21	25	84	3	95	0.71	0.03	0.10	0.00	0.75	1.76	0.18	0.27	0.25		

Gaular																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
22.02.2008	132	5.75	1.47	0.70	1.30	2	5	110	5	170	1.01	<0.05	0.07	<0.01	0.23	1.60	<0.05	<0.10	<1.00		
06.05.2008	77	6.12	1.69	0.74	1.20	1	4	80	6	160	0.98	0.07	0.09	0.01	0.37	1.70	0.10	0.10	<1.00		
17.08.2008	47	6.27	1.24	0.37	0.86	<1	3	27	7	109	0.53	<0.05	0.04	<0.01	0.15	0.65	0.08	<0.10	<1.00		
21.10.2008	131	5.87	1.71	0.95	2.50	3	8	73	5	320	1.03	<0.05	0.10	0.01	0.33	1.50	0.10	<0.10	2.50		
Lower avg.	97	6.00	1.53	0.69	1.46	2	5	73	6	190	0.89	0.02	0.08	0.00	0.27	1.36	0.07	0.02	0.62		
Upper avg..	97	6.00	1.53	0.69	1.46	2	5	73	6	190	0.89	0.06	0.08	0.01	0.27	1.36	0.08	0.10	1.38		
Minimum	47	5.75	1.24	0.37	0.86	1	3	27	5	109	0.54	0.05	0.04	0.01	0.15	0.65	0.05	0.10	1.00		
Maximum	132	6.27	1.71	0.95	2.50	3	8	110	7	320	1.03	0.07	0.10	0.01	0.37	1.70	0.10	0.10	2.50		
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	42	0.24	0.22	0.24	0.72	1	2	34	1	91	0.24	0.01	0.03	0.00	0.10	0.48	0.02	0.00	0.75		

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]
08.02.2008	78	6.10	2.70	0.80	1.10	3	5	185	<2	280	1.24	<0.05	0.04	0.01	0.24	2.52	0.10	<0.10	<1.00		
06.05.2008	79	6.19	1.82	0.54	1.00	<1	3	105	3	175	1.07	<0.05	0.04	0.01	0.19	1.40	0.08	<0.20	<1.00		
05.08.2008	51	6.46	1.54	0.80	1.20	<1	5	85	3	170	0.83	<0.05	0.03	0.01	0.19	1.00	0.08	<0.10	<1.00		
22.10.2008	173	5.93	1.68	1.08	2.00	3	7	115	5	230	1.13	<0.05	0.09	0.01	0.30	1.80	0.08	<0.10	1.50		
Lower avg.	95	6.17	1.94	0.80	1.32	2	5	123	3	214	1.07	0.00	0.05	0.01	0.23	1.68	0.08	0.00	0.38		
Upper avg..	95	6.17	1.94	0.80	1.32	2	5	123	3	214	1.07	0.05	0.05	0.01	0.23	1.68	0.08	0.12	1.12		
Minimum	51	5.93	1.54	0.54	1.00	1	3	85	2	170	0.83	0.05	0.03	0.01	0.19	1.00	0.08	0.10	1.00		
Maximum	173	6.46	2.70	1.08	2.00	3	7	185	5	280	1.24	0.05	0.09	0.01	0.30	2.52	0.10	0.20	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	53	0.22	0.52	0.22	0.46	1	2	43	1	52	0.17	0.00	0.03	0.00	0.05	0.65	0.01	0.05	0.25		

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]
08.02.2008	30	6.01	4.11	0.32	0.96	3	3	160	<2	215	1.55	<0.05	0.05	0.02	1.27	3.54	0.20	<0.10	<1.00		
06.05.2008	31	5.92	1.81	0.77	1.20	<1	3	36	3	95	0.79	<0.05	0.07	0.01	1.33	1.20	0.08	<0.20	<1.00		
05.08.2008	20	6.43	1.03	4.85	1.50	2	8	<1	4	104	0.51	<0.05	0.06	0.01	0.20	0.70	0.08	<0.10	<1.00		
22.10.2008	67	5.91	1.76	1.29	2.70	6	11	92	5	220	1.16	<0.05	0.12	0.01	0.33	1.80	0.20	<0.10	2.50		
Lower avg.	37	6.07	2.18	1.81	1.59	3	6	72	3	159	1.00	0.00	0.08	0.01	0.78	1.81	0.14	0.00	0.62		
Upper avg..	37	6.07	2.18	1.81	1.59	3	6	72	4	159	1.00	0.05	0.08	0.01	0.78	1.81	0.14	0.12	1.38		
Minimum	20	5.91	1.03	0.32	0.96	1	3	1	2	95	0.51	0.05	0.05	0.01	0.20	0.70	0.08	0.10	1.00		
Maximum	67	6.43	4.11	4.85	2.70	6	11	160	5	220	1.55	0.05	0.12	0.02	1.33	3.54	0.20	0.20	2.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	21	0.25	1.34	2.07	0.77	2	4	69	1	68	0.45	0.00	0.03	0.01	0.60	1.24	0.07	0.05	0.75		

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]
21.02.2008	85	6.65	1.93	0.70	0.87	2	3	260	<2	285	1.68	<0.05	0.02	<0.01	0.05	0.92	0.08	0.10	<1.00		
13.05.2008	67	6.41	1.85	0.59	0.86	<1	3	245	2	305	1.50	0.20	0.02	0.01	0.24	0.83	0.10	<0.10	<1.00		
13.08.2008	59	6.74	1.42	1.37	0.54	<1	1	64	5	91	0.81	0.05	0.02	<0.01	0.20	0.48	0.07	<0.10	<1.00		
12.10.2008	61	6.51	1.56	2.76	1.50	2	7	95	6	180	0.88	<0.05	0.06	<0.01	0.28	0.92	0.10	<0.10	1.50		
Lower avg.	68	6.58	1.69	1.36	0.94	1	4	166	3	215	1.22	0.06	0.03	0.00	0.19	0.79	0.09	0.02	0.38		
Upper avg..	68	6.58	1.69	1.36	0.94	2	4	166	4	215	1.22	0.09	0.03	0.01	0.19	0.79	0.09	0.10	1.12		
Minimum	59	6.41	1.42	0.59	0.54	1	1	64	2	91	0.81	0.05	0.02	0.01	0.05	0.48	0.07	0.10	1.00		
Maximum	85	6.74	1.93	2.76	1.50	2	7	260	6	305	1.68	0.20	0.06	0.01	0.28	0.92	0.10	0.10	1.50		
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	12	0.15	0.24	1.00	0.40	1	3	101	2	99	0.44	0.08	0.02	0.00	0.10	0.21	0.02	0.00	0.25		

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]
03.03.2008	72	7.00	5.56	1.46	1.20	3	3	430	<2	500	3.87	0.20	0.04	0.01	0.83	0.62	0.10	0.20	<1.00		
13.05.2008	219	6.99	2.80	6.21	1.90	4	8	120	3	240	2.72	<0.05	0.08	<0.01	4.31	1.70	0.31	0.30	<1.00		
04.08.2008	90	7.22	2.22	10.50	1.20	4	9	22	4	123	2.16	<0.05	0.06	<0.01	0.79	0.74	0.20	0.20	<1.00		
16.10.2008	64	7.11	3.37	0.47	0.89	<1	2	97	<2	175	3.00	<0.05	0.01	<0.01	0.77	0.70	0.07	<0.10	<1.00		
Lower avg.	112	7.08	3.49	4.66	1.30	3	6	167	2	260	2.94	0.05	0.04	0.00	1.67	0.94	0.17	0.18	0.00		
Upper avg..	112	7.08	3.49	4.66	1.30	3	6	167	3	260	2.94	0.09	0.04	0.01	1.67	0.94	0.17	0.20	1.00		
Minimum	64	6.99	2.22	0.47	0.89	1	2	22	2	123	2.16	0.05	0.01	0.01	0.77	0.62	0.07	0.10	1.00		
Maximum	219	7.22	5.56	10.50	1.90	4	9	430	4	500	3.87	0.20	0.08	0.01	4.31	1.70	0.31	0.30	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	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	73	0.11	1.46	4.63	0.43	1	4	180	1	167	0.71	0.08	0.03	0.00	1.76	0.51	0.11	0.08	0.00		

Surna																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
12.02.2008	49	6.67	2.09	0.33	1.50	<1	1	84	2	160	1.87	<0.05	0.01	<0.01	0.23	0.34	0.09	<0.10	<1.00		
05.05.2008	107	6.60	2.88	2.60	2.20	2	6	99	6	210	1.61	<0.05	0.04	<0.01	0.52	0.79	0.38	0.20	<1.00		
07.08.2008	51	6.89	2.24	2.14	4.20	<1	7	63	3	235	1.39	<0.05	0.05	<0.01	0.63	0.61	0.32	0.20	<1.00		
08.10.2008	63	7.05	3.56	0.60	3.30	1	5	195	3	360	1.97	0.05	0.03	<0.01	0.66	0.56	0.40	0.40	<1.00		
Lower avg.	67	6.80	2.69	1.42	2.80	1	5	110	4	241	1.71	0.01	0.03	0.00	0.51	0.58	0.30	0.20	0.00		
Upper avg..	67	6.80	2.69	1.42	2.80	1	5	110	4	241	1.71	0.05	0.03	0.00	0.51	0.58	0.30	0.22	1.00		
Minimum	49	6.60	2.09	0.33	1.50	1	1	63	2	160	1.39	0.05	0.01	0.01	0.23	0.34	0.09	0.10	1.00		
Maximum	107	7.05	3.56	2.60	4.20	2	7	195	6	360	1.97	0.05	0.05	0.01	0.66	0.79	0.40	0.40	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	27	0.21	0.67	1.12	1.19	1	3	58	2	85	0.26	0.00	0.02	0.00	0.20	0.19	0.14	0.13	0.00		

Gaula																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
26.02.2008	115	7.35	19.00	9.78	4.20	5	14	495	2	700	5.31	0.10	0.13	0.02	2.19	4.53	2.52	0.75	<1.00		
08.05.2008	402	6.99	3.26	28.40	2.90	6	11	37	3	160	3.27	0.10	0.34	0.01	3.03	5.11	2.20	1.50	<1.00		
21.08.2008	61	7.61	8.92	1.73	2.40	<1	4	38	17	200	2.22	0.07	0.06	<0.01	0.89	1.50	0.85	0.39	<1.00		
28.10.2008	51	7.30	12.20	1.24	3.00	<1	4	71	18	250	3.27	<0.05	0.04	0.01	2.08	2.86	0.92	0.20	<1.00		
Lower avg.	157	7.31	10.84	10.29	3.12	3	8	160	10	328	3.52	0.07	0.14	0.01	2.05	3.50	1.62	0.71	0.00		
Upper avg..	157	7.31	10.84	10.29	3.12	3	8	160	10	328	3.52	0.08	0.14	0.01	2.05	3.50	1.62	0.71	1.00		
Minimum	51	6.99	3.26	1.24	2.40	1	4	37	2	160	2.23	0.05	0.04	0.01	0.89	1.50	0.85	0.20	1.00		
Maximum	402	7.61	19.00	28.40	4.20	6	14	495	18	700	5.31	0.10	0.34	0.02	3.03	5.11	2.52	1.50	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	4		
St.dev	165	0.25	6.57	12.69	0.76	3	5	224	9	251	1.29	0.02	0.14	0.01	0.88	1.64	0.86	0.57	0.00		

Nidelva(Tr.heim)																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
26.02.2008	81	7.07	3.50	1.96	2.50	2	11	125	<2	225	2.05	<0.05	0.04	<0.01	6.07	1.10	0.61	0.32	1.00		
08.05.2008	338	7.13	3.20	1.56	2.60	<1	3	90	3	200	1.92	0.07	0.04	<0.01	2.07	1.00	0.65	0.10	<1.00		
21.08.2008	65	7.30	3.26	0.89	2.20	<1	4	39	7	170	1.58	0.06	0.03	<0.01	0.63	0.79	0.54	0.10	<1.00		
28.10.2008	53	7.11	3.49	1.65	2.40	1	4	91	7	215	2.08	0.09	0.06	0.01	1.25	0.98	0.70	0.30	<1.00		
Lower avg.	134	7.15	3.36	1.52	2.42	1	6	86	4	203	1.91	0.06	0.04	0.00	2.51	0.97	0.62	0.20	0.25		
Upper avg..	134	7.15	3.36	1.52	2.42	1	6	86	5	203	1.91	0.07	0.04	0.01	2.51	0.97	0.62	0.20	1.00		
Minimum	53	7.07	3.20	0.89	2.20	1	3	39	2	170	1.58	0.05	0.03	0.01	0.63	0.79	0.54	0.10	1.00		
Maximum	338	7.30	3.50	1.96	2.60	2	11	125	7	225	2.08	0.09	0.06	0.01	6.07	1.10	0.70	0.32	1.00		
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	136	0.10	0.16	0.45	0.17	1	4	35	3	24	0.23	0.02	0.01	0.00	2.45	0.13	0.07	0.12	0.00		

