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Riverine inputs and direct discharges to Norwegian coastal waters – 2010

Norwegian Institute for Water Research
– an institute in the Environmental Research Alliance of Norway

REPORT

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Abstract

Riverine inputs and direct discharges to Norwegian coastal waters in 2010 have been estimated in accordance with the requirements of the OSPAR Commission. With a few exceptions, riverine inputs of nutrients decreased in 2010 as compared to 2009, mainly due to reduced water discharges. Analyses of long-term (1990-2010) trends indicate that nutrient loads have decreased in several of the main rivers. Fish farming continues to be a major source of nutrients to coastal waters. In terms of metals, there was a significant reduction of riverine loads of mercury, and also reductions of zinc and copper, whereas nickel loads increased slightly. Copper discharges from fish farming could not be calculated due to late data deliveries. For the entire period of 1990-2010, riverine metal loads of zinc, copper and lead have been reduced. Inputs of PCBs and the pesticide lindane were, as in former years, insignificant.

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

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Preface

This report presents the results of the 2010 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 2010 has been administered first by Christine Daae Olseng (untill 1 July 2011) and then by Pål Inge Hals, both at Klif (the Climate and Pollution Agency). Klif has commissioned the Norwegian Institute for Water Research (NIVA), the Norwegian Institute for Agricultural and Environmental Research (Bioforsk) and the Norwegian Water Resources and Energy Directorate (NVE) to organise and carry out the monitoring, undertake the analyses and report the results.

At NIVA, Øyvind Kaste has co-ordinated the RID programme in 2010. 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 2010 reporting, including comparisons between 2010 and 2009. Per Stålnacke has carried out and reported the statistical trend analyses with the assistance of Annelene Pengerud.

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

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

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

Oslo, November 2011

Øyvind Kaste

Project co-ordinator

Content

Appendices

Appendix I	The RID principles and objectives
Appendix II	Water sampling personnel
Appendix III	Catchment information for the 10 main and 36 tributary rivers
Appendix IV	Methodology, detailed information and changes over time
Appendix V	Trend analyses – riverine pollutant loads. Complementary graphs to Chpt. 4.3.

Addendum

Table 1.	Raw data and summary statistics for the 10 main and 36 tributary rivers in Norway in 2010
Table 2.	Riverine inputs from the 10 main and 36+109 tributary rivers in Norway in 2010
Table 3.	Total inputs from Norway 2010

Summary

This report presents the 2010 results of the Norwegian Programme on Riverine Inputs and Direct Discharges to 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 2010, 46 rivers have been monitored in Norway. Ten of these, labelled 'main' rivers, are monitored monthly or more often, whereas the remaining 36 are labelled 'tributary rivers' (although they drain directly to the sea) and are monitored four times a year. In addition, loads are estimated from the remaining land area draining into the Atlantic ocean including 201 unmonitored rivers, as well as areas located downstream of the sampling points and coastal areas. Direct discharges are only estimated from unmonitored areas, and include discharges from industry, sewage treatment plants and fish farming.

In 2010, the programme monitored the same substances as in former years, i.e. six fractions of nutrients (total phosphorus, orthophosphates, total nitrogen, ammonium, nitrate and silicate); eight heavy metals (copper, zinc, cadmium, lead, chromium, nickel, mercury and arsenic); one pesticide (lindane); seven PCB compounds (PCB7); and four other parameters (suspended particulate matter, pH, conductivity and total organic carbon).

Climate and water discharges in 2010

The year 2010 was a relatively cold and dry year, with a mean precipitation of 85 % of a normal year. The total water discharges from Norway to the sea were lower in 2010 than in 2009. The only region with higher discharges in 2010 was the Barents Sea, with 15 % higher flows than in 2009. Mild weather in May gave severe snow-melt floods in the northernmost counties, whereas heavy rains in June gave floods in the county of Trøndelag (mid-Norway).

Nutrients and suspended particulate matter

The total nutrient inputs to Norwegian coastal waters in 2010 were estimated to about 11 000 tonnes of phosphorus, 139 000 tonnes of nitrogen, 393 000 tonnes of silicate, 469 000 tonnes of total organic carbon and 770 000 tonnes of suspended particulate matter. Fish farming is the most important nutrient source to Norwegian coastal waters, although in the Skagerrak region the main nutrient sources are riverine inputs and sewage treatment plants.

Riverine inputs of nutrients to Norwegian coastal waters generally decreased in 2010 as compared to 2009, with a few exceptions. In terms of the direct discharges, the industrial discharges of nitrogen increased by about 11 %, but discharges from phosphorus did not change. No changes were detected in nitrogen or phosphorus from sewage treatment plants since 2009. Losses from fish industry cannot readily be compared to former years since the figures need to be re-calculated for the entire dataset. This is because there have been a change in the figures used for calculating the nutrient levels in fish fodder; with less nutrients in the fodder today than in earlier years.

Long-term trend analyses on loads have been performed for nine of the ten main rivers[1] for the period 1990-2010. There have been downward trends in nitrogen loads (total-N and nitrate-N) in Rivers Skienselva, Vefsna and Altaelva and in ammonium loads in Rivers Glomma, Vefsna and Orrelva. Downward trends in total phosphorus loads have also been found in

[1] River Vosso is not included in the trend analyses due to infrequent sampling from 1990-2008.

Rivers Vefsna and Altaelva; and in orthophosphate loads in River Vefsna. The only statistically significant upward trend in riverine nutrient loads was found for total nitrogen loads in River Numedalslågen.

Metals

In 2010, the inputs of metals to the Norwegian maritime areas were estimated to 99 kg mercury, 1.95 tonnes of cadmium, 22 tonnes of arsenic, 29 tonnes of lead, 52 tonnes of chromium, 134 tonnes of nickel, 489 tonnes of zinc and 883 tonnes of copper (lower estimates). For most metals the riverine loads account for about 80-90% of the total inputs; the exception is copper where the majority of the discharges derive from fish farming.

In 2010 a substantial reduction in mercury levels in rivers was observed, with a decrease in loads of 161 kg or 67 % (lower estimates) compared to 2009. This reduction was relatively evenly distributed between the four coastal regions (about 60-70% in each region, lower estimates). Only for one metal, nickel, the riverine inputs increased from 2009 to 2010 (28%). This was caused by high levels in River Pasvikelva, which is draining to the Barents Sea. Infrequent sampling (and therefore a certain level of randomness) is believed to be the main reason for this, combined with the fact that water discharges were higher in this region in 2010 than in 2009. Riverine loads of zinc and copper went slightly down since 2009, whereas there were insignificant changes in lead, arsenic, cadmium and chromium. Metal discharges from industry increased slightly for zinc and mercury, but was reduced for arsenic. Copper discharges from fish farming are based on the data reported for 2009.

Long-term trend analyses revealed that metal loads have been reduced in several rivers. Copper loads have been reduced in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva; zinc loads have been reduced in Rivers Glomma, Orkla, Vefsna, Numedalslågen, Skienselva and Otra; whereas loads of lead have been reduced in Rivers Glomma, Numedalslågen, Vefsna and Orkla.

Pesticides

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

Sammendrag

Resultater fra Elvetilførselsprogrammet (RID) i 2010 er presentert i denne rapporten. Programmet er en del av OSPAR-programmet og har pågått siden 1990. Fire havområder inngår i Norges rapportering. Disse er Skagerrak, Nordsjøen, Norskehavet og Barentshavet. Til sammen 46 vassdrag er overvåket i 2009. I tillegg er tilførsler beregnet fra det resterende landområdet som drenerer til Atlanterhavet, herunder 201 vassdrag som ikke er overvåket i 2009, samt områder nedstrøms prøvetakingsstedene og langs kysten. Direkte utslipp fra industri, kloakkrenseanlegg og akvakulturanlegg er beregnet for de områdene som ikke er overvåket.

I 2010 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).

Elvetilførsler av næringsstoffer i 2010 var generelt lavere enn i 2009, hovedsakelig pga. lavere vannføringer. Langtidstrender (1990-2010) viser at transporten av både fosfor, nitrogen og metaller har gått ned i flere elver. Direktetilførsler av nitrogen fra industri har økt. Forøvrig har det ikke vært noen endringer i næringsstofftilførslene fra verken industri eller kloakkrenseanlegg. For næringsstoffer fra fiskeoppdrett bør estimater tilbake i tid oppdateres.

Tilsvarende som for næringsstoffer gikk også metalltilførslene fra elver ned i 2010 i forhold til i 2009. Et unntak er tilførslene av nikkel, men dette er antakelig knyttet til metodikk, siden tilførslene økte i Pasvikelva, ei elv med relativt høye metallkonsentrasjoner og hvor det bare tas fire prøver per år. Kvikksølvtilførslene, som har økt de siste årene, viste nå en stor nedgang over hele landet. Langtidstrender (1990-2010) i de elvene som overvåkes månedlig tilsier at sink- og kobbertilførsler har blitt redusert. Kobbertilførslene fra fiskeoppdrettsanleggene er usikre ettersom grunnlagsdata ikke var klare i tide.

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

I forbindelse med at RID-dataene ble grundig gjennomgått i 2009 (Stålnacke et al. 2009) blir det i 2011 også utgitt en norsk rapport med oversikt over tilførsler til norske kystområder i 20-års perioden 1990-2009 (Skarbøvik m.fl. 2011).

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. In connection with a thorough evaluation and correction of former years' data, a report (in Norwegian) presenting 20 years of data from the RID-programme (1990-2009) was produced in 2011.

This report presents the 2010 results of the monitoring of 46 rivers in Norway, as well as estimated loads from the remaining land area draining into the Atlantic sea, including 201 unmonitored rivers and areas downstream sampling points (see Figure 1 for the different RID areas). The report also gives direct discharges from industry, sewage treatment plants and fish farming in unmonitored areas.

In 2010, the following parameters were monitored:

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

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

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

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

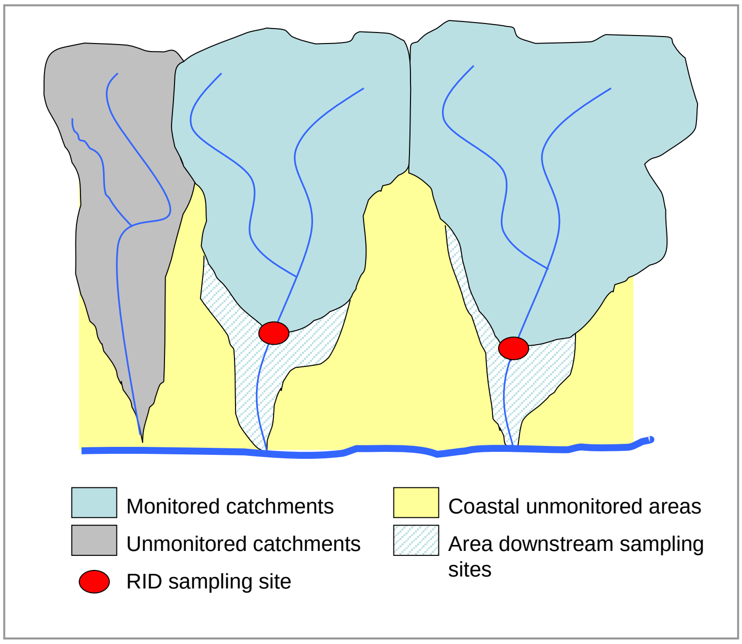


Figure 1. Illustration of RID areas. Areas covered by RID monitoring stations (blue; 46 rivers); areas downstream of the sampling sites (blue shaded); coastal areas between catchments (yellow); and unmonitored catchments (grey).

1.2 Riverine inputs, direct discharges and unmonitored areas

The Norwegian river basin register system "REGINE" (NVE; www.nve.no) classifies the Norwegian river basins into 262 main catchment areas, of which 247 drain into coastal areas. These rivers range from River Haldenvassdraget in the south east (river no. 001) to River Grense Jakobselv in the north east (river no. 247). A selection of these rivers has been done in order to fulfil the RID requirements, and in 2010 ten 'main' rivers were monitored monthly or more often; and 36 'tributary' rivers were monitored quarterly. It is important to note that the name 'tributary' is only used to signify that these rivers are monitored less often than the main rivers; they all drain directly into the sea. The programme in 2010 has not undergone any major alterations since 2009. Details on former changes of the RID monitoring programme are given in Appendix IV.

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

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

1.3 Outline of the 2010 RID Report

The 2010 RID Report is organised as follows:

- Chapter 2: The methodology of the RID Programme;
- Chapter 3: The results, including riverine inputs and direct discharges in 2010 as well as climatic and water discharge conditions this year;
- Chapter 4: Discussions, including comparisons with last year's results as well as long-term trend analyses of riverine loads since 1990;
- Chapter 5: Conclusions.

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

An addendum to the report gives, as in former years, the three most important data tables of the programme, namely an overview of all concentrations and water discharge values in all rivers during sampling in 2010; the calculated annual loads of each river in 2010; as well as overview tables of all loads to the four coastal areas of Norway in 2010.

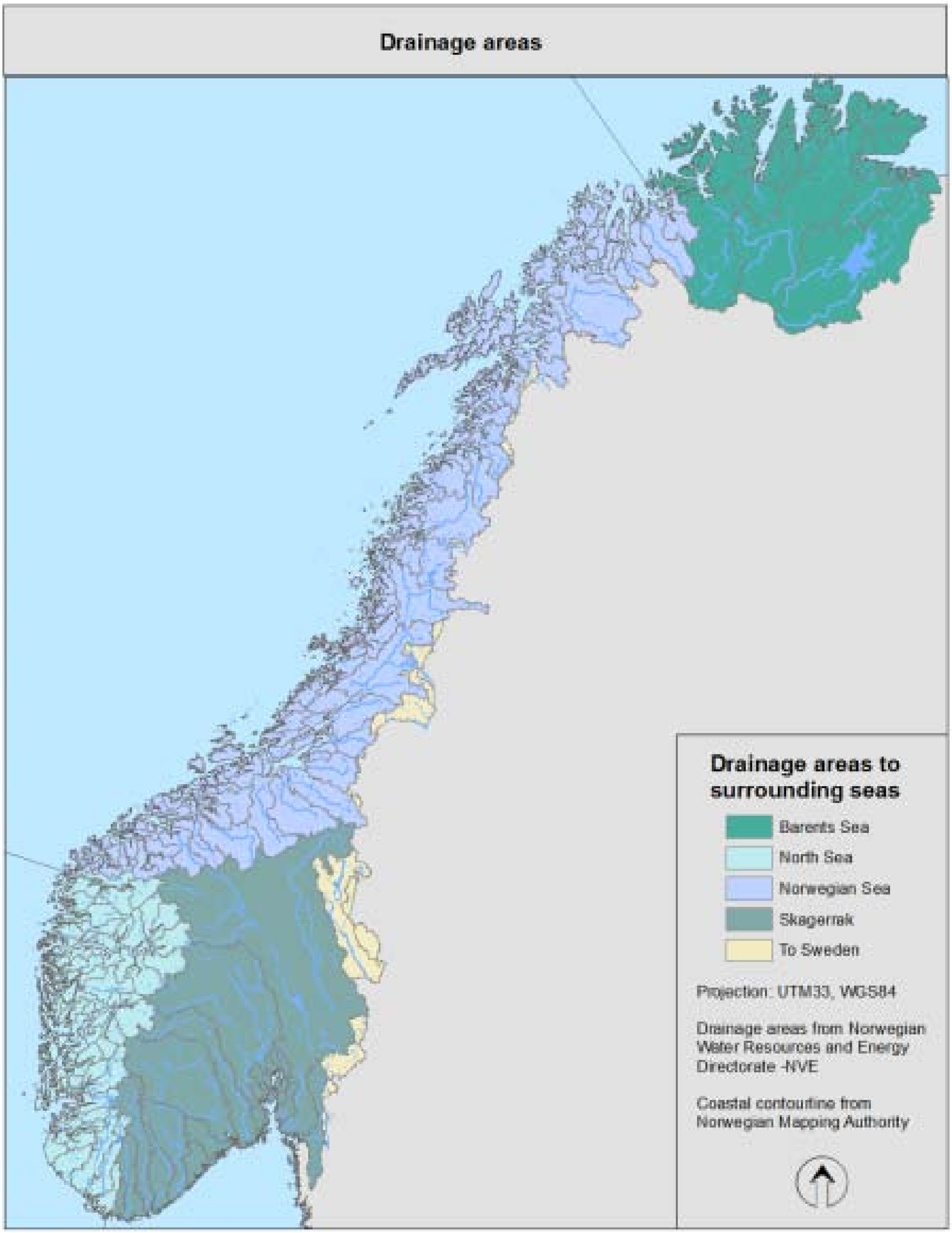


Figure 2. Norway has been divided into four Discharge Areas, i.e. Skagerrak, North Sea, Norwegian Sea and the Barents Sea. Minor parts of Norway drain to Sweden.

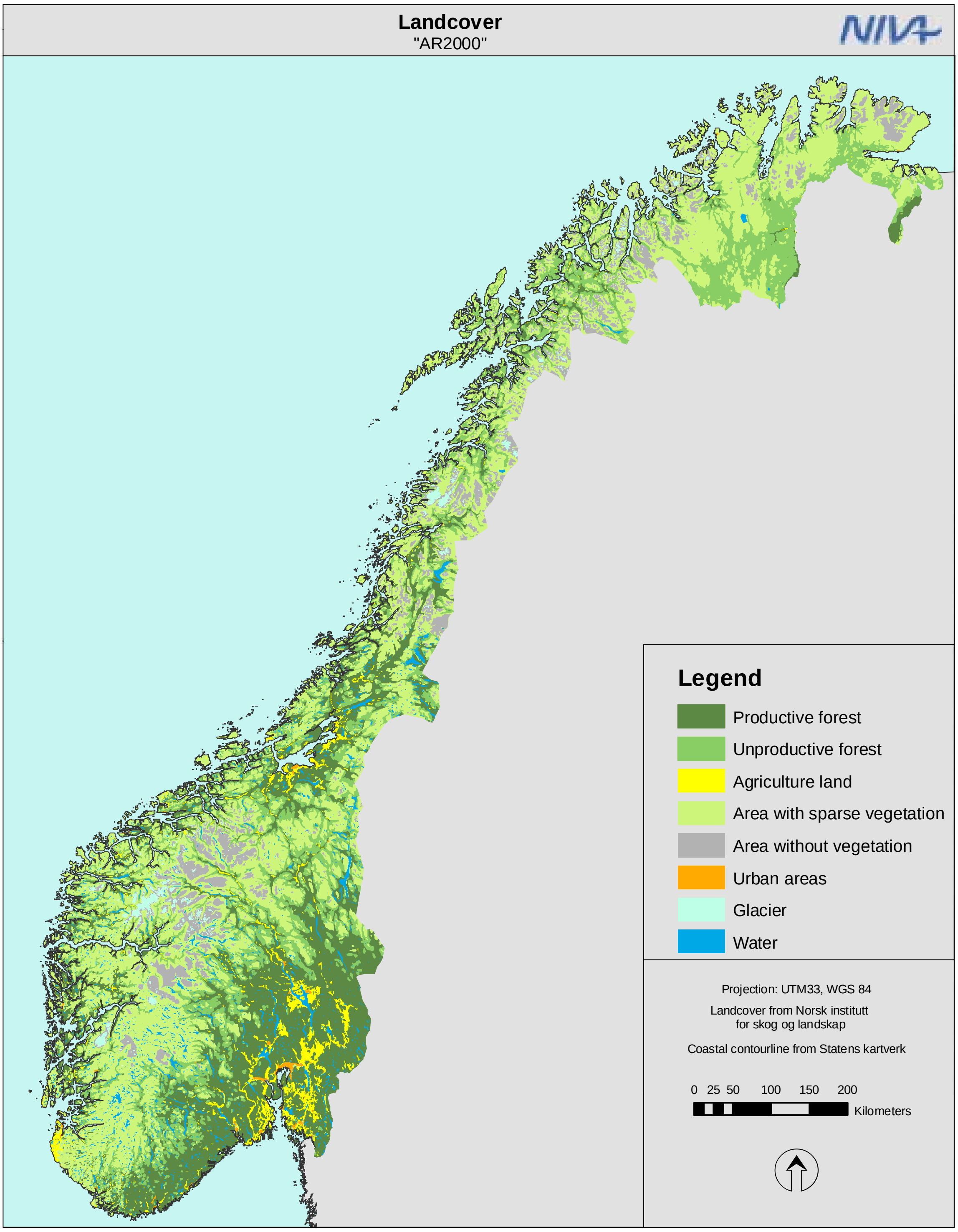


Figure 3. Land cover map of Norway. See also Figure 4 where the land use in the catchments of the 10 main RID rivers is shown. Based on data from the Norwegian Forest and Landscape Institute.

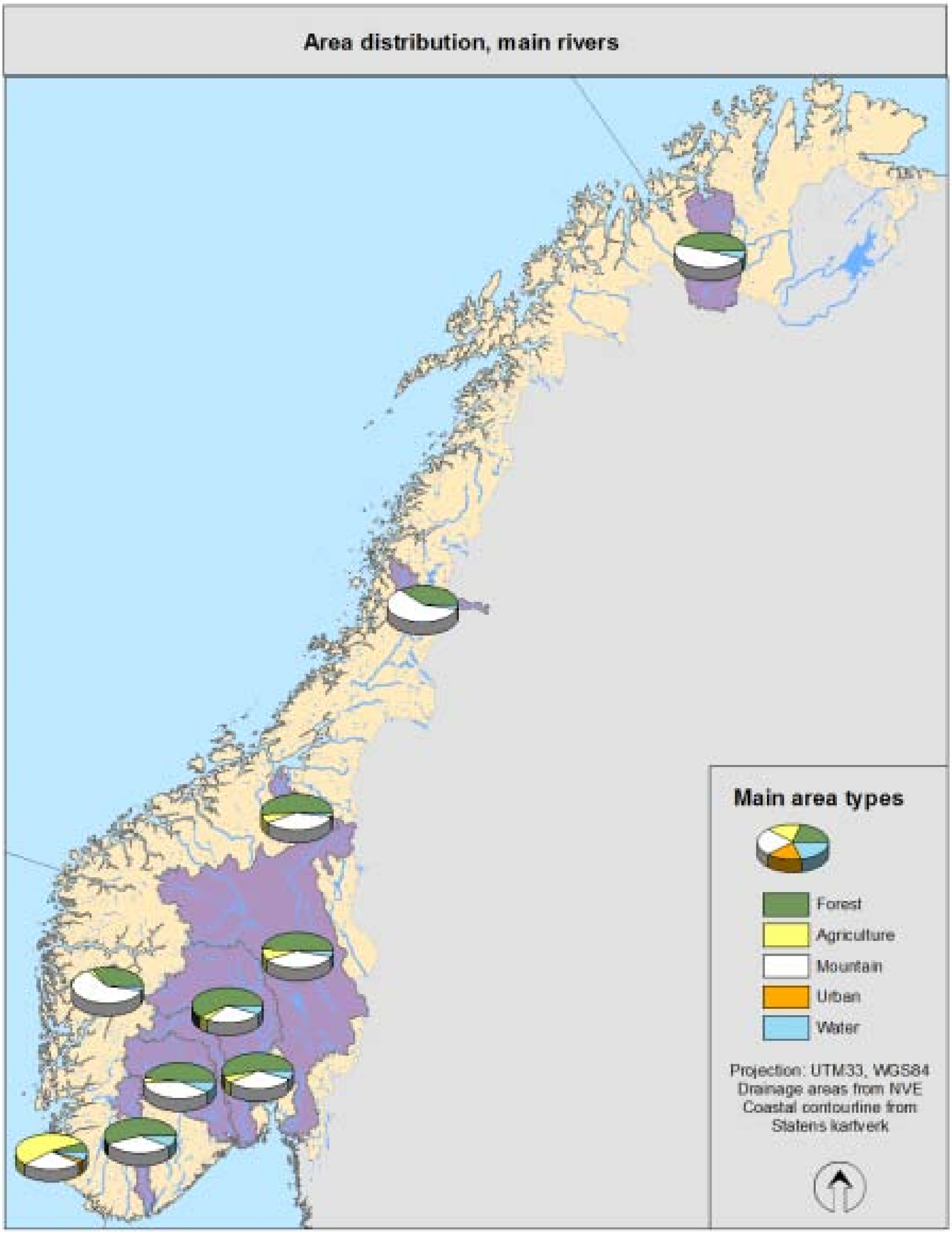


Figure 4. Land use in the catchment areas of the 10 main rivers. "Water" signifies proportion of lakes in the catchment; "Mountains" include moors and mountain plateaus not covered by forest. Based on data from The Norwegian Forest and Landscape Institute.

2. Materials and methods

This chapter presents the methodology used in the RID 2010 Programme, including selection of rivers for monitoring; water sampling and analysis methodology; water discharge and hydrological modelling; calculation formula for riverine loads and methods for estimating direct discharges; methods for estimating long-term trends in rivers. Appendix IV gives more details.

2.1 Selection of RID Rivers

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

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

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

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

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

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

2.2 Water sampling methodology

The methodology for water sampling described in the Commission’s Document “Principles of the Comprehensive Study on Riverine Inputs” (PARCOM, 1988; 1993) has been followed.

Sampling has been carried out in the same manner as the previous year (Skarbøvik et al., 2010).

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

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

Table 2. Sampling frequency and dates of sampling in 2010 in the 10 main rivers for all substances. Dates for analyses of PCB7 and lindane are shown below.

River	Glomma	Drammen	Numedals-lågen	Skienselva	Otra	Orre	Vosso	Orkla	Vefsna	Altaelva
Date ddmm	04.01	07.01	07.01	12.01	05.01	05.01	12.01	04.01	12.01	07.01
	08.02	03.02	04.02	03.02	09.02	02.02	02.02	04.02	01.02	08.02
	08.03	03.03	04.03	10.03	10.03	02.03	08.03	10.03	05.03	12.03
	06.04	06.04	07.04	06.04	07.04	06.04	06.04	07.04	06.04	06.04
	10.05	07.05	06.05	07.05	05.05	03.05	03.05	10.05	03.05	10.05
	18.05	14.05								
	25.05	20.05								
	31.05	08.06								
	07.06	15.06	02.06	02.06	09.06	08.06	07.06	07.06	02.06	07.06
	18.06	26.06								
	05.07	07.07	06.07	30.06	01.07	05.07	12.07	01.07	06.07	07.07
	09.08	04.08	04.08	05.08	10.08	11.08	03.08	05.08	16.08	09.08
	06.09	08.09	06.09	06.09	08.09	06.09	09.09	07.09	06.09	08.09
	04.10	06.10	06.10	12.10	06.10	04.10	04.10	05.10	04.10	08.10
	08.11	03.11	04.11	01.11	09.11	01.11	03.11	09.11	01.11	09.11
	06.12	07.12	02.12	06.12	06.12	06.12	30.11	07.12	30.11	06.12
sum	16	16	12	12	12	12	12	12	12	12

River	Glomma	Drammen	Numedals-lågen	Skienselva	Otra	Orre	Vosso	Orkla	Vefsna	Altaelva
PCB7 and Lindane	08.02	03.02	04.02	03.02	09.02	02.02	02.02	04.02	05.03	12.03
	10.05	07.05	06.05	07.05	05.05	03.05	03.05	10.05	03.05	10.05
	09.08	04.08	04.08	05.08	10.08	11.08	03.08	05.08	16.08	09.08
	04.10	06.10	06.10	12.10	06.10	04.10	04.10	05.10	04.10	08.10
sum	4	4	4	4	4	4	4	4	4	4

Table 3. Sampling frequency and dates in 2010 in the 36 tributary rivers.

River	Tista	Tokkeelva	Nidelv (south)	Tovdalselva	Mandalselva	Lyngdalselva
Date ddmm	08.02.2010	08.02.2010	09.02.2010	09.02.2010	10.02.2010	10.02.2010
	10.05.2010	10.05.2010	10.05.2010	04.05.2010	10.05.2010	10.05.2010
	09.08.2010	02.08.2010	02.08.2010	10.08.2010	09.08.2010	09.08.2010
	04.10.2010	11.10.2010	05.10.2010	06.10.2010	11.10.2010	11.10.2010
River	Kvina	Sira	Bjerkreimselva	Figgjoelva	Lyseelva	Årdalselva
Date ddmm	10.02.2010	10.02.2010	09.02.2010	02.02.2010	21.02.2010	17.02.2010
	10.05.2010	10.05.2010	10.05.2010	03.05.2010	09.05.2010	18.05.2010
	09.08.2010	09.08.2010	05.08.2010	11.08.2010	08.08.2010	17.08.2010
	11.10.2010	11.10.2010	05.10.2010	04.10.2010	17.10.2010	12.10.2010
River	Ulla	Sauda	Vikedalselva	Suldalslågen	Jostedøla	Gaular
Date ddmm	17.02.2010	02.02.2010	01.02.2010	08.02.2010	16.02.2010	05.02.2010
	18.05.2010	04.05.2010	03.05.2010	04.05.2010	19.05.2010	10.05.2010
	17.08.2010	02.08.2010	16.08.2010	02.08.2010	04.08.2010	17.08.2010
	12.10.2010	04.10.2010	04.10.2010	04.10.2010	11.10.2010	05.10.2010
River	Jølstra	Nausta	Breimselva	Driva	Surna	Gaula
Date ddmm	05.02.2010	05.02.2010	05.03.2010	02.03.2010	15.02.2010	04.02.2010
	10.05.2010	06.05.2010	02.06.2010	10.05.2010	05.05.2010	03.05.2010
	17.08.2010	17.08.2010	22.08.2010	24.08.2010	03.08.2010	09.08.2010
	08.10.2010	08.10.2010	15.10.2010	07.10.2010	18.10.2010	21.10.2010
River	Nidelva	Stjørdalselva	Verdalselva	Snåsa	Namsen	Røssåga
Date ddmm	04.02.2010	04.02.2010	04.02.2010	04.02.2010	08.02.2010	01.02.2010
	03.05.2010	03.05.2010	03.05.2010	03.05.2010	10.05.2010	14.05.2010
	09.08.2010	09.08.2010	13.08.2010	13.08.2010	09.08.2010	16.08.2010
	21.10.2010	21.10.2010	21.10.2010	21.10.2010	11.10.2010	06.10.2010
River	Ranaelva	Beiarelva	Målselv	Barduelva	Tanaelva	Pasvikelva
Date ddmm	01.02.2010	10.02.2010	02.02.2010	17.02.2010	05.02.2010	06.02.2010
	14.05.2010	21.05.2010	17.05.2010	17.05.2010	05.05.2010	05.05.2010
	16.08.2010	25.08.2010	03.08.2010	03.08.2010	02.08.2010	02.08.2010
	06.10.2010	20.10.2010	11.10.2010	11.10.2010	06.10.2010	06.10.2010

2.3 Chemical parameters – detection limits and analytical methods

The parameters monitored in 2010 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 last year (Skarbøvik et al., 2010).

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

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

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

According to the RID Principles, and in particular the document "Principles of the Comprehensive Study of Riverine Inputs and Direct Discharges" (PARCOM, 1988), it is necessary to choose an analytical method which gives at least 70 % of positive findings (i.e. no more than 30% of the samples below the detection limit). As shown in Table 4, mercury and chromium did not achieve this requirement in 2010. Also as previously, PCB7 compounds and lindane were 100% below the detection limit. As the analytical methods used have acceptably low detection limits, the number of samples below the detection limit reflects that the concentrations of these compounds were low in Norwegian river waters in 2010.

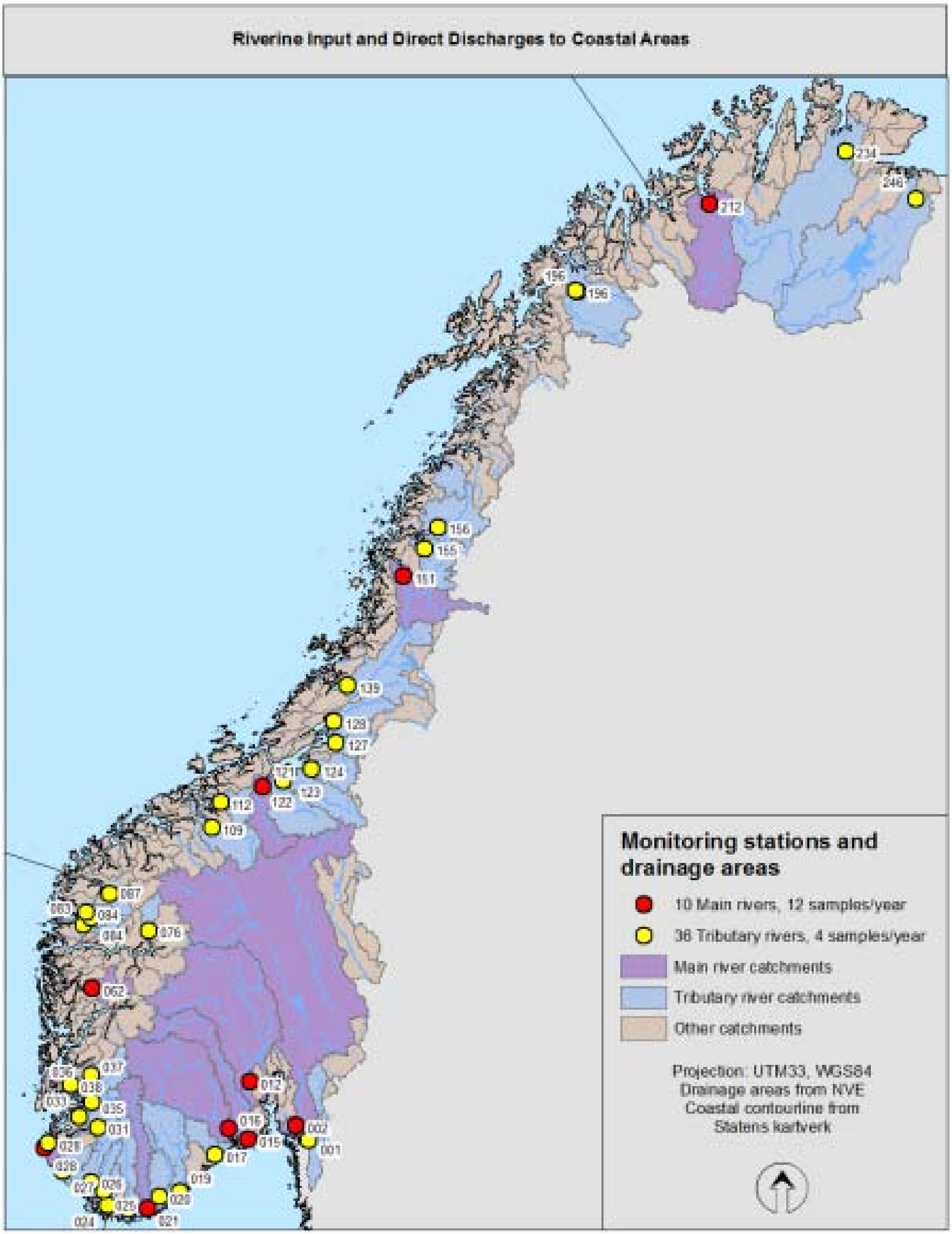


Figure 5. River sampling sites in the Norwegian RID programme. Red dots represent the 10 main rivers. Yellow dots represent the 36 'tributary' rivers. Numbers refer to the national river register (REGINE; www.nve.no).