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]
27.02.2008	58	7.00	4.15	2.76	2.90	2	4	140	4	280	1.83	<0.05	0.08	<0.01	3.24	2.19	0.34	0.30	9.50		
07.05.2008	232	6.73	1.96	4.67	2.60	<1	4	34	<2	131	1.09	0.07	0.57	<0.01	2.38	3.50	0.49	0.20	<1.00		
22.08.2008	44	7.05	3.03	2.11	4.10	1	4	23	3	185	1.11	0.06	0.07	<0.01	1.41	3.46	1.60	<0.10	<1.00		
28.10.2008	45	7.12	4.40	2.41	3.60	2	4	120	8	270	2.12	0.09	0.06	0.01	2.86	5.37	0.57	0.20	<1.00		
Lower avg.	95	6.98	3.38	2.99	3.30	1	4	79	4	217	1.54	0.06	0.19	0.00	2.47	3.63	0.75	0.18	2.38		
Upper avg..	95	6.98	3.38	2.99	3.30	2	4	79	4	217	1.54	0.07	0.19	0.01	2.47	3.63	0.75	0.20	3.12		
Minimum	44	6.73	1.96	2.11	2.60	1	4	23	2	131	1.09	0.05	0.06	0.01	1.41	2.19	0.34	0.10	1.00		
Maximum	232	7.12	4.40	4.67	4.10	2	4	140	8	280	2.12	0.09	0.57	0.01	3.24	5.37	1.60	0.30	9.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	92	0.17	1.12	1.15	0.68	1	0	59	3	71	0.52	0.02	0.25	0.00	0.79	1.31	0.58	0.08	4.25		

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]
27.02.2008	40	7.37	5.97	12.80	3.80	7	11	240	<2	400	3.47	0.06	0.22	0.01	1.20	2.40	0.71	0.65	<1.00		
07.05.2008	174	6.91	2.31	15.90	2.70	13	16	30	3	131	1.66	0.10	0.25	0.01	1.31	2.08	0.74	0.51	<1.00		
22.08.2008	25	7.41	5.25	0.92	4.20	<1	3	45	4	220	1.43	0.09	0.04	<0.01	0.37	0.24	0.44	<0.10	<1.00		
28.10.2008	42	7.21	4.88	0.63	4.10	<1	3	110	4	265	1.96	0.06	0.06	<0.01	1.23	1.10	0.43	0.10	2.00		
Lower avg.	70	7.22	4.60	7.56	3.70	5	8	106	3	254	2.13	0.08	0.14	0.00	1.03	1.46	0.58	0.32	0.50		
Upper avg..	70	7.22	4.60	7.56	3.70	6	8	106	3	254	2.13	0.08	0.14	0.01	1.03	1.46	0.58	0.34	1.25		
Minimum	25	6.91	2.31	0.63	2.70	1	3	30	2	131	1.43	0.06	0.04	0.01	0.37	0.24	0.43	0.10	1.00		
Maximum	174	7.41	5.97	15.90	4.20	13	16	240	4	400	3.47	0.10	0.25	0.01	1.31	2.40	0.74	0.65	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	70	0.23	1.59	7.94	0.69	6	6	96	1	112	0.92	0.02	0.11	0.00	0.44	0.98	0.17	0.28	0.50		

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]
27.02.2008	36	7.03	4.92	0.94	4.00	2	4	225	<2	360	1.62	<0.05	0.04	<0.01	2.52	0.91	0.27	0.20	<1.00		
07.05.2008	82	7.13	4.77	2.25	4.00	1	6	185	3	330	1.46	0.10	0.06	<0.01	0.56	1.30	0.35	0.10	<1.00		
22.08.2008	11	7.32	4.87	0.68	3.50	<1	4	93	9	260	0.94	<0.05	0.03	<0.01	0.49	0.10	0.32	0.10	<1.00		
28.10.2008	27	7.13	5.17	0.87	4.10	<1	5	185	3	350	1.47	0.07	0.08	0.01	2.17	1.20	0.36	<0.10	<1.00		
Lower avg.	39	7.15	4.93	1.18	3.90	1	5	172	4	325	1.37	0.04	0.05	0.00	1.44	0.88	0.32	0.10	0.00		
Upper avg..	39	7.15	4.93	1.18	3.90	1	5	172	4	325	1.37	0.07	0.05	0.01	1.44	0.88	0.32	0.12	1.00		
Minimum	11	7.03	4.77	0.68	3.50	1	4	93	2	260	0.94	0.05	0.03	0.01	0.49	0.10	0.27	0.10	1.00		
Maximum	82	7.32	5.17	2.25	4.10	2	6	225	9	360	1.62	0.10	0.08	0.01	2.52	1.30	0.36	0.20	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	30	0.12	0.17	0.72	0.27	1	1	56	3	45	0.30	0.02	0.02	0.00	1.06	0.54	0.04	0.05	0.00		

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]
27.02.2008	28	6.90	4.39	11.70	2.60	7	8	105	<2	210	2.52	<0.05	0.19	0.01	1.34	5.72	0.83	0.76	1.50		
05.06.2008	148	6.84	1.99	3.96	1.30	2	4	33	4	100	1.01	0.10	0.07	<0.01	0.43	1.40	0.31	0.30	<1.00		
19.08.2008	17	7.18	4.69	0.73	1.40	1	4	43	3	155	0.90	0.08	0.09	0.01	1.02	1.60	0.31	0.20	<1.00		
20.10.2008	51	6.81	3.47	15.40	5.20	11	15	39	5	205	2.95	0.20	0.27	0.01	1.07	3.08	1.20	1.10	<1.00		
Lower avg.	61	6.93	3.64	7.95	2.62	5	8	55	3	168	1.85	0.10	0.15	0.01	0.96	2.95	0.66	0.59	0.38		
Upper avg..	61	6.93	3.64	7.95	2.62	5	8	55	4	168	1.85	0.11	0.15	0.01	0.96	2.95	0.66	0.59	1.12		
Minimum	17	6.81	1.99	0.73	1.30	1	4	33	2	100	0.90	0.05	0.07	0.01	0.43	1.40	0.31	0.20	1.00		
Maximum	148	7.18	4.69	15.40	5.20	11	15	105	5	210	2.95	0.20	0.27	0.01	1.34	5.72	1.20	1.10	1.50		
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	60	0.17	1.21	6.77	1.82	5	5	34	1	51	1.05	0.07	0.09	0.00	0.39	1.99	0.43	0.42	0.25		

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]
07.02.2008	48	7.05	3.78	0.17	0.77	<1	1	58	<2	116	0.88	0.07	0.01	<0.01	0.18	2.11	0.32	<0.10	<1.00		
06.05.2008	194	7.32	5.29	0.45	1.20	<1	3	39	5	117	0.92	0.10	0.40	0.02	0.52	22.90	0.30	<0.10	<1.00		
15.08.2008	78	7.40	3.63	1.34	0.54	<1	2	22	10	77	1.03	0.08	0.05	<0.01	0.28	0.92	0.24	0.10	<1.00		
06.10.2008	74	7.39	4.15	0.66	0.90	<1	3	39	3	110	0.79	0.10	0.06	0.01	0.30	2.74	0.34	0.20	2.00		
Lower avg.	98	7.29	4.21	0.66	0.85	0	2	40	5	105	0.90	0.09	0.13	0.01	0.32	7.17	0.30	0.08	0.50		
Upper avg..	98	7.29	4.21	0.66	0.85	1	2	40	5	105	0.90	0.09	0.13	0.01	0.32	7.17	0.30	0.12	1.25		
Minimum	48	7.05	3.63	0.17	0.54	1	1	22	2	77	0.79	0.07	0.01	0.01	0.18	0.92	0.24	0.10	1.00		
Maximum	194	7.40	5.29	1.34	1.20	1	3	58	10	117	1.03	0.10	0.40	0.02	0.52	22.90	0.34	0.20	2.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	no	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	65	0.16	0.75	0.50	0.28	0	1	15	4	19	0.10	0.02	0.18	0.01	0.15	10.52	0.04	0.05	0.50		

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]
07.02.2008	67	7.14	4.34	0.43	0.67	<1	2	46	3	104	1.30	<0.05	0.02	0.01	0.17	0.57	0.20	0.10	<1.00		
06.05.2008	366	7.45	6.10	1.25	1.30	<1	3	33	6	102	1.35	0.09	0.07	<0.01	0.37	1.50	0.21	0.10	<1.00		
15.08.2008	166	7.43	3.76	0.22	0.72	<1	1	26	5	78	0.68	0.09	0.04	<0.01	0.28	2.00	0.34	<0.10	<1.00		
06.10.2008	184	7.45	4.30	0.40	0.68	<1	2	31	4	79	1.16	0.07	0.01	<0.01	0.26	0.43	0.20	0.20	1.50		
Lower avg.	196	7.37	4.62	0.57	0.84	0	2	34	5	91	1.12	0.06	0.03	0.00	0.27	1.12	0.24	0.10	0.38		
Upper avg..	196	7.37	4.62	0.57	0.84	1	2	34	5	91	1.12	0.08	0.03	0.01	0.27	1.12	0.24	0.12	1.12		
Minimum	67	7.14	3.76	0.22	0.67	1	1	26	3	78	0.69	0.05	0.01	0.01	0.17	0.43	0.20	0.10	1.00		
Maximum	366	7.45	6.10	1.25	1.30	1	3	46	6	104	1.35	0.09	0.07	0.01	0.37	2.00	0.34	0.20	1.50		
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	125	0.15	1.02	0.46	0.31	0	1	9	1	14	0.30	0.02	0.03	0.00	0.08	0.75	0.07	0.05	0.25		

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]
06.03.2008	27	7.01	10.90	215.00	3.00	152	162	1150	245	1920	4.24	0.52	3.36	0.19	5.43	62.00	3.33	3.15	5.00		
20.05.2008	33	7.37	6.56	0.53	1.10	<1	2	47	2	136	2.40	0.06	0.01	<0.01	0.35	0.36	0.41	0.20	<1.00		
05.08.2008	46	7.32	3.13	2.04	0.25	<1	2	10	4	56	1.64	0.10	0.06	<0.01	0.32	0.68	0.38	0.20	<1.00		
15.10.2008	94	7.14	3.99	2.00	3.00	1	5	15	<2	133	2.27	0.07	0.05	<0.01	0.61	0.92	0.64	<0.10	1.00		
Lower avg.	50	7.21	6.14	54.89	1.84	38	43	306	63	561	2.64	0.19	0.87	0.05	1.68	15.99	1.19	0.89	1.50		
Upper avg..	50	7.21	6.14	54.89	1.84	39	43	306	63	561	2.64	0.19	0.87	0.05	1.68	15.99	1.19	0.91	2.00		
Minimum	27	7.01	3.13	0.53	0.25	1	2	10	2	56	1.64	0.06	0.01	0.01	0.32	0.36	0.38	0.10	1.00		
Maximum	94	7.37	10.90	215.00	3.00	152	162	1150	245	1920	4.24	0.52	3.36	0.19	5.43	62.00	3.33	3.15	5.00		
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	30	0.17	3.49	106.74	1.39	76	80	563	121	907	1.12	0.22	1.66	0.09	2.51	30.67	1.43	1.49	2.00		

Målselv																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
03.02.2008	33	7.36	9.24	0.57	1.10	<1	2	90	18	315	3.02	<0.05	0.03	0.01	0.74	4.99	<0.05	0.10	<1.00		
06.05.2008	230	7.41	6.88	9.27	2.90	7	14	34	6	200	2.59	0.09	0.16	<0.01	0.91	1.80	0.57	0.53	<1.00		
04.08.2008	99	7.78	7.43	0.69	0.85	<1	2	15	4	103	2.09	<0.05	0.01	<0.01	0.28	0.27	0.07	<0.10	<1.00		
07.10.2008	110	7.79	8.41	0.60	1.00	<1	2	25	2	98	2.37	<0.05	0.01	<0.01	0.36	0.29	0.07	0.30	<1.00		
Lower avg.	118	7.58	7.99	2.78	1.46	2	5	41	8	179	2.52	0.02	0.05	0.00	0.57	1.84	0.18	0.23	0.00		
Upper avg..	118	7.58	7.99	2.78	1.46	3	5	41	8	179	2.52	0.06	0.05	0.01	0.57	1.84	0.19	0.26	1.00		
Minimum	33	7.36	6.88	0.57	0.85	1	2	15	2	98	2.09	0.05	0.01	0.01	0.28	0.27	0.05	0.10	1.00		
Maximum	230	7.79	9.24	9.27	2.90	7	14	90	18	315	3.02	0.09	0.16	0.01	0.91	4.99	0.57	0.53	1.00		
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no		
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4		
St.dev	82	0.23	1.05	4.33	0.96	3	6	34	7	102	0.39	0.02	0.07	0.00	0.30	2.22	0.25	0.21	0.00		