Table 4. The proportion of analyses below the detection limit for all parameters included in the sampling programme in 2010. The detection limits are shown in Appendix IV.

Parameter	Unit	% below detection limit	Total no of samples	No of samples below detection limit
pH		0	272	0
Conductivity	mS/m	0	272	0
SPM	mg/l	1	278	2
TOC	mg C/l	0	278	0
TOT-P	µg P/l	1	272	4
PO4-P	µg P/l	29	272	80
TOT-N	µg N/l	0	272	0
NO3-N	µg N/l	3	272	9
NH4-N	µg N/l	11	272	30
SiO2	mg/l	0	270	1
Pb	µg/l	1	269	4
Cd	µg/l	28	269	76
Cu	µg/l	0	269	1
Zn	µg/l	0	269	0
As	µg/l	12	269	32
Hg	ng/l	82	268	219
Cr	µg/l	32	269	85
Ni	µg/l	1	269	4
Lindane(HCHG)	ng/l	100	39	39
PCB(CB101)	ng/l	100	39	39
PCB(CB118)	ng/l	100	38	38
PCB(CB138)	ng/l	100	39	39
PCB(CB153)	ng/l	100	39	39
PCB(CB180)	ng/l	100	39	39
PCB(CB28)	ng/l	100	39	39
PCB(CB52)	ng/l	100	39	39

2.4 Quality assurance and direct on-line access to data

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

2.5 Water discharge and hydrological modelling

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

For the 36 rivers monitored quarterly, as well as the remaining 109 rivers monitored once a year before 2004, water discharge has been simulated with a spatially distributed version of the HBV-model (Beldring et al., 2003). The use of this model was introduced in 2004. Appendix IV gives more information on the methodology. There have been no amendments or changes in this method since last year's reporting (Skarbøvik et al. 2010).

For each of the 46 rivers that have been monitored in 2010, as well as for the 109 rivers monitored earlier, the water discharge has been calculated at the location where the water samples are collected. This is the water discharge that is used to calculate riverine inputs.

2.6 Calculating riverine loads

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

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

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

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

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

- For nutrients, sediments, silica and total organic carbon, the modelled average water discharge in 2010 was multiplied with average concentration for the period 1990-2003.
- For metals, the modelled average water discharge in 2010 was multiplied with average concentration for the period 2000-2003 (earlier data were not used due to high detection limits).

For the remaining area (the 92 rivers that drain to the sea but are not included in either this or former RID studies, areas downstream the sampling points and coastal areas), the nutrient loads were calculated by means of the TEOTIL model (e.g. Tjomsland and Bratli 1996; Bakken et al. 2006; Hindar and Tjomsland 2007). The model has been utilised for pollution load compilations of nitrogen and phosphorus in catchments or groups of catchments. The model estimates annual loads of phosphorus and nitrogen based on national statistical information on population and effluent treatment, as well as industrial and agricultural point sources. Losses from agricultural fields and natural runoff from forest and mountain areas are modelled by an export coefficient approach (Tjomsland and Bratli, 1996).

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

2.7 Direct discharges to the sea

Data sources for direct discharges include:

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

The details on how these data are extracted are given in Appendix IV. Direct discharges have been calculated for point sources and diffuse sources. The point sources include industry (Figure 6); sewage treatment plants (Figure 7) and fish farming (Figure 8). 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).

Figure 6. Industrial units reporting discharges of nitrogen and phosphorus to freshwater systems in 2010. Co-ordinates on industry from Klif's database 'Forurensning'.

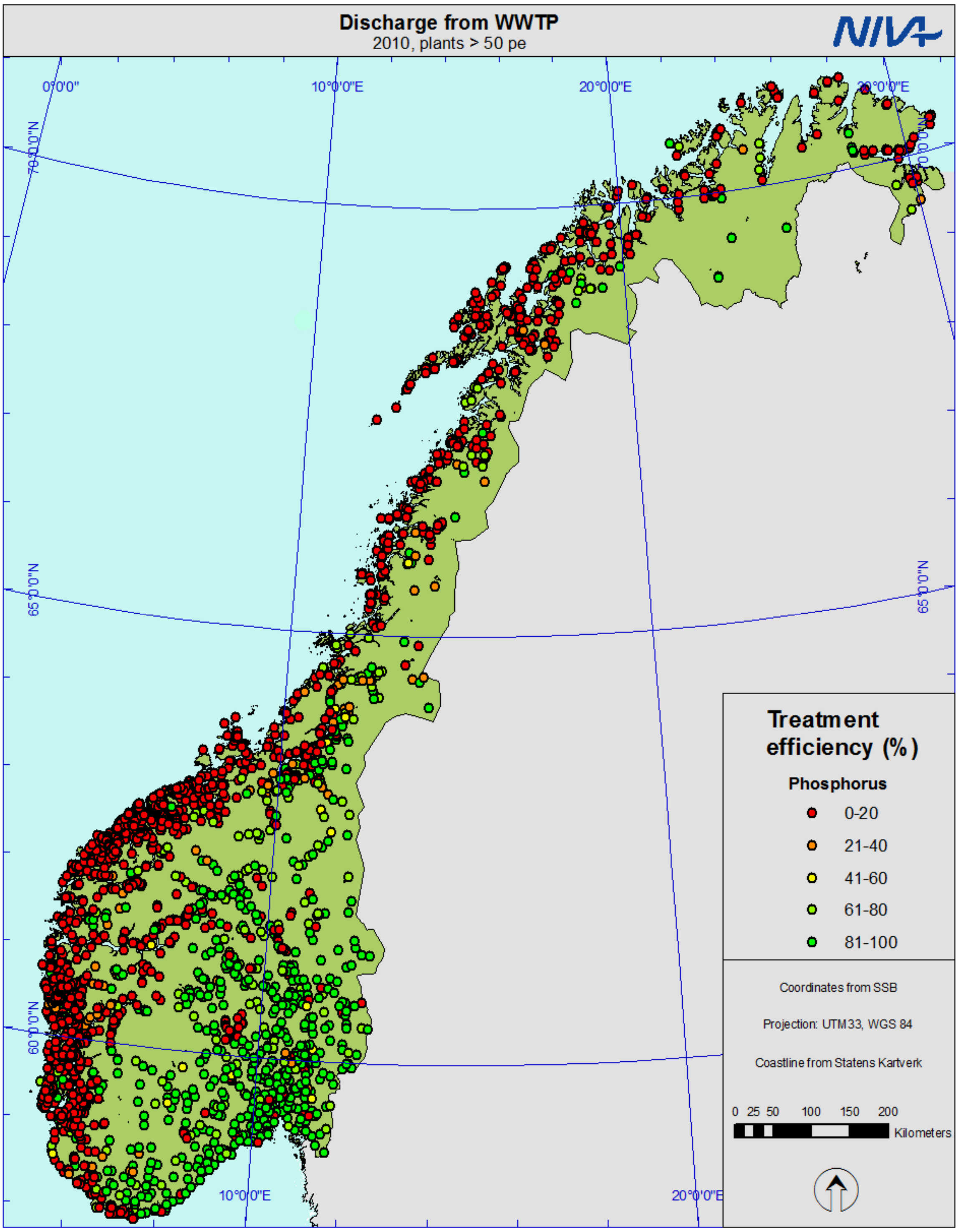


Figure 7. Sewage treatment plants in Norway in 2010 and phosphorus treatment efficiency. Co-ordinates from KOSTRA/SSB.

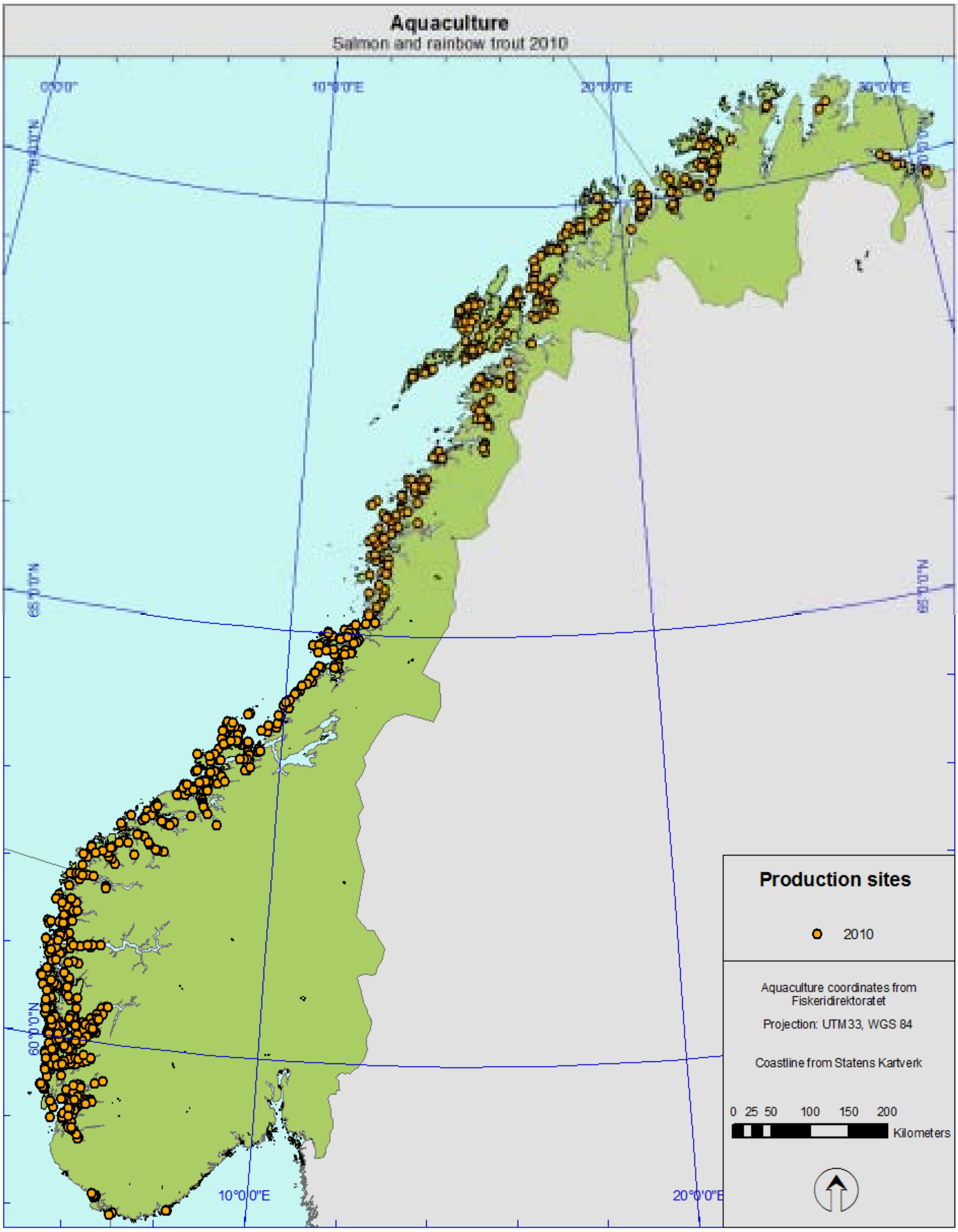


Figure 8. Fish farms for salmon and trout in Norway in 2010. Based on data from the Directorate of Fisheries/ALTINN.

Estimated inputs of nutrients from fish farming followed the same procedure as in previous years (ref). The sale statistics from SSB with regard to trout and salmon show that the there has been a general increase since 1995. 2007 and 2008 were quite similar but in 2009 the quantities increased, with 13.9 % from 2008, and there was a further increase by 4.8 % from 2009 to 2010 (see Figure 9). Increased production will lead to increased discharges of nutrients despite improvements in production procedures over the years.

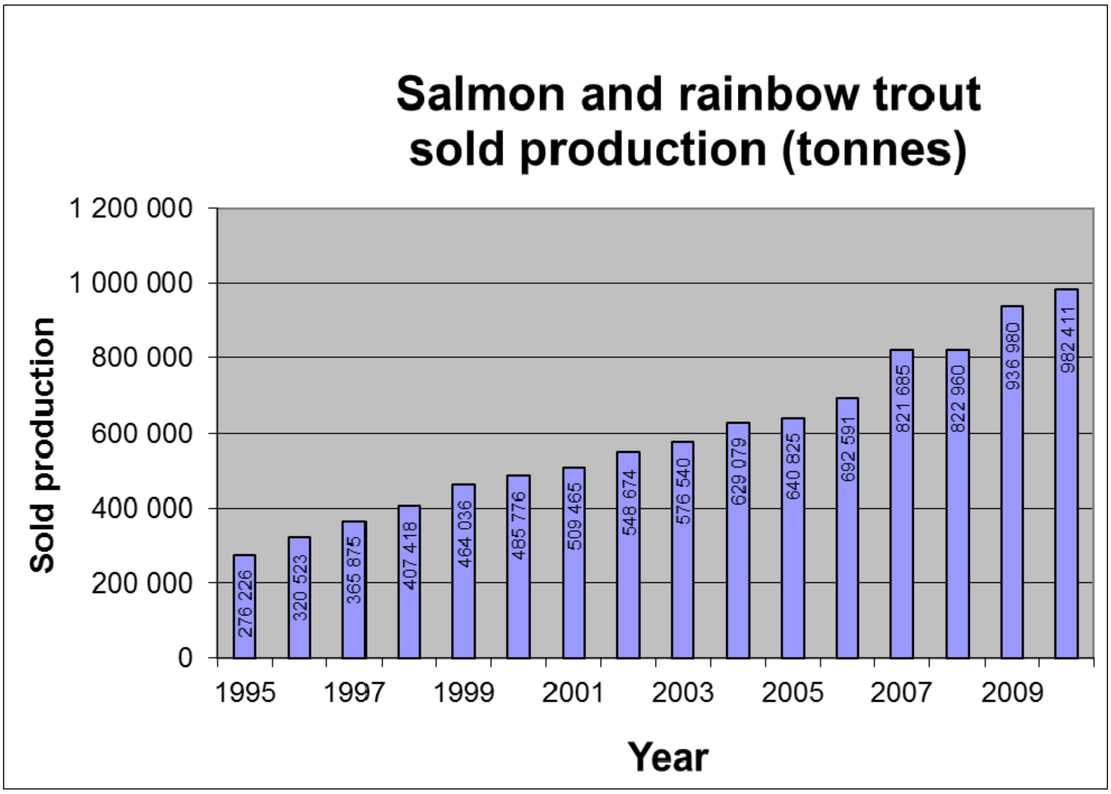


Figure 9. Quantities of sold trout and salmon for the period 1995-2010 (based on SSB data).

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 10). Klif assumes that 85% of the copper content is lost to the environment. The quantity used per fish farm is not included in official statistics, but for the RID Programme a theoretical distribution proportional to the fish production has been used.

Since no new sale statistics of antifouling products were available for 2010, the copper discharges in 2010 have been estimated on the basis of a factor for the loss of copper per tonn nutrient discharge last year (2009).

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.

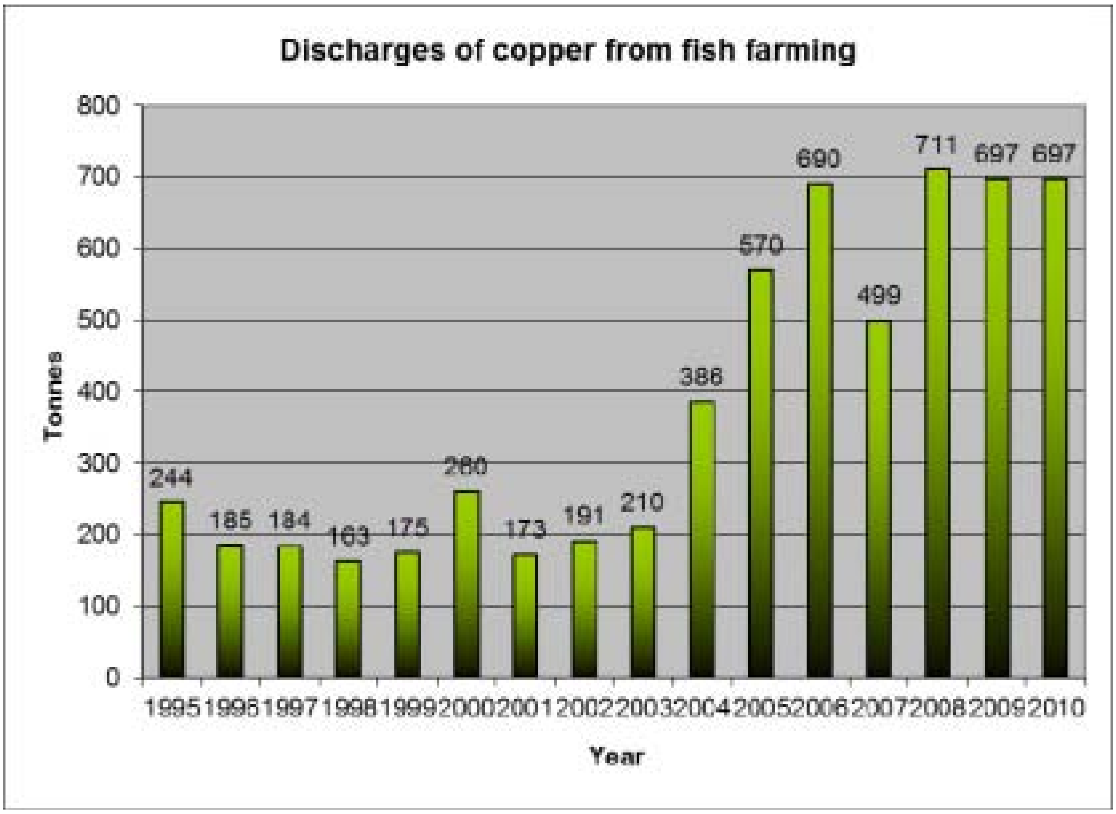


Figure 10. Discharge of copper from fish farming, deriving from antifouling impregnation of net cages, in the period 1995-2010. Data for 2010 are not yet available and are therefore set equal to 2009.

2.8 Statistical methodology for trends in riverine inputs

Long-term trends in riverine pollutant inputs are reported in Chapter 4.3, but the methodology is given here. Only main rivers[2] are included in these trend analyses, due to the lower sampling frequency for the tributary rivers.

All annual loads were recalculated during the work of Stålnacke et al. (2009). Some concentrations were last year removed from the riverine datasets prior to the concentration trend analyses, an overview of these are given in Skarbøvik et al. (2010). For the load trend analyses, the loads were estimated based on extrapolation or interpolation of the trend line wherever concentrations were missing. This was also done in the two last years' reporting. The bars with estimated loads (extrapolated or interpolated) have been given different colours in the charts in Appendix V, to separate them from the loads based on measured concentration values.

It should also be noted that the statistical trend analyses were conducted only for some, selected metals, given the problem with changed levels of detection (LOD) over time and/or a large number of samples reported at the LOD. The lower and upper estimates are, however, given in graphs supplemented with a qualitative assessment based on a visual inspection of these graphs and underlying data (Appendix V).

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

The partial Mann-Kendall test (Libiseller and Grimvall, 2002) has been used to test for long-term monotonic[3] trends (including linear trends) in annual riverine inputs measured in nine of the ten main rivers. The method has its methodological basis in the seasonal Mann-Kendall-test (Hirsch and Slack, 1984) with the difference that water discharge is included as explanatory variable. The test also includes a correction for serial correlation up to a user-defined time span; in our case a span of one year was used. The method also offers convenient handling of missing values and ties.

The trend analyses for nutrients and suspended particulate matter were performed on the upper estimates of the loads. The trend analyses for metals were performed on both the lower and upper estimates of the loads.

The trends were regarded as statistically significant at the 5%-level (double-sided test)[4]. Trend slopes were also computed according to Sen (1968).

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

[3] 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.

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

3. Results

This chapter describes the climatic and water discharge conditions in 2010, and presents the main results of the 2010 monitoring and modelling of riverine inputs and direct discharges.

3.1 Climatic conditions in 2010

The year 2010 can be characterised as rather cold and dry. The mean temperature for Norway was 1 °C below normal. This is the tenth lowest mean temperature since 1900. Only the northernmost counties and the arctic stations had mean temperatures above normal (http://met.no/Klima/Klimastatistikk/Varet_i_Norge/).

The mean precipitation in Norway was 85 % of a normal year, which makes 2010 the 15th driest year since 1900. Some areas in the southern and western parts of the country received only 60-75% of normal precipitation this year. However, parts of the country, and especially in the north and south-east, had precipitation above normal. In the northernmost county of Finnmark the precipitation was as much as 150% of normal precipitation (Figure 12).

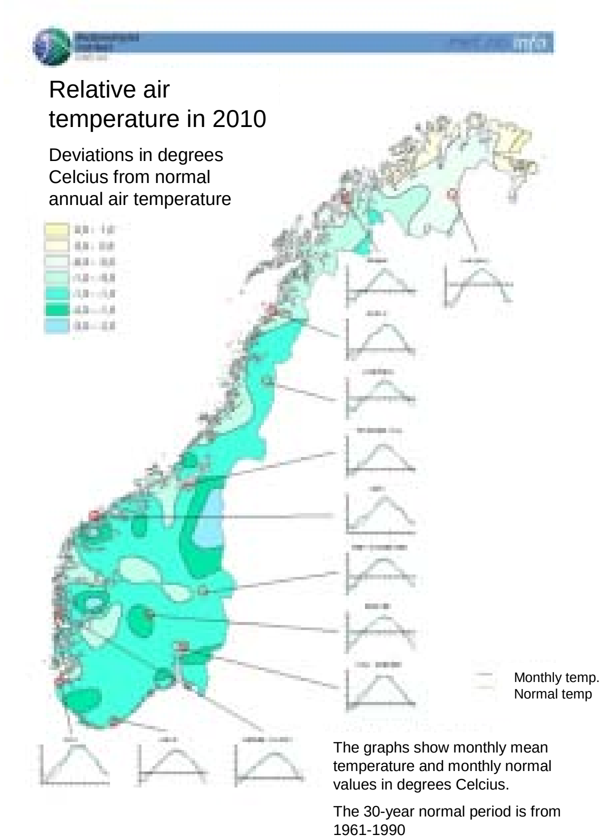


Figure 11. Air temperature in Norway in 2010 relative to the long-term normal of 1961-1990. Source: Norwegian Meteorological Institute (http://met.no/Klima/Klimastatistikk/Varet_i_Norge/)

The winter was cold and with relatively low snowfall, which resulted in low water discharges in Norwegian rivers (NVE, 2011). Mild weather in May gave severe floods especially in the northernmost counties, with subsequent avalanches. Heavy rains in June resulted in floods also this month, in particular in the county of Trøndelag. Cold summer temperatures resulted in water temperatures below average in the northern part of the country, whereas the rest of the country had average water temperatures. An exception is the south-eastern parts of the country where water temperatures were higher than normal.

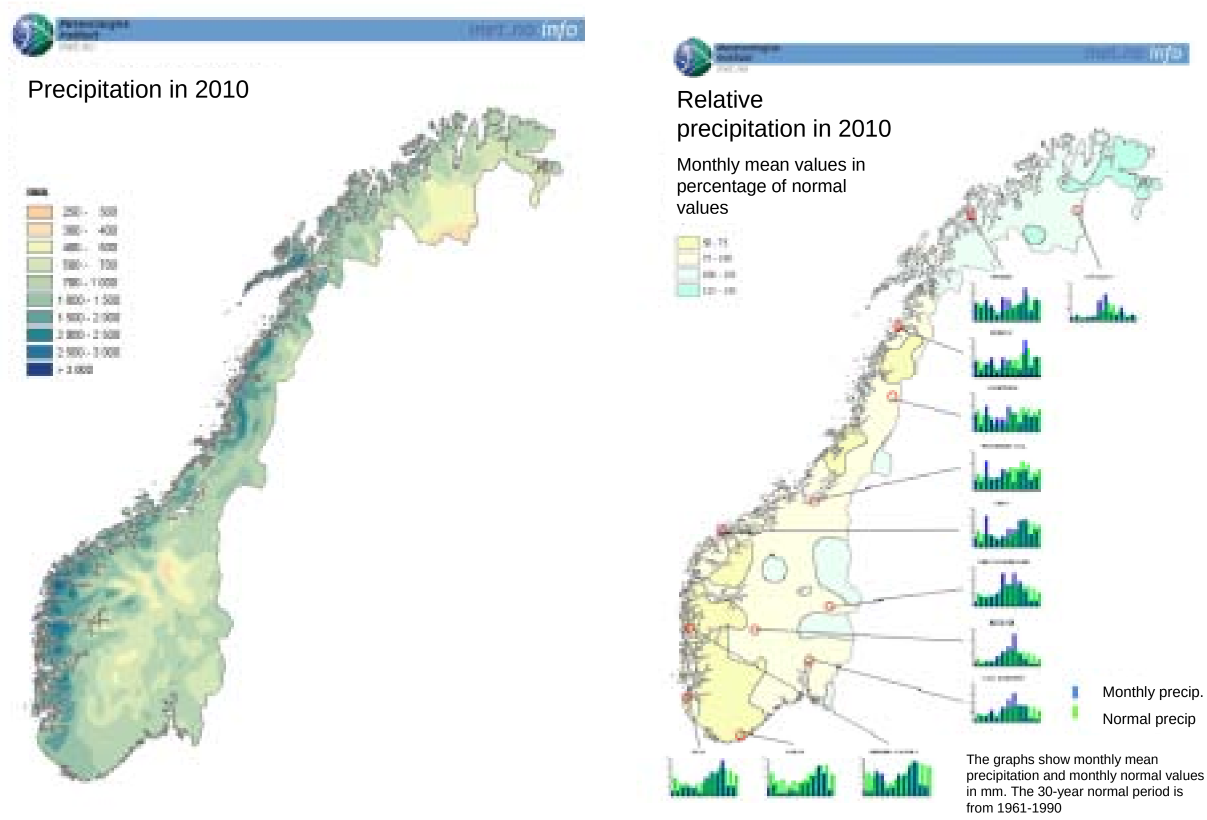


Figure 12. Total precipitation in 2010 (left panel) and precipitation in 2010 relative to the long-term normal of 1961-1990 (right panel). Source: The Norwegian Meteorological Institute (http://met.no/Klima/Klimastatistikk/Varet_i_Norge/).

3.2 Water discharges in 2010

For nine of the ten main rivers the monthly mean water discharges in 2010 have been compared to mean water discharges in the 30-year period 1980-2009 (Figure 13), the mean discharges in the 30-year normal (1971-2000) and the discharges in 2009 (Table 5).

In rivers draining to the Skagerrak area (rivers Glomma, Drammen, Numedalslågen, Skien and Otra), there were only minor changes in the total water discharges in 2009 and 2010. All discharges in 2010 were, however, higher than for the 30-year normal period (1971-2000). In general, the spring floods were relatively lower than average whereas the autumn flows were slightly higher. Many of the rivers in this region also had higher than usual water discharges in August.

River Vosso is draining to the North Sea. Table 5 shows that water discharges in 2010 were only 50% of both the 30-year normal and the discharges in 2009. The discharges in River Vosso in both the spring and winter were significantly lower than usual.

For the two rivers draining to the Norwegian Sea (rivers Orkla and Vefsna), water discharges were lower than in 2009 (9 and 32 % respectively), but more or less at the same level as the thirty year averages. The highest water discharges during spring were in May for both rivers, which is early for River Vefsna compared to the 30-year average.

In the north of the country, the annual average flow in River Alta (Barents Sea) was 14% higher than the previous year, but similar to the 30 year normal. The spring flood came in May, which is early compared to the 30-year normal (June flood).

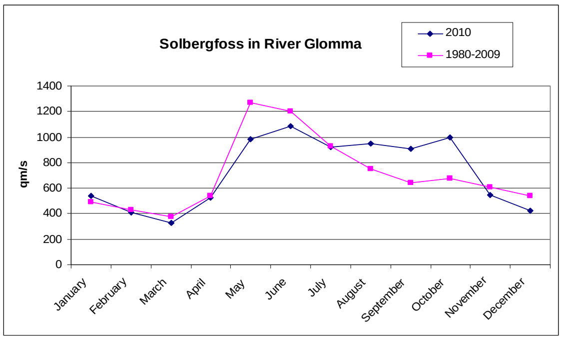
Table 5. Average annual water discharges in the 30-year period 1971-2000, in 2009 and in 2010. Note that these water discharges derive directly from the hydrological stations and are not adjusted to the RID sampling sites.

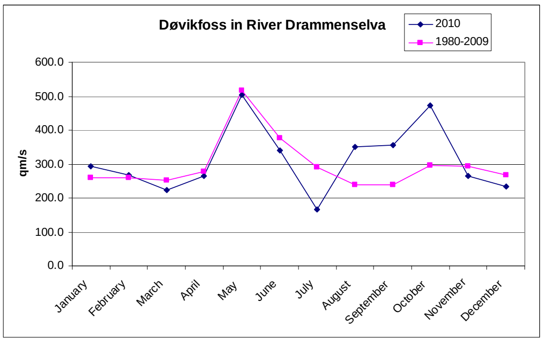
Station	30 year normal 1971-2000	2009	2010	Difference 2009-2010	Maritime area
	m^3/s	m^3/s	m^3/s	%	
Solbergfoss in Glomma	678.0	741.8	720.1	-3	Skagerrak
Døvikfoss in Drammenselva	281.3	308.6	312.0	1	
Holmsfoss in Numedalslågen	104.7	109.4	107.4	-2	
Norsjø in Skienselva	259.5	281.2	269.1	-4	
Heisel in Otra	145.6	148.6	146.8	-1	
Bulken in Vosso	72.8	70.2	46.4	-51	North Sea
Syrstad in Orkla	48.5	42.6	39.2	-9	Norwegian Sea
Laksfors in Vefsna	150.0	150.1	113.9	-32	
Kista in Alta	75.4	65.2	75.8	14	Barents Sea

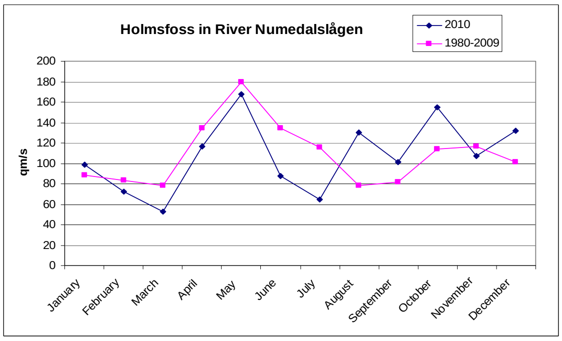
Water discharges calculated by the RID Programme as total input of water to the four different maritime areas are shown in Table 6. The figures reflect the above discussion. The total flow in 2010 was lower than in 2009 for all regions except for rivers draining to the Barents Sea, where the flow was 15 % higher.

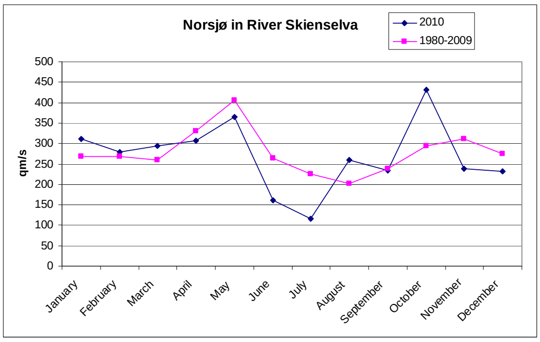
Table 6. River water discharges (1000 m^3/d) to the Norwegian coast in 2010 and 2009. The data are based on the main rivers (10) and tributary rivers (36+109).