Barduelva																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
03.02.2008	30	7.47	7.80	7.50	1.10	<1	3	90	22	310	2.70	<0.05	0.06	0.01	0.54	4.39	0.09	0.20	5.50		
06.05.2008	209	7.58	9.58	27.90	2.40	23	32	43	15	225	2.65	0.06	0.16	0.01	0.93	2.76	0.48	0.40	<1.00		
04.08.2008	90	7.83	9.48	2.89	0.70	1	4	22	7	103	1.90	0.07	0.03	<0.01	0.37	0.29	<0.05	0.20	<1.00		
07.10.2008	100	7.81	8.37	1.35	0.99	<1	3	25	3	98	2.14	0.06	0.02	<0.01	0.35	0.33	0.05	0.30	<1.00		
Lower avg.	107	7.67	8.81	9.91	1.30	6	11	45	12	184	2.35	0.05	0.07	0.00	0.55	1.94	0.16	0.28	1.38		
Upper avg..	107	7.67	8.81	9.91	1.30	7	11	45	12	184	2.35	0.06	0.07	0.01	0.55	1.94	0.17	0.28	2.12		
Minimum	30	7.47	7.80	1.35	0.70	1	3	22	3	98	1.90	0.05	0.02	0.01	0.35	0.29	0.05	0.20	1.00		
Maximum	209	7.83	9.58	27.90	2.40	23	32	90	22	310	2.70	0.07	0.16	0.01	0.93	4.39	0.48	0.40	5.50		
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	75	0.18	0.87	12.28	0.75	11	14	31	8	102	0.39	0.01	0.06	0.00	0.27	2.00	0.21	0.10	2.25		

Tanaelva																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.02.2008	65	6.76	9.27	0.14	0.68	2	2	230	<2	300	11.17	<0.05	0.01	0.01	0.50	0.85	0.20	0.20	<1.00		
07.05.2008	270	7.22	5.81	2.76	2.60	6	13	33	5	200	7.81	0.07	0.05	<0.01	0.51	0.92	0.36	0.31	<1.00		
11.08.2008	153	7.37	4.40	0.63	3.10	<1	3	7	7	92	6.03	0.07	0.01	<0.01	0.34	0.37	0.28	0.20	<1.00		
10.10.2008	141	7.29	4.65	0.93	2.60	<1	6	12	3	124	7.40	0.05	0.01	<0.01	0.34	0.35	0.24	0.30	<1.00		
Lower avg.	157	7.16	6.03	1.12	2.24	2	6	71	4	179	8.10	0.05	0.02	0.00	0.42	0.62	0.27	0.25	0.00		
Upper avg..	157	7.16	6.03	1.12	2.24	3	6	71	4	179	8.10	0.06	0.02	0.01	0.42	0.62	0.27	0.25	1.00		
Minimum	65	6.76	4.40	0.14	0.68	1	2	7	2	92	6.03	0.05	0.01	0.01	0.34	0.35	0.20	0.20	1.00		
Maximum	270	7.37	9.27	2.76	3.10	6	13	230	7	300	11.17	0.07	0.05	0.01	0.51	0.92	0.36	0.31	1.00		
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	85	0.27	2.24	1.14	1.07	2	5	107	2	93	2.18	0.01	0.02	0.00	0.10	0.31	0.07	0.06	0.00		

Pasvikelva																					
Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.02.2008	74	6.74	3.21	0.27	2.60	1	2	48	6	180	5.22	0.06	0.04	0.01	0.79	1.40	0.77	0.20	<1.00		
07.05.2008	393	6.96	3.14	0.96	2.70	2	6	41	11	215	4.56	0.40	0.28	0.03	5.09	5.94	6.27	0.20	<1.00		
11.08.2008	86	7.34	3.32	0.61	2.70	<1	3	<1	9	94	4.24	0.10	0.02	<0.01	0.98	0.46	3.48	<0.10	<1.00		
12.10.2008	94	7.19	3.51	0.96	2.90	<1	4	3	3	121	4.73	0.10	0.02	0.01	1.01	0.97	5.25	<0.10	<1.00		
Lower avg.	162	7.06	3.30	0.70	2.72	1	4	23	7	153	4.69	0.16	0.09	0.01	1.97	2.19	3.94	0.10	0.00		
Upper avg..	162	7.06	3.30	0.70	2.72	1	4	23	7	153	4.69	0.16	0.09	0.01	1.97	2.19	3.94	0.15	1.00		
Minimum	74	6.74	3.14	0.27	2.60	1	2	1	3	94	4.24	0.06	0.02	0.01	0.79	0.46	0.77	0.10	1.00		
Maximum	393	7.34	3.51	0.96	2.90	2	6	48	11	215	5.22	0.40	0.28	0.03	5.09	5.94	6.27	0.20	1.00		
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	155	0.26	0.16	0.33	0.13	1	2	25	4	55	0.41	0.16	0.13	0.01	2.08	2.53	2.41	0.06	0.00		

Table 2.
Riverine inputs from the 10 main and 36 + 109 tributary rivers in Norway in 2008

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.*	72 829	416 367	109 124	359	543	9 445	511	15 075	122 134	5.347	11.868	0.404	54.077	122.037	25.510	13.119	2.36	0.00	1.32
	upper avg.	72 829	416 367	109 124	360	543	9 445	511	15 075	122 134	5.347	11.868	0.404	54.077	122.037	25.510	13.384	27.44	5.33	36.61
Drammenselva	*lower avg.*	34 239	35 355	40 489	26	76	3 437	120	5 406	36 039	1.408	1.849	0.128	13.706	44.529	5.584	1.709	3.60	0.00	0.00
	upper avg.	34 239	35 355	40 489	30	81	3 437	120	5 406	36 039	1.435	1.849	0.133	13.706	44.529	5.584	2.236	15.23	2.51	17.54
Numedalslågen	*lower avg.*	11 742	28 990	16 469	19	45	890	94	1 680	14 507	0.675	1.439	0.066	5.530	18.841	1.543	0.685	0.83	0.00	0.00
	upper avg.	11 742	28 990	16 469	19	45	890	94	1 680	14 507	0.684	1.439	0.068	5.530	18.841	1.543	0.836	4.56	0.86	6.02
Skienselva	*lower avg.*	31 157	11 237	26 406	13	62	1 901	112	3 241	24 769	1.163	0.737	0.105	4.562	25.783	2.421	0.911	1.21	0.00	0.00
	upper avg.	31 157	11 237	26 406	16	62	1 901	114	3 241	24 769	1.192	0.737	0.108	4.562	25.783	2.421	1.598	11.40	3.08	21.52
Otra	*lower avg.*	16 178	7 533	16 906	4	25	515	68	1 434	9 719	0.825	1.888	0.105	9.690	30.275	3.300	1.358	9.78	0.00	0.00
	upper avg.	16 178	7 533	16 906	7	25	515	68	1 434	9 719	0.836	1.888	0.109	9.690	30.275	3.300	1.459	14.93	1.18	8.29
Orreelva	*lower avg.*	528	2 201	1 036	4	15	215	3	347	531	0.057	0.065	0.002	0.288	0.612	0.165	0.066	0.15	0.00	0.00
	upper avg.	528	2 201	1 036	4	15	215	3	347	531	0.058	0.065	0.002	0.288	0.612	0.165	0.067	0.29	0.04	0.27
Suldalslågen	*lower avg.*	4 148	826	1 495	0	3	223	2	318	1 527	0.030	0.097	0.015	0.256	2.139	0.308	0.024	0.00	0.00	0.00
	upper avg.	4 148	826	1 495	2	3	223	4	318	1 527	0.081	0.097	0.015	0.261	2.139	0.308	0.168	1.52	0.30	2.13
Orkla	*lower avg.*	6 737	9 294	7 256	2	13	330	9	677	6 098	0.323	0.134	0.103	17.308	34.671	1.698	1.001	0.54	0.00	0.00
	upper avg.	6 737	9 294	7 256	4	13	330	9	677	6 098	0.326	0.134	0.103	17.308	34.671	1.698	1.001	2.71	0.49	3.45
Vefsna	*lower avg.*	12 582	9 622	6 262	1	13	206	14	594	5 855	0.448	0.325	0.001	1.711	4.582	0.847	0.649	0.51	0.00	0.00
	upper avg.	12 582	9 622	6 262	5	14	206	15	594	5 855	0.452	0.325	0.023	1.711	4.582	0.856	1.040	4.61	0.92	6.45
Altaelva	*lower avg.*	8 449	24 497	9 346	6	24	64	14	528	11 196	0.473	0.235	0.001	2.367	24.599	1.424	2.024	0.00	0.00	0.00
	upper avg.	8 449	24 497	9 346	7	24	64	14	528	11 196	0.475	0.235	0.016	2.367	24.599	1.427	2.024	3.09	0.62	4.33
TRIBUTARY RIVERS (36)																				
Tista utløp Femsjøen	*lower avg.*	2 854	4 848	8 536	5	16	609	5	903	4 096	0.323	0.311	0.021	1.366	4.161	0.759	0.485	0.80		
	upper avg.	2 854	4 848	8 536	5	16	609	6	903	4 096	0.323	0.311	0.021	1.366	4.161	0.759	0.485	1.45		
Tokkeelva	*lower avg.*	2 893	1 589	5 702	0	5	172	6	364	3 059	0.220	0.240	0.038	0.537	6.079	0.457	0.021	0.00		
	upper avg.	2 893	1 589	5 702	1	5	172	6	364	3 059	0.220	0.240	0.038	0.537	6.079	0.457	0.135	1.06		
Nidelva(Rykene)	*lower avg.*	12 558	6 011	17 326	4	20	832	67	1 600	10 755	0.804	1.568	0.168	3.713	29.635	1.305	0.198	0.00		
	upper avg.	12 558	6 011	17 326	7	20	832	67	1 600	10 755	0.804	1.568	0.168	3.713	29.635	1.305	0.639	4.60		
Tovdalselva	*lower avg.*	6 847	3 963	11 072	0	11	327	27	790	4 583	0.546	1.367	0.128	3.867	17.609	0.947	0.403	0.46		
	upper avg.	6 847	3 963	11 072	3	11	327	27	790	4 583	0.546	1.367	0.128	3.867	17.609	0.947	0.452	2.66		
Mandalselva	*lower avg.*	9 462	6 144	14 584	1	20	378	53	1 096	4 996	0.600	1.852	0.089	2.568	14.646	0.609	0.455	4.22		

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.	9 462	6 144	14 584	3	20	378	53	1 096	4 996	0.600	1.852	0.089	2.568	14.646	0.609	0.681	6.28		
Lyngdalselva	*lower avg.*	3 232	3 024	4 784	2	9	160	9	397	1 754	0.240	0.658	0.029	0.829	5.341	0.172	0.208	0.81		
	upper avg.	3 232	3 024	4 784	3	9	160	9	397	1 754	0.240	0.658	0.029	0.829	5.341	0.172	0.289	1.45		
Kvina	*lower avg.*	7 848	6 611	15 586	6	25	338	14	995	4 290	0.651	2.192	0.063	3.156	12.827	0.527	0.293	6.94		
	upper avg.	7 848	6 611	15 586	6	25	338	15	995	4 290	0.651	2.192	0.063	3.156	12.827	0.527	0.472	8.00		
Sira	*lower avg.*	15 228	3 873	9 784	0	21	469	145	1 262	4 591	0.489	1.508	0.068	4.498	14.695	0.545	1.694	3.52		
	upper avg.	15 228	3 873	9 784	6	21	469	145	1 262	4 591	0.489	1.508	0.068	4.498	14.695	0.545	2.021	5.57		
Bjerkreimselva	*lower avg.*	4 992	1 309	2 452	2	15	552	6	714	2 525	0.095	0.383	0.038	0.388	4.895	0.097	0.166	1.66		
	upper avg.	4 992	1 309	2 452	3	15	552	7	714	2 525	0.138	0.383	0.038	0.388	4.895	0.140	0.242	2.10		
Figgjoelva	*lower avg.*	641	690	701	2	5	205	1	276	554	0.023	0.090	0.003	0.336	1.443	0.098	0.064	0.88		
	upper avg.	641	690	701	2	5	205	1	276	554	0.025	0.090	0.003	0.336	1.443	0.098	0.072	0.91		
Lyseelva	*lower avg.*	1 786	308	690	0	1	66	1	96	818	0.044	0.097	0.010	0.115	1.545	0.045	0.000	1.35		
	upper avg.	1 786	308	690	1	1	66	2	96	818	0.047	0.097	0.010	0.115	1.545	0.048	0.087	1.35		
Årdalselva	*lower avg.*	4 953	1 164	1 871	0	4	842	14	955	2 101	0.000	0.179	0.012	0.484	4.092	0.168	0.000	0.46		
	upper avg.	4 953	1 164	1 871	2	4	842	15	955	2 656	0.091	0.179	0.012	0.484	4.092	0.168	0.181	1.81		
Ulladalsåna (Ulla)	*lower avg.*	3 550	391	1 386	0	3	74	7	154	1 233	0.000	0.090	0.015	0.528	3.268	0.350	0.026	0.52		
	upper avg.	3 550	425	1 386	1	3	74	8	154	1 871	0.065	0.090	0.015	0.528	3.268	0.350	0.143	1.47		
Saudaelva	*lower avg.*	3 827	210	979	1	2	188	3	274	1 411	0.005	0.114	0.016	0.709	3.732	0.161	0.047	0.38		
	upper avg.	3 827	229	979	1	2	188	3	274	1 411	0.071	0.114	0.016	0.709	3.732	0.161	0.179	1.59		
Vikedalselva	*lower avg.*	1 019	349	425	0	3	65	7	106	386	0.060	0.086	0.007	0.256	1.371	0.140	0.015	0.36		
	upper avg.	1 019	349	425	0	3	65	7	106	386	0.062	0.086	0.007	0.256	1.371	0.140	0.046	0.42		
Vosso(Bolstadelvi)	*lower avg.*	11 099	2 425	4 039	2	18	472	28	797	4 176	0.274	0.257	0.019	1.708	8.478	1.249	0.104	2.40		
	upper avg.	11 099	2 425	4 039	5	18	472	28	797	4 176	0.291	0.257	0.027	1.708	8.478	1.249	0.501	5.09		
Jostedøla	*lower avg.*	6 059	35 583	2 207	53	68	178	13	322	6 008	0.037	0.504	0.007	2.490	6.400	0.848	1.064	1.08		
	upper avg.	6 059	35 583	2 207	53	68	178	13	322	6 008	0.129	0.504	0.015	2.490	6.400	0.848	1.077	2.58		
Gaular	*lower avg.*	5 694	1 596	3 510	4	12	170	11	454	1 997	0.028	0.170	0.007	0.591	3.080	0.136	0.039	1.96		
	upper avg.	5 694	1 596	3 510	4	12	170	11	454	1 997	0.112	0.170	0.011	0.591	3.080	0.170	0.208	3.26		
Jølstra	*lower avg.*	6 074	1 988	3 460	5	13	271	8	491	2 456	0.000	0.136	0.014	0.568	3.899	0.186	0.000	1.72		
	upper avg.	6 074	1 988	3 460	5	13	271	9	491	2 456	0.111	0.136	0.014	0.568	3.899	0.186	0.265	2.80		
Nausta	*lower avg.*	2 339	1 233	1 684	3	7	70	3	155	923	0.000	0.079	0.007	0.576	1.590	0.139	0.000	1.10		
	upper avg.	2 339	1 233	1 684	3	7	70	3	155	923	0.043	0.079	0.007	0.576	1.590	0.139	0.102	1.52		