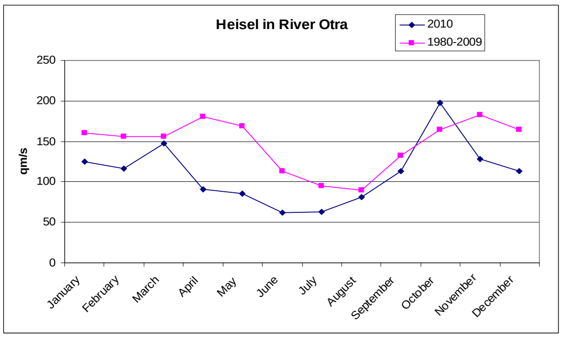
	Total Norway	Skagerrak	North Sea	Norwegian Sea	Barents Sea
2010	442 161	163 764	93 261	133 801	51 335
2009	534 539	183 365	137 940	169 659	43 574
% change	-21	-12	-48	-27	15

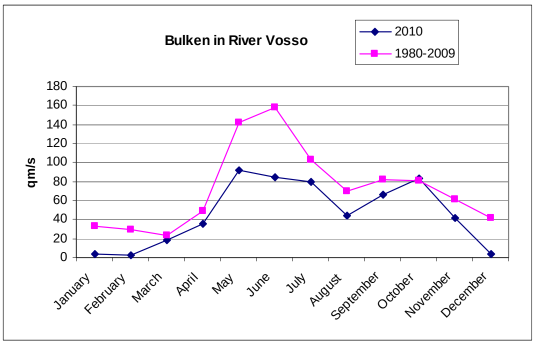


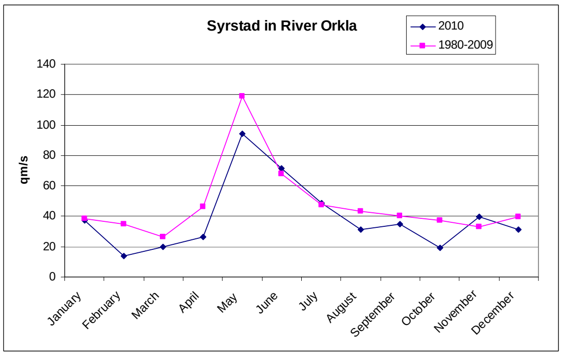


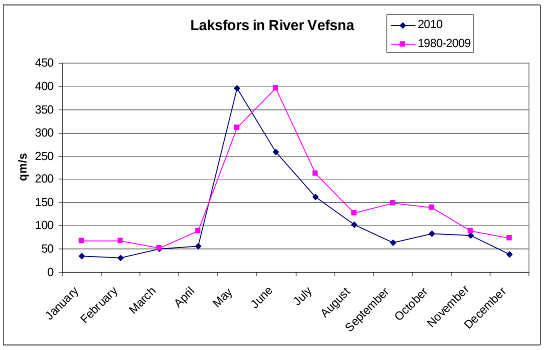












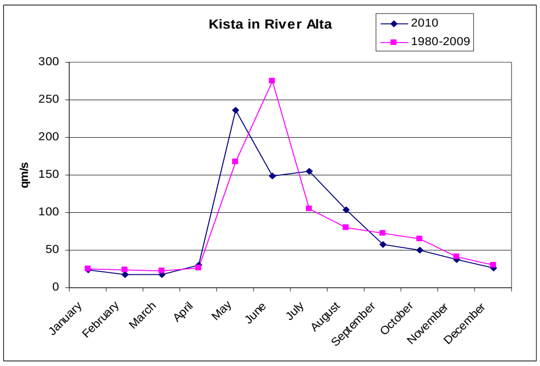


Figure 13. Monthly mean water discharge in 2010 and as a mean of 30 years (1980-2009), derived from hydrological stations (named) in 9 of the rivers monitored monthly (data from the Norwegian Water Resources and Energy Directorate, NVE).

3.3 Total nutrient and particle inputs in 2010

The total nutrient inputs[5] to coastal Norwegian waters in 2010 were estimated to about 11 000 tonnes of phosphorus and about 139 000 tonnes of nitrogen (Figure 14). Total silicate inputs were estimated to about 393 000 tonnes and total organic carbon (TOC) to about 469 000 tonnes. The input of suspended particulate matter amounted to about 770 000 tonnes.

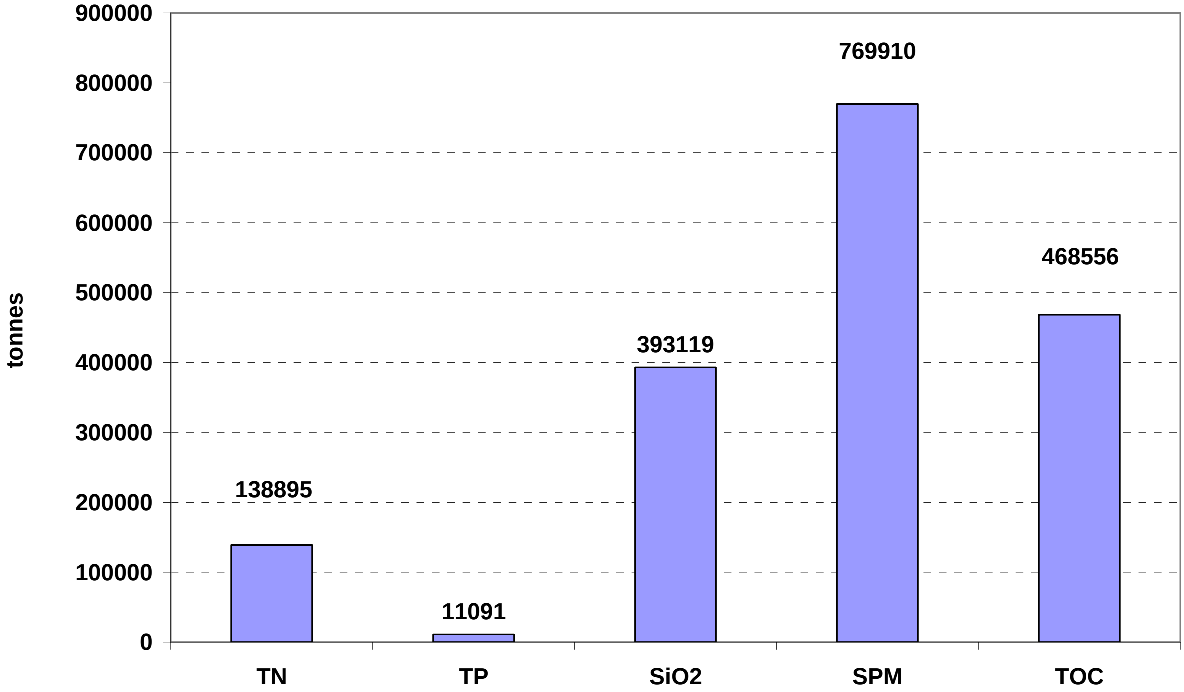


Figure 14. Total inputs (riverine and direct) of total nitrogen (TN), total phosphorus (TP), silicate (SiO_2), suspended particulate matter (SPM) and total organic carbon (TOC) to Norwegian coastal waters in 2010 (lower estimates).

An overview of the inputs of the different nitrogen and phosphorus fractions per coastal area is given in Figure 15. The relatively high ammonium and orthophosphate inputs to the North Sea and Norwegian Sea derive from fish farming. In the Barents Sea there is less fish farming, but this source of nutrients is still the most important of all nutrient sources, including riverine inputs, in this northern part of Norway. In the Skagerrak area, riverine inputs are the main source of nutrients, followed by sewage treatment plants. This area has very little contribution from fish farms. Overall, nutrient inputs were highest to the Norwegian Sea, and lowest to the Barents Sea.

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

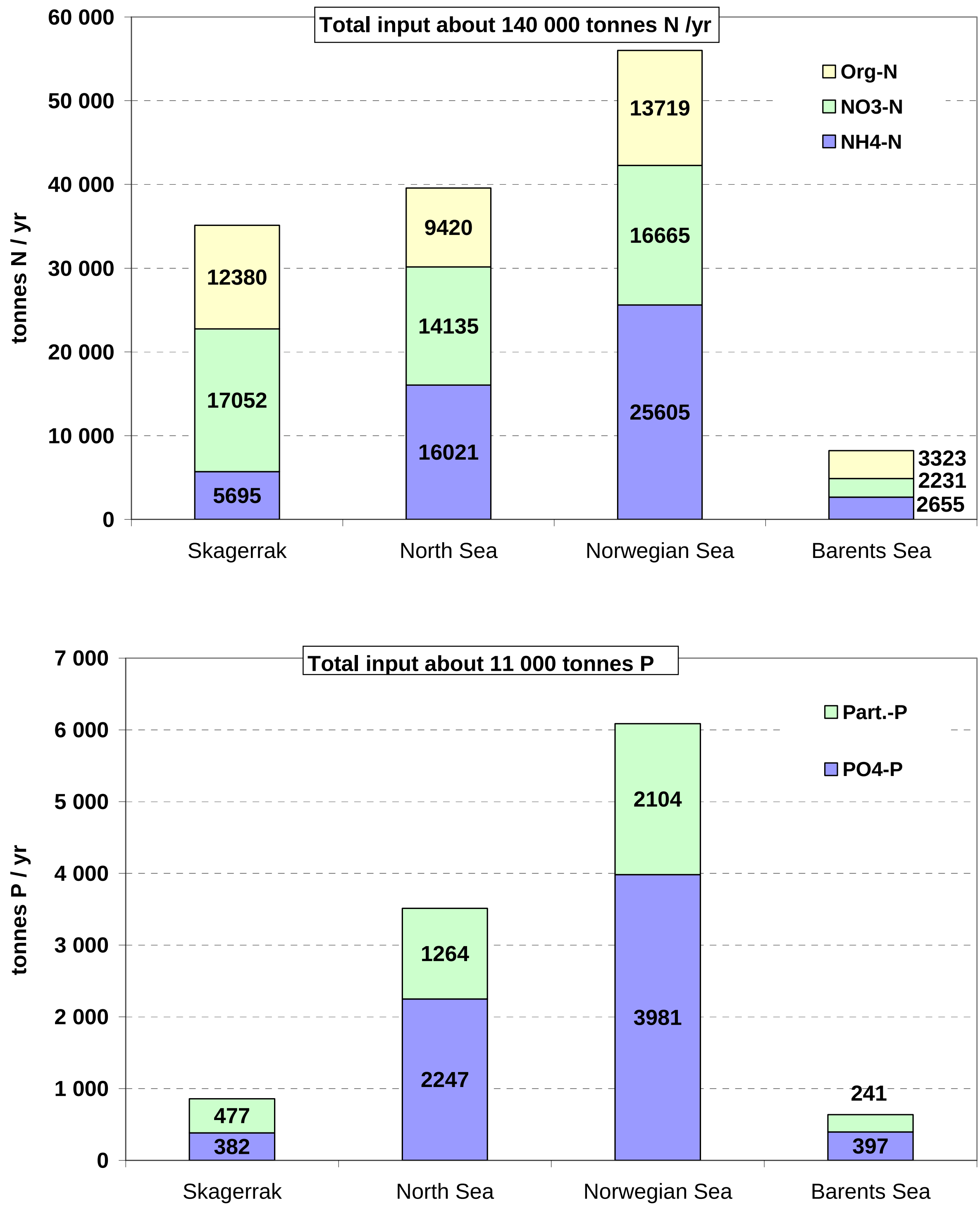


Figure 15. Inputs of total nitrogen (upper panel) and total phosphorus (lower panel) divided into different fractions for the four Norwegian maritime areas (lower estimates).

The sources of suspended particulate matter are shown in Figure 16. The input from rivers is the major source, with a total of about 731 000 tonnes, of which the main rivers contribute about 236 000 tonnes. Of the direct discharges, industrial effluents contribute most, with about 30 000 tonnes.

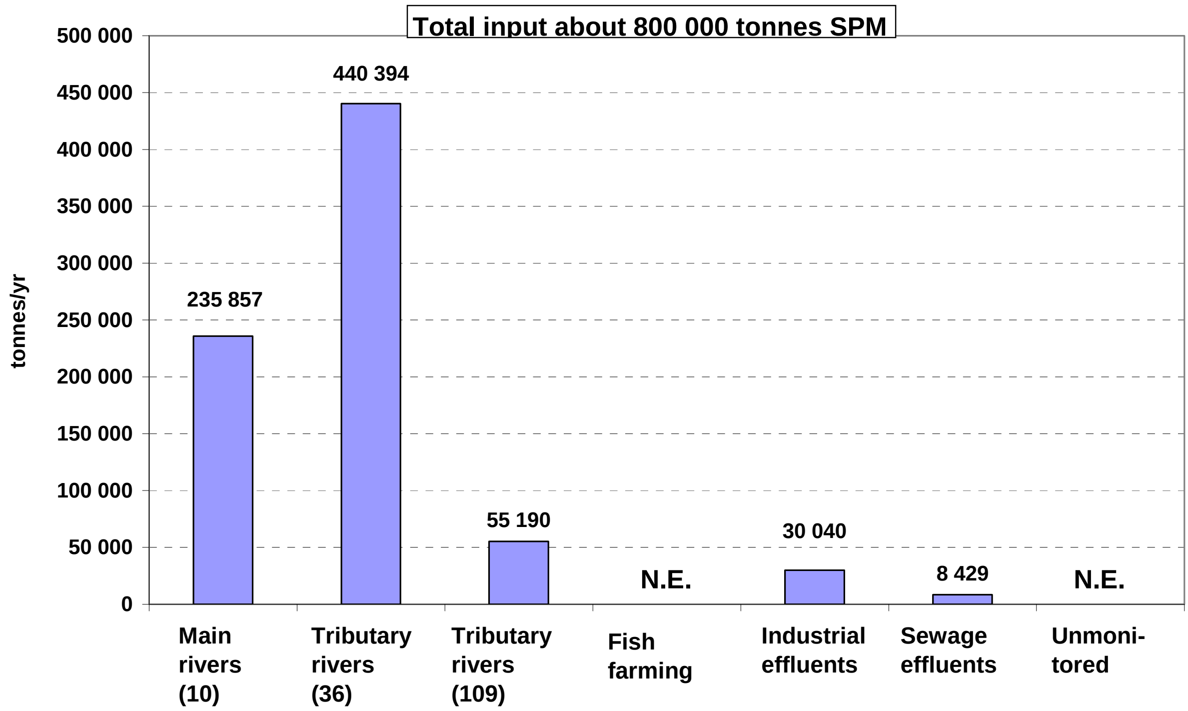


Figure 16. Inputs of particulate matter (SPM) from rivers and direct discharges in 2010 (lower estimates).

The proportion of sources of particulate matter and nutrients is further illustrated in Figure 17. In general, the 46 monitored rivers account for 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 17, lower panel) shows that direct discharges are most important for phosphorus (total and orthophosphate) and ammonium. This reflects high nutrient discharges from fish farming. The riverine sources are most important for loads of silicate and particulate matter, but it should be noted that although particulate matter is discharged from fish farming, it is not reported.

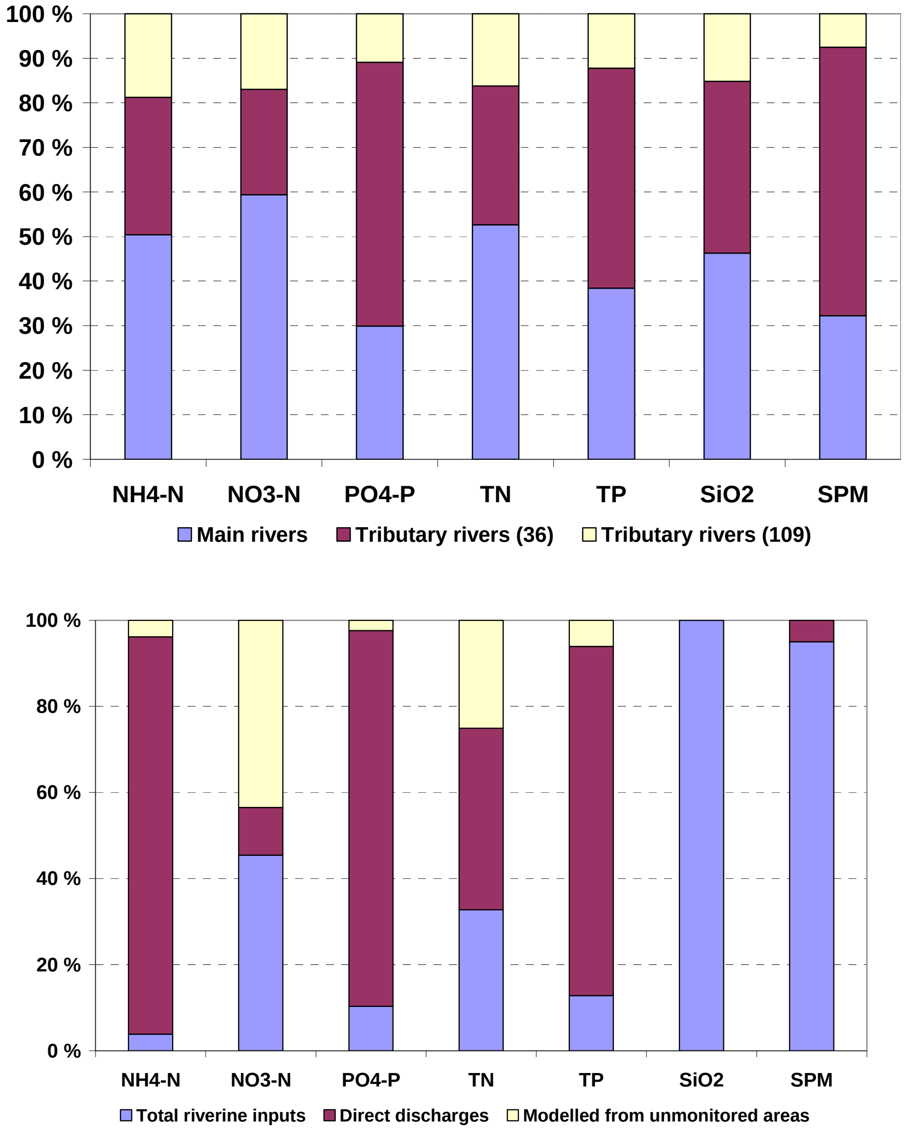


Figure 17. Main sources for nutrients, silicate and suspended particulate matter (SPM) divided into riverine contribution only (upper panel) and the proportion between riverine, direct inputs and unmonitored areas (lower panel). Note that for SPM or silica there are no estimates of inputs from fish farming and unmonitored areas.

The relative share of inputs from fish farms to the total inputs of nutrients is shown in Figure 18 for the four coastal areas. Due to few fish farms in the Skagerrak area, this area has significantly lower inputs from this source than the other three coastal areas. Totally in Norway, the nutrient loadings from fish farming contributed to 70 % of the total phosphorus inputs and 32 % of the total nitrogen inputs in 2010. In terms of nutrient fractions, 70 % of the ammonium, 10 % of the nitrate and 77 % of orthophosphate derived from fish farming in 2010.

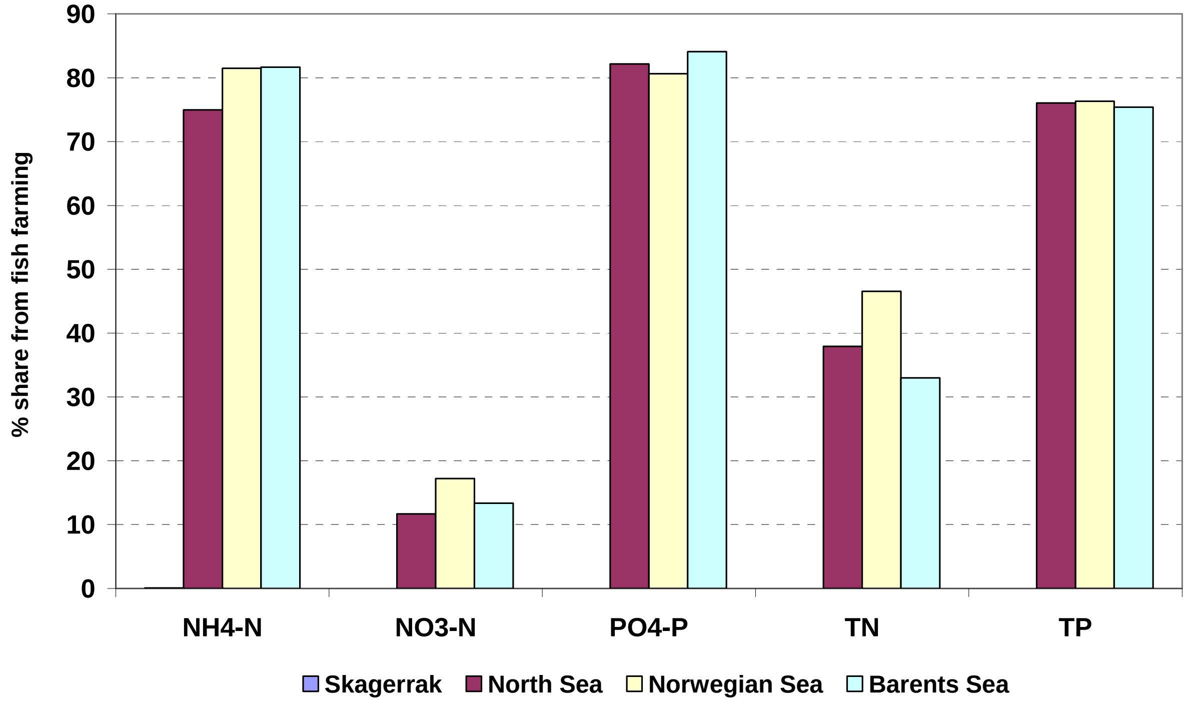


Figure 18. The relative share of nutrient inputs from fish-farming to the total inputs in 2010 for the four coastal areas.

3.4 Total metal inputs in 2010

In 2010, the inputs of metals to the Norwegian coastal areas were estimated to 99 kg mercury, 1.95 tonnes of cadmium, 22 tonnes of arsenic, 29 tonnes of lead, 52 tonnes of chromium, 134 tonnes of nickel, 489 tonnes of zinc and 883 tonnes of copper (lower estimates; Figure 19).

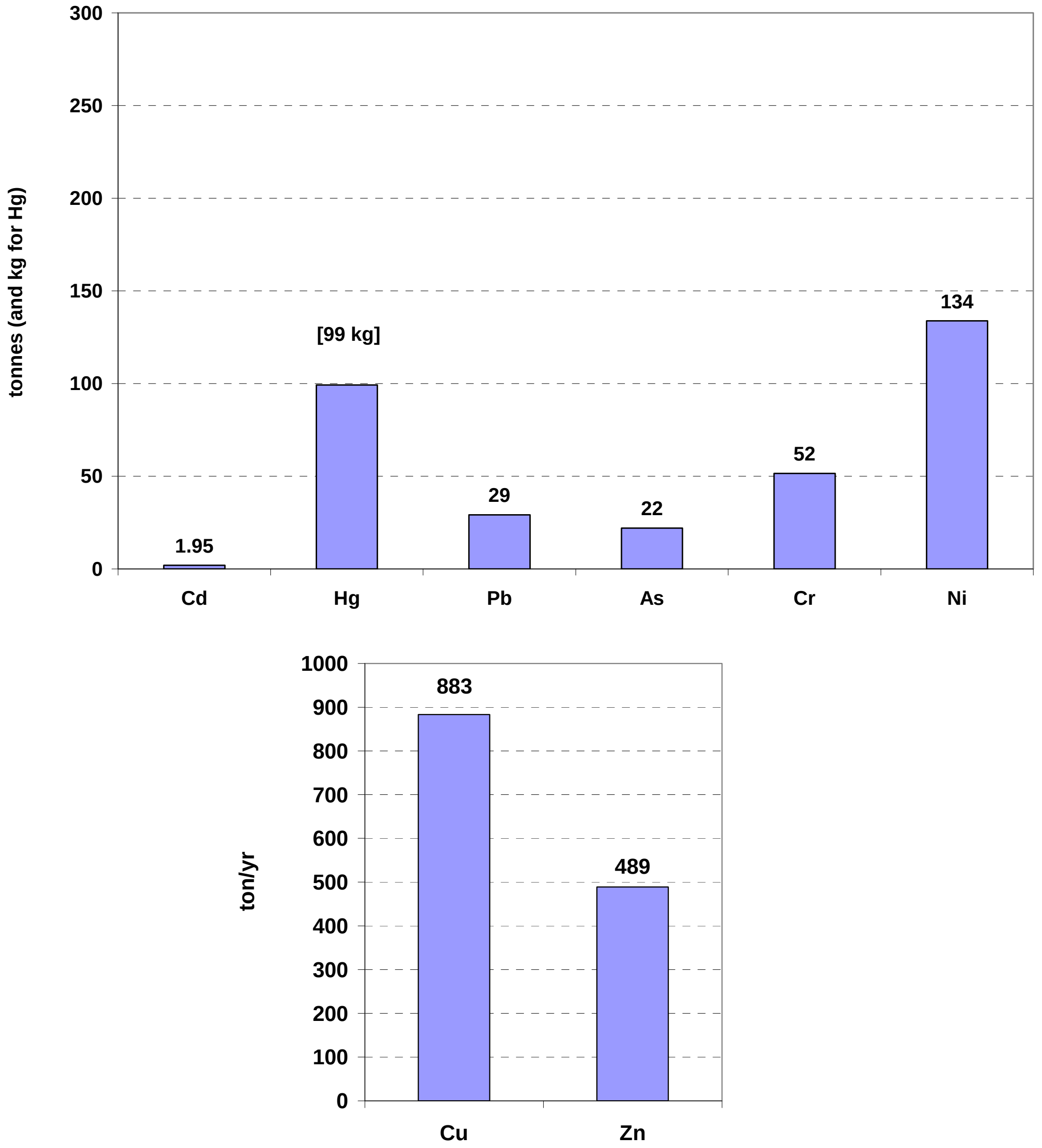


Figure 19 . Total inputs of metals in 2010 (lower estimates). Upper panel: Cadmium (Cd), mercury (Hg), lead (Pb), arsenic (As), chromium (Cr) and nickel (Ni). Note that mercury (Hg) is given in kg whereas the other metals are given in tonnes. Lower panel: Copper (Cu) and Zinc (Zn).

For all metals except copper the riverine loads account for about 80-90% of the total inputs to Norwegian coastal waters (Figure 20). The high proportion of copper in the direct discharges is explained by fish farming. The fish cages are protected from algae growth with copper-containing chemicals, which leak copper to the surrounding water. The metal inputs per sub-region and other details are given in the Addendum (Table 3).

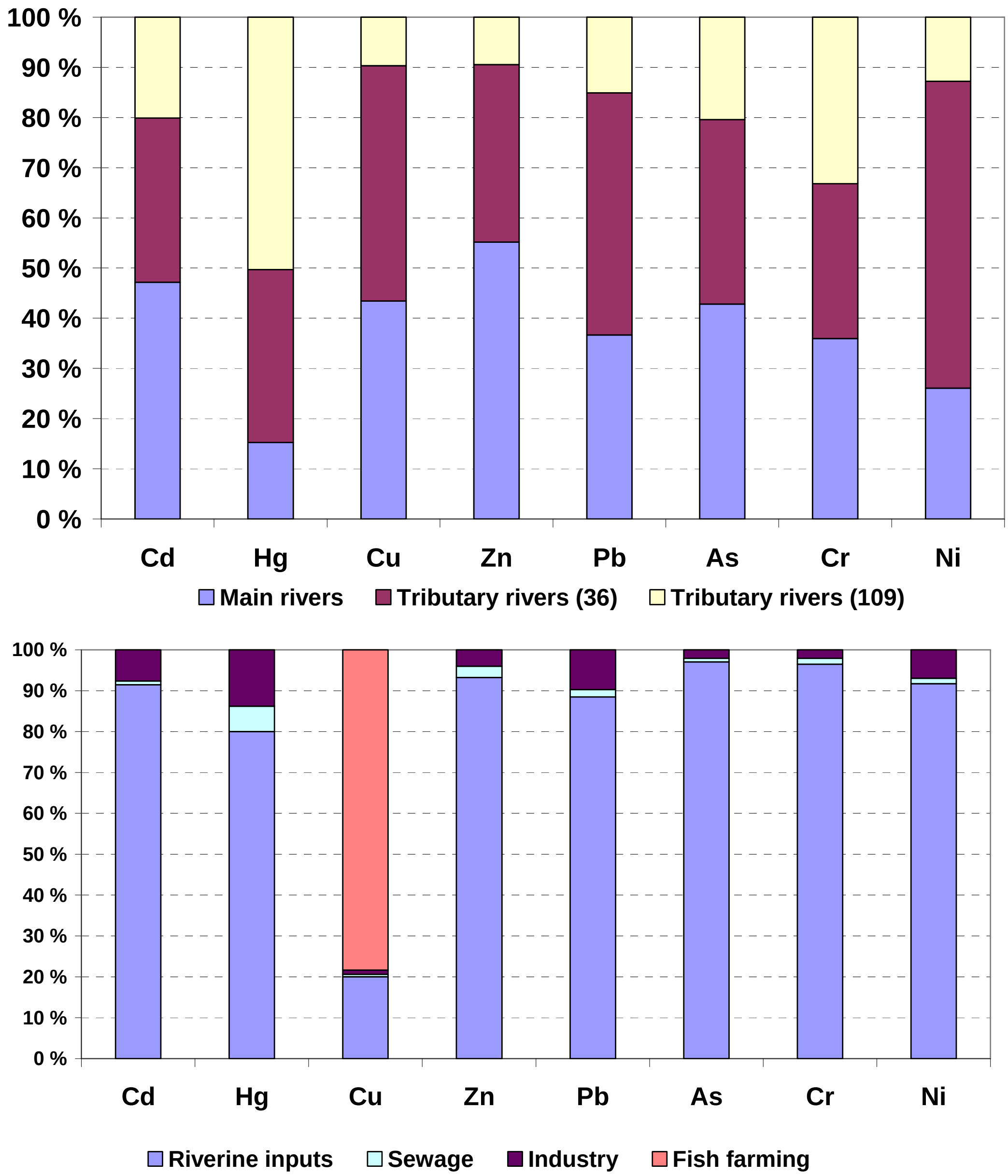


Figure 20. Relative share of riverine and direct discharges of the total inputs of metals to the Norwegian coastal waters in 2010 (lower estimates).

3.5 Total lindane and PCB7 inputs in 2010

For lindane and PCB7, only inputs from the main rivers have been estimated, since no measurements have been made in the other rivers. The results of the analyses of water from the main rivers were all below the LOD (level of detection) for both of these parameters. Discharges of lindane (g-HCH) therefore reflect the LOD, with the lower estimate on 0 and the upper on 12. The same is true for riverine discharges of PCB7, i.e. the lower average is 0 and the upper reflects the LOD and is 85 kg.

Discharges of PCB7 have also been reported from sewage treatment plants in the Skagerrak region (99 kg) and the North Sea (only 1 kg) as well as from industries in the Skagerrak area (also just 1 kg). For the latter data only one estimate is given (i.e. no separation between upper and lower estimates). Hence, the total lower estimate of PCB7 reflects the losses from sewage treatments plants and industry, whereas the total upper estimate reflects inputs from both sewage, industry and rivers (the latter is then reflecting the LOD since concentrations in this estimate are set equal to the LOD) (Figure 21).

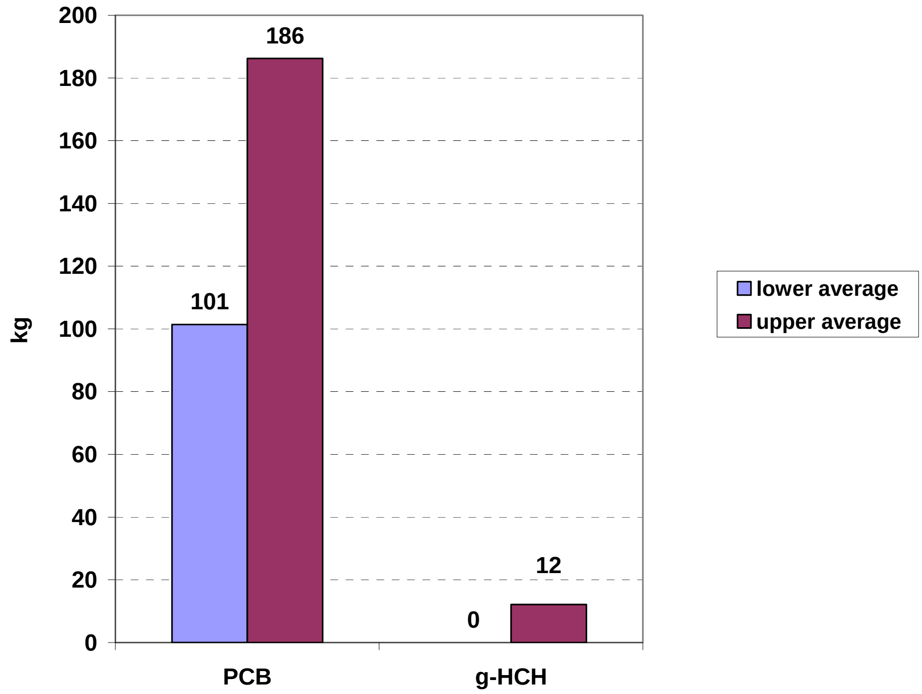


Figure 21. Total inputs of PCB7 and lindane (g-HCH) in 2010 (lower and upper estimates).

4. Discussion

Riverine inputs and direct discharges in 2010 are compared with those in 2009. In addition, long term trends in riverine inputs are discussed for the main rivers.

4.1 Comparison of riverine inputs in 2009 and 2010

The comparison of riverine inputs is based on the data for the 10 main rivers, the 36 tributary rivers monitored four times a year and the 109 previously monitored rivers. Inputs and estimated water discharges for unmonitored areas (92 rivers and areas below sampling points) are not included. Changes in the 109 tributary rivers not monitored since 2003 will mainly reflect between-year variations in annual water discharge, as the concentrations have not been measured since 2003. Section 3.2 gives an overview of the water discharges in 2010, with comparisons to 2009.