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.*	4 727	2 336	1 691	2	6	306	5	392	2 187	0.096	0.056	0.003	0.317	1.418	0.153	0.055	0.70		
	upper avg.	4 727	2 336	1 691	3	6	306	6	392	2 187	0.147	0.056	0.009	0.317	1.418	0.153	0.173	1.96		
Driva	*lower avg.*	7 951	14 649	4 220	9	18	451	6	740	8 384	0.108	0.151	0.004	6.828	3.299	0.598	0.600	0.00		
	upper avg.	7 951	14 649	4 220	9	18	451	8	740	8 384	0.226	0.151	0.016	6.828	3.299	0.598	0.655	2.91		
Surna	*lower avg.*	4 843	2 776	4 832	2	9	211	7	443	3 050	0.026	0.059	0.000	0.944	1.098	0.582	0.400	0.00		
	upper avg.	4 843	2 776	4 832	2	9	211	7	443	3 050	0.089	0.059	0.009	0.944	1.098	0.582	0.429	1.77		
Gaula	*lower avg.*	7 904	57 794	8 987	14	30	365	16	791	10 291	0.255	0.707	0.030	7.482	12.908	5.843	3.295	0.00		
	upper avg.	7 904	57 794	8 987	14	30	365	16	791	10 291	0.268	0.707	0.032	7.482	12.908	5.843	3.295	2.89		
Nidelva(Tr.heim)	*lower avg.*	7 360	4 186	6 779	1	12	241	9	544	5 171	0.162	0.106	0.002	6.557	2.664	1.714	0.420	0.42		
	upper avg.	7 360	4 186	6 779	3	12	241	10	544	5 171	0.183	0.106	0.014	6.557	2.664	1.714	0.420	2.69		
Stjørdalselva	*lower avg.*	4 953	6 871	5 340	1	7	110	4	324	2 435	0.110	0.670	0.002	4.476	6.408	1.090	0.350	2.69		
	upper avg.	4 953	6 871	5 340	2	7	110	6	324	2 435	0.124	0.670	0.010	4.476	6.408	1.090	0.371	4.22		
Verdalselva	*lower avg.*	3 621	15 510	4 260	12	16	99	4	264	2 583	0.115	0.262	0.007	1.592	2.401	0.875	0.557	0.43		
	upper avg.	3 621	15 510	4 260	12	16	99	4	264	2 583	0.115	0.262	0.008	1.592	2.401	0.875	0.569	1.54		
Snåsavassdraget	*lower avg.*	2 090	1 206	3 047	1	4	144	2	257	1 119	0.049	0.042	0.001	1.006	0.847	0.253	0.080	0.00		
	upper avg.	2 090	1 206	3 047	1	4	144	2	257	1 119	0.061	0.042	0.004	1.006	0.847	0.253	0.095	0.77		
Namsen	*lower avg.*	3 195	8 812	2 808	6	8	52	4	167	1 946	0.128	0.158	0.004	0.855	2.793	0.690	0.638	0.24		
	upper avg.	3 195	8 812	2 808	6	8	52	5	167	1 946	0.135	0.158	0.008	0.855	2.793	0.690	0.638	1.25		
Røssåga	*lower avg.*	8 522	1 913	3 051	0	8	119	15	339	2 818	0.292	0.698	0.042	1.238	39.007	0.940	0.193	1.42		
	upper avg.	8 522	1 913	3 051	3	8	119	16	339	2 818	0.292	0.698	0.046	1.238	39.007	0.940	0.383	3.83		
Ranaelva	*lower avg.*	16 075	4 547	5 761	0	14	189	30	539	6 919	0.457	0.253	0.004	1.822	7.160	1.347	0.652	2.48		
	upper avg.	16 075	4 547	5 761	6	14	189	30	539	6 919	0.479	0.253	0.032	1.822	7.160	1.347	0.753	6.71		
Beiarelva	*lower avg.*	3 511	41 654	2 914	29	34	233	46	484	3 157	0.178	0.666	0.035	1.562	12.310	1.222	0.660	1.63		
	upper avg.	3 511	41 654	2 914	29	34	233	48	484	3 157	0.178	0.666	0.041	1.562	12.310	1.222	0.731	2.02		
Målselv	*lower avg.*	7 887	13 669	5 436	10	22	91	15	463	7 117	0.123	0.239	0.002	1.813	3.705	0.876	0.998	0.00		
	upper avg.	7 887	13 669	5 436	11	22	91	15	463	7 117	0.199	0.239	0.015	1.813	3.705	0.885	1.048	2.89		
Barduelva	*lower avg.*	7 162	38 279	4 238	29	44	97	28	450	6 227	0.152	0.240	0.008	1.676	4.507	0.650	0.850	0.86		
	upper avg.	7 162	38 279	4 238	30	44	97	28	450	6 227	0.160	0.240	0.014	1.676	4.507	0.673	0.850	3.32		
Tanaelva	*lower avg.*	14 149	8 209	13 083	14	42	207	23	861	39 572	0.301	0.142	0.004	2.216	3.344	1.534	1.422	0.00		
	upper avg.	14 149	8 209	13 083	17	42	207	24	861	39 572	0.325	0.142	0.028	2.216	3.344	1.534	1.422	5.18		
Pasvikelva	*lower avg.*	11 945	3 717	11 912	6	21	133	39	793	20 187	1.220	0.784	0.084	15.192	17.444	22.808	0.623	0.00		