The overall decrease in water discharges since 2009 for the three southernmost maritime areas is in general reflected in a decrease also in nutrient and sediment loads (Table 7). However, there are some exceptions to this: In the Norwegian Sea, loads of total phosphorus and suspended particulate matter increased, due to a marked increase in loads in two tributary rivers, River Målselv and River Barduelv. May samples from these two rivers, located in the very north of this coastal region, were taken during a severe spring flood and had concentrations of SPM of 73 and 104 mg/l, and of TP of 119 and 104 µg/l, respectively. These two samples represent the main reason for the 50-60% increase in SPM and TP loads to the entire region. This does, of course, reflect the sampling frequency used. With only four samples per year, such variations will continue to occur from time to time. It can therefore not be deduced that any actual increase of phosphorus and sediments has occurred in this region.

In the Barents Sea, water discharges in 2010 were higher than in 2009. In spite of this, the loads of total phosphorus and suspended particulate matter decreased, mainly caused by a decrease in one of the tributary rivers, River Tanaelva. The explanation is similar to the above, only that in this case samples taken in 2009 during the spring flood had higher water discharges than in 2010, hence also higher concentrations of suspended particulate matter and phosphorus.

Table 7. Total riverine loads of total nitrogen (TN), total phosphorus (TP) and suspended particulate matter (SPM) in 2009 and 2010. Decreases in loads shown in green, increases in orange; relatively small changes (<10 %) are not highlighted.

Maritime area	Nitrogen (tonnes)		Phosphorus (tonnes)		SPM (1000 tonnes)	
	2009	2010	2009	2010	2009	2010
Skagerrak	29181	26307	725	603	290	259
North Sea	10488	7773	225	182	82	70
Norwegian Sea	9527	8553	244	556	158	381
Barents Sea	2743	2863	93	83	32	21
Total Norway	51 939	45 496	1 287	1 424	562	731

Variations in riverine loads of metals are often caused by variations in a few rivers with high metal concentrations; these often have point sources such as mines in their catchment area. River Pasvikelva and River Orkla are typical examples. As shown in earlier annual reports (Skarbøvik et al. 2009, 2010), metal loads in rivers generally decreased in the period between

2004 and 2009, with an exception of mercury. However, in 2010 the total riverine loads of mercury went down as compared with 2009. This reduction is quite substantial, with a decrease in loads of 161 kg or 67 % (lower estimates). As opposed to 2009, many concentrations in 2010 were below the detection limit (1.00 ng/l), and concentrations above 2 ng/l were seldom found. This might possibly be explained by reduced water discharges in 2010 as compared to 2009, but a scrutinisation of the 2009-data does not indicate that samples with high Hg-values were taken at particular high water discharges. No explanation has therefore been found as to why the mercury levels were reduced in 2010. The reduction was relatively evenly distributed between the four coastal regions (about 60-70% in each region, lower estimates).

Only for one metal, nickel, the riverine inputs increased from 2009 to 2010 . This increase is caused by high levels in River Pasvikelva, which is draining to the Barents Sea. In this river, mean concentrations of five metals were higher in 2010 than in 2009. These include arsenic, lead, copper, zinc, and nickel. The main reason is particularly high levels in the May 2010 sample. Again, infrequent sampling is believed to be the main reason for the changes here, combined with the fact that water discharges were higher in this region in 2010 than in 2009.

Figure 22 shows the changes in all riverine inputs of metals for all four regions (total for Norway). Nickel loads increased, mercury, zinc and copper decreased, whereas there were none or only minor changes in lead, arsenic, cadmium and chromium.

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.

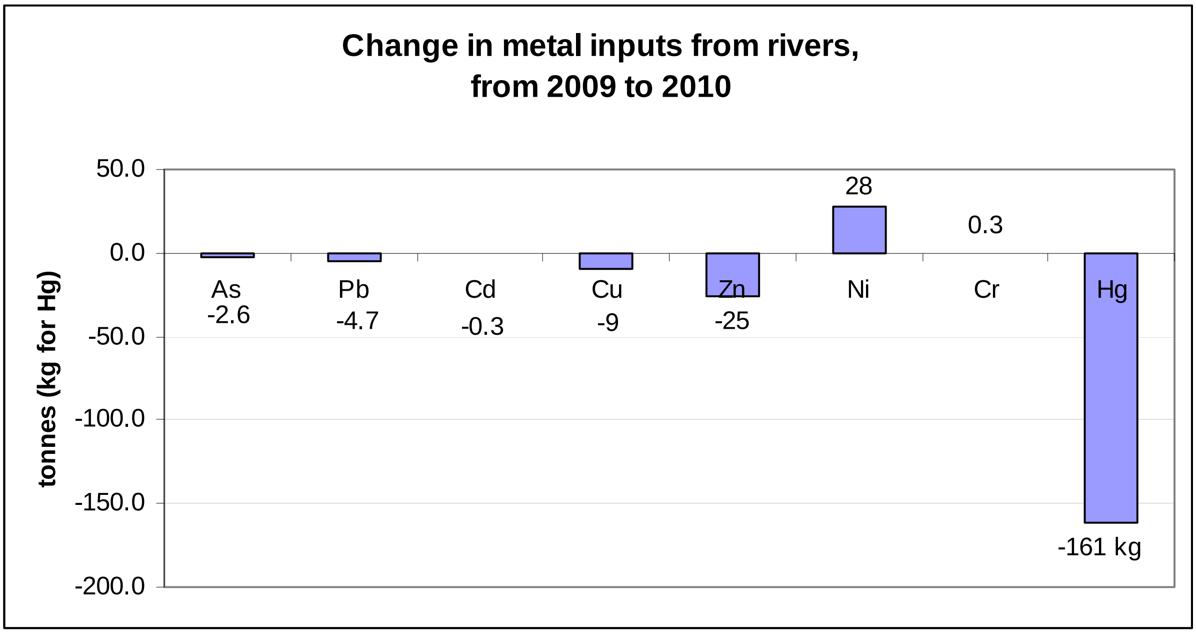


Figure 22. Change in riverine inputs of metals from 2009 to 2010, for all four maritime regions (Norway total). All values in tonnes except for mercury (Hg) which is in kg.

4.2 Comparison of direct discharges in 2009 and 2010

After the revision of the RID data in 2009 (Stålnacke et al. 2009), a new routine was introduced where direct discharges are compared from year to year between the same industries and sewage treatment plants. This is done in order to detect errors in reporting (e.g. use of wrong units). Nevertheless, the challenges related to the quality assessment of these data have not been entirely solved. As a general rule, only data that are obviously wrong are removed from the dataset, other anomalies are included in the reporting since accident spills can have occurred.

For industrial discharges, there was an increase in nitrogen losses of about 11 %, but no significant change in phosphorus losses (Table 8). The nitrogen increases were in the Skagerrak and Norwegian Sea regions, whereas there was a decrease in the North Sea region. Sewage treatment plants contributed to approximately the same amounts of nutrients in 2010 as in 2009.

The fodder used in fish farming has changed during the latter years, and is now less nutrient rich than in former years. Hence, in 2010 the Climate and Pollution Agency (Klif) calculated new values for nutrients in the fodder. These new values were used in the method for calculating losses from fish farming in 2010. The result is that the nutrient discharges from fish farming seemingly went down, while this in reality is a methodological question. Since earlier years' values have not been re-calculated, a comparison of nutrient losses from 2009 and 2010 from this source is therefore futile.

Table 8. Nutrient discharges from three sectors to the Norwegian coast in 2009 and 2010. Totals for all four maritime areas. Orange colour indicates an increase in nutrient discharges, green a reduction; relatively small changes (<10 %) are not highlighted. (STP: Sewage treatment plants).

Sector	2009	2010	% difference	Actual difference
Total nitrogen (Tonnes)				
Fish farming	*	43781		
Industry	2312	2588	11	276
STP	12168	12179	0.1	11
Total phosphorus (Tonnes)				
Fish farming	*	7795		
Industry	256	258	0.8	2
STP	921	937	1.7	16

* The calculated discharges for 2009 and 2010 are based on different values for nutrient contents in fish fodder. The discharges for 2009 and earlier years therefore need to be re-calculated.

Changes in metal discharges from industry and sewage treatment plants are shown in Figure 23. In 2009 an industrial unit located in the region draining to the North Sea reported high discharges of arsenic. This unit had not reported discharges of arsenic before, but the discharges were nevertheless included in the reporting from 2009, since an accident could have occurred. This implied an increase of 336 % in arsenic from direct discharges from 2008 to 2009. In 2010, however, the same factory did not report any discharges of arsenic, hence the direct discharges of this metal were 'back to normal'. The comparison between 2009 and 2010 does, therefore show a marked decrease in arsenic (Figure 23). The highest increase from industry was for zinc, which increased by 4 tonnes from 2009 to 2010. However, due to the decrease in riverine inputs there was a net decrease of zinc to the coastal waters. Mercury discharges from industry also increased, but only by 4 kg. Compared to the significant reduction of riverine mercury loads of about 160 kg, and taking into account the possibilities of inconsistent reporting from industrial units, this increase is considered negligible.

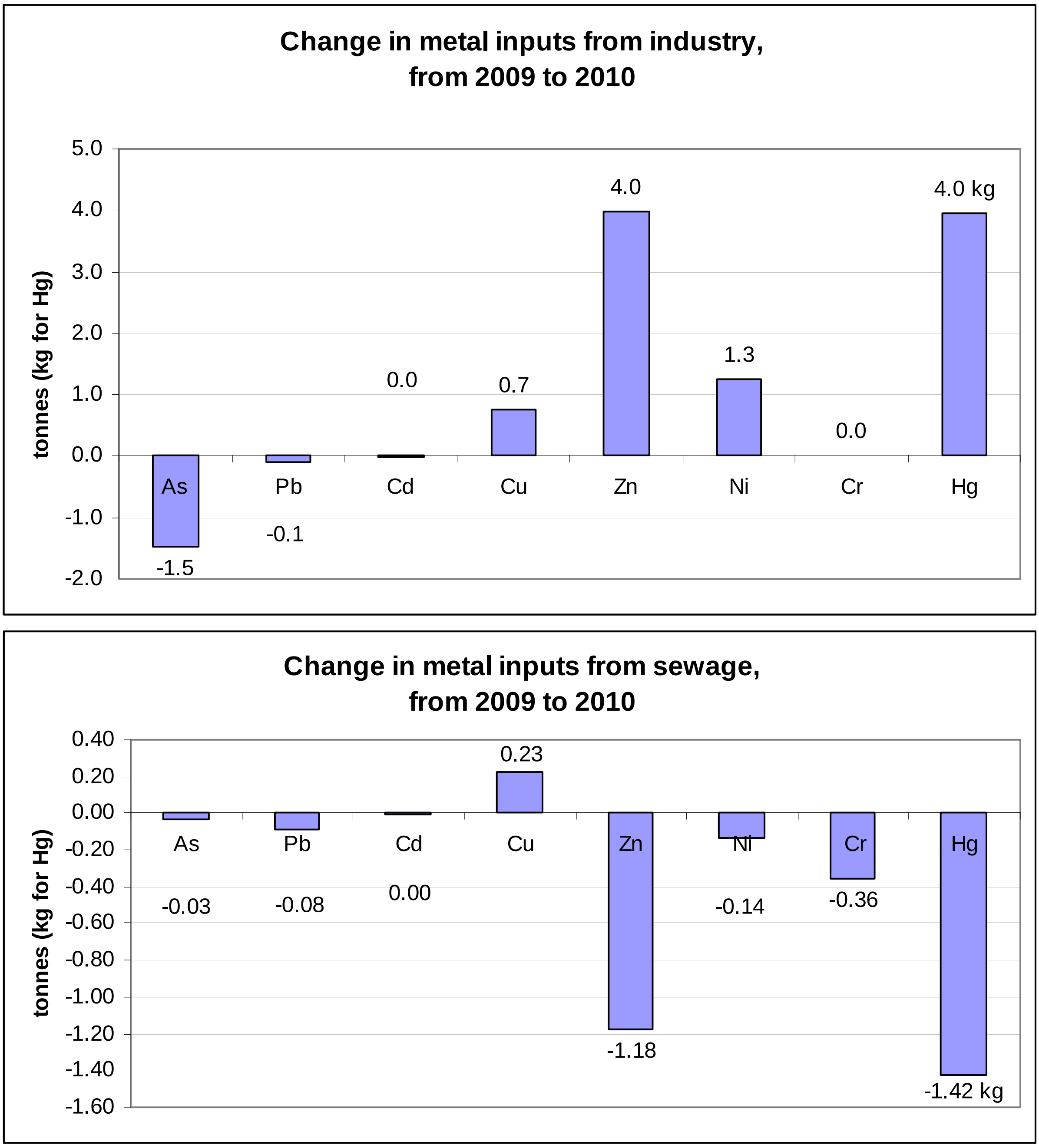


Figure 23. Differences in direct discharges of metals to the Norwegian coast from 2009 to 2010; Upper panel: industry; Lower panel: sewage treatment plants. All values in tonnes except for mercury (Hg) which is in kg.

Copper discharges from fish farming derive from the net cages, which are impregnated against algae growth with a solution containing copper. As noted in Chapter 2.7, the estimation of these discharges are based on the amount of copper in purchased antifouling products used for impregnation. These figures were, however, not available before reporting in 2009, and the figures in last year's annual report were therefore based on the total fish production. This gave an estimate that, when the actual figures for purchased antifouling products in 2009 became available, turned out to be much too high. The figures in the 2009 annual report are therefore not correct. In the reporting for 2010 we face the same situation; the figures for purchased antifouling products in 2010 are still not available. We have therefore chosen to use the figures from 2009 in the estimations for 2010, i.e. the recalculated data for 2009. Hence, the data from 2010 are in fact the corrected data for 2009, and it does not make any sence to compare the data from these two years with each other.

Metal discharges from sewage treatment plants had only minor changes since 2009, but in general there is a small reduction since 2009.

4.3 Long-term trends in loads in main rivers 1990-2010

In this section an analysis of long-term trends (1990-2010) and anomalies in the inter-annual variability of the riverine loads of pollutants in nine of the main rivers is given. The methodology is described in Section 2.8. Additional charts with calculated annual pollutant loads are presented in Appendix V.

4.3.1 Data selection

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

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

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

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

1998 many values below LOD were reported. These examples illustrate the importance of recording changes in laboratory procedures (see Skarbøvik and Borgvang, 2007.)

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

An overview of the statistical trend tests for nutrients and suspended particles is given in Table 9. The numbers refer to an estimated Sen-slope which gives an indication of the amount of change per year in the unit given. The results presented in the table below are further commented in the sections below for each pollutant separately.

Table 9. Unit trend-change per year and statistical significant trends (colored cells) in 9 main rivers 1990-2010.

River	Water discharge	SPM	PO_4-P	TOT-P	NO_3-N	NH_4-N	TOT-N
		(k tonnes/yr)	(tonnes/yr)				
Drammenselva	364.49	0.45	0.54	1.10	22.86	-2.08	61.01
Skienselva	255.81	0.20	0.32	0.52	-32.79	-1.22	-18.20
Otra	-35.74	-0.15	-0.01	-0.21	-17.38	-0.20	-7.40
Numedalslågen	98.06	0.44	0.37	0.54	7.41	-0.04	22.01
Glomma at Sarpsfoss	385.15	-2.84	0.66	-1.27	33.72	-17.38	82.80
Orkla	11.56	-0.03	0.00	0.05	1.40	-0.41	4.59
Altaelva	18.71	-0.12	-0.43	-0.78	-4.55	-0.37	-8.79
Vefsna	-120.89	-0.45	-0.37	-0.81	-10.78	-4.48	-31.83
Orreelva	1.93	0.05	-0.01	0.18	-1.19	-0.29	1.01

Upward trend	p-value	Downward trend
+	0.005<p<0.05	-
++	0.0005<p<0.005	--
+++	p<0.0005	---

4.3.3 Trends in water discharge

Variations in runoff to large extent explain the inter-annual variability in the riverine loads of nutrients and particles as already shown in previous reporting of the Norwegian RID-programme (e.g. Skarbøvik et al., 2008; 2009; 2010).

Time series of actual[6] annual water discharges are presented in Appendix V. The most interesting observations in the water discharge series include:

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

No other obvious trends in annual water discharge could be detected in the visual inspection of the data.

[6] 'Actual' water discharge indicates the total water discharge as measured continuously, as opposed to the water discharge measured only at sampling dates (as reported in the previous chapter).

4.3.4 Trends in nutrient loads

Nitrogen

A clear downward trend (1990-2010) in total nitrogen can be detected in River Vefsna (Figure 24). As reported last year (Skarbøvik et al. 2010) this river shows a rather abrupt change in loads of some substances before and after 1999, including nitrogen. In this river also loads of lead and copper, and to some extent ammonium, dropped after 1999. The river has relatively high concentration levels of these substances, which might indicate that the substances derive from either industrial discharges or sewage treatment effluents. This theory is further supported by the fact that high concentrations before 1999 were mainly observed at low water discharges, when dilution is at a minimum. However, in spite of efforts to reveal the reasons for this decrease, including contacts with local expertise, no clear explanations have been found. The sampling site in Vefsna is located *upstream* of any major industries as well as the major settlement (Mosjøen).

A downward long-term trend (1990-2010) in nitrogen can also be statistically detected in Rivers Skienselva and Altaelva when variations in water-discharge is taken into account, although it is difficult to visually identify such trends in Figure 25 and 26. For Altaelva, a substantial interannual variability combined with a notable serial correlation between adjacent years was noted, which is somewhat peculiar. These trends in Skienselva and Altaelva may be caused by a number of different changes or measures in the river basin, but no specific explanation has yet been found. A visible downward trend in River Otra for nitrate loads was statistically detected (Figure 27). However this is not the case with total-N. The reason for this is not known.

A statistically significant upward trend was detected for total nitrogen in river Numedalslågen (Table 9; Figure 28) which seems to be related to an increase in organic-N since no significant trends in inorganic-N were detected. Data for total organic carbon (TOC) (not part of the official RID-reporting) indicate an increased trend (not shown), to some extent supporting an increased transport of organic compounds in this river.

A statistically significant downward trend in ammonium load was detected in Rivers Glomma, Vefsna and Orrelva (Table 9). Changes in ammonium loads are shown in figures in Appendix V. Ammonium loads in most rivers only account for 1-5 % of the total nitrogen loads. In addition, ammonium is normally quickly converted to nitrate in river water (via nitrification processes) and is thus a less informative parameter for long-term trend assessments.

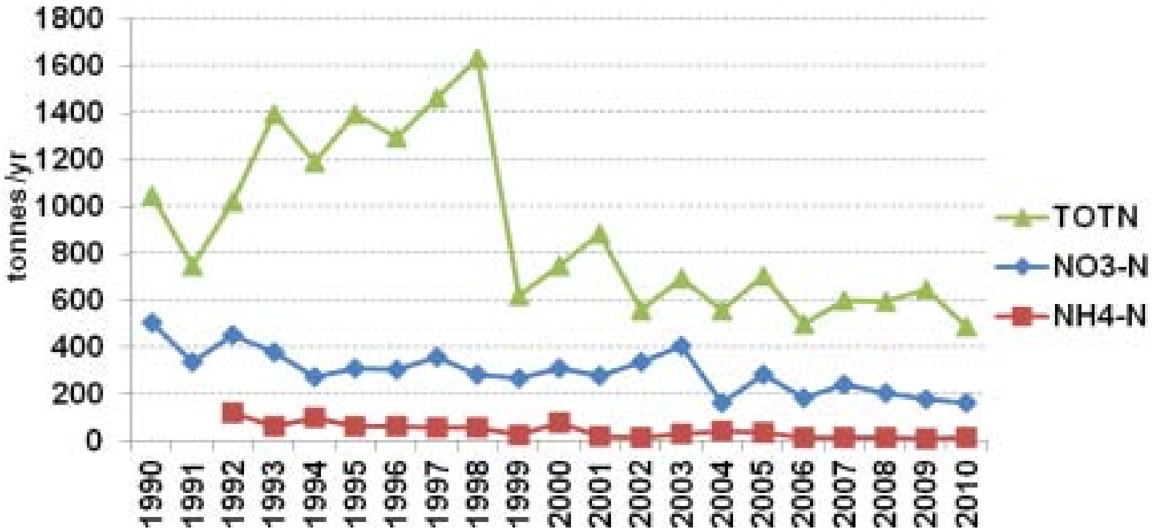


Figure 24. Annual riverine loads in River Vefsna of total nitrogen, nitrate nitrogen and ammonium in 1990-2010. Loads shown are the upper estimates.

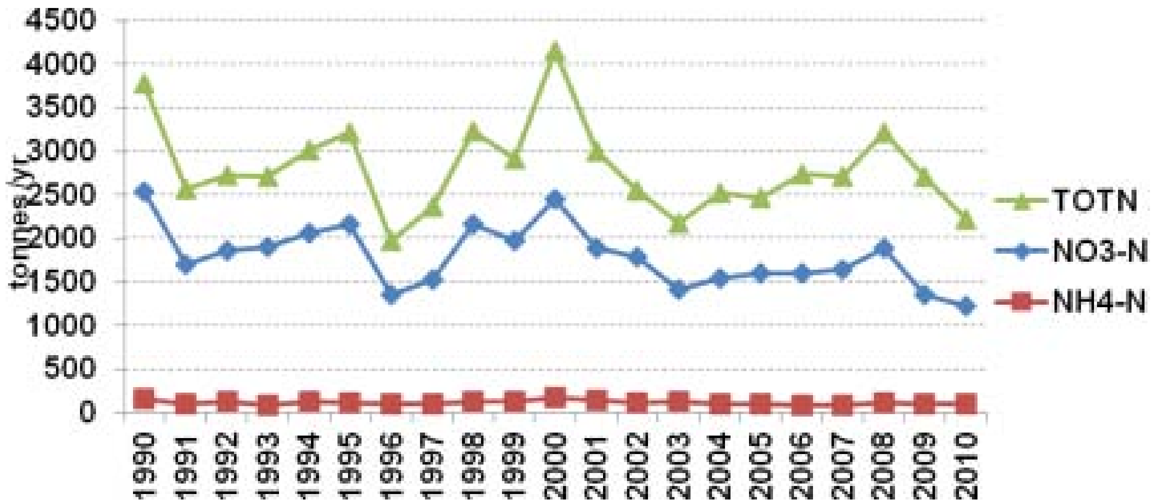


Figure 25. Annual riverine loads in River Skienselva of total nitrogen, nitrate nitrogen and ammonium in 1990-2010. Loads shown are the upper estimates.

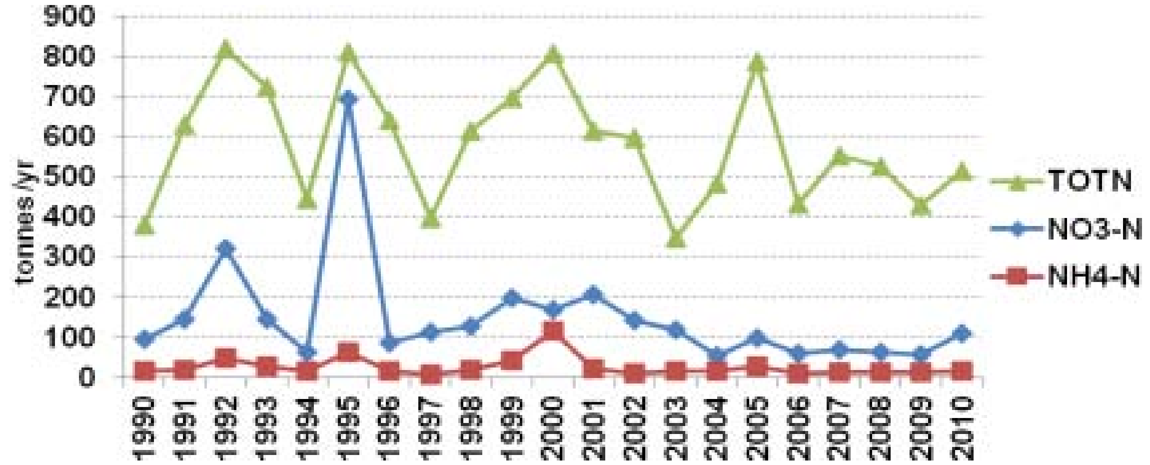


Figure 26. Annual riverine loads in River Altaelva of total nitrogen, nitrate nitrogen and ammonium in 1990-2010.

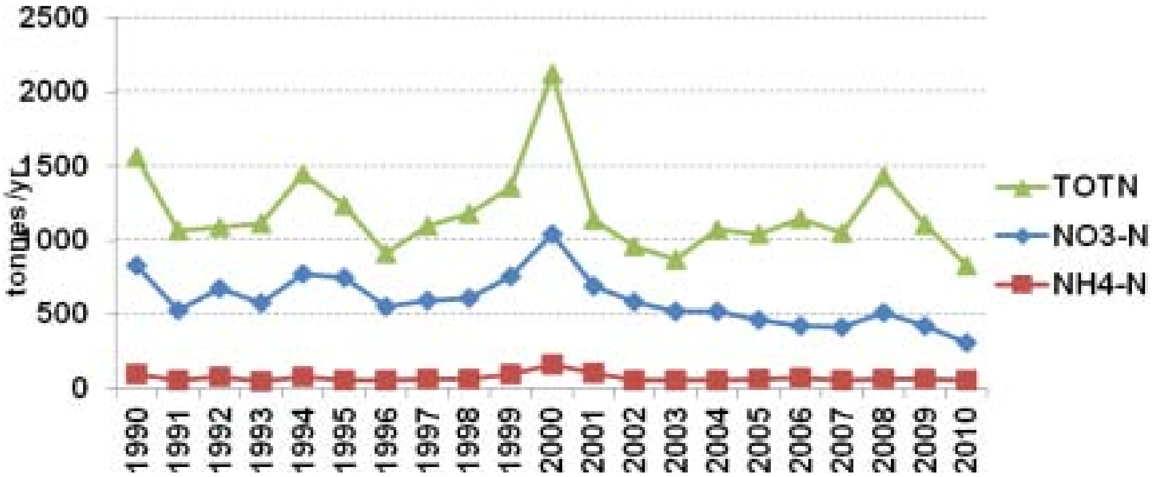


Figure 27. Annual riverine loads in River Otra of total nitrogen, nitrate nitrogen and ammonium in 1990-2010.

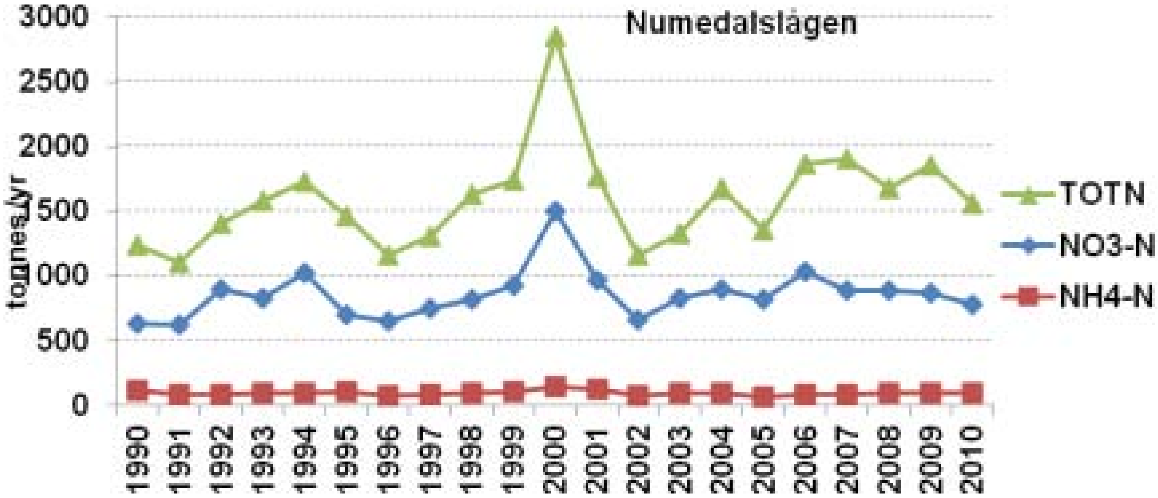


Figure 28. Annual riverine loads in River Numedalslågen of total nitrogen, nitrate nitrogen and ammonium in 1990-2010.

Phosphorus

The total phosphorus loads generally show large inter-annual variability, varying by a factor of three or more over the 21-year study period in a majority of the nine rivers (e.g., Rivers Numedalslågen, Skienselva, Otra, Vefsna and Altaelva; Appendix V). Given this, and especially the high inter-annual variability, it is difficult to detect long-term trends. The only exception is in the two northern-most rivers; Rivers Vefsna and Altaelva, where the phosphorus loads have statistically declined (Table 9). Apparently, the high phosphorus loads in Vefsna in 1995 is linked to high particle (SPM) loads the same year (Figure 29; upper panel). Similarly, in River Altaelva, the peak years in phosphorus loads are explained by corresponding peaks in the particle transport (Figure 29; lower panel).

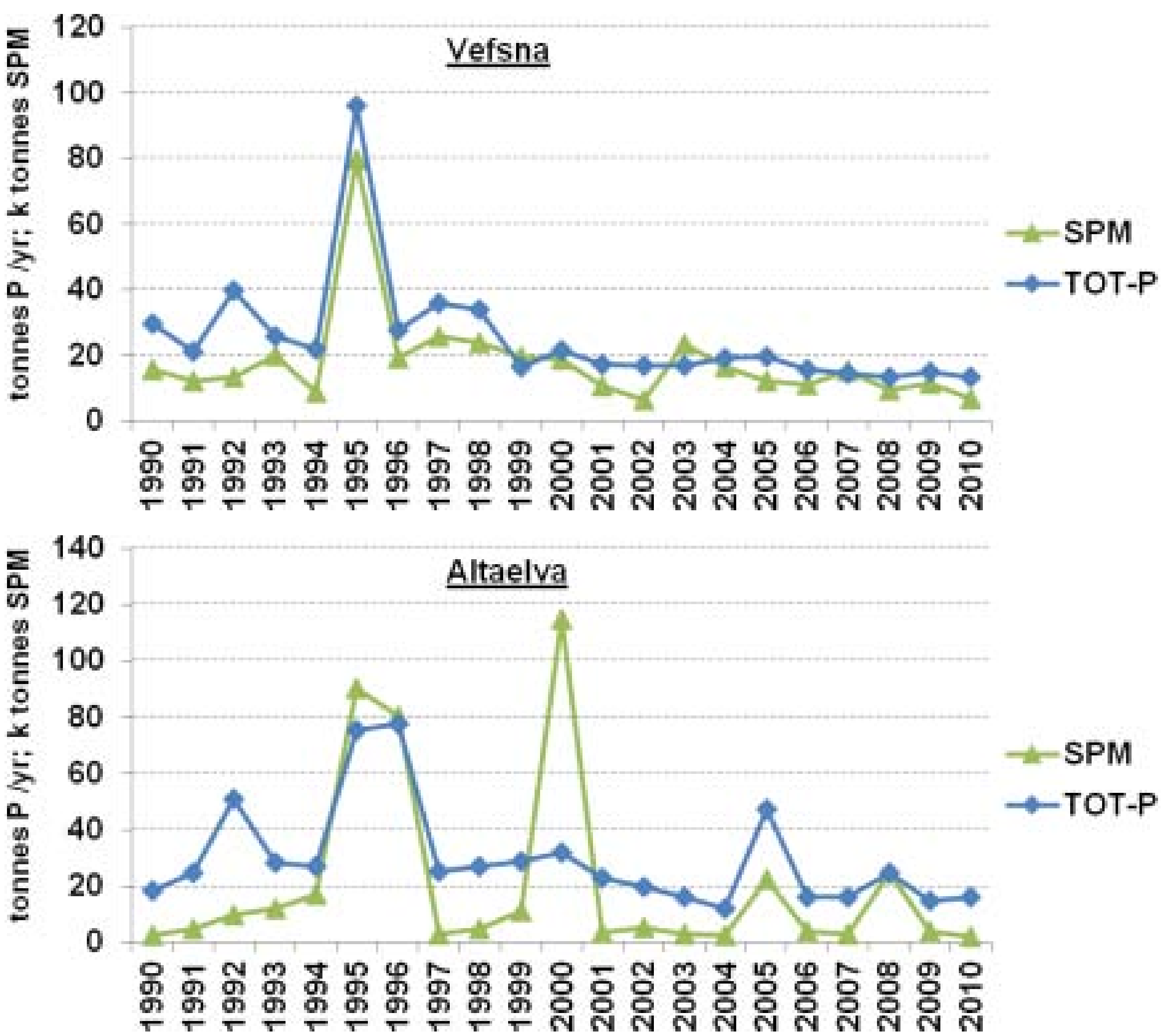


Figure 29. Riverine loads of total phosphorus (tot-P) and suspended particulate matter (SPM) in Vefsna (upper panel) and Altaelva (lower panel) 1990-2010. It should be noted that total phosphorus loads in 1999-2003 are calculated and not monitored (cf. Stålnacke et al. 2009).

For the other seven rivers there are some tendencies of declining trends in Rivers Glomma and Otra, but due to the high inter-annual variability, no statistically significant trends can be detected (Table 9).

For orthophosphate a statistically downward trend was detected in River Vefsna (Table 9). It should be noted that orthophosphate concentrations are in most samples at very low levels (1-2 µg/l) or at LOD, with the LOD having changed during the course of the monitoring period. This implies that interpretation of orthophosphate trends should be made with great caution.