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.	11 945	3 717	11 912	7	21	134	39	793	20 187	1.220	0.784	0.086	15.192	17.444	22.808	0.748	4.37		
TRIBUTARY RIVERS(109)																				
Mosselva	lower avg.	1 094	2694.349	3090.076	1.201	10.771	174.874	6.153	365.884	167.727	0.151	0.103	0.001	0.601	0.597	0.408	0.000	0.601		
	upper avg.	1 094	2694.349	3090.076	1.201	10.771	174.874	6.153	365.884	167.727	0.151	0.103	0.001	0.601	0.597	0.408	0.003	0.601		
Hølenelva	lower avg.	173	421.091	629.250	2.115	5.006	89.071	2.563	121.965	558.655	0.043	0.033	0.001	0.154	0.273	0.179	0.000	0.158		
	upper avg.	173	421.091	629.250	2.115	5.006	89.071	2.563	121.965	558.655	0.043	0.033	0.001	0.154	0.273	0.179	0.001	0.158		
Årungelva	lower avg.	70	72.083	148.393	0.275	1.127	71.091	0.038	87.405	62.188	0.005	0.002	0.000	0.049	0.024	0.030	0.000	0.038		
	upper avg.	70	72.083	148.393	0.275	1.127	71.091	0.038	87.405	62.188	0.005	0.002	0.000	0.049	0.024	0.030	0.000	0.038		
Gjersjøelva	lower avg.	119	36.588	310.871	0.066	0.341	49.602	1.178	65.967	215.733	0.012	0.002	0.000	0.065	0.018	0.092	0.000	0.098		
	upper avg.	119	36.588	310.871	0.066	0.341	49.602	1.178	65.967	215.733	0.012	0.002	0.000	0.065	0.018	0.092	0.000	0.098		
Ljanselva	lower avg.	73	160.013	142.050	0.928	2.303	24.581	1.092	32.438	169.357	0.015	0.006	0.001	0.065	0.000	0.067	0.013	0.080		
	upper avg.	73	160.013	142.050	0.928	2.303	24.581	1.092	32.438	169.357	0.015	0.006	0.001	0.065	0.000	0.067	0.013	0.080		
Loelva	lower avg.	122	714.332	263.846	2.561	5.714	50.304	9.747	79.821	322.820	0.025	0.043	0.002	0.195	0.418	0.077	0.035	0.000		
	upper avg.	122	714.332	263.846	2.561	5.714	50.304	9.747	79.821	322.820	0.025	0.043	0.002	0.195	0.418	0.077	0.035	0.045		
Akerselva	lower avg.	399	169.805	597.195	0.541	2.860	31.199	4.771	60.718	519.030	0.037	0.092	0.002	0.201	0.729	0.047	0.010	0.621		
	upper avg.	399	169.805	597.195	0.541	2.860	31.199	4.771	60.718	519.030	0.037	0.092	0.002	0.201	0.729	0.047	0.010	0.621		
Frognerelva	lower avg.	35	39.571	56.651	0.384	0.680	15.870	0.760	21.611	78.447	0.006	0.000	0.000	0.061	0.024	0.020	0.003	0.045		
	upper avg.	35	39.571	56.651	0.384	0.680	15.870	0.760	21.611	78.447	0.006	0.000	0.000	0.061	0.024	0.020	0.003	0.045		
Lysakerelva	lower avg.	346	131.853	708.393	0.271	0.301	23.166	1.759	37.274	294.286	0.042	0.012	0.001	0.000	0.060	0.006	0.014	0.254		
	upper avg.	346	131.853	708.393	0.271	0.301	23.166	1.759	37.274	294.286	0.042	0.012	0.001	0.001	0.060	0.006	0.014	0.254		
Sandvikselva	lower avg.	346	148.415	658.087	0.623	2.658	22.274	1.784	40.245	588.956	0.045	0.000	0.000	0.074	0.000	0.043	0.060	0.000		
	upper avg.	346	148.415	658.087	0.623	2.658	22.274	1.784	40.245	588.956	0.045	0.001	0.000	0.074	0.001	0.043	0.060	0.000		
Åroselva	lower avg.	188	867.727	487.121	0.739	1.845	108.824	2.234	123.973	462.508	0.045	0.066	0.003	0.152	0.254	0.075	0.082	0.120		
	upper avg.	188	867.727	487.121	0.739	1.845	108.824	2.234	123.973	462.508	0.045	0.066	0.003	0.152	0.254	0.075	0.082	0.120		
Lierelva	lower avg.	508	6878.781	1350.137	2.230	8.863	146.350	0.352	169.967	1322.972	0.152	0.260	0.008	0.459	2.504	0.228	0.352	0.662		
	upper avg.	508	6878.781	1350.137	2.230	8.863	146.350	0.352	169.967	1322.972	0.152	0.260	0.008	0.459	2.504	0.228	0.352	0.662		
Sandeelva	lower avg.	327	998.900	535.149	0.479	1.468	50.339	2.160	77.905	440.464	0.092	0.164	0.014	0.396	4.343	0.150	0.085	0.180		
	upper avg.	327	998.900	535.149	0.479	1.468	50.339	2.160	77.905	440.464	0.092	0.164	0.014	0.396	4.343	0.150	0.085	0.180		
Aulielva	lower avg.	574	2935.654	1326.299	9.564	35.081	306.266	23.055	363.871	1786.634	0.195	0.108	0.012	0.570	1.058	0.573	0.154	0.920		
	upper avg.	574	2935.654	1326.299	9.564	35.081	306.266	23.055	363.871	1786.634	0.195	0.108	0.012	0.570	1.058	0.573	0.154	0.920		
Farriselva-Siljanvassdraget	lower avg.	1 361	343.968	2374.294	0.904	1.580	167.338	2.612	247.308	1883.905	0.075	0.000	0.022	0.000	5.077	0.042	0.010	0.000		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	1 361	343.968	2374.294	0.904	1.580	167.338	2.612	247.308	1883.905	0.075	0.002	0.022	0.003	5.077	0.042	0.010	0.498		
Gjerstadelva	lower avg.	1 238	545.593	2476.180	0.595	2.508	79.707	12.137	158.780	769.751	0.109	0.212	0.005	0.229	2.138	0.269	0.027	0.680		
	upper avg.	1 238	545.593	2476.180	0.595	2.508	79.707	12.137	158.780	769.751	0.109	0.212	0.005	0.229	2.138	0.269	0.027	0.680		
Vegårdselva	lower avg.	1 283	607.511	2548.690	1.330	2.551	64.859	4.838	146.812	460.202	0.128	0.132	0.011	0.282	0.103	0.255	0.047	0.469		
	upper avg.	1 283	607.511	2548.690	1.330	2.551	64.859	4.838	146.812	460.202	0.128	0.132	0.011	0.282	0.103	0.255	0.047	0.469		
Søgneelva-Songdalselva	lower avg.	1 009	357.382	1625.304	1.026	4.392	145.262	8.188	216.954	235.704	0.096	0.145	0.019	0.200	1.975	0.193	0.000	0.369		
	upper avg.	1 009	357.382	1625.304	1.026	4.392	145.262	8.188	216.954	235.704	0.096	0.145	0.019	0.200	1.975	0.193	0.003	0.369		
Audnedalselva	lower avg.	1 577	548.445	2107.184	0.577	2.908	174.085	6.976	278.495	527.690	0.113	0.248	0.016	0.176	3.310	0.196	0.000	0.722		
	upper avg.	1 577	548.445	2107.184	0.577	2.908	174.085	6.976	278.495	527.690	0.113	0.248	0.016	0.176	3.310	0.196	0.005	0.722		
Soknedalselva	lower avg.	2 383	1099.166	1631.302	2.221	6.833	219.561	14.705	309.601	1029.430	0.140	0.252	0.020	0.436	2.797	2.098	0.064	1.090		
	upper avg.	2 383	1099.166	1631.302	2.221	6.833	219.561	14.705	309.601	1029.430	0.140	0.252	0.020	0.436	2.797	2.098	0.064	1.090		
Hellelandselva	lower avg.	1 702	670.908	1454.424	1.705	4.204	183.075	9.343	267.137	648.388	0.093	0.243	0.014	0.230	2.071	0.198	0.048	0.779		
	upper avg.	1 702	670.908	1454.424	1.705	4.204	183.075	9.343	267.137	648.388	0.093	0.243	0.014	0.230	2.071	0.198	0.048	0.779		
Håelva	lower avg.	471	460.447	815.851	2.435	5.875	169.273	12.193	294.592	442.750	0.077	0.028	0.002	0.151	0.693	0.093	0.000	0.258		
	upper avg.	471	460.447	815.851	2.435	5.875	169.273	12.193	294.592	442.750	0.077	0.028	0.002	0.151	0.693	0.093	0.001	0.258		
Imselva	lower avg.	382	131.363	475.144	0.203	0.917	74.854	2.126	101.597	4.751	0.014	0.012	0.001	0.072	0.266	0.067	0.000	0.140		
	upper avg.	382	131.363	475.144	0.203	0.917	74.854	2.126	101.597	4.751	0.014	0.012	0.001	0.072	0.266	0.067	0.001	0.140		
Oltedalselva,utløp Ragsvatnet	lower avg.	958	238.541	580.567	0.118	0.132	99.100	4.210	119.183	718.400	0.024	0.053	0.006	0.140	1.040	0.144	0.038	0.000		
	upper avg.	958	238.541	580.567	0.118	0.132	99.100	4.210	119.183	718.400	0.024	0.053	0.006	0.140	1.040	0.144	0.038	0.351		
Dirdalsåna	lower avg.	1 499	212.374	904.860	0.274	1.509	136.808	1.547	183.373	544.360	0.059	0.100	0.004	0.145	0.702	0.403	0.000	0.686		
	upper avg.	1 499	212.374	904.860	0.274	1.509	136.808	1.547	183.373	544.360	0.059	0.100	0.004	0.145	0.702	0.403	0.004	0.686		
Frafjordelva	lower avg.	1 689	304.995	977.583	0.402	1.906	119.937	6.491	154.249	572.308	0.044	0.141	0.007	0.192	0.592	0.031	0.057	0.618		
	upper avg.	1 689	304.995	977.583	0.402	1.906	119.937	6.491	154.249	572.308	0.044	0.141	0.007	0.192	0.592	0.031	0.057	0.618		
Espedalselva	lower avg.	1 310	259.424	666.645	0.852	1.917	83.998	2.354	134.006	684.379	0.025	0.061	0.003	0.028	0.324	0.084	0.093	0.479		
	upper avg.	1 310	259.424	666.645	0.852	1.917	83.998	2.354	134.006	684.379	0.025	0.061	0.003	0.028	0.324	0.084	0.093	0.479		
Førrelva	lower avg.	1 472	269.438	947.075	0.808	1.886	33.245	1.078	49.494	868.938	0.032	0.077	0.003	0.059	0.230	0.124	0.046	0.000		
	upper avg.	1 472	269.438	947.075	0.808	1.886	33.245	1.078	49.494	868.938	0.032	0.077	0.003	0.059	0.230	0.124	0.046	0.539		
Åbøelva	lower avg.	889	138.274	292.815	0.534	0.705	29.278	0.000	41.412	106.901	0.023	0.022	0.001	0.044	0.306	0.062	0.088	0.407		
	upper avg.	889	138.274	292.815	0.534	0.705	29.278	0.325	41.412	106.901	0.023	0.022	0.001	0.044	0.306	0.062	0.088	0.407		
Etneelva	lower avg.	1 914	530.601	817.095	0.887	1.844	218.164	3.042	277.836	482.420	0.121	0.054	0.010	0.271	0.767	0.575	0.805	1.226		
	upper avg.	1 914	530.601	817.095	0.887	1.844	218.164	3.042	277.836	482.420	0.121	0.054	0.010	0.271	0.767	0.575	0.805	1.226		

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.	5 002	5187.716	1524.703	3.877	4.308	171.954	18.536	290.012	2175.905	0.369	0.732	0.000	0.460	2.920	0.625	0.000	0.000		
	upper avg.	5 002	5187.716	1524.703	3.877	4.308	171.954	18.536	290.012	2175.905	0.369	0.732	0.000	0.460	2.920	0.625	0.015	1.831		
Tysso	lower avg.	3 526	489.627	2103.700	0.000	0.000	191.942	6.453	260.096	947.218	0.144	0.066	0.007	1.093	4.446	0.851	0.165	1.936		
	upper avg.	3 526	489.627	2103.700	0.000	1.032	191.942	6.453	260.096	947.218	0.144	0.066	0.007	1.093	4.446	0.851	0.165	1.936		
Kinso	lower avg.	1 676	607.340	348.454	0.220	0.245	15.987	6.380	54.273	119.628	0.062	0.030	0.000	0.000	0.045	0.067	0.168	0.613		
	upper avg.	1 676	607.340	348.454	0.220	0.245	15.987	6.380	54.273	119.628	0.062	0.030	0.000	0.000	0.045	0.067	0.168	0.613		
Veig	lower avg.	2 959	649.715	1067.390	2.221	2.468	30.320	2.986	97.539	1448.272	0.050	0.050	0.003	0.089	0.000	0.460	0.250	1.083		
	upper avg.	2 959	649.715	1067.390	2.221	2.468	30.320	2.986	97.539	1448.272	0.050	0.050	0.003	0.089	0.011	0.460	0.250	1.083		
Bjoreio	lower avg.	3 531	924.098	2720.596	1.298	3.877	54.153	6.462	136.611	1329.372	0.118	0.094	0.000	0.455	0.300	0.775	0.000	1.292		
	upper avg.	3 531	924.098	2720.596	1.298	3.877	54.153	6.462	136.611	1329.372	0.118	0.094	0.000	0.455	0.300	0.775	0.010	1.292		
SIMA	lower avg.	865	241.642	133.870	0.508	0.629	27.095	1.144	41.847	713.013	0.023	0.009	0.000	0.032	0.229	0.096	0.014	0.317		
	upper avg.	865	241.642	133.870	0.508	0.629	27.095	1.144	41.847	713.013	0.023	0.009	0.000	0.032	0.229	0.096	0.014	0.317		
Austdøla	lower avg.	730	170.886	84.256	0.000	0.000	20.804	2.503	30.342	81.366	0.016	0.016	0.002	0.032	0.121	0.029	0.012	0.334		
	upper avg.	730	170.886	84.256	0.000	0.214	20.804	2.503	30.342	81.366	0.016	0.016	0.002	0.032	0.121	0.029	0.012	0.334		
Nordøla /Austdøla	lower avg.	219	79.302	16.021	0.000	0.000	8.678	0.320	11.014	97.372	0.008	0.005	0.000	0.010	0.001	0.040	0.005	0.000		
	upper avg.	219	79.302	16.021	0.000	0.064	8.678	0.320	11.014	97.372	0.008	0.005	0.000	0.010	0.001	0.040	0.005	0.080		
Tysselvi Samnangervassdraget	lower avg.	1 940	440.768	1201.112	1.143	2.379	59.464	5.010	124.862	169.440	0.065	0.116	0.010	0.206	0.994	0.170	0.000	0.710		
	upper avg.	1 940	440.768	1201.112	1.143	2.379	59.464	5.010	124.862	169.440	0.065	0.116	0.010	0.206	0.994	0.170	0.006	0.710		
Oselva	lower avg.	873	341.873	1046.547	1.385	3.195	45.152	2.716	103.317	302.353	0.049	0.083	0.006	0.320	0.000	0.170	0.000	0.000		
	upper avg.	873	341.873	1046.547	1.385	3.195	45.152	2.716	103.317	302.353	0.049	0.083	0.006	0.320	0.003	0.170	0.003	0.320		
DaleelviBergsdalsvassdraget	lower avg.	1 785	452.191	735.138	0.921	1.027	53.796	4.693	114.382	335.223	0.054	0.124	0.008	0.221	1.085	0.160	0.000	0.000		
	upper avg.	1 785	452.191	735.138	0.921	1.027	53.796	4.693	114.382	335.223	0.054	0.124	0.008	0.221	1.085	0.160	0.005	0.653		
Ekso -Storelvi	lower avg.	4 253	1089.703	2315.034	3.113	6.227	83.284	11.827	248.297	299.112	0.053	0.195	0.016	0.000	0.000	0.265	0.101	0.000		
	upper avg.	4 253	1089.703	2315.034	3.113	6.227	83.284	11.827	248.297	299.112	0.053	0.195	0.016	0.011	0.016	0.265	0.101	1.557		
Modalselva -Moelvi	lower avg.	3 901	713.826	1221.663	0.814	4.997	124.206	6.211	184.861	788.438	0.043	0.186	0.014	0.000	0.337	0.297	0.261	0.000		
	upper avg.	3 901	713.826	1221.663	0.814	4.997	124.206	6.211	184.861	788.438	0.043	0.186	0.014	0.010	0.337	0.297	0.261	1.428		
Nærøydalselvi	lower avg.	1 864	548.702	414.512	1.221	2.047	50.083	3.998	102.156	1635.628	0.034	0.000	0.000	0.156	0.589	0.060	0.147	0.682		
	upper avg.	1 864	548.702	414.512	1.221	2.047	50.083	3.998	102.156	1635.628	0.034	0.003	0.000	0.156	0.589	0.060	0.147	0.682		
Flåmselvi	lower avg.	1 323	597.376	206.867	0.731	0.790	27.335	3.244	49.017	298.084	0.048	0.012	0.000	0.053	0.301	0.136	0.092	0.000		
	upper avg.	1 323	597.376	206.867	0.731	0.790	27.335	3.244	49.017	298.084	0.048	0.012	0.000	0.053	0.301	0.136	0.092	0.484		
Aurlandselvi	lower avg.	3 844	1357.694	843.600	1.011	1.123	123.810	5.804	183.587	1498.388	0.113	0.211	0.000	0.467	1.193	0.339	0.069	0.000		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	3 844	1357.694	843.600	1.011	1.123	123.810	5.804	183.587	1498.388	0.113	0.211	0.000	0.467	1.193	0.339	0.069	1.407		
Erdalselvi	lower avg.	507	97.158	177.295	0.000	0.000	0.663	0.481	14.713	107.690	0.010	0.008	0.000	0.015	0.015	0.016	0.045	0.000		
	upper avg.	507	97.158	177.295	0.000	0.149	0.663	0.481	14.713	107.690	0.010	0.008	0.000	0.015	0.015	0.016	0.045	0.186		
Lærdalselva /Mjeldo	lower avg.	4 308	985.442	1245.598	2.334	3.219	133.705	6.301	263.310	1741.885	0.106	0.095	0.000	0.505	0.635	0.342	0.258	0.000		
	upper avg.	4 308	985.442	1245.598	2.334	3.219	133.705	6.301	263.310	1741.885	0.106	0.095	0.000	0.505	0.635	0.342	0.258	1.577		
Årdalselvi	lower avg.	4 052	1008.613	1038.105	1.577	4.099	99.406	7.786	168.342	2454.361	0.059	0.028	0.007	1.483	0.519	0.391	0.000	4.449		
	upper avg.	4 052	1008.613	1038.105	1.577	4.099	99.406	7.786	168.342	2454.361	0.059	0.028	0.007	1.483	0.519	0.391	0.000	4.449		
Fortundalselva	lower avg.	2 591	2579.532	430.700	1.418	2.744	85.672	3.104	120.001	1358.668	0.145	0.057	0.011	0.818	1.085	0.251	0.133	1.896		
	upper avg.	2 591	2579.532	430.700	1.418	2.744	85.672	3.104	120.001	1358.668	0.145	0.057	0.011	0.818	1.085	0.251	0.133	1.896		
Mørkrisdalselvi	lower avg.	1 438	2283.419	225.710	0.724	0.666	30.868	2.369	55.758	972.658	0.037	0.068	0.000	0.288	0.915	0.266	0.187	0.000		
	upper avg.	1 438	2283.419	225.710	0.724	0.666	30.868	2.369	55.758	972.658	0.037	0.068	0.000	0.288	0.915	0.266	0.187	0.526		
Årøyelva	lower avg.	2 875	1297.519	799.768	1.198	2.933	70.822	6.314	136.466	1515.233	0.059	0.080	0.000	0.070	0.749	0.140	0.179	0.000		
	upper avg.	2 875	1297.519	799.768	1.198	2.933	70.822	6.314	136.466	1515.233	0.059	0.080	0.000	0.070	0.749	0.140	0.179	1.052		
Sogndalselva	lower avg.	1 109	271.381	489.579	1.811	2.012	33.906	3.105	64.006	165.714	0.037	0.041	0.005	0.080	0.661	0.025	0.154	0.000		
	upper avg.	1 109	271.381	489.579	1.811	2.012	33.906	3.105	64.006	165.714	0.037	0.041	0.005	0.080	0.661	0.025	0.154	0.406		
Oselva	lower avg.	2 584	643.090	2364.303	0.552	4.138	49.934	14.186	145.996	557.975	0.156	0.091	0.000	0.303	1.608	0.297	0.000	1.419		
	upper avg.	2 584	643.090	2364.303	0.552	4.138	49.934	14.186	145.996	557.975	0.156	0.091	0.000	0.303	1.608	0.297	0.008	1.419		
Hopselva	lower avg.	761	210.180	195.055	0.042	0.557	24.904	1.341	36.382	66.959	0.015	0.024	0.003	0.008	0.288	0.020	0.114	0.279		
	upper avg.	761	210.180	195.055	0.042	0.557	24.904	1.341	36.382	66.959	0.015	0.024	0.003	0.008	0.288	0.020	0.114	0.279		
Ååelva (Gjengedalselva)	lower avg.	1 752	507.193	955.504	0.641	2.565	38.477	3.481	77.675	195.552	0.053	0.040	0.000	0.118	0.501	0.059	0.121	1.250		
	upper avg.	1 752	507.193	955.504	0.641	2.565	38.477	3.481	77.675	195.552	0.053	0.040	0.000	0.118	0.501	0.059	0.121	1.250		
Oldenelva	lower avg.	1 543	819.195	438.159	0.429	2.259	72.525	5.984	113.257	646.309	0.119	0.059	0.006	0.169	0.368	0.080	0.061	0.000		
	upper avg.	1 543	819.195	438.159	0.429	2.259	72.525	5.984	113.257	646.309	0.119	0.059	0.006	0.169	0.368	0.080	0.061	0.565		
Loelvi	lower avg.	1 783	1011.329	326.235	0.000	2.602	56.591	2.610	89.808	897.924	0.143	0.047	0.006	0.187	0.095	0.052	0.159	0.000		
	upper avg.	1 783	1011.329	326.235	0.261	2.602	56.591	2.610	89.808	897.924	0.143	0.047	0.006	0.187	0.095	0.052	0.159	0.652		
Stryneelva	lower avg.	3 634	1705.771	665.018	1.330	4.798	127.683	8.844	234.086	1563.742	0.146	0.078	0.008	0.805	1.197	0.258	0.231	1.330		
	upper avg.	3 634	1705.771	665.018	1.330	4.798	127.683	8.844	234.086	1563.742	0.146	0.078	0.008	0.805	1.197	0.258	0.231	1.330		
Hornindalselva(Horndøla)	lower avg.	2 867	787.092	1259.348	0.840	4.967	126.984	8.396	186.069	1219.056	0.120	0.030	0.006	0.300	0.844	0.322	0.000	1.049		
	upper avg.	2 867	787.092	1259.348	0.840	4.967	126.984	8.396	186.069	1219.056	0.120	0.030	0.006	0.300	0.844	0.322	0.008	1.049		
Ørstaelva	lower avg.	1 111	337.422	635.855	3.659	8.903	40.247	6.053	84.152	680.943	0.037	0.007	0.000	0.131	0.383	0.114	0.000	0.407		
	upper avg.	1 111	337.422	635.855	3.659	8.903	40.247	6.053	84.152	680.943	0.037	0.007	0.000	0.131	0.383	0.114	0.003	0.407		