Particulate matter

Similar as for total phosphorus, there has been major inter-annual variability in loads of suspended particulate matter (SPM). Nevertheless, a common feature in the time series was the high particle loads in 2000 for all five Skagerrak rivers (less in River Glomma). This is explained by the high water discharges this year. No long-term time trends can be statistically detected (Table 9), although there is a slight downward tendency in the Glomma River (Figure 30)

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

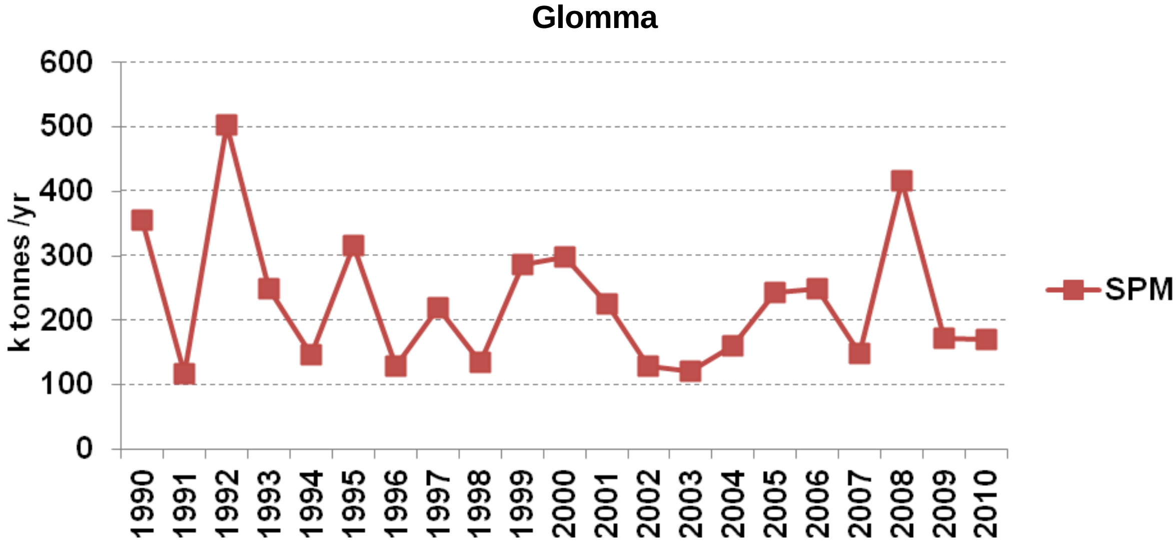


Figure 30. Riverine loads of suspended particulate matter (SPM) in Glomma 1990-2010.

4.3.5 Trends in metal loads

In this section the annual riverine loads of six metals in the nine main rivers during the period 1990-2010 are assessed. All figures are given in Appendix V for both upper and lower estimates. The metals for which long-term trends are investigated are:

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

It should be stressed that no firm conclusions can be drawn about long-term changes in metal loads, except for copper, zinc and perhaps also lead. Possible visual trends in the data and figures shown in this section (and in Appendix V) 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.

An overview of the statistical trend tests of the metals are given in Table 10 (upper estimates) and Table 11 (lower estimates). The numbers in the tables refer to the Sen-slope, which gives an estimate of the amount of change per year in the given unit. The results in the tables are further commented in the sections below for each metal.

Table 10. Unit trend-change per year and statistically significant trends (coloured cells) in 9 main rivers 1990-2010. The trend test was performed on the upper estimates.

River	Water discharge	Cu (tonnes/yr)	Pb (tonnes/yr)	Zn (tonnes/yr)	Cd (tonnes/yr)	Hg (kg/yr)	As (tonnes/yr)
Drammenselva	364	0.121	-0.030	0.309	-0.010	-0.259	-0.004
Skienselva	256	-0.231	-0.035	-0.791	-0.010	-0.458	-0.003
Otra	-36	0.088	-0.024	-0.457	-0.004	-0.092	-0.009
Numedalslågen	98	-0.137	-0.072	-0.362	-0.008	-0.211	0.010
Glomma at Sarpsfoss	385	-0.225	-0.428	-2.827	-0.037	-2.216	0.060
Orkla	12	-0.383	-0.013	-1.136	-0.003	-0.030	-0.006
Altaelva	19	-0.161	-0.019	-0.070	-0.002	-0.133	-0.042
Vefsna	-121	-0.616	-0.118	-1.615	-0.010	-0.289	-0.013
Orreelva	2	-0.001	-0.001	-0.002	0.000	0.001	-0.001

Upward trend	p-value	Downward trend
+	0.005<p<0.05	-
++	0.0005<p<0.005	--
+++	p<0.0005	---

Table 11. Unit trend-change per year and statistically significant trends (coloured cells) in 9 main rivers 1990-2010. The trend test was performed on the lower estimates

River	Water discharge	Cu (tonnes/yr)	Pb (tonnes/yr)	Zn (tonnes/yr)	Cd (tonnes/yr)	Hg (kg/yr)	As (tonnes/yr)
Drammenselva	364	0.121	-0.018	0.309	-0.007	-0.317	-0.009
Skienselva	256	-0.231	-0.038	-0.791	-0.009	-0.520	0.000
Otra	-36	0.088	-0.018	-0.457	-0.002	0.050	-0.009
Numedalslågen	98	-0.137	-0.050	-0.364	-0.005	-0.331	0.009
Glomma at Sarpsfoss	385	-0.225	-0.344	-2.827	-0.015	-3.485	0.062
Orkla	12	-0.384	-0.013	-1.138	-0.002	0.041	-0.004
Altaelva	19	-0.161	-0.005	-0.075	-0.003	-0.228	-0.042
Vefsna	-121	-0.617	-0.103	-1.641	-0.009	-0.216	-0.012
Orreelva	2	-0.001	-0.001	-0.002	0.000	0.005	-0.001

Upward trend	p-value	Downward trend
+	0.005<p<0.05	-
++	0.0005<p<0.005	--
+++	p<0.0005	---

Copper (Cu)

Copper was, together with lead and zinc, the only metal with few values below LOD and few changes in LOD over the monitoring period 1990-2009. In five out of the nine rivers a statistically significant decline in the copper riverine loads was detected (

Table 10 and Table 11). As noted above for nutrients, River Vefsna shows a sharp decline in some substances after 1999, and copper is one of these. The annual loads of copper during the years 1990-1998 amounted to around 12-17 tonnes, while in the following period (1999-2009) the loads dropped to 2-5 tonnes (Figure 31; upper panel). A statistically significant decline in copper loads in Rivers Numedalslågen, Altaelva, Orkla and Skienselva was also detected (Table 10 and 11). In River Altaelva, the loads have declined from 4-7 tonnes in the early to mid 1990's to 1-3 tonnes in the 2000s; except for the year 2002 with a load of almost 4 tonnes (Figure 31; middle panel). The high load in River Skienselva in 1990 (Figure 31; lower panel) is explained by two samples with high concentrations (17 µg/l and 20 µg/l), whereas more normal values in this river are less than 1 µg/l.

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

Single years of anomalies also occur, such as 1993 in River Numedalslågen, and 1990 in Rivers Skienselva and Otra (Annex VI). The high copper 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. In comparison, concentrations above 5 µg/l have only occurred at one sampling occasion (in 2007) during the entire time period 2000-2010.

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

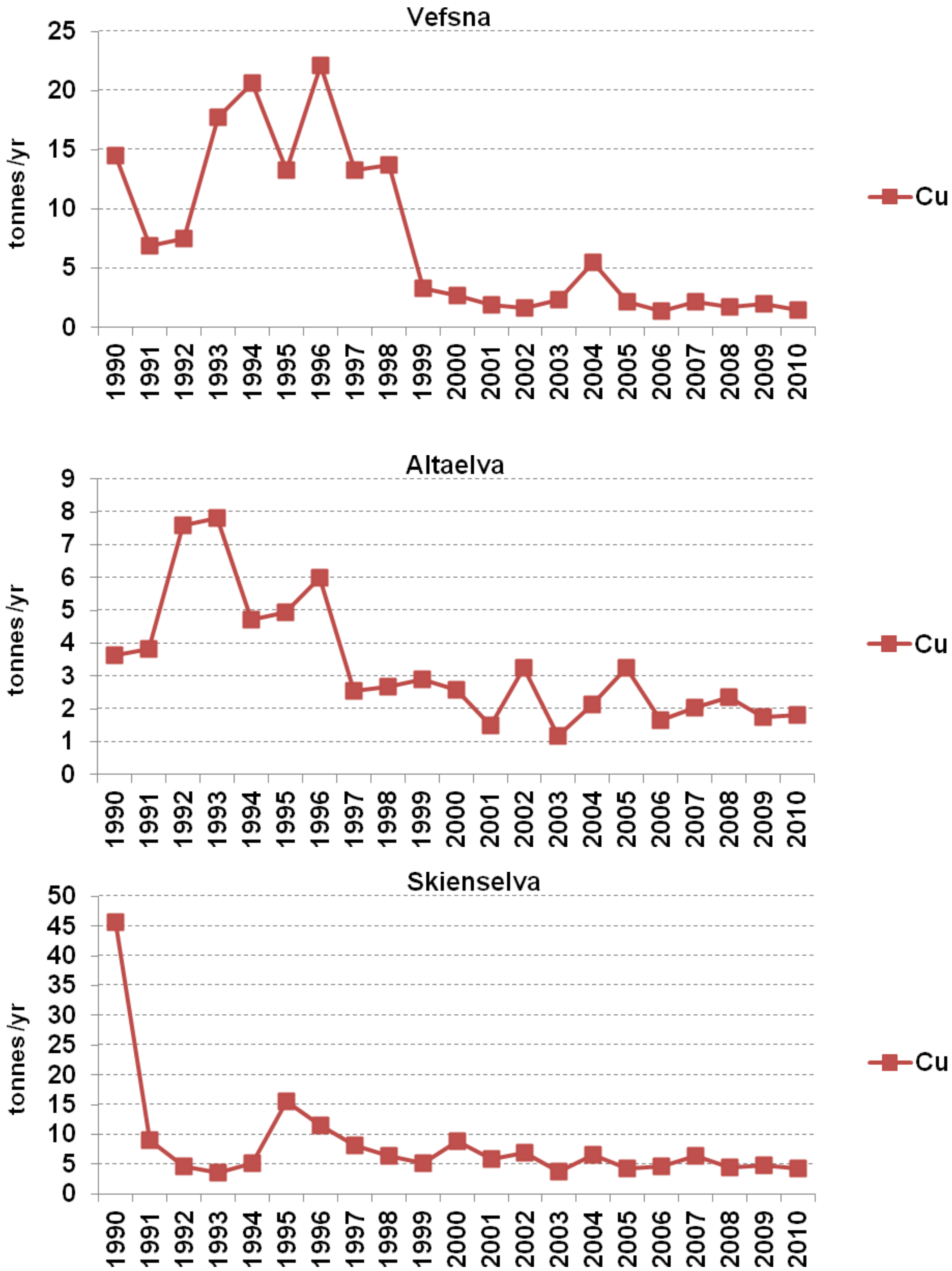


Figure 31. Annual riverine loads of copper in River Vefsna, Altaelva and River Skienselva, 1990-2010.

Lead (Pb)
The inter-annual variability and trends in inputs of lead are mainly due to changes in LOD. Table 12 shows that the LOD for lead has changed by a factor of 100 during the monitoring period (1990-2010). This means that the interpretation of trends in lead loads should be done with great caution. Nonetheless, the statistical analysis of trends showed downward trends for both upper and lower estimates in four rivers: Glomma, Numedalslågen, Vefsna and Orkla (

Table 10 and Table 11). In addition, a statistically significant downward trend was detected in Altaelva for the upper load estimates (

Table 10), whereas no significant trend was detected based on lower load estimates in the same river (Table 11). The most prominent trends were found in Rivers Glomma and Vefsna (Figure 32).

Table 12. Changes in detection limits (LOD) for lead (µg/l).

Year	1990	1991	1992 -1998	1999	2000	2001	2002-2003	2004-2010
LOD	0.5	0.1	0.02	0.01 (0.1)[1]	0.01	0.01-0.02 (0.1)[1]	0.02-0.05 (0.2)[1]	0.005

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

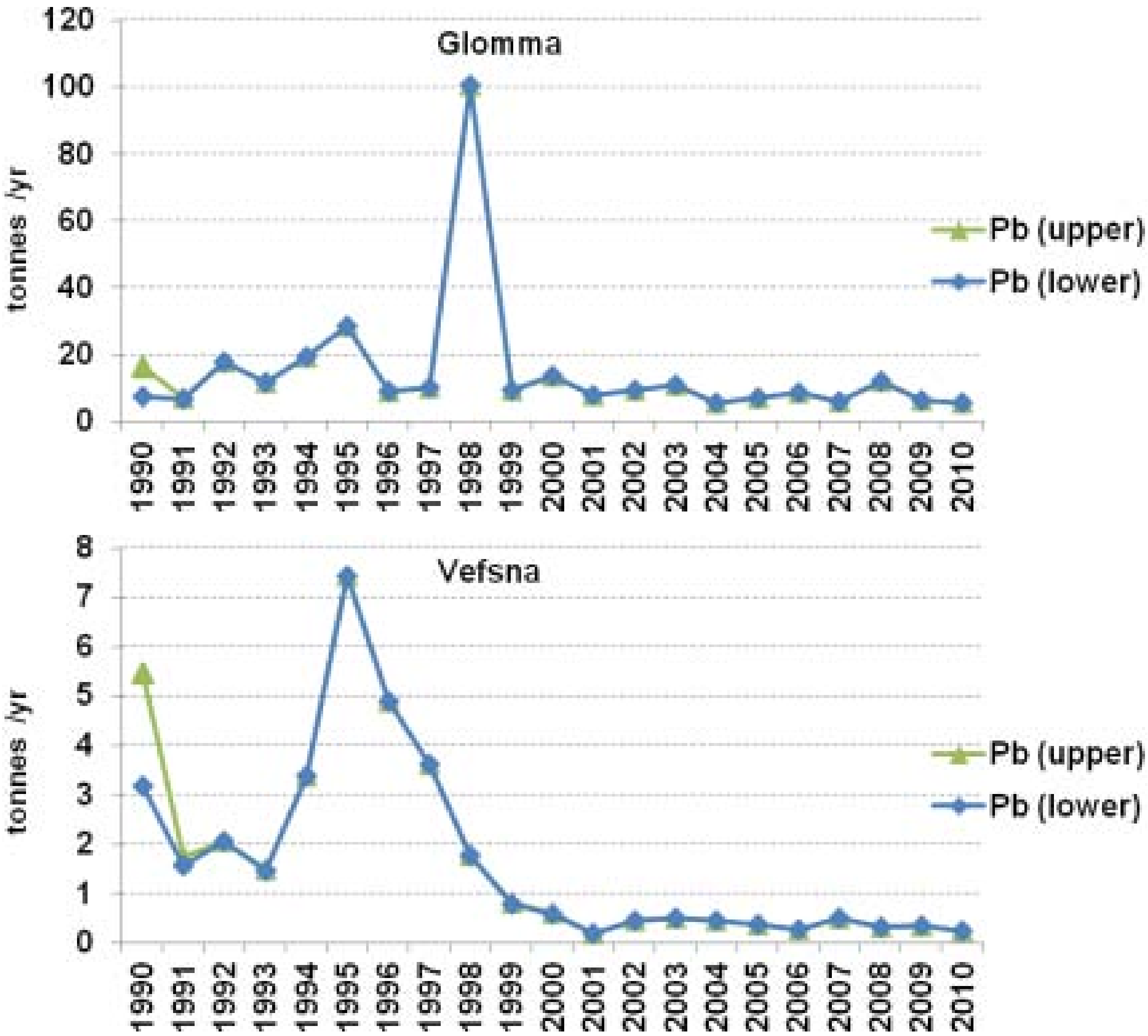


Figure 32. Annual riverine loads of lead in River Glomma and River Vefsna, 1990-2010.

Zinc (Zn)

The zinc loads show relatively low inter-annual variability as compared to many of the other metals. A downward trend could be statistically detected in six of the nine investigated rivers for both the lower and upper estimate method: Glomma, Orkla, Vefsna, Numedalslågen, Skienselva and Otra (

Table *10* and Table 11). The most prominent trends in terms of statistical significance and slope change are shown in Figure 33. High loads in single years were almost solely explained by high single concentration values (e.g. 1993 in River Numedalslågen, 1990 in River Skienselva, 2005 in River Orreelva, and 2008 in River Altaelva).

Cadmium (Cd)

For the upper estimates, all nine rivers showed a statistically significant downward trend (

Table 10), while for the lower estimates six trends were detected (Table 11). The different results were due to the fact that more than 25% of the observations of cadmium in the nine main rivers were below LOD. In addition, the LODs have changed substantially during the course of the monitoring period; e.g., from 100 ng/l in 1990 to 10 ng/l in 1991 and down to 5 ng/l in 2004-2010. For this reason, a trend assessment of the annual loads is highly uncertain and should be interpreted with great caution. The lower and upper load estimates given in Appendix V should therefore solely be used as an indication of the magnitude of the loads.

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

Table 10 and Table 11 should be interpreted with great caution. It should also be noted that the loads in 1999-2003 are based on estimated concentrations.

Arsenic (As)

For arsenic (As), only one statistically significant trend could be detected (

Table 10 and Table 11), i.e. a downward trend in River Altaelva. Lower and upper load estimates (shown in Appendix V) should only be used as an indication of the magnitude in loads. Arsenic was not monitored in the period 1990-1993.

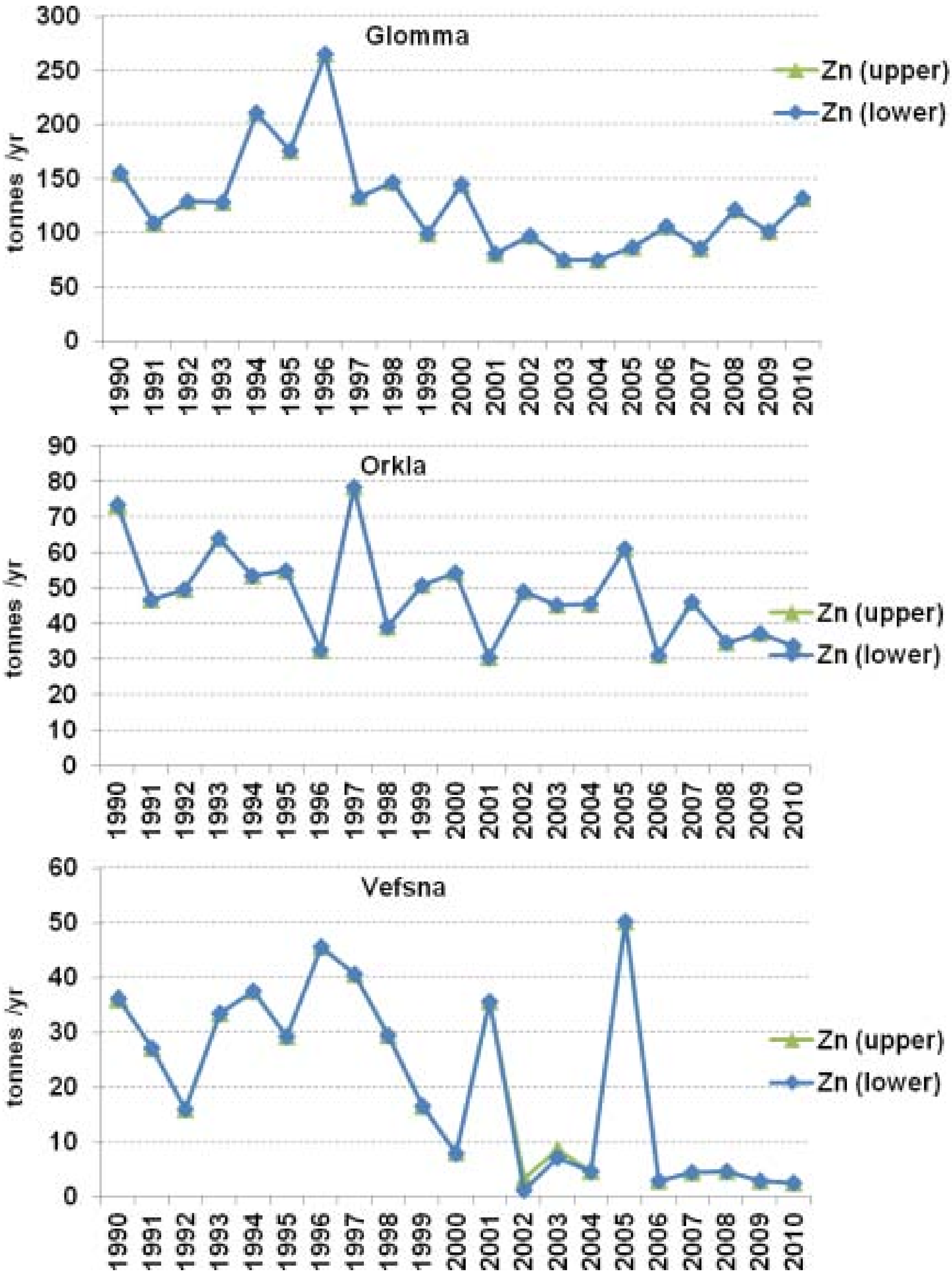


Figure 33. Annual riverine loads of zinc in River Glomma, River Orkla and River Vefsna, 1990-2009.

4.3.6 Trends in loads of PCB7 and lindane

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

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

4.3.7 Overview of trends in riverine loads

The main conclusions of the trend analysis on loads for the period 1990-2010 could be summarised as follows:

- No long-term trends in water discharge was statistically detected
- For nutrients:
  - In Rivers Skienselva, Vefsna and Altaelva, a downward trend in nitrogen loads (total-N and nitrate-N);
  - In River Numedalslågen, an upward trend in total nitrogen loads;
  - In River Glomma, Vefsna and Orrelva, a downward trend in ammonium loads;
  - In River Vefsna and Altaelva, a downward trend in total phosphorus load, and
  - In River Vefsna, a downward trend in orthophosphate load.
- For suspended particles, no long-term trends can be detected due to a very high inter-annual variability. This is most likely due to too low sampling frequency and the fact that SPM concentrations normally show high peaks during high water discharge.
- For copper there was a downward trend in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva.
- For zinc, a downward trend could be statistically detected in six of the nine investigated rivers for both the lower and upper estimate methods; i.e. Rivers Glomma, Orkla, Vefsna, Numedalslågen, Skienselva and Otra.
- For lead, a downward trend was detected in four rivers; Rivers Glomma, Numedalslågen, Vefsna and Orkla. A statistically significant trend was also detected in River Altaelva for the upper load estimates. It should be noted that the LOD for lead has changed by a factor of 100 during the monitoring period (1990-2010), so no firm conclusions on the trend should be drawn.
- For the other metal loads (Hg, As, Cr, Ni), no firm conclusions can be drawn about long-term changes since any visual downward trends are not necessarily due to 'real' changes in loads. Changes in LOD values over the monitoring period and many samples with concentrations at or below LOD means that the interpretations should be made with great caution.
- For lindane and PCB, no conclusion about trends can be drawn due to the very low concentrations. A majority of analyses were below LOD, and there have also been changes in the LOD during the monitoring period.

5. Conclusions

Detailed tables of concentrations and loads for the individual rivers as well as total inputs to the different coastal areas are given in the Addendum to this report.

Climate and water discharges
The year 2010 can be characterised as rather cold and dry. The mean precipitation in Norway was 85 % of a normal year, and the total water discharges from Norway were lower in 2010 than in 2009. The only region with higher discharges in 2010 was the Barents Sea; here, the flow was 15 % higher than in 2009. In this region, mild weather in May gave severe snow-melt floods. In addition, heavy rains in June resulted in floods in the middle parts of Norway (county of Trøndelag). No long-term trends in water discharges have been detected.

Nutrients and suspended particulate matter
The total nutrient inputs to coastal waters from land based sources in Norway in 2010 were estimated to about 11 000 tonnes of phosphorus and about 139 000 tonnes of nitrogen. Total silicate inputs were estimated to about 393 000 tonnes, total organic carbon to about 469 000 tonnes and suspended particulate matter to about 770 000 tonnes. Fish farming is the most important of all nutrient sources, except for the Skagerrak region where riverine inputs are the main nutrient source, followed by sewage treatment plants. Nutrient inputs were highest to the Norwegian Sea, and lowest to the Barents Sea.

Nutrient inputs to Norwegian coastal waters generally decreased as compared to 2009, with a few exceptions. In the Norwegian Sea, total phosphorus and suspended particulate matter increased due to a marked increase in loads in two of the tributary rivers. This mainly reflects the sampling frequency (May 2010 samples with collected during very high water discharges) and we can therefore not conclude that an actual increase of phosphorus and sediments has occurred in this region. Industrial discharges of nitrogen increased by about 11 %, but there were no significant changes in phosphorus losses neither from industry nor sewage.

Nutrient losses from fish farming are still high and responsible for the majority of inputs of total phosphorus, orthophosphate and ammonium to Norwegian coastal waters. The discharges in former years need to be re-calculated since there has been a change in the nutrient levels in fish fodder over the years.

Long-term trend analyses on loads for the period 1990-2010 revealed that there has been

- a downward trend in nitrogen loads (total-N and nitrate-N) in Rivers Skienselva, Vefsna and Altaelva;
- a downward trend in ammonium loads in Rivers Glomma, Vefsna and Orrelva,;
- a downward trend in total phosphorus loads in Rivers Vefsna and Altaelva; and
- a downward trend in orthophosphate loads in River Vefsna.
- an upward trend in total nitrogen loads in River Numedalslågen,;

For suspended particles, no long-term trends could be detected due to a very high inter-annual variability.

Metals
In 2010, the inputs of metals to the Norwegian maritime areas were estimated to 99 kg mercury, 1.95 tonnes of cadmium, 22 tonnes of arsenic, 29 tonnes of lead, 52 tonnes of chromium, 134 tonnes of nickel, 489 tonnes of zinc and 883 tonnes of copper (lower

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

In 2010 a substantial reduction in mercury levels in rivers was observed, with a decrease in loads of 161 kg, or 67 % (lower estimates) compared to 2009. This reduction was relatively evenly distributed between the four coastal regions (about 60-70% in each region, lower estimates). Only for one metal, nickel, the riverine inputs increased from 2009 to 2010 (by 28%), caused by high levels in River Pasvikelva, which is draining to the Barents Sea. Infrequent sampling (and therefore a certain level of randomness) is believed to be the main reason for this, combined with the fact that water discharges were higher in this region in 2010 than in 2009. Riverine loads of zinc and copper went slightly down since 2009, whereas there were none or only insignificant changes in lead, arsenic, cadmium and chromium. In terms of direct discharges of metals, losses from industry increased slightly for zinc and mercury, but were reduced for arsenic. Such changes from year to year are partly explained by differences in discharges, partly by the reporting practices. No major changes in metals from sewage treatment plants were detected. Copper discharges from fish farming are based on the data reported for 2009.

Long-term analyses of trends revealed no that there have been downwards trends in several rivers:

- For copper there was a downward trend in Rivers Numedalslågen, Altaelva, Vefsna, Orkla and Skienselva.
- For zinc, a downward trend could be statistically detected in six of the nine investigated rivers for both the lower and upper estimate methods; i.e. Rivers Glomma, Orkla, Vefsna, Numedalslågen, Skienselva and Otra.
- For lead, a downward trend was detected in four rivers; Rivers Glomma, Numedalslågen, Vefsna and Orkla. A statistically significant trend was also detected in River Altaelva for the upper load estimates. It should be noted that the LOD for lead has changed by a factor of 100 during the monitoring period (1990-2010), so no firm conclusions on the trend should be drawn.

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.

Recommendations

Discharges of copper from fish farming are incompletely reported this year, due to lack of necessary data. These will therefore have to be calculated at a later stage or during next year’s reporting. Discharges of nutrients from fish farming are based on corrected estimates of the nutrient contents in the fish fodder in 2010, but former some of the former years’ estimates are probably too high and will have to be corrected.

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Appendices

Appendix I The RID Principles and Objectives
Appendix II Water sampling personnel
Appendix III Catchment information for the 10 main and the 36 tributary rivers
Appendix IV Methodology, detailed information and changes over time
Appendix V Trend analyses – pollutant concentrations
Appendix VI Long-term trends in riverine loads

Appendix 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 2010 is given below:

Personnel for water sampling in the 10 main rivers:

Nils Haakensen (Glomma)
Vibeke Svenne (Drammen)
Vebjørn Opdahl (Vefsna)
Anders Bjordal (Alta)
Joar Skauge (Orkla)
Geir Ove Henden (Vosso)
Eskild Henning Larsen (Skien)
Sverre Holm (Numedalen)
Einar Helland (Orre)
Ellen Grethe Ruud Åtland (Otra)

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

Olav Smestad
Svein Gitle Tangen
Leif Johnny Bogetveit
Hallgeir Hansen
Nils Haakensen
Vebjørn Opdahl
Erik Kårvatn
Harald Viken
Egil Moen
Helge Utby/Øystein Iselvmo
Einar Pettersen
Ellen Grethe Ruud Åtland
Einar Helland
Asbjørn Bjerkan
Bjarne Stangvik
Rune Roaldskvam
Odd Birger Nilsen
Torbjørn Langland
Tor G. Skaar/Magnus Jekteberg
Jan Stokkeland
Marie Knagenhjem

Appendix III
Catchment information

Catchment information for rivers monitored monthly - Main Rivers

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

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

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

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

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

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

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

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

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

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

The ten watercourses represent river systems typical for different parts of the country. As such they are very useful when estimating loads of comparable rivers with less data than the main rivers. All rivers except Orreelva are to varying degrees 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[7] is 2380 km^2, but the size varies from Vikedalselva with its 118 km^2, to the second largest drainage basin in Norway, Pasvikelva with a drainage basin of 18404 km^2.

Land use varies considerably, as shown in Figure A-III-1. As an example, the Figgjo and Tista Rivers have the highest coverage of agricultural land (31[8] and 12%, respectively), whereas some of the rivers have none or insignificant agricultural activities in their drainage basins (e.g. Ulla, Røssåga, Målselv, Tana and Pasvik). Some catchments, like Lyseelv,

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

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

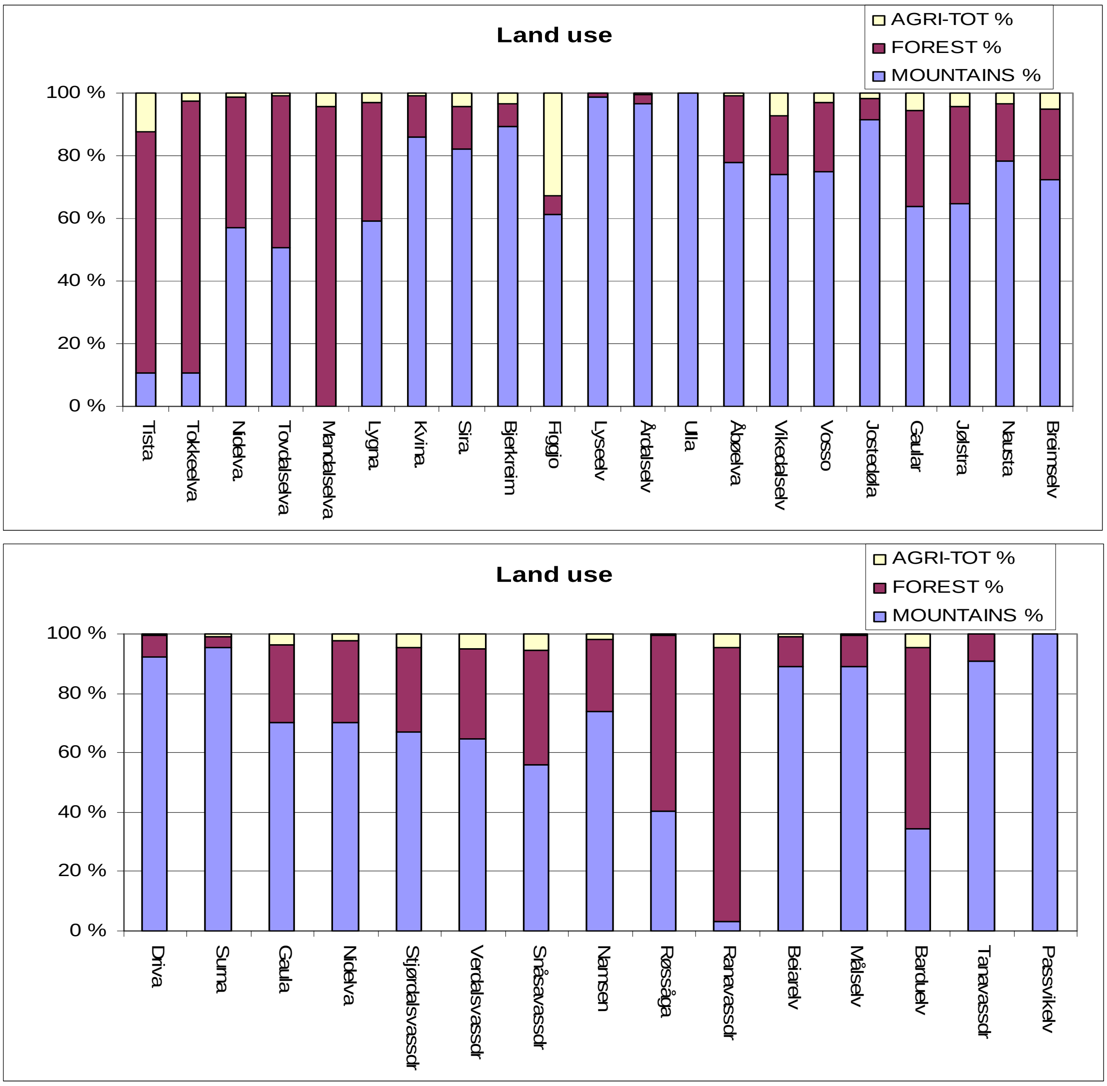

Figure A-III-1. Land use distribution in the catchment areas of the 36 rivers monitored quarterly. "Agri-tot" means total agricultural land. "Mountains" include moors and mountain plateaus not covered by forest.

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

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

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

Appendix IV
Methodology, detailed information and changes over time

Method for the selection of rivers for monitoring

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

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

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

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

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

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

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

Sampling methodology and sampling sites

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

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

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

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

Regine No	RID-ID	Station name	Latitude	Longitude	RID-Region
002.A51	2	Glomma at Sarpsfoss	59.27800	11.13400	Skagerrak
012.A3	15	Drammenselva	59.75399	10.00903	
015.A1	18	Numedalslågen	59.08627	10.06962	
016.A221	20	Skienselva	59.19900	9.61100	
021.A11	26	Otra	58.18742	7.95411	
028.4A	37	Orreelva	58.73143	5.52936	North Sea
062.B0	64	Vosso (Bolstadelvi)	60.64800	6.00000	
121.A41	100	Orkla	63.20100	9.77300	Norwegian Sea
151.A4	115	Vefsna	65.74900	13.23900	
212.A0	140	Altaelva	69.90100	23.28700	Barents Sea
Regine No	RID-ID	Station name	Latitude	Longitude	RID-Region
001.A6	1	Tista	59,12783	11.44436	Skagerrak
017.A1	21	Tokkeelva	58.87600	9.35400	
019.A230	24	Nidelv (Rykene)	58.40100	8.64200	
020.A12	25	Tovdalselva	58.21559	8.11668	
022.A5	28	Mandalselva	58.14300	7.54604	
024.B120	30	Lyngdalselva	58.16300	7.08798	North Sea
025.AA	31	Kvina	58.32020	6.97023	
026.C	32	Sira	58.41367	6.65669	
027.A1	35	Bjerkreimselva	58.47894	5.99530	
028.A3	38	Figgjoelva	58.79168	5.59780	
031.AA0	44	Lyseelva	59.05696	6.65835	
032.4B1	45	Årdalselva	59.08100	6.12500	
035.A21	47	Ulladalsåna (Ulla)	59.33000	6.45000	
036.A21	48	Suldalslågen	59.48200	6.26000	
035.721	49	Saudaelva	59.38900	6.21800	
038.A0	51	Vikedalselva	59.49958	5.91030	
076.A0	75	Jostedøla	61.41333	7.28025	
083.A0	78	Gaular	61.37000	5.68800	
084.A2	79	Jølstra	61.45170	5.85766	
084.7A0	80	Nausta	61.51681	5.72318	
087.A221	84	Gloppenelva (Breimselva)	61.76500	6.21300	
109.A0	95	Driva	62.66900	8.57100	Norwegian Sea
112.A0	98	Surna	62.98000	8.72600	
122.A24	103	Gaula	63.28600	10.27000	
123.A2	104	Nidelva(Tr.heim)	63.43300	10.40700	
124.A21	106	Stjørdalselva	63.44900	10.99300	
127.A0	108	Verdalselva	63.79200	11.47800	
128.A1	110	Snåsavassdraget	64.01900	11.50700	
139.A50	112	Namsen	64.44100	11.81900	
155.A0	119	Røssåga	66.10900	13.80700	
156.A0	122	Ranaelva	66.32300	14.17700	
161.B4	124	Beiarelva	66.99100	14.75000	
196.B2	132	Målselv	69.03600	18.66600	
196.AA3	133	Barduelva	69.04300	18.59500	
234.B41	150	Tanaelva	70.23000	28.17400	Barents Sea
246.A5	153	Pasvikelva	69.50100	30.11600	

Analytical methods and detection limits

Table A-IV-3. Analytical methods and obtainable detection limits for all parameters included in the sampling programme in 2010.

Parameter	Detection limit	Analytical Methods (NS: Norwegian Standard)
pH		NS 4720
Conductivity (mS/m)	0.05	NS-ISO 7888
Suspended particulate matter (SPM.) (mg/L)	0.1	NS 4733 modified
Total Organic Carbon (TOC) (mg C/L)	0.1	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 SiO_2 /L)	0.1	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)	0.5	NIVA's accredited method H3-2 (PCB)
2,2',5,5'-tetrachlorobiphenyl (CB52) (ng/L)	0.5	NIVA's accredited method H3-2 (PCB)
2,2',4,5,5'-pentachlorobiphenyl (CB101) (ng/L)	0.5	NIVA's accredited method H3-2 (PCB)
2,3',4,4',5-pentachlorobiphenyl (CB118) (ng/L)	0.5	NIVA's accredited method H3-2 (PCB)
2,2',3,4,4',5'-hexachlorobiphenyl (CB138) (ng/L)	0.5	NIVA's accredited method H3-2 (PCB)
2,2',4,4',5,5'-hexachlorobiphenyl (CB153) (ng/L)	0.5	NIVA's accredited method H3-2 (PCB)
2,2',3,4,4',5,5'-heptachlorobiphenyl (CB180) (ng/L)	0.5	NIVA's accredited method H3-2 (PCB)

Water discharge and hydrological modelling

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

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

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

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

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

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

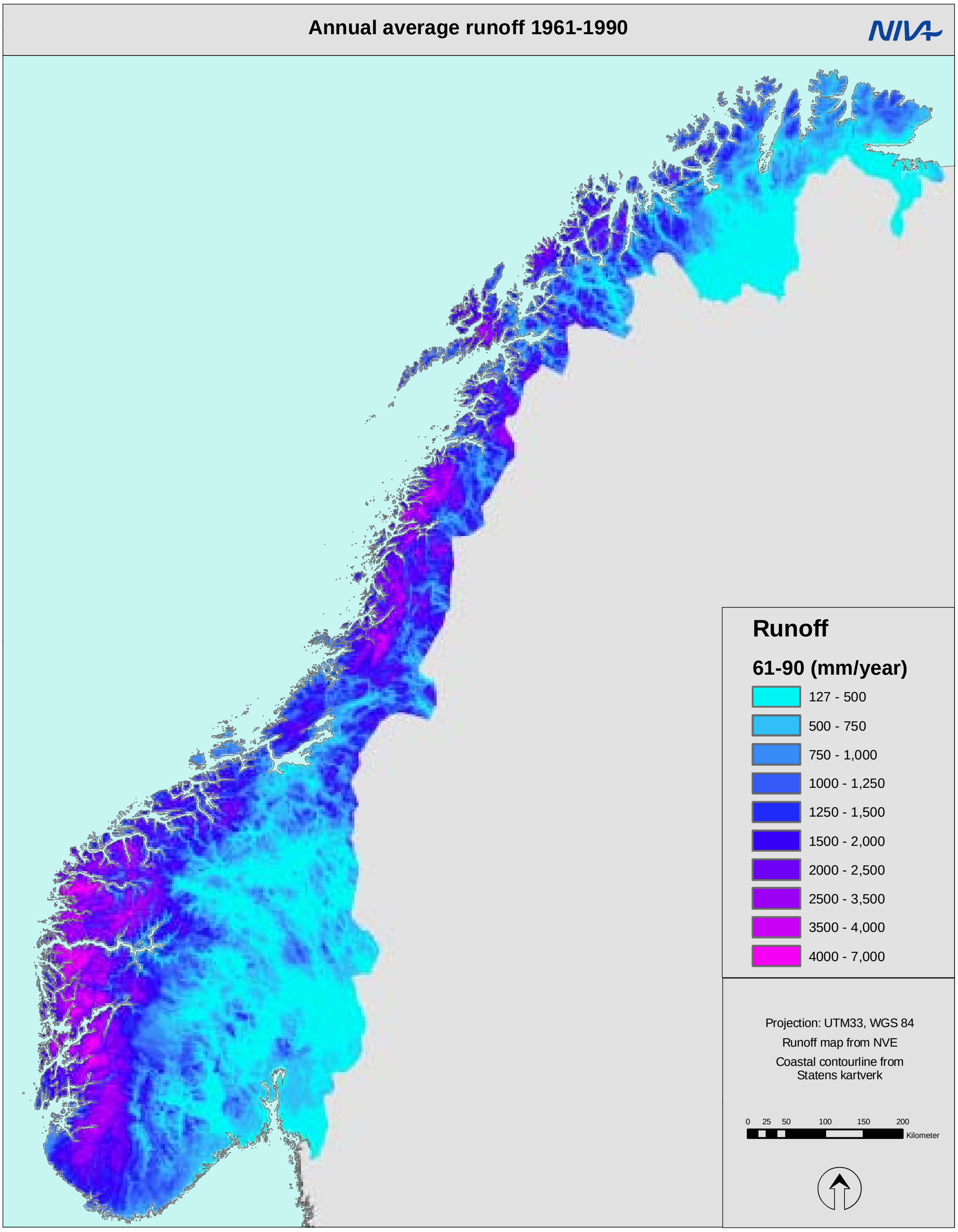

Figure A-IV-1. Average annual runoff (mm/year) for Norway for the period 1961-1990.

Direct discharges to the sea

Data sources:

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

Wastewater

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

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

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

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

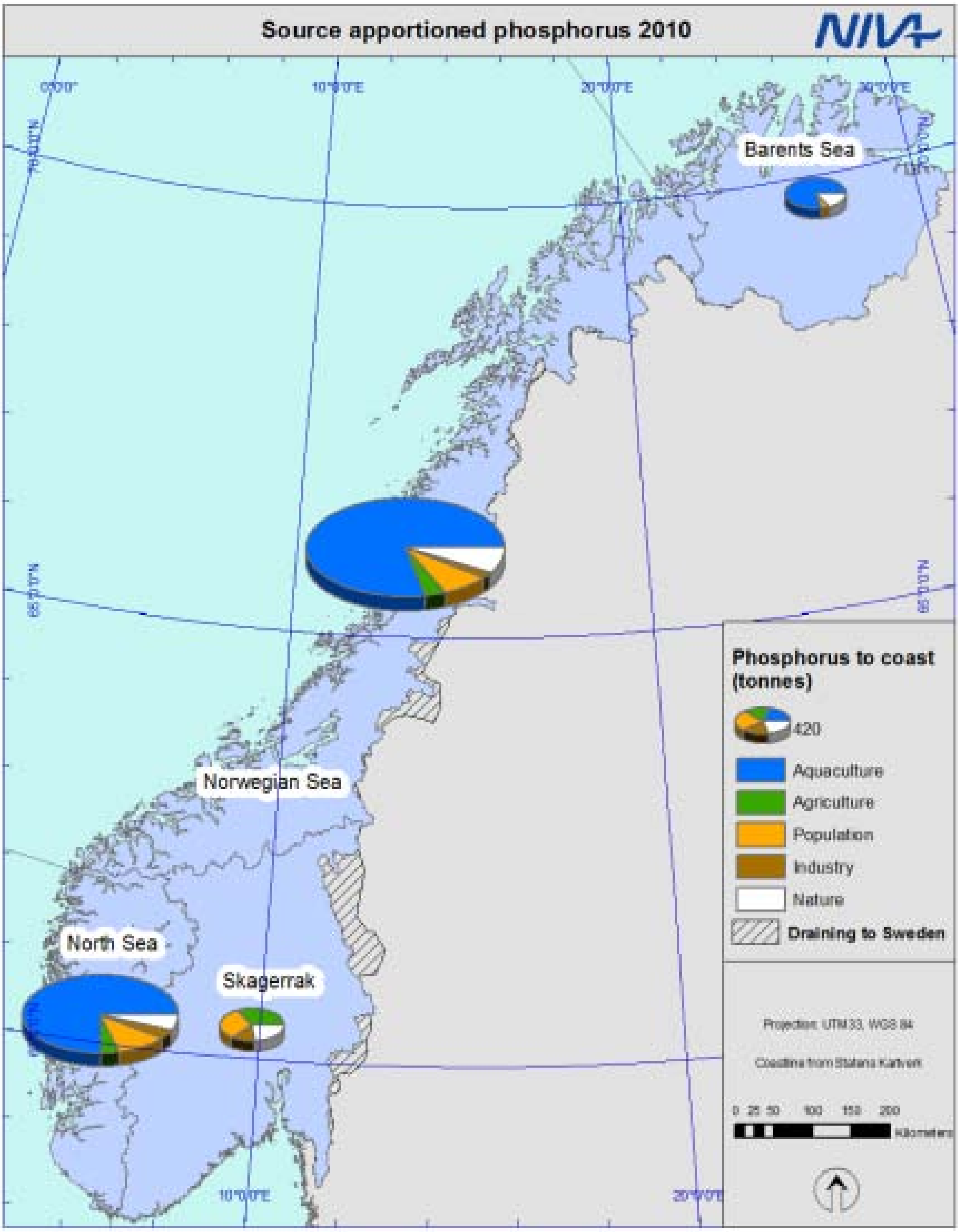

Figure A-IV-2. The relative importance of the five phosphorus sources to total inputs to the four coastal areas (Source Orientated Approach, incl. marine salmon/trout farming). The size of the circles indicates the total amount (tonnes). Note that in this map all direct sources are shown, whether they are covered downstream by riverine monitoring or not.

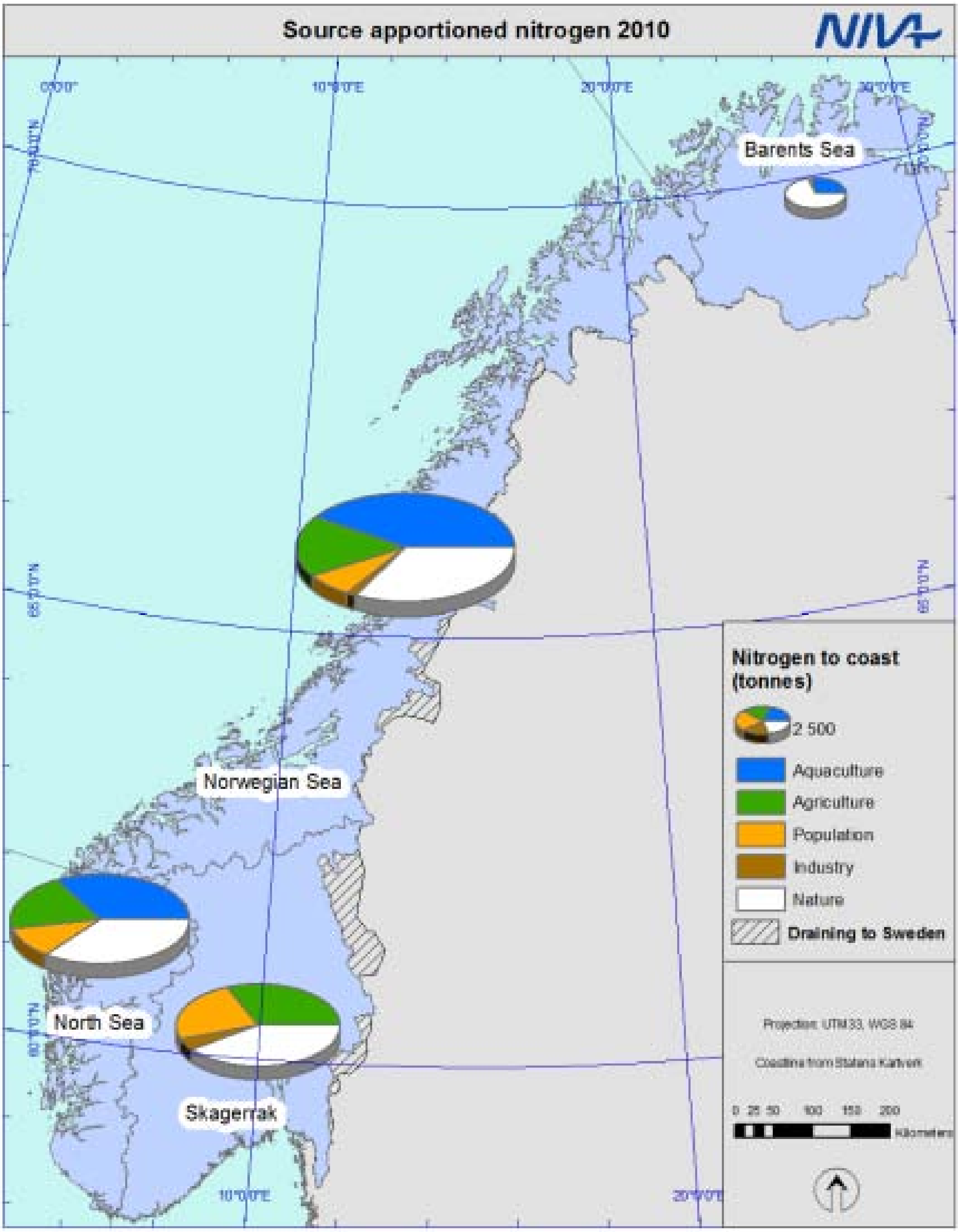

Figure A-IV-3. The relative importance of the five nitrogen sources to total inputs to the four coastal areas (Source Orientated Approach, incl. marine salmon/trout farming). The size of the circles indicates the total amount (tonnes). Note that in this map all direct sources are shown, whether they are covered downstream by riverine monitoring or not.

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

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

Metals from wastewater

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

Nutrients from wastewater

Statistics Norway (SSB) and the Climate and Pollution Agency (Klif) jointly initiated annual registration of data on nutrients from all wastewater treatment plants in the country with a capacity of more than 50 person equivalents (p.e.). The data are reported each year by the municipalities. The electronic reporting system KOSTRA is used for reporting of effluent data from the municipalities directly to SSB. Discharge figures from KOSTRA are used in the transport model "TEOTIL" to calculate the total discharges of total phosphorus and total nitrogen from population (wastewater treatment plants and scattered dwellings not connected to wastewater treatment plants), industry, agriculture and aquaculture sources to Norwegian coastal waters. The Norwegian Institute for Water Research (NIVA) performs this modelling. The figures take account of retention of nutrients in lakes.

Industrial effluents

Sampling frequency for industrial wastewater varies from weekly composite samples to random grab samples. Sampling is performed at least twice a year. NIVA has used TEOTIL for estimating the total nitrogen and total phosphorus loads from industry not connected to municipal treatment plants. The metal data were collected from Klif's data base Forurensning.

Fish farming effluents

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

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

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

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

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

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

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

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

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

Changes in the Norwegian RID programme over the years

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

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

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

In 2008, data from a parallel sampling programme was included in the database for River Glomma, and the number of samples in this river therefore increased. This parallel dataset only contains data for some nutrients and TOC.

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

It is important to note that the name ‘tributary’ is only used to signify that these rivers are monitored more seldom than the main rivers, as they all drain directly into the sea.
In the period 1990-2003, 145 ‘tributary’ rivers were sampled once a year only. Since 2004, the number of ‘tributary rivers’ was reduced to 36 rivers that were monitored four times a year. The remaining 109 rivers, formerly monitored once a year since 1990, were no longer sampled.

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

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

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

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

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

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

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

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

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

The charts cover the following substances in consecutive order:

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

The charts in this Appendix are complimentary to Chapter 4.3.

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

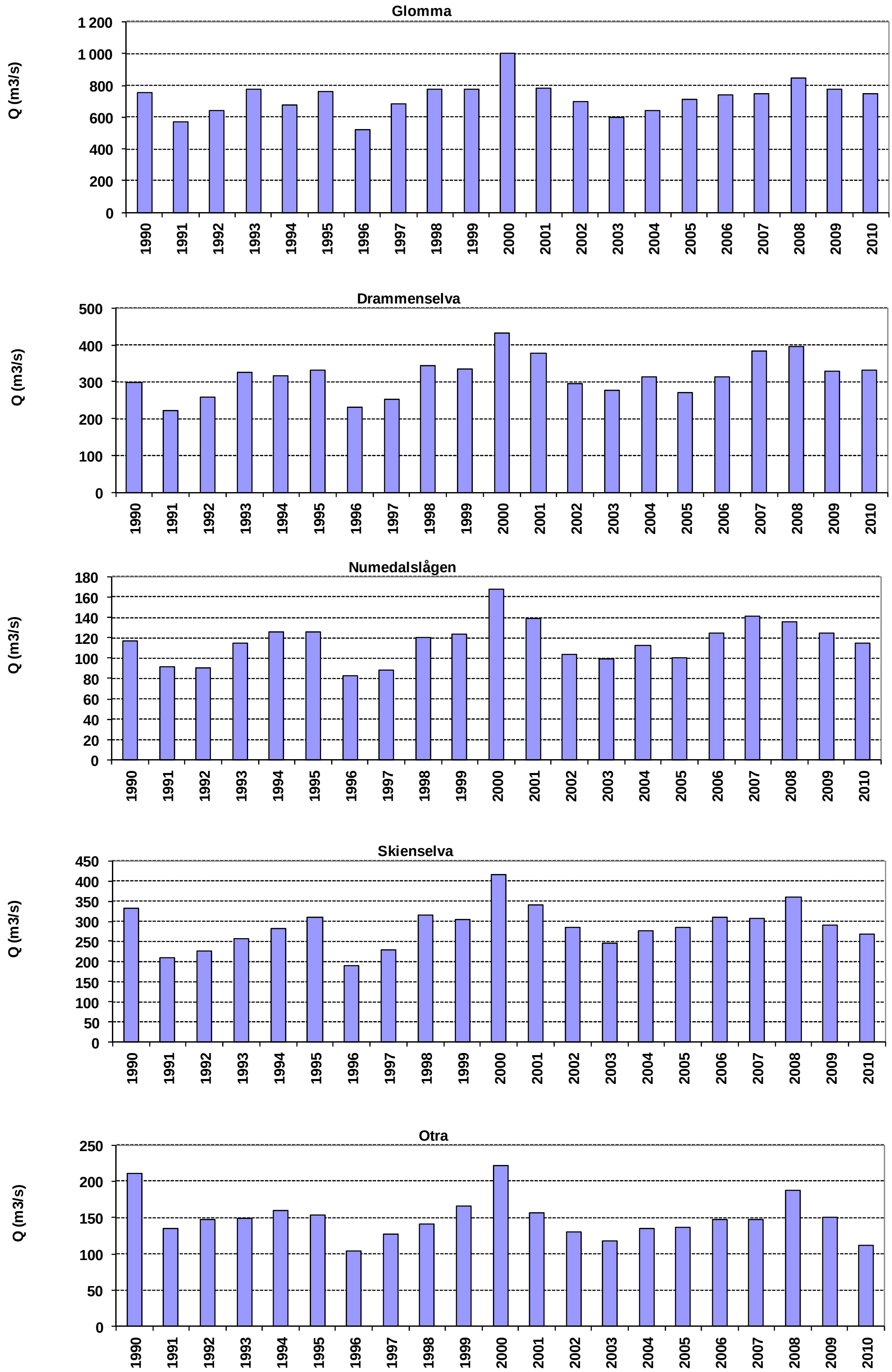


Figure A-V-1a. Annual water discharge in the five main Norwegian rivers draining to Skagerrak, 1990-2010.

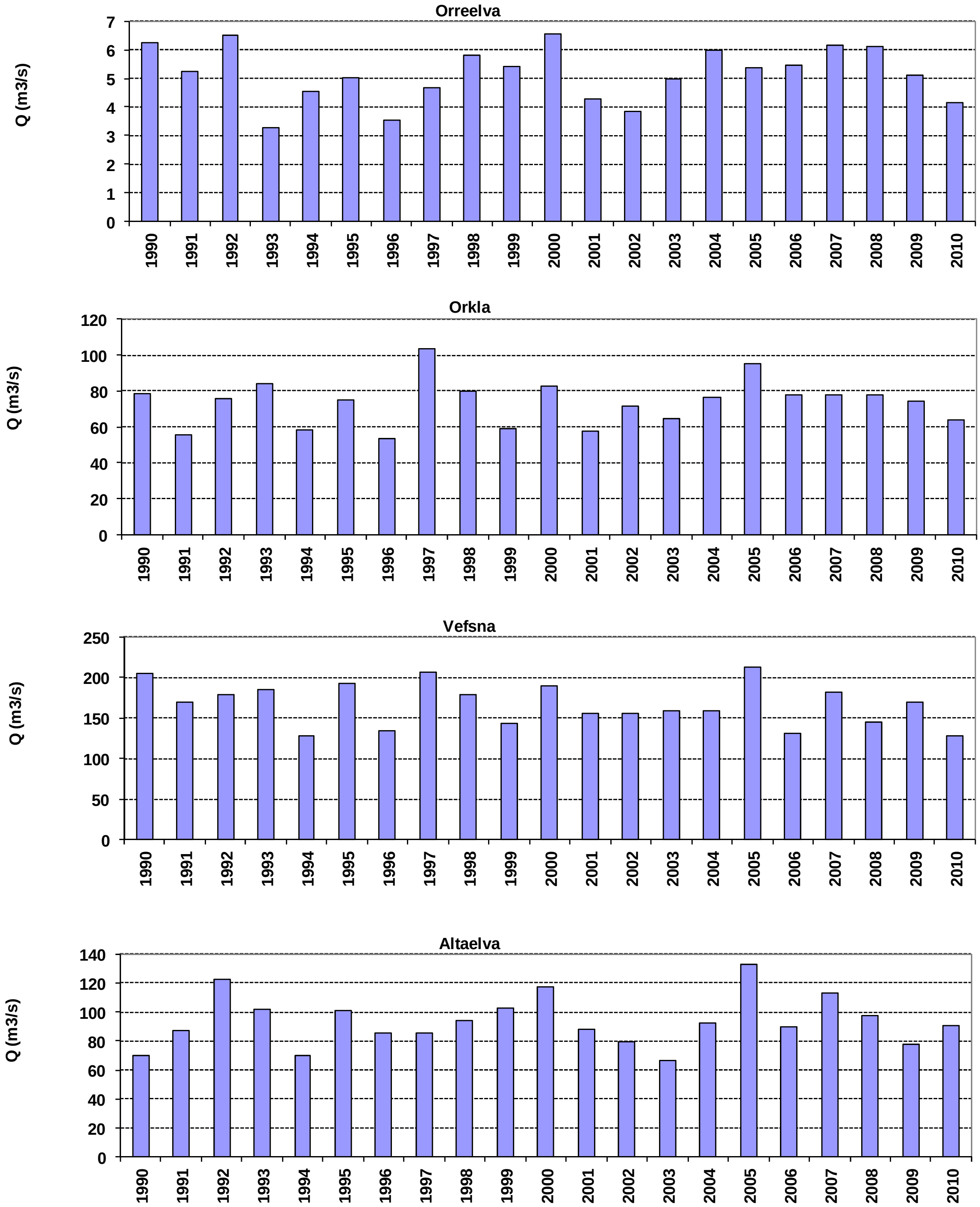


Figure A-V-1b. Annual water discharge in four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.

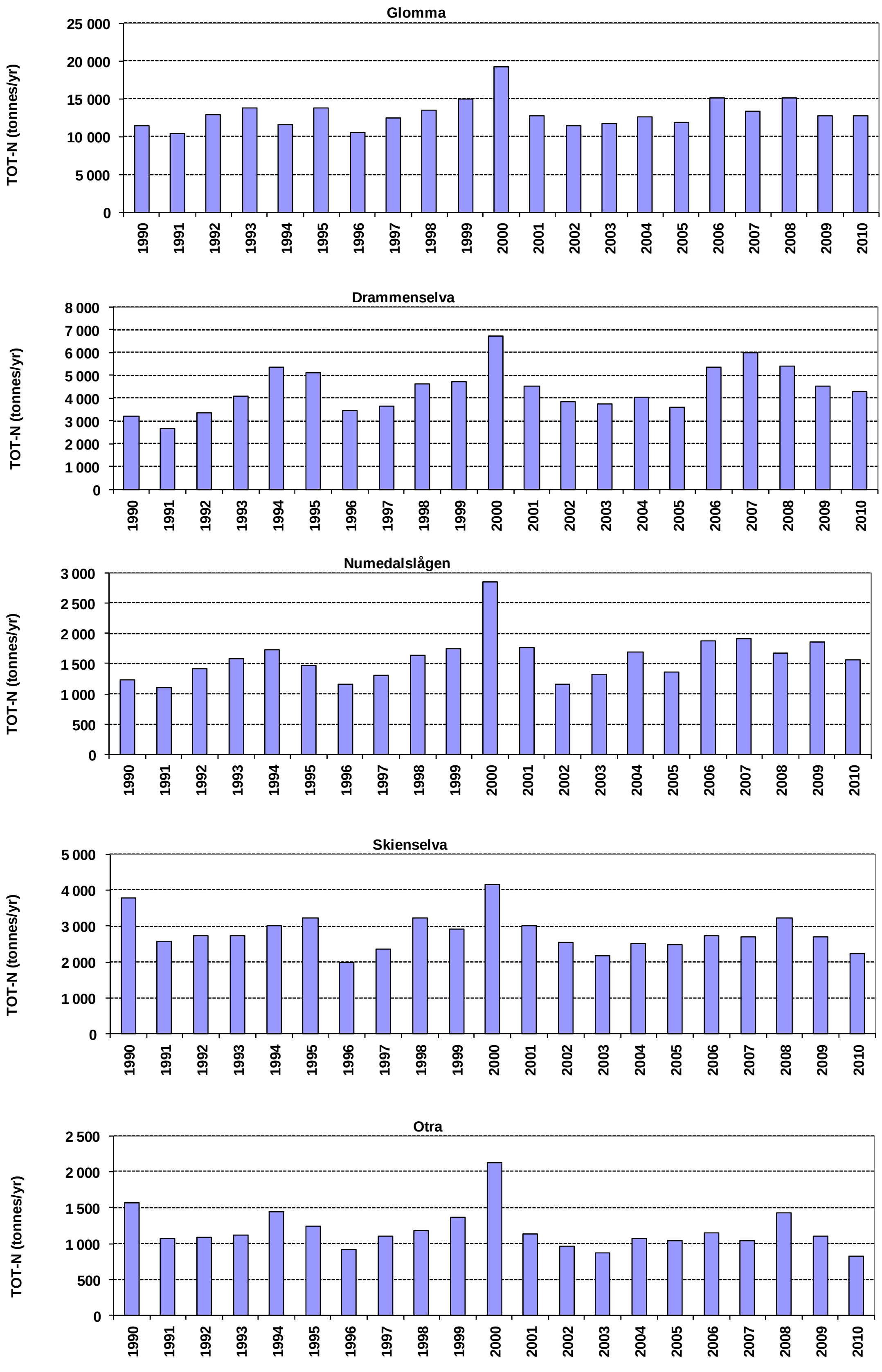


Figure A-V-2a. Annual riverine loads of total nitrogen from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

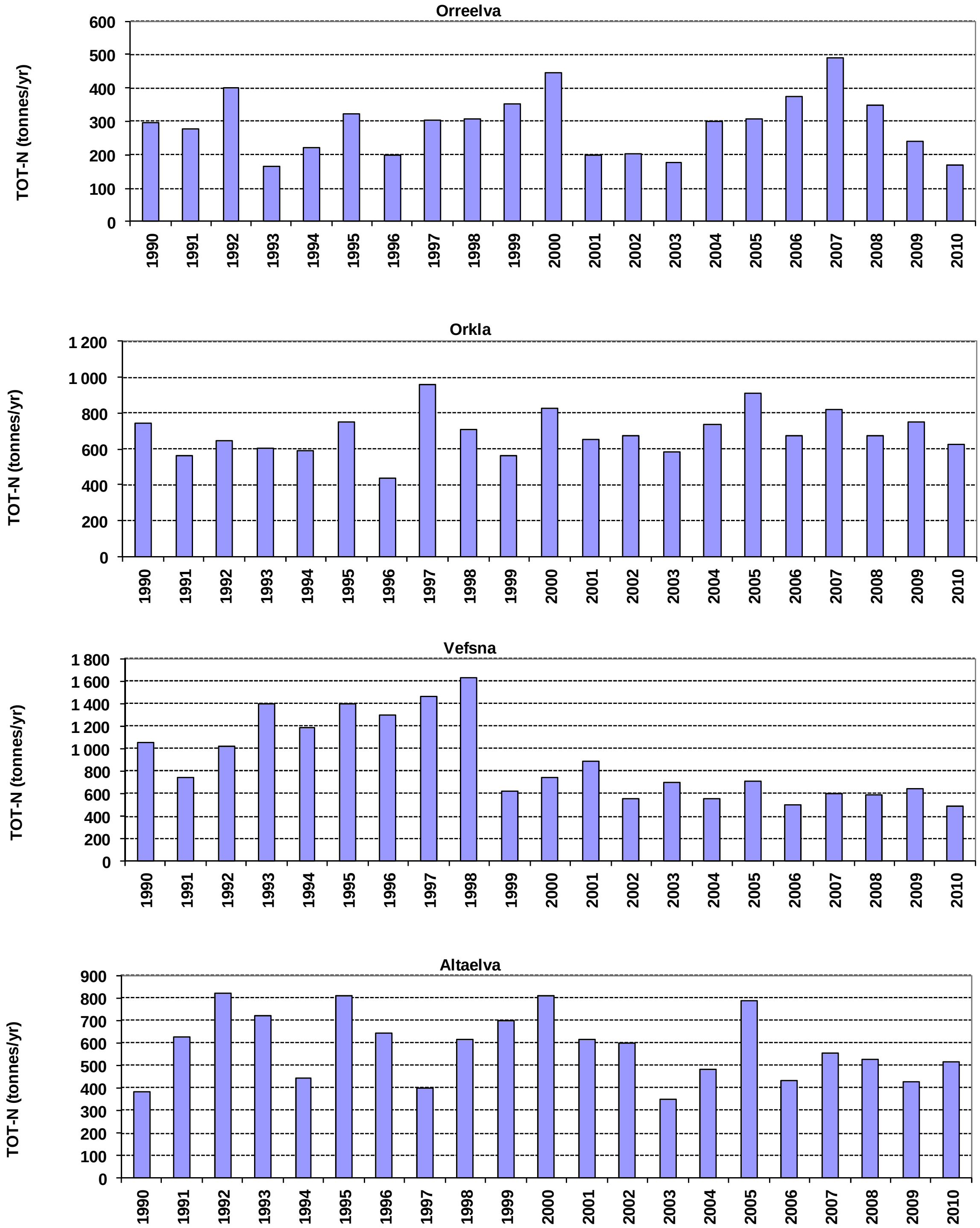


Figure A-V-2b. Annual riverine loads of <u>*total nitrogen*</u> *from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.*