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.	2 454	538.917	462.570	0.449	2.117	0.000	4.940	4.940	654.399	0.046	0.005	0.002	0.171	0.631	0.081	0.050	0.000		
	upper avg.	2 454	538.917	462.570	0.449	2.117	0.719	4.940	8.982	654.399	0.046	0.005	0.002	0.171	0.631	0.081	0.050	0.898		
Rauma	lower avg.	5 995	1250.642	1327.741	1.097	4.114	37.300	10.971	121.636	1676.142	0.125	0.073	0.000	0.668	1.108	0.371	0.000	0.000		
	upper avg.	5 995	1250.642	1327.741	1.097	4.114	37.300	10.971	121.636	1676.142	0.125	0.073	0.000	0.668	1.108	0.371	0.018	2.194		
Isa	lower avg.	882	257.411	175.627	0.258	0.827	4.544	1.613	5.324	504.737	0.017	0.000	0.000	0.101	0.012	0.072	0.079	0.323		
	upper avg.	882	257.411	175.627	0.258	0.827	4.544	1.613	5.324	504.737	0.017	0.002	0.000	0.101	0.012	0.072	0.079	0.323		
Eira	lower avg.	5 308	0.000	1141.253	0.971	3.157	203.969	8.795	288.146	3871.242	0.194	0.024	0.000	0.555	0.515	0.233	0.486	2.914		
	upper avg.	5 308	97.128	1141.253	0.971	3.157	203.969	8.795	288.146	3871.242	0.194	0.024	0.000	0.555	0.515	0.233	0.486	2.914		
Litledalselva	lower avg.	1 078	224.802	236.634	0.296	0.611	55.017	1.240	62.248	1412.761	0.022	0.000	0.000	0.014	0.019	0.260	0.110	0.000		
	upper avg.	1 078	224.802	236.634	0.296	0.611	55.017	1.240	62.248	1412.761	0.022	0.002	0.000	0.014	0.019	0.260	0.110	0.394		
Ålvunda	lower avg.	881	468.055	569.155	0.484	1.612	41.813	2.334	74.392	621.821	0.013	0.025	0.000	0.270	0.242	0.064	0.017	0.403		
	upper avg.	881	468.055	569.155	0.484	1.612	41.813	2.334	74.392	621.821	0.013	0.025	0.000	0.270	0.242	0.064	0.017	0.403		
Toåa	lower avg.	1 111	235.873	510.719	0.396	1.084	7.219	1.775	38.756	438.631	0.012	0.019	0.000	0.182	0.089	0.018	0.000	0.000		
	upper avg.	1 111	235.873	510.719	0.396	1.084	7.219	1.775	38.756	438.631	0.012	0.019	0.000	0.182	0.089	0.018	0.003	0.407		
Bøvra	lower avg.	981	268.624	915.200	0.305	0.359	44.760	2.799	92.577	484.518	0.029	0.009	0.002	0.085	0.083	0.063	0.015	0.000		
	upper avg.	981	268.624	915.200	0.305	0.359	44.760	2.799	92.577	484.518	0.029	0.009	0.002	0.085	0.083	0.063	0.015	0.359		
Børselva	lower avg.	217	348.794	439.872	0.501	0.634	25.069	2.219	47.411	106.975	0.017	0.004	0.000	0.111	0.000	0.111	0.012	0.277		
	upper avg.	217	348.794	439.872	0.501	0.634	25.069	2.219	47.411	106.975	0.017	0.004	0.000	0.111	0.001	0.111	0.012	0.277		
Vigda	lower avg.	325	1250.664	442.844	0.476	1.181	22.484	0.832	42.934	237.344	0.021	0.007	0.000	0.110	0.000	0.000	0.000	0.267		
	upper avg.	325	1250.664	442.844	0.476	1.181	22.484	0.832	42.934	237.344	0.021	0.007	0.000	0.110	0.001	0.001	0.001	0.267		
Homla	lower avg.	373	92.894	914.055	0.171	0.682	5.423	2.306	29.502	217.794	0.066	0.003	0.001	0.089	0.000	0.068	0.000	0.273		
	upper avg.	373	92.894	914.055	0.171	0.682	5.423	2.306	29.502	217.794	0.066	0.003	0.001	0.089	0.001	0.068	0.001	0.273		
Gråe	lower avg.	218	181.111	436.716	0.554	0.929	35.286	1.779	56.846	15.360	0.026	0.000	0.000	0.086	0.000	0.031	0.021	0.000		
	upper avg.	218	181.111	436.716	0.554	0.929	35.286	1.779	56.846	15.360	0.026	0.000	0.000	0.086	0.001	0.031	0.021	0.080		
Figgja	lower avg.	541	1256.946	1513.485	0.991	2.957	73.835	1.211	91.918	297.150	0.056	0.032	0.001	0.218	0.129	0.168	0.073	0.000		
	upper avg.	541	1256.946	1513.485	0.991	2.957	73.835	1.211	91.918	297.150	0.056	0.032	0.001	0.218	0.129	0.168	0.073	0.198		
Årgårdselva	lower avg.	1 362	1392.193	3324.074	0.826	8.532	49.032	8.476	184.903	757.266	0.021	0.047	0.000	0.339	0.157	0.223	0.000	1.583		
	upper avg.	1 362	1392.193	3324.074	0.826	8.532	49.032	8.476	184.903	757.266	0.021	0.047	0.000	0.339	0.157	0.223	0.004	1.583		
Moelva(Salsvatenelva)	lower avg.	1 441	272.255	1048.574	0.000	0.000	30.600	3.113	64.667	527.584	0.053	0.011	0.003	0.000	0.541	0.066	0.000	0.000		
	upper avg.	1 441	272.255	1048.574	0.000	0.422	30.600	3.113	64.667	527.584	0.053	0.011	0.003	0.004	0.541	0.066	0.004	0.528		
Åelva(Åbjøra)	lower avg.	2 404	656.861	903.916	0.880	2.067	26.392	8.005	81.814	354.403	0.065	0.040	0.000	0.141	0.572	0.213	0.089	0.000		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	2 404	656.861	903.916	0.880	2.067	26.392	8.005	81.814	354.403	0.065	0.040	0.000	0.141	0.572	0.213	0.089	0.880		
Skjerva	lower avg.	400	270.624	490.048	1.079	2.575	13.970	10.313	63.905	192.486	0.036	0.045	0.003	0.154	0.294	0.218	0.008	0.293		
	upper avg.	400	270.624	490.048	1.079	2.575	13.970	10.313	63.905	192.486	0.036	0.045	0.003	0.154	0.294	0.218	0.008	0.293		
Fusta	lower avg.	2 533	820.355	822.673	0.927	4.017	12.699	19.061	105.884	420.716	0.119	0.017	0.019	0.126	0.640	0.209	0.000	0.927		
	upper avg.	2 533	820.355	822.673	0.927	4.017	12.699	19.061	105.884	420.716	0.119	0.017	0.019	0.126	0.640	0.209	0.007	0.927		
Drevja	lower avg.	821	449.423	223.835	0.601	0.601	4.889	1.903	25.588	92.281	0.008	0.000	0.005	0.069	0.112	0.017	0.000	0.000		
	upper avg.	821	449.423	223.835	0.601	0.601	4.889	1.903	25.588	92.281	0.008	0.002	0.005	0.069	0.112	0.017	0.002	0.300		
Bjerkaelva	lower avg.	1 572	542.772	1096.093	0.259	0.288	13.977	5.035	58.688	472.044	0.025	0.048	0.001	0.290	0.392	0.364	0.020	1.438		
	upper avg.	1 572	542.772	1096.093	0.259	0.288	13.977	5.035	58.688	472.044	0.025	0.048	0.001	0.290	0.392	0.364	0.020	1.438		
Dalselva	lower avg.	882	205.502	504.340	0.323	1.291	2.144	2.284	22.140	260.024	0.000	0.011	0.000	0.121	0.003	0.156	0.026	0.888		
	upper avg.	882	205.502	504.340	0.323	1.291	2.144	2.284	22.140	260.024	0.003	0.011	0.000	0.121	0.003	0.156	0.026	0.888		
Fykanåga	lower avg.	1 648	1118.957	301.606	1.206	1.810	21.414	4.222	48.860	210.047	0.115	0.000	0.000	0.069	0.310	0.069	0.000	0.000		
	upper avg.	1 648	1118.957	301.606	1.206	1.810	21.414	4.222	48.860	210.047	0.115	0.003	0.000	0.069	0.310	0.069	0.005	0.603		
Saltelva	lower avg.	2 862	4305.812	510.726	0.000	0.000	23.747	5.238	87.653	1964.330	0.102	0.000	0.000	0.244	1.217	0.293	2.399	0.000		
	upper avg.	2 862	4305.812	510.726	0.000	0.838	23.747	5.238	87.653	1964.330	0.102	0.005	0.000	0.244	1.217	0.293	2.399	1.048		
SulitjelmavassdragetUtl Øvrevt	lower avg.	2 438	0.000	937.014	0.287	0.319	10.135	7.139	53.463	575.275	0.000	0.000	0.000	0.000	0.000	0.139	5.662	2.008		
	upper avg.	2 438	44.620	937.014	0.287	0.319	10.135	7.139	53.463	575.275	0.009	0.004	0.000	0.006	0.009	0.139	5.662	2.008		
Kobbelva	lower avg.	1 472	401.428	215.532	0.081	0.090	15.212	1.904	37.179	583.090	0.048	0.003	0.008	0.027	0.007	0.084	0.000	0.000		
	upper avg.	1 472	401.428	215.532	0.081	0.090	15.212	1.904	37.179	583.090	0.048	0.003	0.008	0.027	0.007	0.084	0.004	0.539		
Elvegårdselva	lower avg.	2 698	2190.723	1096.287	1.014	3.457	9.383	7.901	62.345	1774.740	0.072	0.125	0.014	0.420	0.898	0.617	0.667	1.728		
	upper avg.	2 698	2190.723	1096.287	1.014	3.457	9.383	7.901	62.345	1774.740	0.072	0.125	0.014	0.420	0.898	0.617	0.667	1.728		
Spanselva	lower avg.	369	84.359	76.045	0.135	0.135	3.910	0.442	11.981	197.717	0.007	0.009	0.002	0.063	0.066	0.135	0.000	0.000		
	upper avg.	369	84.359	76.045	0.135	0.135	3.910	0.442	11.981	197.717	0.007	0.009	0.002	0.063	0.066	0.135	0.001	0.135		
Salangselva	lower avg.	1 448	276.970	561.890	0.477	0.530	8.633	4.241	32.644	415.414	0.000	0.019	0.011	0.133	0.159	0.241	0.339	0.000		
	upper avg.	1 448	276.970	561.890	0.477	0.530	8.633	4.241	32.644	415.414	0.005	0.019	0.011	0.133	0.159	0.241	0.339	0.530		
Lakselva(Rossfjordelva)	lower avg.	468	149.112	298.652	0.106	0.118	0.086	1.126	17.025	104.213	0.009	0.006	0.001	0.025	0.031	0.069	0.000	0.343		
	upper avg.	468	149.112	298.652	0.106	0.118	0.086	1.126	17.025	104.213	0.009	0.006	0.001	0.025	0.031	0.069	0.001	0.343		
Nordkjoselva	lower avg.	394	117.396	165.796	0.130	0.144	2.675	0.721	10.741	293.489	0.017	0.006	0.001	0.037	0.060	0.000	0.108	0.000		
	upper avg.	394	117.396	165.796	0.130	0.144	2.675	0.721	10.741	293.489	0.017	0.006	0.001	0.037	0.060	0.001	0.108	0.144		
Signaldalselva	lower avg.	1 123	395.954	760.157	0.786	0.873	7.567	3.395	25.065	850.302	0.036	0.000	0.004	0.214	0.006	0.168	0.000	0.000		
	upper avg.	1 123	395.954	760.157	0.786	0.873	7.567	3.395	25.065	850.302	0.036	0.002	0.004	0.214	0.006	0.168	0.003	0.411		