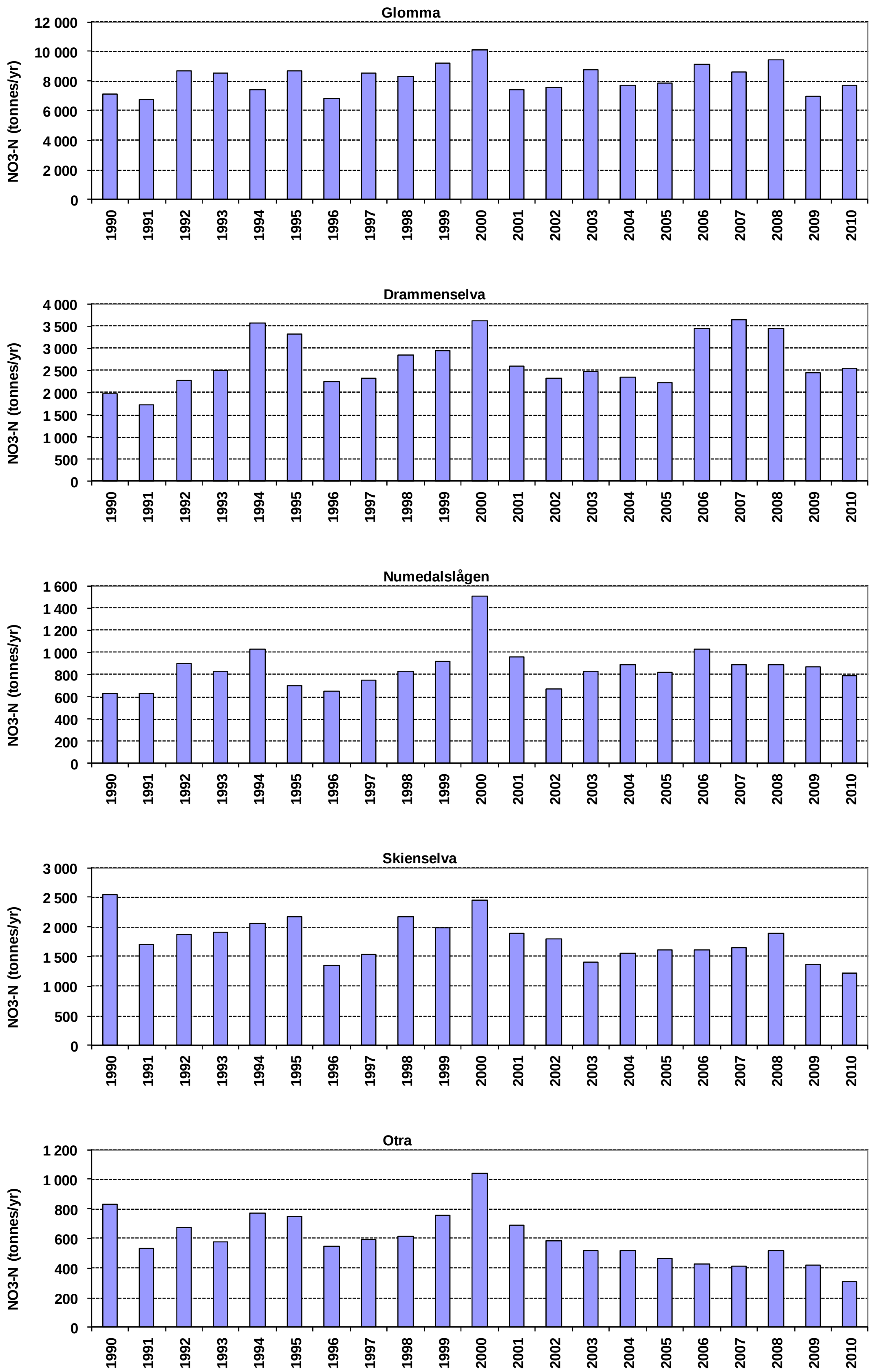


Figure A-V-3a. Annual riverine loads of <u>nitrate nitrogen</u> from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

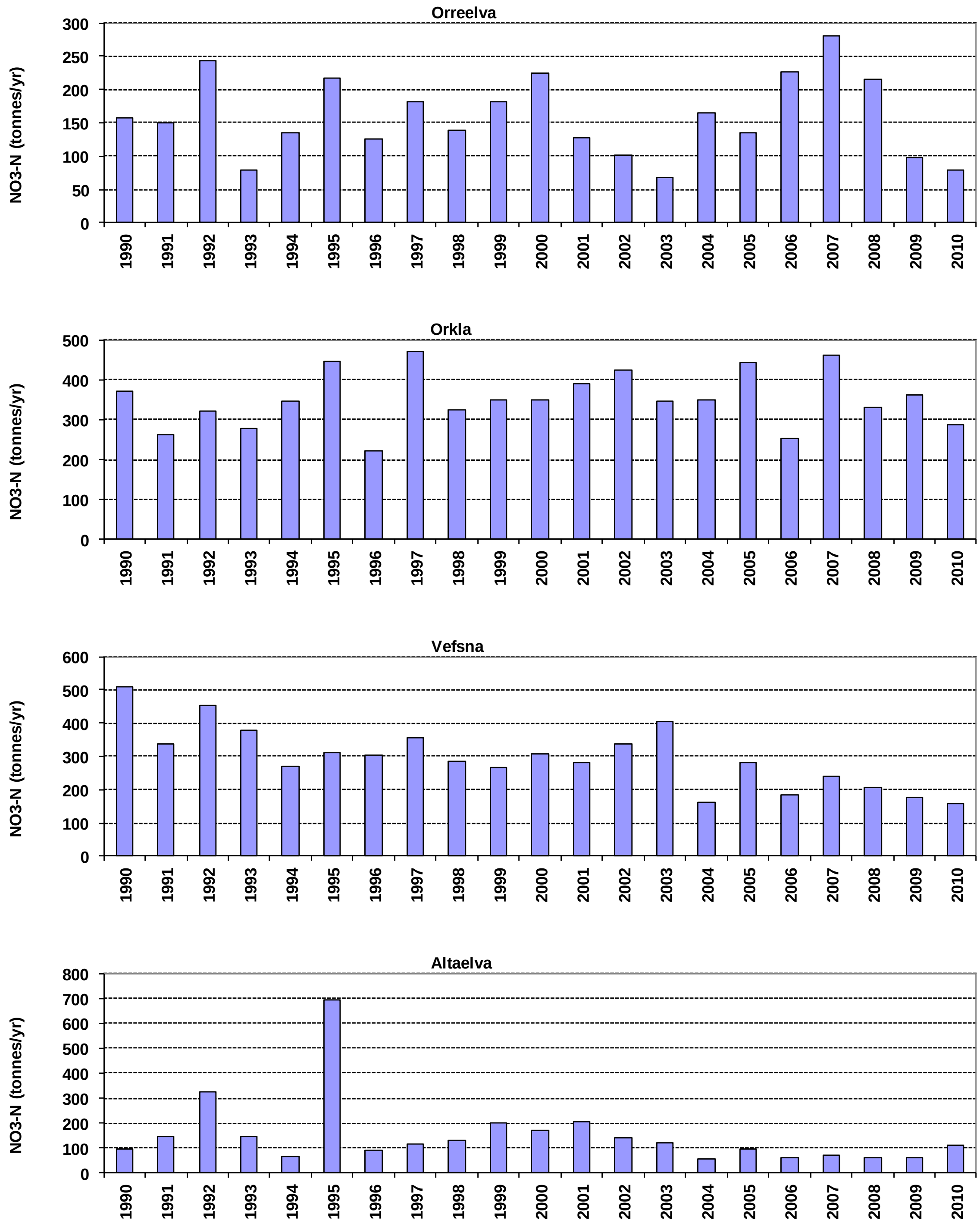


Figure A-V-3b. Annual riverine loads of <u>nitrate nitrogen</u> from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.

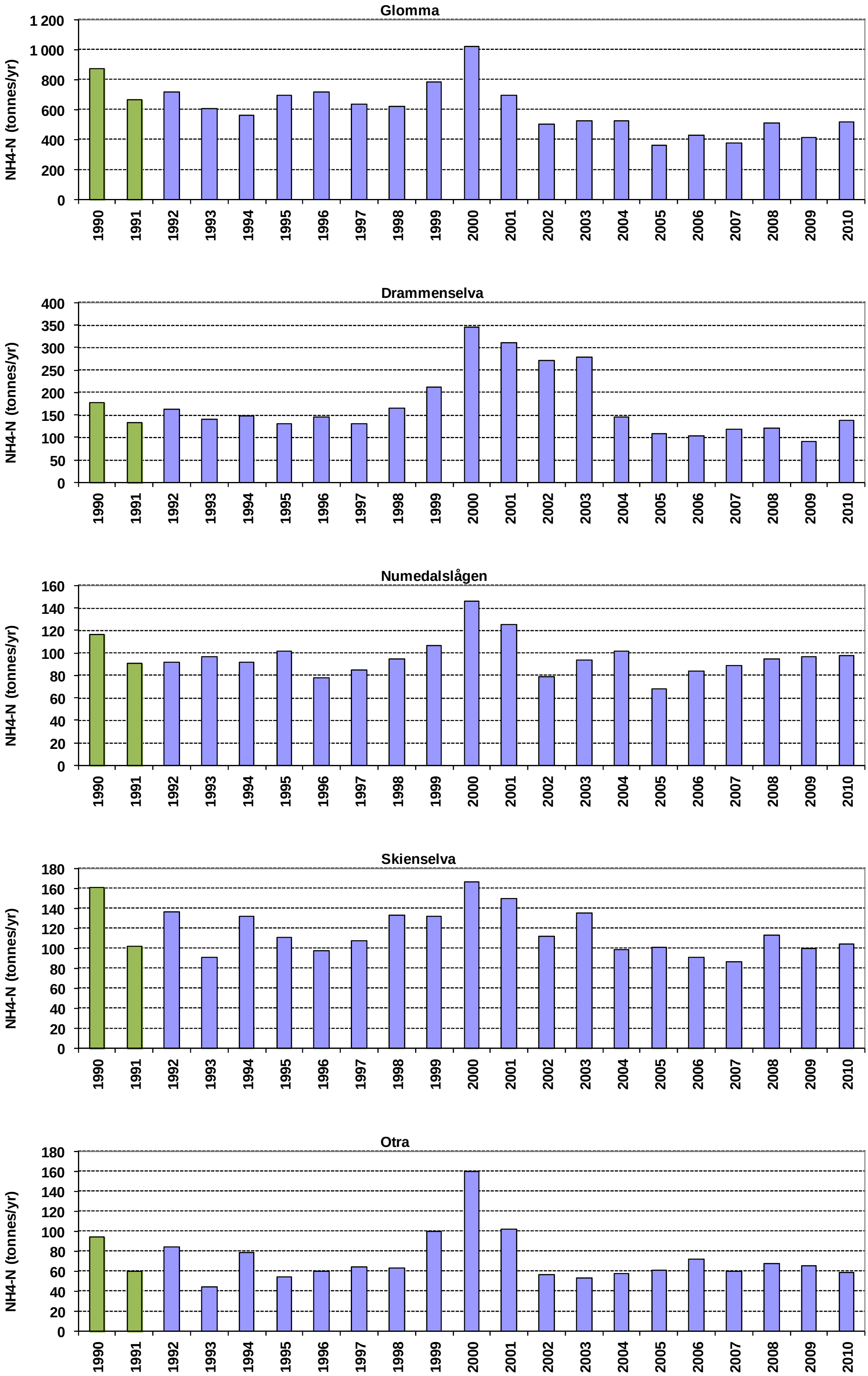


Figure A-V-4a. Annual riverine loads of ammonium nitrogen from the five main Norwegian rivers draining to Skagerrak, 1990-2010. Years with interpolated values are given in green.

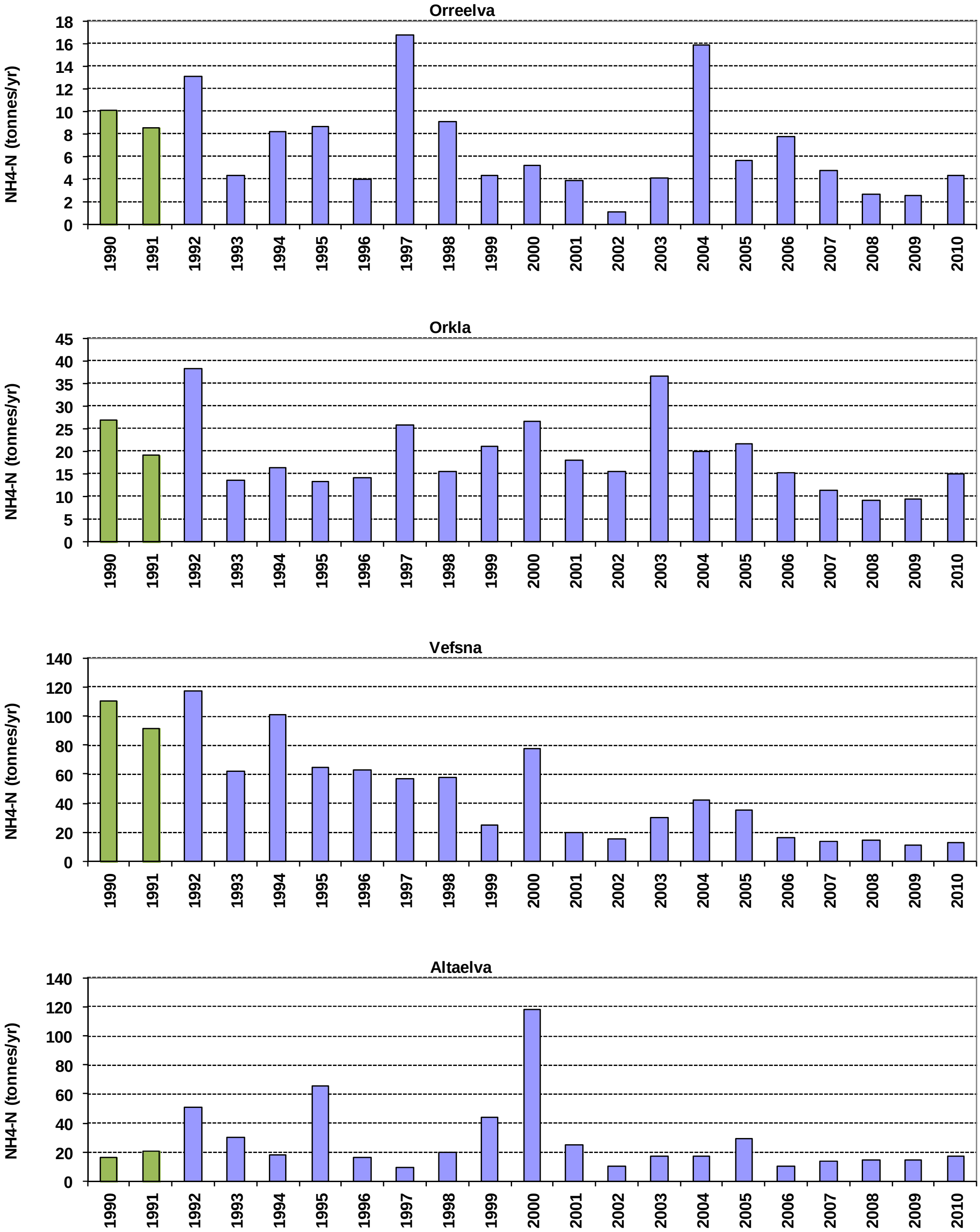


Figure A-V-4b. Annual riverine loads of ammonium nitrogen from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010. Years with interpolated values are given in green.

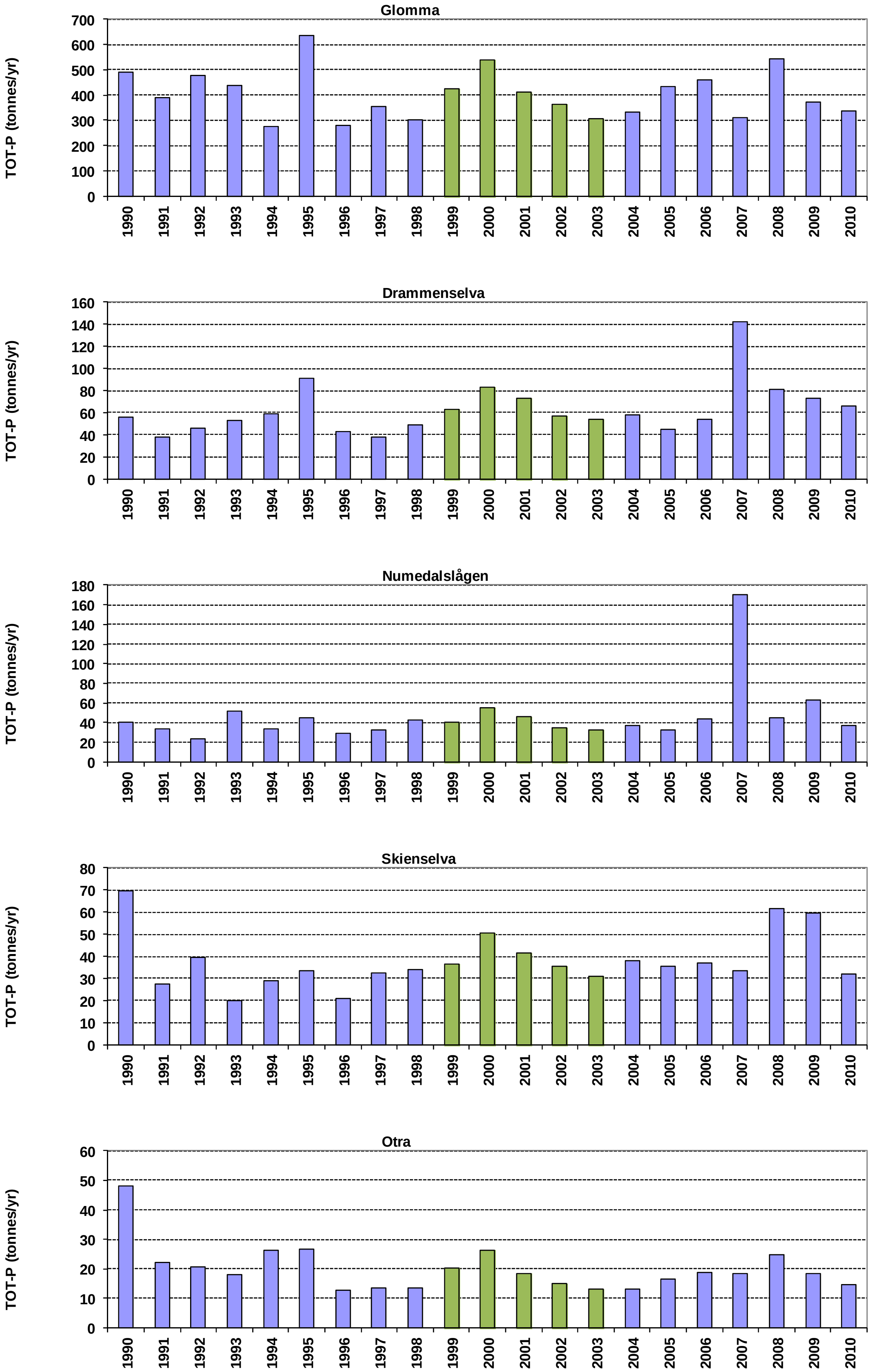


Figure A-V-5a. Annual riverine loads of <u>total phosphorus</u> from the five main Norwegian rivers draining to Skagerrak, 1990-2010. Years with interpolated values are given in green.

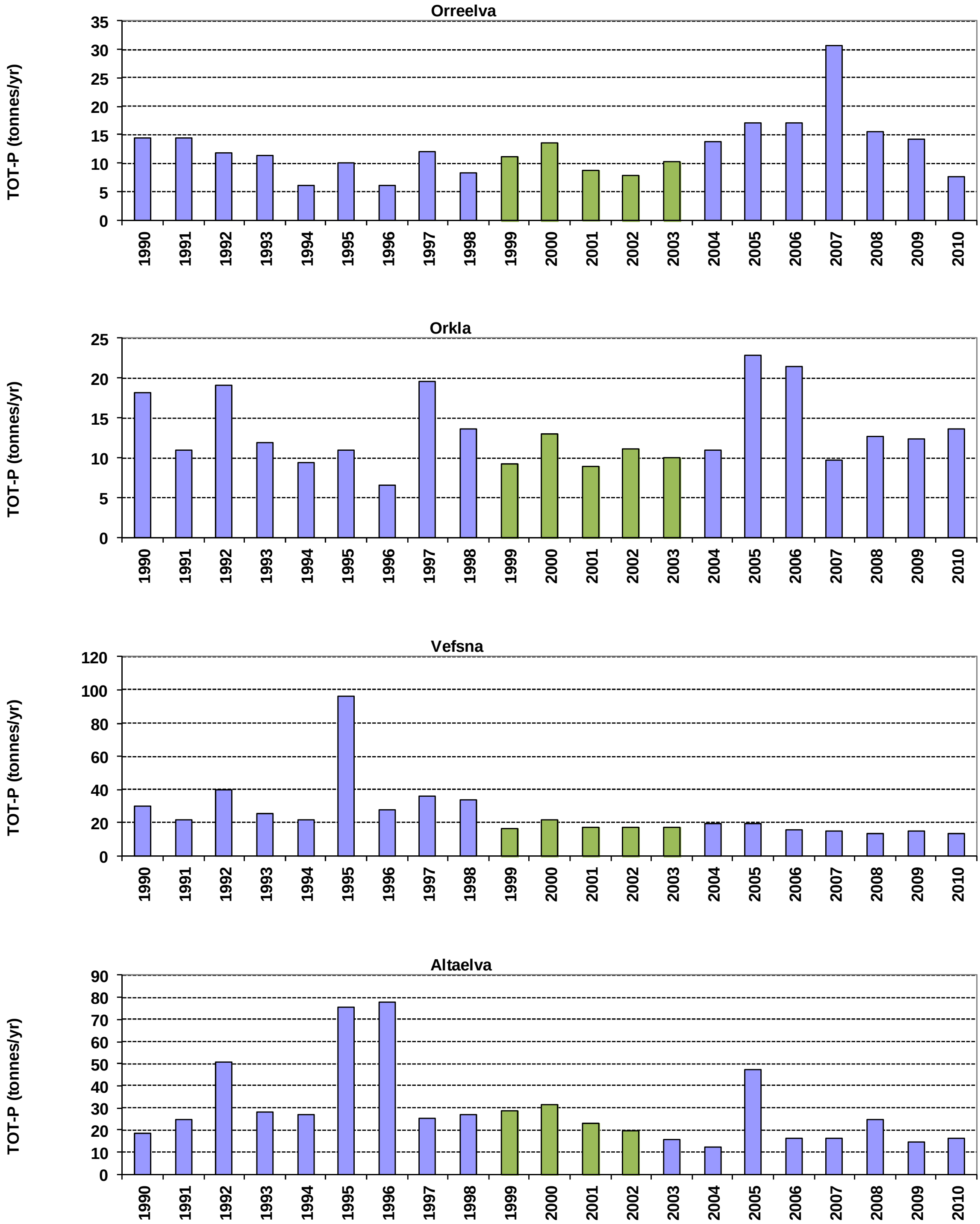


Figure A-V- 5b. Annual riverine loads of <u>*total phosphorus*</u> *from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010. Years with interpolated values are given in green.*

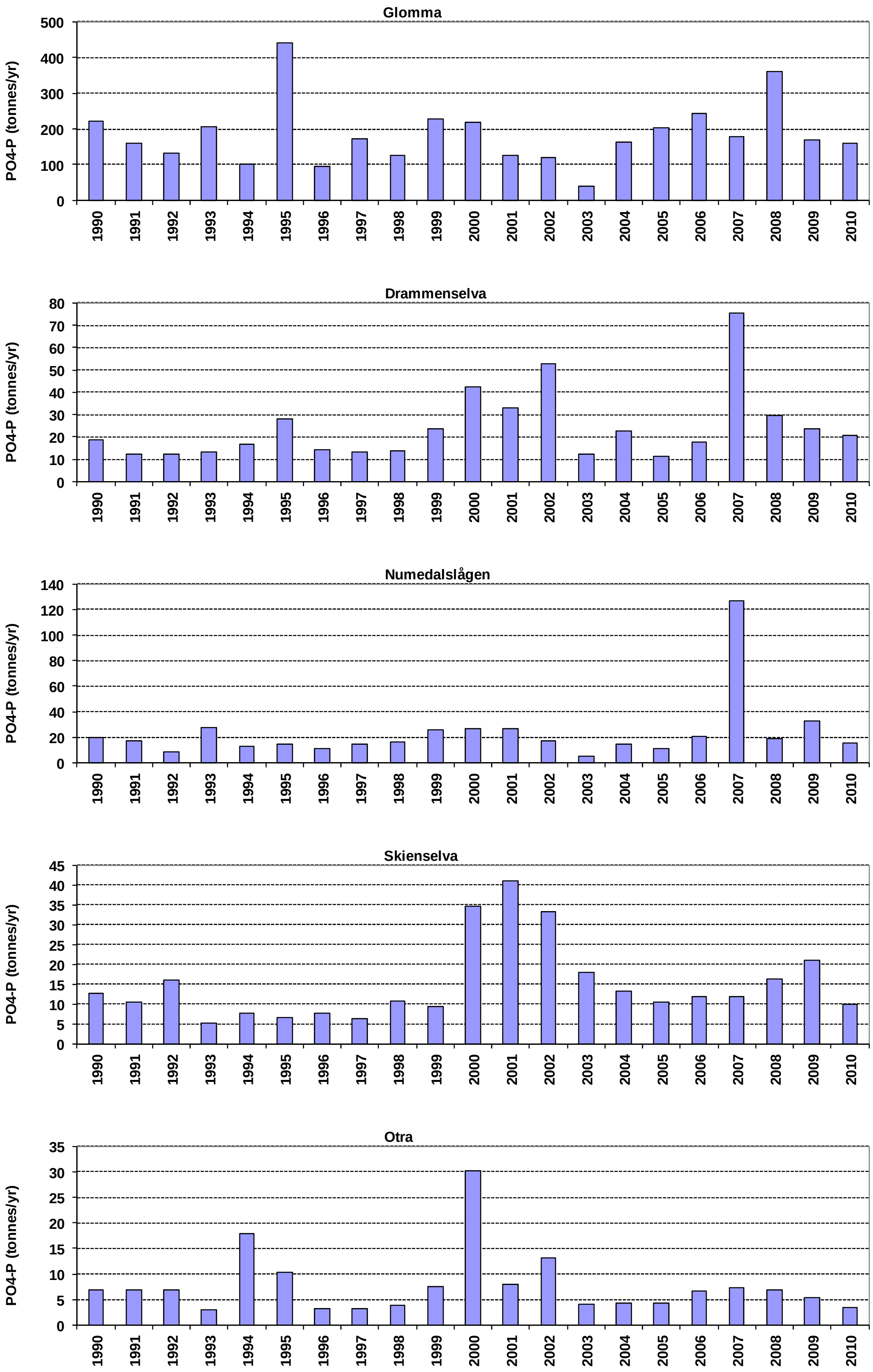


Figure A-V-6a. Annual riverine loads of orthophosphate from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

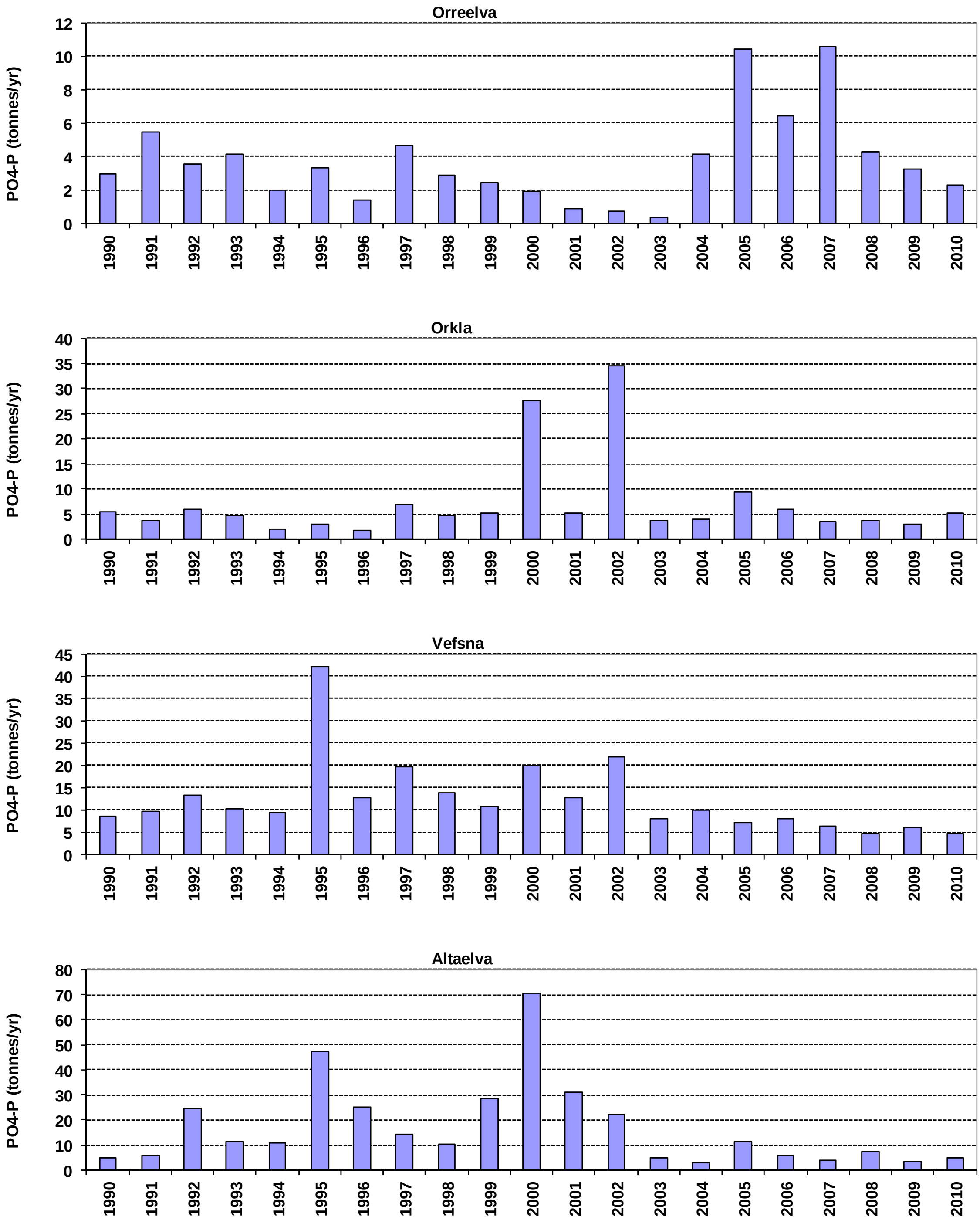


Figure A-V-6b. Annual riverine loads of orthophosphate from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.