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.	1 613	415.060	974.007	0.266	0.295	13.872	2.952	35.861	950.515	0.036	0.008	0.009	0.256	0.000	0.612	0.413	1.476		
	upper avg.	1 613	415.060	974.007	0.266	0.295	13.872	2.952	35.861	950.515	0.036	0.008	0.009	0.256	0.006	0.612	0.413	1.476		
Kåfjordelva	lower avg.	890	130.355	228.121	0.000	0.000	19.602	0.978	36.923	488.831	0.009	0.017	0.005	0.318	0.028	0.212	0.067	0.000		
	upper avg.	890	130.355	228.121	0.000	0.261	19.602	0.978	36.923	488.831	0.009	0.017	0.005	0.318	0.028	0.212	0.067	0.326		
Reisaelva	lower avg.	5 116	1551.011	3224.772	3.034	3.589	67.408	12.037	191.525	4531.325	0.142	0.144	0.021	1.354	1.428	1.297	0.000	6.554		
	upper avg.	5 116	1551.011	3224.772	3.034	3.589	67.408	12.037	191.525	4531.325	0.142	0.144	0.021	1.354	1.428	1.297	0.015	6.554		
Mattiselva	lower avg.	341	79.789	445.696	0.112	0.125	1.340	0.457	12.524	182.998	0.015	0.000	0.002	0.082	0.024	0.037	0.150	0.000		
	upper avg.	341	79.789	445.696	0.112	0.125	1.340	0.457	12.524	182.998	0.015	0.001	0.002	0.082	0.024	0.037	0.150	0.125		
Tverrelva	lower avg.	244	89.379	514.674	0.094	0.104	3.743	0.521	18.714	191.526	0.008	0.001	0.001	0.069	0.043	0.031	0.013	0.000		
	upper avg.	244	89.379	514.674	0.094	0.104	3.743	0.521	18.714	191.526	0.008	0.001	0.001	0.069	0.043	0.031	0.013	0.089		
Repparfjordelva	lower avg.	2 253	486.532	4169.192	0.618	0.618	12.576	8.750	100.193	954.215	0.055	0.000	0.008	1.089	0.261	0.247	0.048	1.649		
	upper avg.	2 253	486.532	4169.192	0.618	0.618	12.576	8.750	100.193	954.215	0.055	0.004	0.008	1.089	0.261	0.247	0.048	1.649		
Stabburselva	lower avg.	1 376	115.822	1208.580	0.504	0.787	8.629	3.021	31.797	1079.269	0.027	0.004	0.003	0.057	0.285	0.050	0.209	0.000		
	upper avg.	1 376	115.822	1208.580	0.504	0.787	8.629	3.021	31.797	1079.269	0.027	0.004	0.003	0.057	0.285	0.050	0.209	0.504		
Lakseelv	lower avg.	1 291	1327.412	1370.210	0.473	2.363	5.199	3.521	48.588	974.783	0.026	0.018	0.005	0.260	0.000	0.281	0.258	0.000		
	upper avg.	1 291	1327.412	1370.210	0.473	2.363	5.199	3.521	48.588	974.783	0.026	0.018	0.005	0.260	0.005	0.281	0.258	0.473		
Børselva	lower avg.	1 061	388.203	388.203	0.000	0.000	2.054	4.953	30.280	1102.220	0.002	0.043	0.002	0.078	0.205	0.084	0.245	0.000		
	upper avg.	1 061	388.203	388.203	0.000	0.311	2.054	4.953	30.280	1102.220	0.002	0.043	0.002	0.078	0.205	0.084	0.245	0.388		
Mattusjåkka	lower avg.	127	22.901	60.552	0.034	0.037	2.831	0.435	3.726	55.894	0.003	0.019	0.002	0.019	0.179	0.037	0.113	0.000		
	upper avg.	127	22.901	60.552	0.034	0.037	2.831	0.435	3.726	55.894	0.003	0.019	0.002	0.019	0.179	0.037	0.113	0.047		
Stuorrajåkka	lower avg.	869	0.000	222.745	0.000	0.000	7.955	1.273	28.453	750.060	0.029	0.070	0.008	0.000	0.270	0.052	0.138	0.000		
	upper avg.	869	15.910	222.745	0.000	0.255	7.955	1.273	28.453	750.060	0.029	0.070	0.008	0.002	0.270	0.052	0.138	0.318		
Soussjåkka	lower avg.	116	0.000	55.156	0.000	0.000	1.273	0.248	3.182	115.918	0.001	0.004	0.001	0.003	0.017	0.002	0.031	0.000		
	upper avg.	116	2.121	55.156	0.000	0.034	1.273	0.248	3.182	115.918	0.001	0.004	0.001	0.003	0.017	0.002	0.031	0.042		
Adamselva	lower avg.	958	22.793	561.048	0.000	0.000	0.468	2.279	32.903	784.956	0.044	0.014	0.007	0.037	0.288	0.000	0.000	1.052		
	upper avg.	958	22.793	561.048	0.000	0.281	0.468	2.279	32.903	784.956	0.044	0.014	0.007	0.037	0.288	0.004	0.003	1.052		
Syltefjordelva(Vesterelva)	lower avg.	1 083	0.000	317.173	0.793	1.041	2.453	3.568	23.788	870.339	0.064	0.000	0.006	0.023	0.071	0.000	0.698	0.793		
	upper avg.	1 083	19.823	317.173	0.793	1.041	2.453	3.568	23.788	870.339	0.064	0.002	0.006	0.023	0.071	0.004	0.698	0.793		
Jakobselv	lower avg.	1 019	135.685	1044.773	0.672	0.746	0.000	2.239	46.535	1323.291	0.028	0.000	0.004	0.028	0.000	0.004	0.012	0.000		
	upper avg.	1 019	135.685	1044.773	0.672	0.746	0.299	2.239	46.535	1323.291	0.028	0.002	0.004	0.028	0.004	0.004	0.012	0.373		
Neidenelva	lower avg.	2 803	1179.593	4919.244	1.385	1.539	18.463	12.309	194.889	2051.466	0.067	0.000	0.021	0.533	0.000	0.231	0.595	0.000		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
	upper avg.	2 803	1179.593	4919.244	1.385	1.539	18.463	12.309	194.889	2051.466	0.067	0.005	0.021	0.533	0.010	0.231	0.595	1.026		
Grense Jakobselv	lower avg.	255	70.720	336.556	0.084	0.093	0.233	0.634	12.315	277.995	0.016	0.006	0.002	0.210	0.177	0.724	0.277	0.279		
	upper avg.	255	70.720	336.556	0.084	0.093	0.233	0.634	12.315	277.995	0.016	0.006	0.002	0.210	0.177	0.724	0.277	0.279		

Table 3.
Total inputs from Norway 2008

TOTAL INPUTS																			
Discharge region	**Estimate**	**Flow rate (km³/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: TOTAL NORWAY																				
RIVERINE INPUTS																				
Main Rivers	low avg.	198 587	545 922	234 787	434	819	17 225	946	29 299	232 376	10.75	18.64	0.93	109.50	308.07	42.80	21.54	19	0	1
	upp avg.		545 922	234 787	453	823	17 225	950	29 299	232 376	10.89	18.64	0.98	109.50	308.07	42.81	23.81	86	15	107
Tributary Rivers (36)	low avg.	228 848	309 436	199 136	226	572	9 486	681	20 052	185 874	8.21	17.11	0.99	84.86	270.10	50.11	17.08	41		
	upp avg.		309 489	199 136	271	573	9 486	699	20 052	187 067	9.26	17.11	1.15	84.86	270.10	50.22	20.86	104		
Tributary Rivers (109)	low avg.	164 832	77 465	100 692	96	259	6 224	516	11 251	80 623	6.48	6.29	0.49	24.11	66.69	22.73	18.50	56		
	upp avg.		77 645	100 692	96	263	6 225	516	11 260	80 623	6.49	6.33	0.49	24.15	66.76	22.74	18.65	84		
Total Riverine Inputs	**low avg.**	**592 268**	**932 823**	**534 615**	**756**	**1 650**	**32 935**	**2 142**	**60 602**	**498 873**	**25.44**	**42.04**	**2.41**	**218.47**	**644.86**	**115.64**	**57.13**	**117**	**0**	**1**
	upp avg.		**933 056**	**534 615**	**821**	**1 659**	**32 937**	**2 165**	**60 611**	**500 066**	**26.64**	**42.08**	**2.62**	**218.51**	**644.92**	**115.77**	**63.33**	**274**	**15**	**107**
Sewage Effluents	low avg.		8 174	3 922	547	912	577	8 650	11 534		0.26	0.58	0.02	7.98	14.33	2.56	0.88	21		
	upp avg.																			
Industrial Effluents	low avg.		31 230	633	203	338	131	1 958	2 610		0.45	2.88	0.15	9.37	19.90	9.26	0.80	13		
	upp avg.																			
Fish Farming	low avg.				5 921	8 581	4 557	33 142	41 428					724.48						
	upp avg.																			
Total Direct Inputs	**low avg.**		**39 404**	**4 554**	**6 671**	**9 831**	**5 264**	**43 750**	**55 572**		**0.71**	**3.45**	**0.17**	**741.83**	**34.23**	**11.82**	**1.68**	**34**		
	upp avg.																			
Unmonitored Areas	low avg.	397 355			184	749	25 846	2 274	41 354											
	upp avg.																			
REGION TOTAL	**low avg.**	**989 623**	**972 227**	**539 169**	**7 611**	**12 230**	**64 046**	**48 167**	**157 529**	**498 873**	**26.14**	**45.49**	**2.59**	**960.29**	**679.08**	**127.46**	**58.80**	**150**	**0**	**1**
	upp avg.		**972 460**	**539 169**	**7 676**	**12 239**	**64 047**	**48 190**	**157 538**	**500 066**	**27.35**	**45.54**	**2.80**	**960.34**	**679.15**	**127.59**	**65.00**	**308**	**15**	**107**

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.	166 145	499 482	209 394	420	750	16 187	905	26 837	207 169	9.42	17.78	0.81	87.57	241.47	38.36	17.78	18	0	1
	upp avg.		499 482	209 394	432	755	16 187	906	26 837	207 169	9.50	17.78	0.82	87.57	241.47	38.36	19.51	74	13	90
Tributary Rivers (36)	low avg.	34 614	22 555	57 220	11	71	2 318	158	4 754	27 489	2.49	5.34	0.44	12.05	72.13	4.08	1.56	5		
	upp avg.		22 555	57 220	20	71	2 318	159	4 754	27 489	2.49	5.34	0.44	12.05	72.13	4.08	2.39	16		
Tributary Rivers (109)	low avg.	10 843	18 672	21 435	26	93	1 795	92	2 697	10 867	1.38	1.63	0.12	3.93	22.91	2.95	0.89	6		
	upp avg.		18 672	21 435	26	93	1 795	92	2 697	10 867	1.38	1.63	0.12	3.93	22.91	2.95	0.90	7		
Total Riverine Inputs	**low avg.**	**211 602**	**540 709**	**288 049**	**458**	**914**	**20 300**	**1 155**	**34 288**	**245 524**	**13.29**	**24.75**	**1.37**	**103.54**	**336.50**	**45.39**	**20.23**	**29**	**0**	**1**
	upp avg.		**540 709**	**288 049**	**478**	**919**	**20 300**	**1 157**	**34 288**	**245 524**	**13.37**	**24.75**	**1.38**	**103.55**	**336.50**	**45.39**	**22.81**	**96**	**13**	**90**
Sewage Effluents	low avg.		2 583	2 376	59	98	222	3 323	4 430		0.20	0.31	0.02	4.16	10.22	1.40	0.53	8		
	upp avg.																			
Industrial Effluents	low avg.		3 467	193	50	83	64	955	1 273		0.25	0.38	0.05	7.61	6.56	2.97	0.76	5		0
	upp avg.																			
Fish Farming	low avg.				5	7	4	27	34					0.60						
	upp avg.																			
Total Direct Inputs	**low avg.**		**6 049**	**2 569**	**114**	**188**	**289**	**4 305**	**5 737**	**0**	**0.45**	**0.69**	**0.07**	**12.36**	**16.78**	**4.37**	**1.29**	**14**	**0**	**0**
	upp avg.																			
Unmonitored Areas	low avg.	9 907			20	79	2 089	184	3 343											
	upp avg.																			
REGION TOTAL	**low avg.**	**221 509**	**546 758**	**290 619**	**591**	**1 182**	**22 679**	**5 643**	**43 368**	**245 524**	**13.75**	**25.43**	**1.44**	**115.90**	**353.28**	**49.75**	**21.52**	**43**	**0**	**1**
	upp avg.		**546 758**	**290 619**	**611**	**1 186**	**22 679**	**5 645**	**43 368**	**245 524**	**13.82**	**25.44**	**1.45**	**115.91**	**353.28**	**49.75**	**24.10**	**110**	**13**	**90**

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.	4 675	3 027	2 530	4	18	438	4	664	2 058	0.09	0.16	0.02	0.54	2.75	0.47	0.09	0	0	0
	upp avg.		3 027	2 530	6	18	438	6	664	2 058	0.14	0.16	0.02	0.55	2.75	0.47	0.23	2	0	2
Tributary Rivers (36)	low avg.	83 067	63 089	55 249	82	211	4 425	276	7 841	37 409	2.04	6.60	0.32	17.55	78.07	5.01	3.78	26		
	upp avg.		63 142	55 249	98	212	4 425	284	7 841	38 602	2.71	6.60	0.35	17.55	78.07	5.09	6.06	42		
Tributary Rivers (109)	low avg.	84 765	32 415	36 157	42	99	3 407	220	5 671	31 806	3.10	3.72	0.19	10.51	31.83	10.94	4.17	24		
	upp avg.		32 415	36 157	42	100	3 407	220	5 671	31 806	3.10	3.72	0.19	10.53	31.86	10.94	4.23	38		
Total Riverine Inputs	**low avg.**	**172 507**	**98 531**	**93 936**	**128**	**328**	**8 271**	**499**	**14 176**	**71 272**	**5.23**	**10.48**	**0.53**	**28.60**	**112.65**	**16.42**	**8.03**	**50**	**0**	**0**
	upp avg.		**98 584**	**93 936**	**146**	**330**	**8 271**	**510**	**14 176**	**72 466**	**5.95**	**10.48**	**0.55**	**28.63**	**112.68**	**16.50**	**10.52**	**82**	**0**	**2**
Sewage Effluents	low avg.		4 271		207	346	168	2 517	3 356		0.06	0.27	0.01	3.82	4.10	1.16	0.35	13		
	upp avg.																			
Industrial Effluents	low avg.		10 608	330	55	91	21	320	427		0.14	0.91	0.05	1.55	11.55	4.49	0.03	5		
	upp avg.																			
Fish Farming	low avg.				2 149	3 115	1 651	12 004	15 005					262.30						
	upp avg.																			
Total Direct Inputs	**low avg.**		**14 879**	**330**	**2 411**	**3 552**	**1 840**	**14 842**	**18 789**		**0.20**	**1.18**	**0.06**	**267.66**	**15.65**	**5.65**	**0.38**	**17**		
	upp avg.																			
Unmonitored Areas	low avg.	152 763			64	258	11 141	980	17 826											
	upp avg.																			
REGION TOTAL	**low avg.**	325 270	**113 410**	**94 266**	**2 603**	**4 138**	**21 252**	**16 322**	**50 791**	**71 272**	**5.43**	**11.66**	**0.58**	**296.27**	**128.30**	**22.07**	**8.41**	**67**	**0**	**0**
	upp avg.		**113 463**	**94 266**	**2 621**	**4 140**	**21 252**	**16 332**	**50 791**	**72 466**	**6.15**	**11.66**	**0.61**	**296.29**	**128.33**	**22.15**	**10.90**	**99**	**0**	**2**

TOTAL INPUTS																				
Discharge region	**Estimate**	**Flow rate (km³/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: Norwegian Sea																				
RIVERINE INPUTS																				
Main Rivers	low avg.	19 318	18 916	13 517	3	26	536	23	1 271	11 953	0.77	0.46	0.10	19.02	39.25	2.55	1.65	1	0	0
	upp avg.		18 916	13 517	8	26	536	24	1 271	11 953	0.78	0.46	0.13	19.02	39.25	2.55	2.04	7	1	10
Tributary Rivers (36)	low avg.	85 074	211 866	61 672	112	227	2 402	186	5 803	61 218	2.16	4.25	0.14	37.85	99.11	16.68	9.69	10		
	upp avg.		211 866	61 672	129	227	2 402	194	5 803	61 218	2.51	4.25	0.25	37.85	99.11	16.71	10.24	37		
Tributary Rivers (109)	low avg.	55 428	22 459	27 486	23	60	954	159	2 295	27 236	1.60	0.77	0.11	7.19	10.13	7.06	10.66	22		
	upp avg.		22 601	27 486	23	61	955	159	2 304	27 236	1.62	0.79	0.11	7.20	10.15	7.06	10.74	32		
Total Riverine Inputs	**low avg.**	**159 820**	**253 242**	**102 675**	**139**	**313**	**3 893**	**368**	**9 369**	**100 407**	**4.53**	**5.48**	**0.36**	**64.06**	**148.49**	**26.28**	**22.01**	**33**	**0**	**0**
	upp avg.		**253 383**	**102 675**	**161**	**314**	**3 893**	**377**	**9 378**	**100 407**	**4.91**	**5.50**	**0.49**	**64.07**	**148.51**	**26.33**	**23.01**	**76**	**1**	**10**
Sewage Effluents	low avg.		1 316	1 545	260	434	174	2 614	3 486											
	upp avg.																			
Industrial Effluents	low avg.		17 155	108	98	164	46	683	910		0.05	1.59	0.05	0.21	1.80	1.80	0.01	2		
	upp avg.																			
Fish Farming	low avg.				3 502	5 075	2 697	19 616	24 520					428.84						
	upp avg.																			
Total Direct Inputs	**low avg.**		**18 471**	**1 653**	**3 860**	**5 673**	**2 917**	**22 913**	**28 916**		**0.05**	**1.59**	**0.05**	**429.05**	**1.80**	**1.80**	**0.01**	**2**		
	upp avg.																			
Unmonitored Areas	low avg.	198 769			92	375	11 309	995	18 094											
	upp avg.																			
REGION TOTAL	**low avg.**	**358 589**	**271 712**	**104 328**	**4 091**	**6 360**	**18 118**	**24 276**	**56 379**	**100 407**	**4.58**	**7.06**	**0.41**	**493.10**	**150.29**	**28.08**	**22.01**	**36**	**0**	**0**
	upp avg.		**271 854**	**104 328**	**4 113**	**6 362**	**18 119**	**24 286**	**56 388**	**100 407**	**4.96**	**7.08**	**0.54**	**493.11**	**150.31**	**28.13**	**23.02**	**78**	**1**	**10**

TOTAL INPUTS																				
Discharge region	Estimate	Flow rate (km^3/d)	SPM [tonnes]	TOC [tonnes]	PO4-P [tonnes]	TOTP [tonnes]	NO3-N [tonnes]	NH4-N [tonnes]	TOTN [tonnes]	SiO2 [tonnes]	As [tonnes]	Pb [tonnes]	Cd [tonnes]	Cu [tonnes]	Zn [tonnes]	Ni [tonnes]	Cr [tonnes]	Hg [kg]	HCHG [kg]	SUMPCB [kg]
INPUTS TO OSPAR REGION: Barents Sea																				
RIVERINE INPUTS																				
Main Rivers	low avg.	8 449	24 497	9 346	6	24	64	14	528	11 196	0.47	0.23	0.00	2.37	24.60	1.42	2.02	0	0	0
	upp avg.		24 497	9 346	7	24	64	14	528	11 196	0.48	0.23	0.02	2.37	24.60	1.43	2.02	3	1	4
Tributary Rivers (36)	low avg.	26 093	11 926	24 995	20	63	340	62	1 654	59 759	1.52	0.93	0.09	17.41	20.79	24.34	2.04	0		
	upp avg.		11 926	24 995	24	63	341	63	1 654	59 759	1.55	0.93	0.11	17.41	20.79	24.34	2.17	10		
Tributary Rivers (109)	low avg.	13 796	3 919	15 614	5	7	67	44	588	10 715	0.39	0.18	0.07	2.49	1.82	1.78	2.79	4		
	upp avg.		3 957	15 614	5	8	68	44	588	10 715	0.39	0.19	0.07	2.49	1.84	1.79	2.79	7		
Total Riverine Inputs	**low avg.**	**48 338**	**40 342**	**49 955**	**31**	**95**	**471**	**120**	**2 770**	**81 669**	**2.38**	**1.34**	**0.16**	**22.26**	**47.21**	**27.55**	**6.85**	**4**	**0**	**0**
	upp avg.		**40 379**	**49 955**	**36**	**96**	**472**	**121**	**2 770**	**81 669**	**2.41**	**1.35**	**0.20**	**22.27**	**47.23**	**27.56**	**6.98**	**20**	**1**	**4**
Sewage Effluents	low avg.		5		21	34	13	196	261											
	upp avg.																			
Industrial Effluents	low avg.			1												0.00	0.00	1		
	upp avg.																			
Fish Farming	low avg.				265	384	206	1 495	1 869					32.76						
	upp avg.																			
Total Direct Inputs	**low avg.**		**5**	**1**	**286**	**418**	**219**	**1 691**	**2 130**	**0**	**0.00**	**0.00**	**0.00**	**32.76**		**0.00**	**0.00**	**1**		
	upp avg.																			
Unmonitored Areas	low avg.	35 916			9	37	1 307	115	2 091											
	upp avg.																			
REGION TOTAL	**low avg.**	84 254	**40 347**	**49 956**	**326**	**550**	**1 997**	**1 926**	**6 991**	**81 669**	**2.38**	**1.34**	**0.16**	**55.02**	**47.21**	**27.55**	**6.86**	**5**	**0**	**0**
	upp avg.		**40 385**	**49 956**	**330**	**551**	**1 998**	**1 927**	**6 991**	**81 669**	**2.41**	**1.35**	**0.20**	**55.02**	**47.23**	**27.56**	**6.99**	**21**	**1**	**4**

Statlig program for forurensningsovervåking

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Om SPFO

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.
SFT er ansvarlig for gjennomføringen av overvåkingsprogrammet.

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