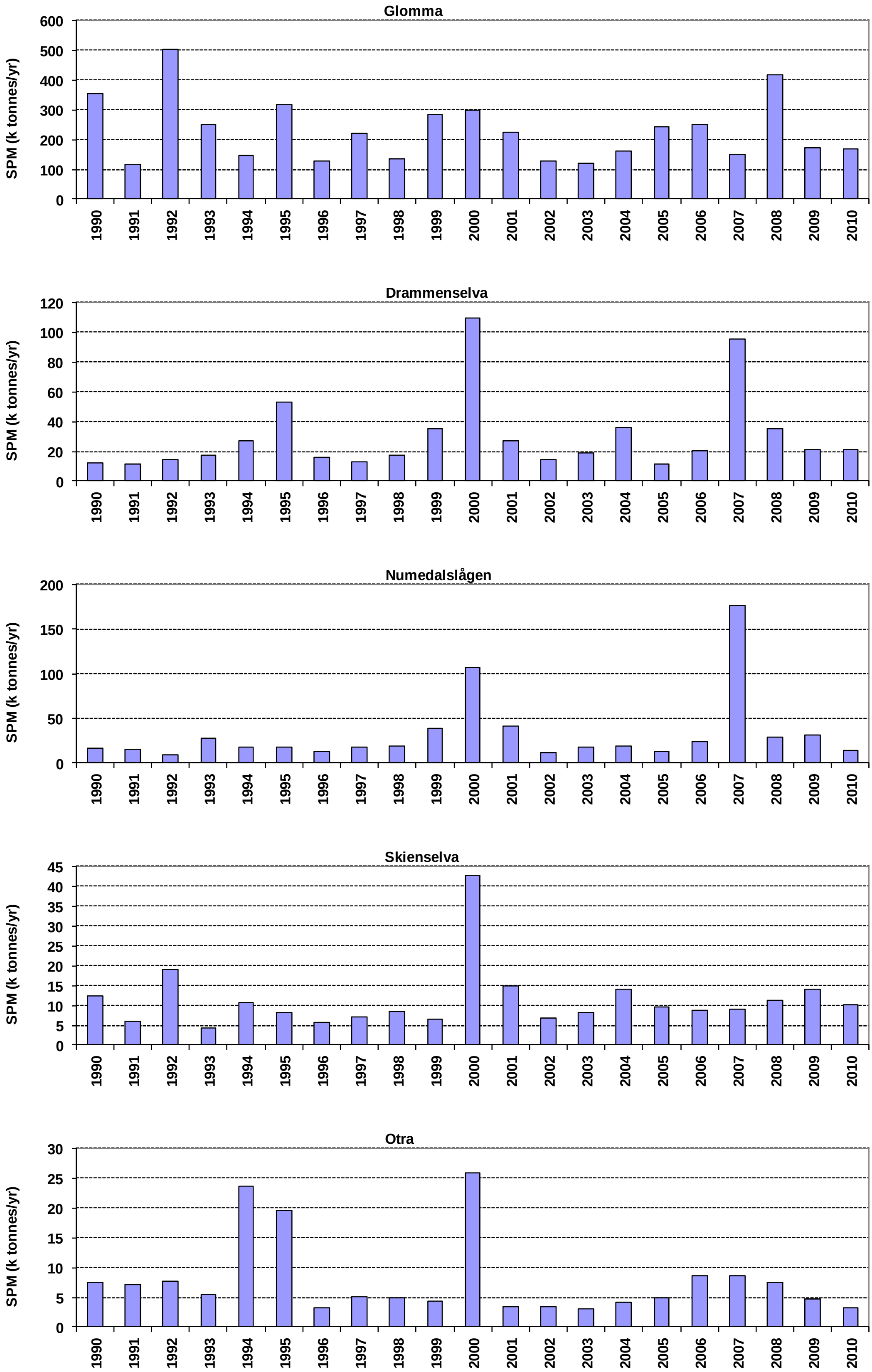


Figure A-V-7a. Annual riverine loads of suspended particulate matter from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

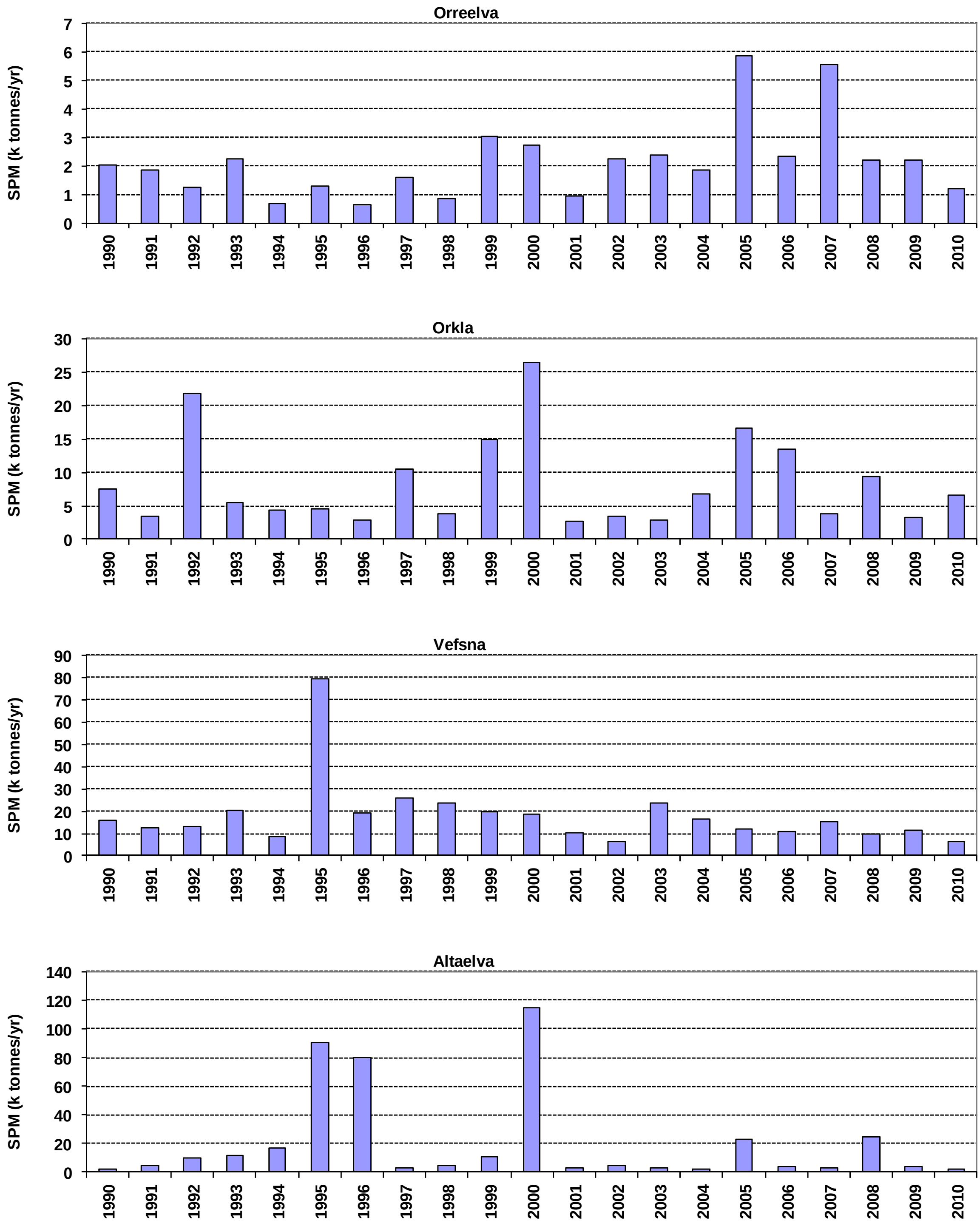


Figure A-V-7b. Annual riverine loads of <u>suspended particulate matter</u> from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, *Norway, 1990-2010.*

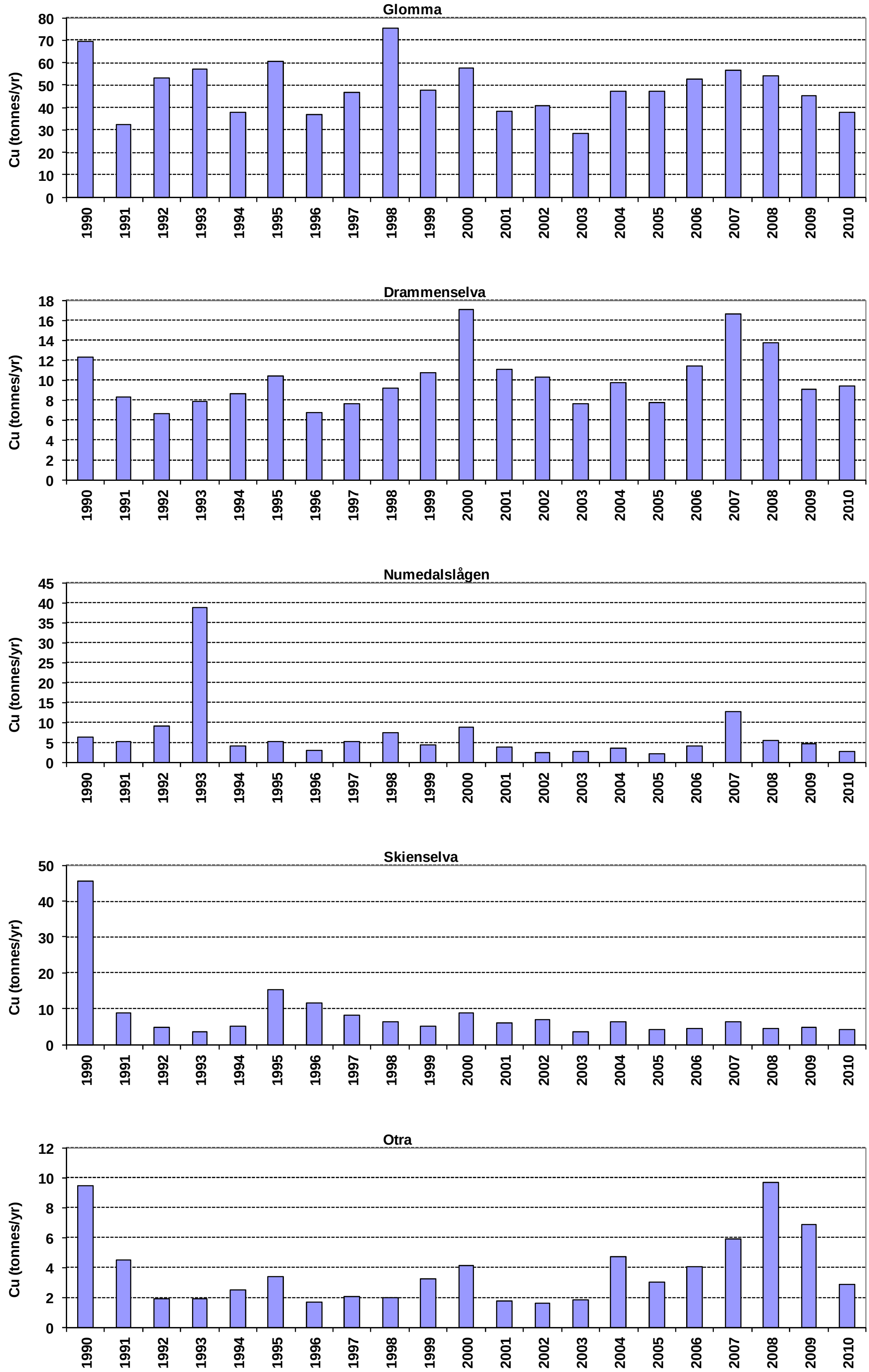


Figure A-V-8a.Annual riverine loads of <u>Copper</u> from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

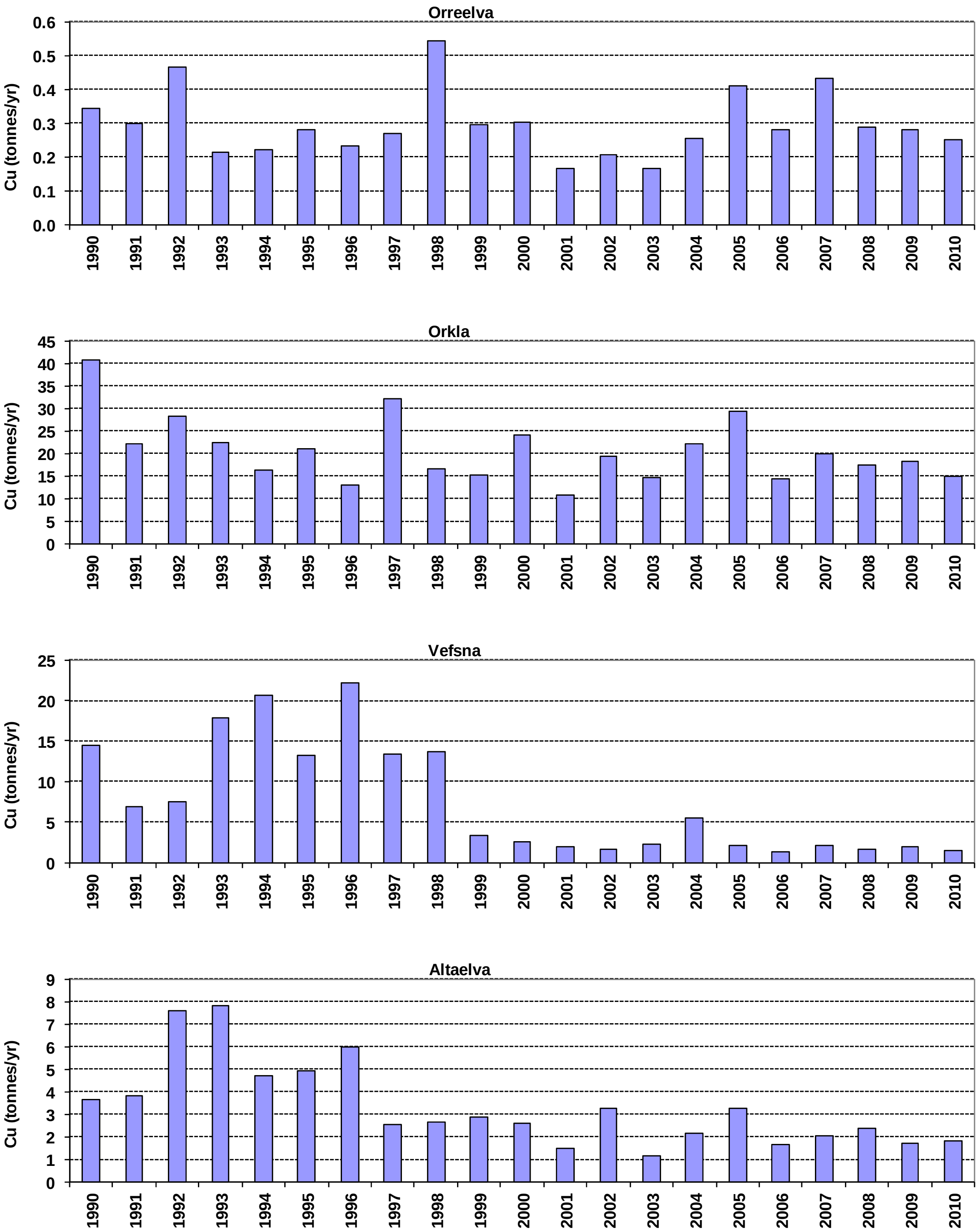


Figure A-V-8b. Annual riverine loads of <u>Copper</u> from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.

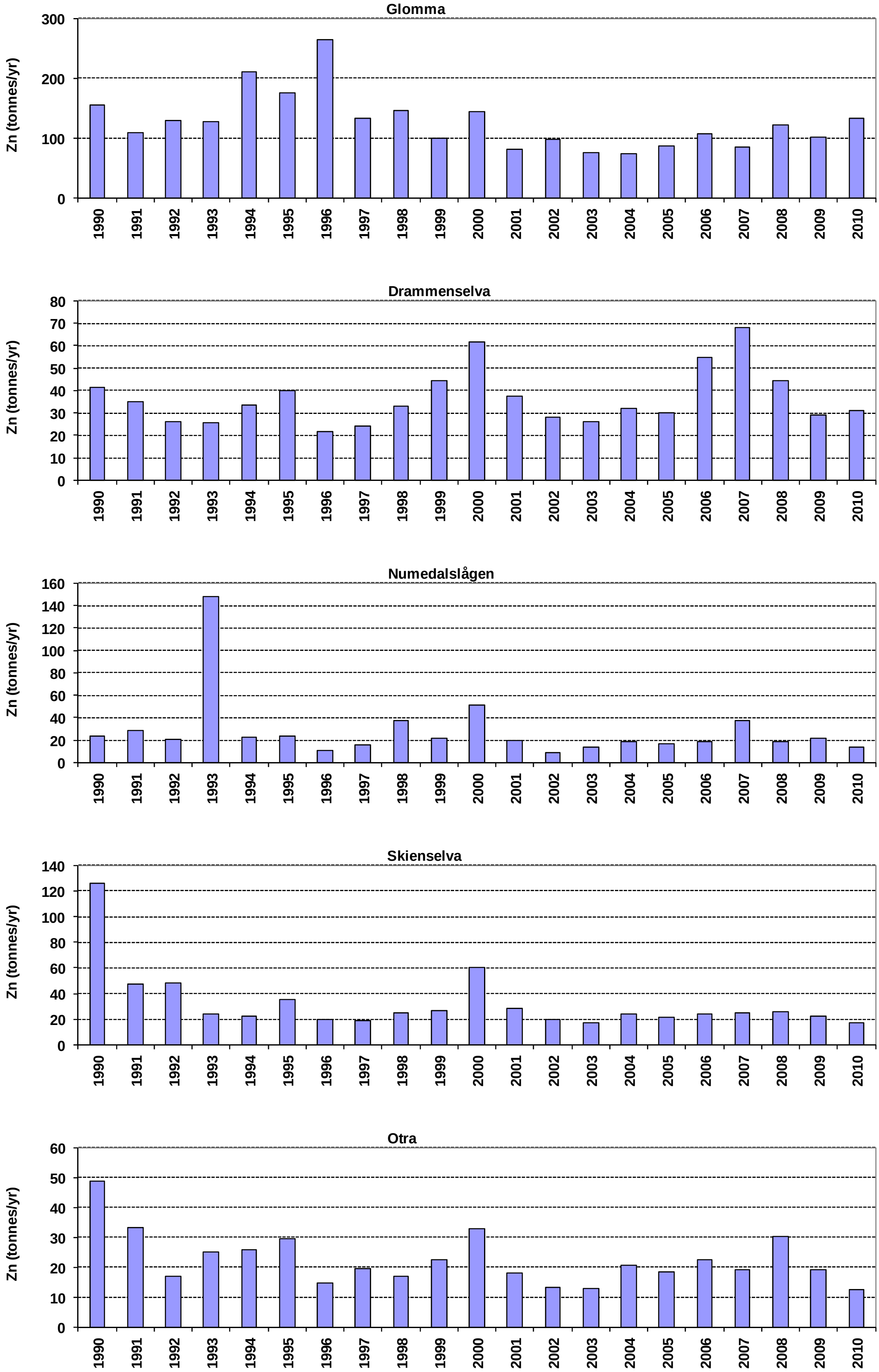


Figure A-V-9a. Annual riverine loads of Zinc from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

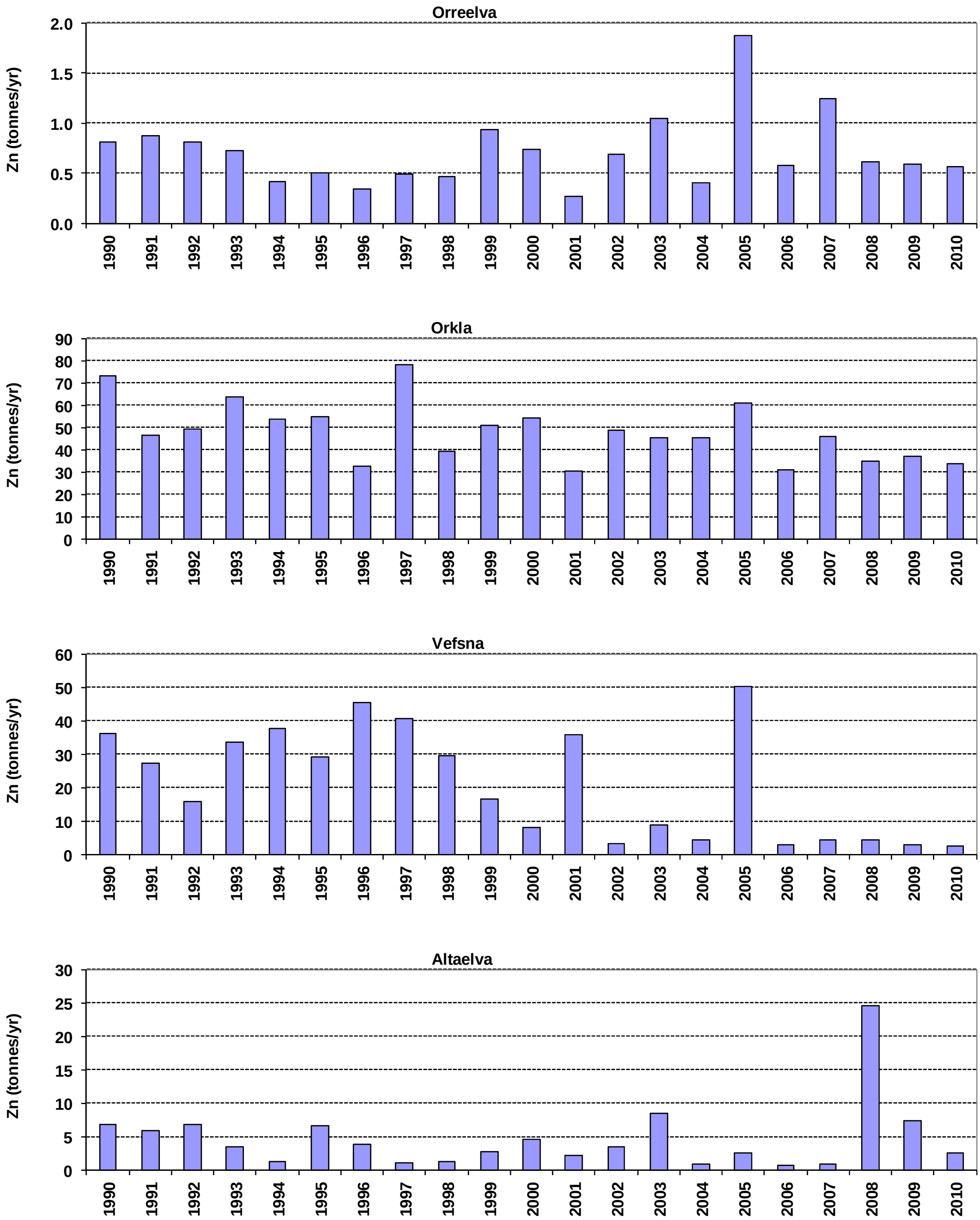
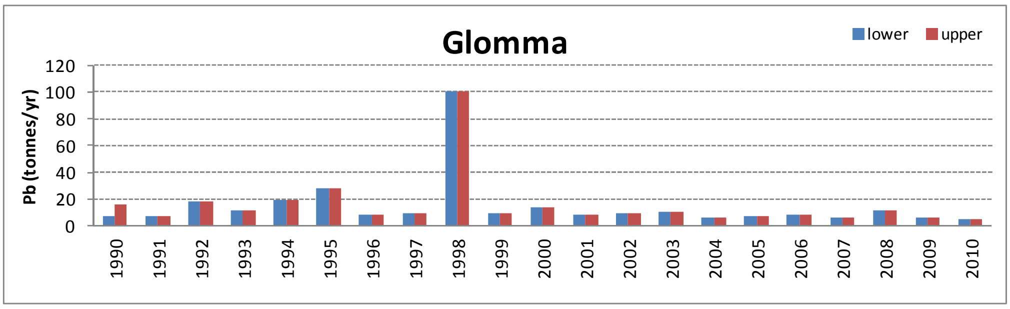
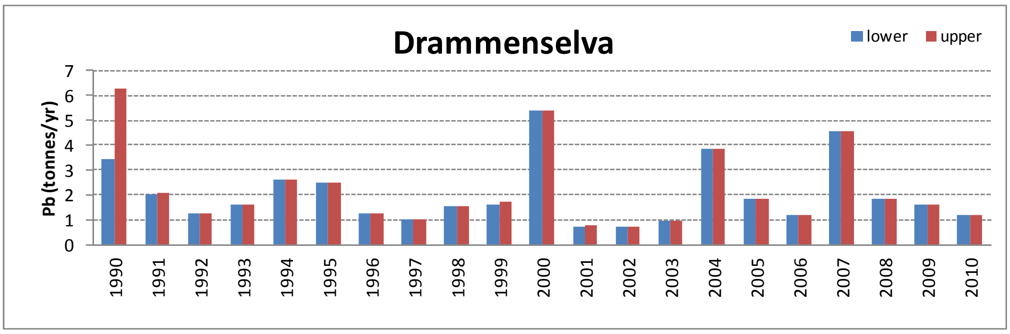
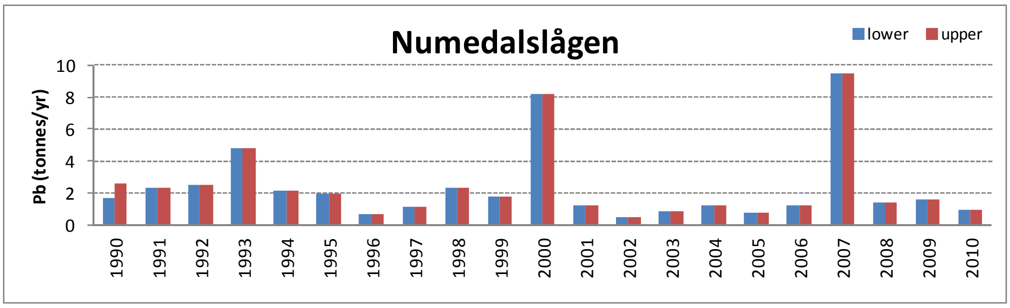
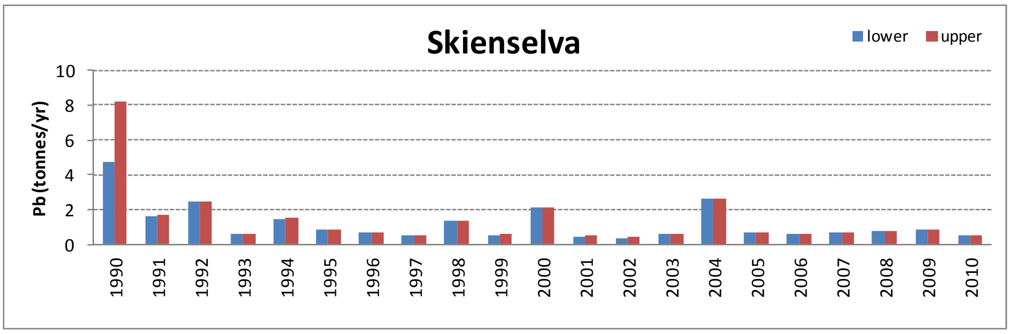


Figure A-V-9b. Annual riverine loads of Zinc from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.









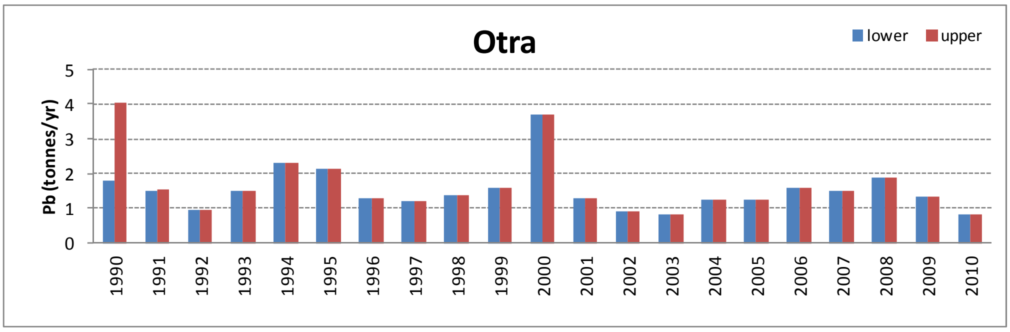


Figure A-V-10a. Annual riverine loads (upper and lower estimates) of Lead from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

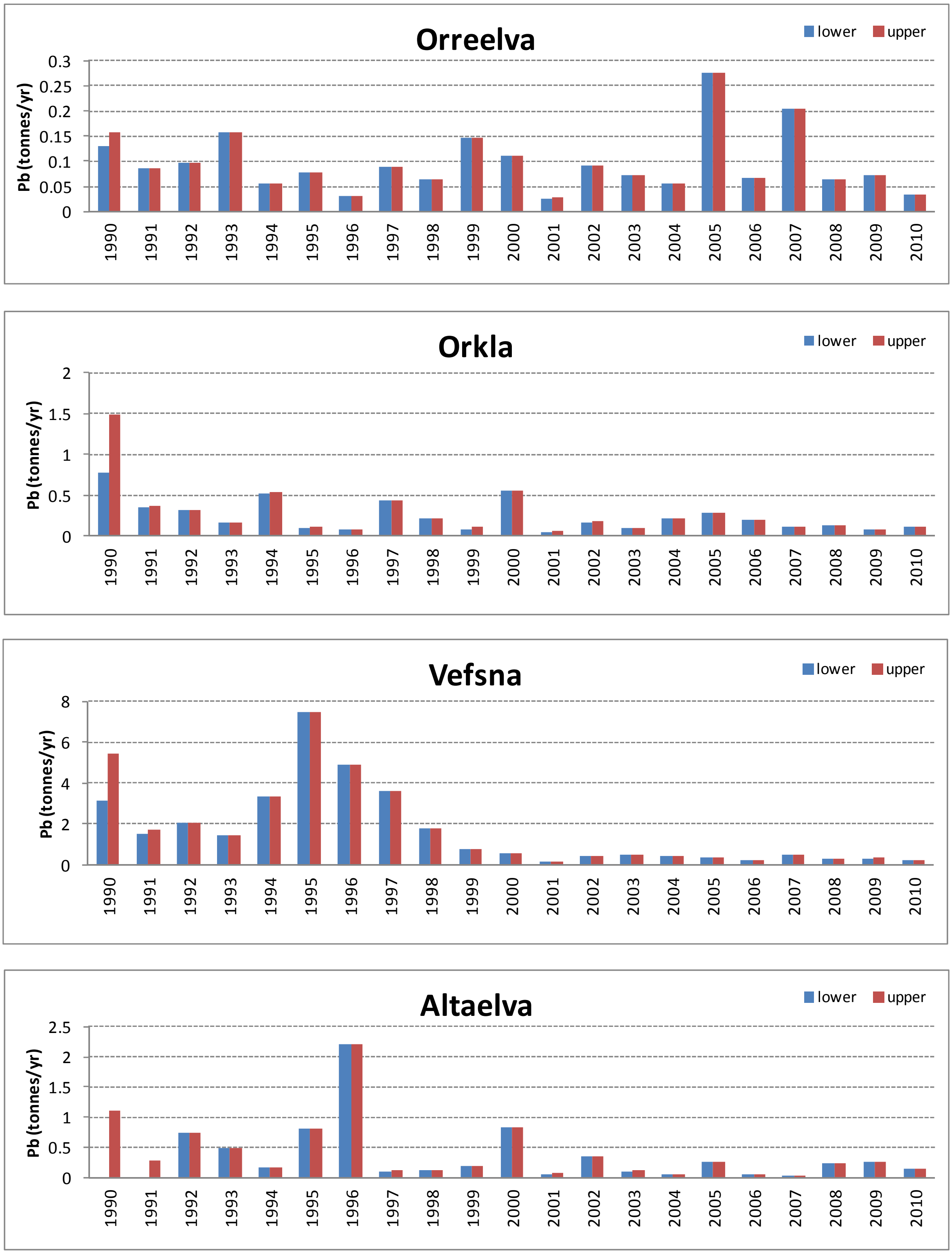


Figure A-V-10b. Annual riverine loads (upper and lower estimates) of Lead from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.

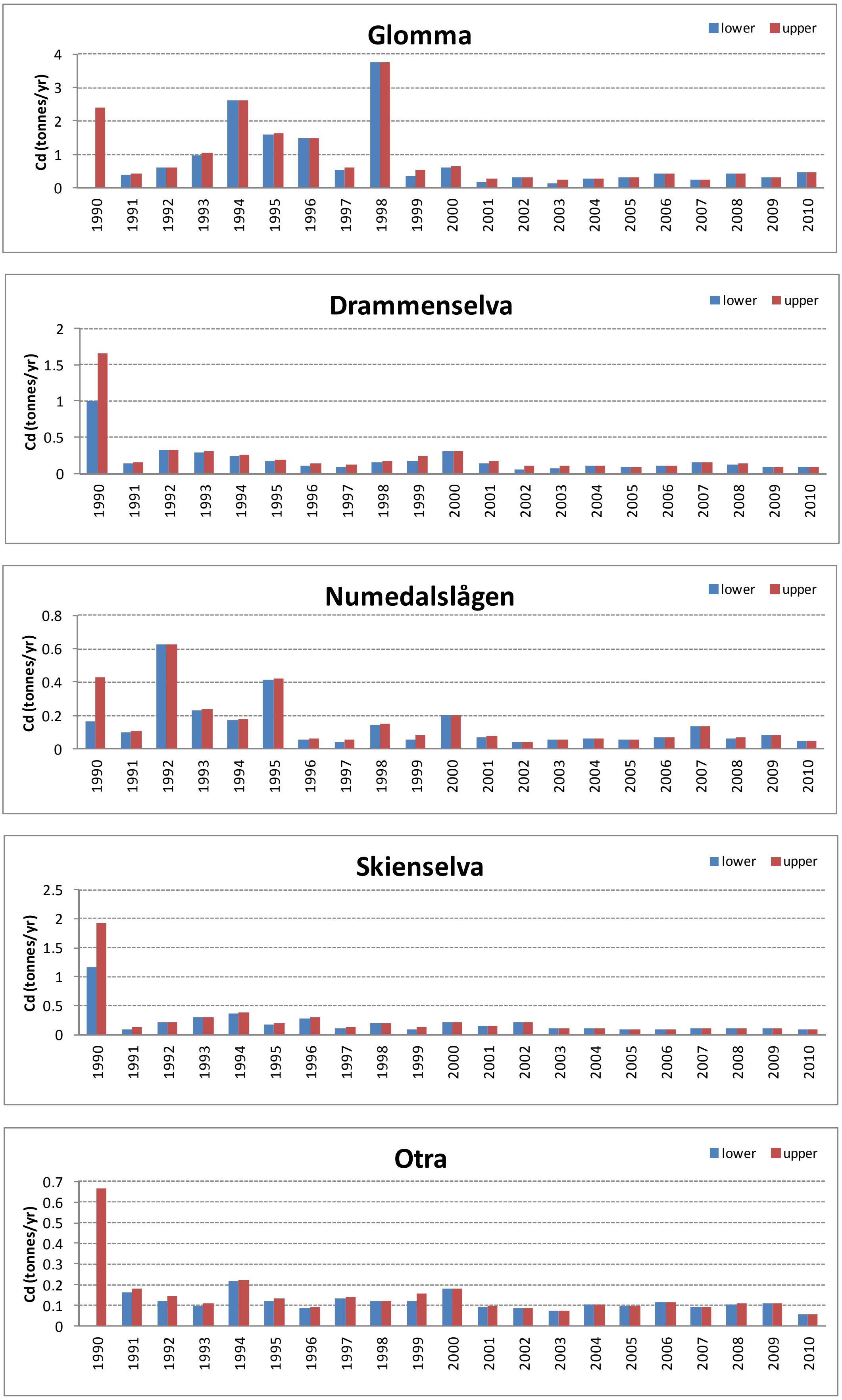


Figure A-V-11a. Annual riverine loads (upper and lower estimates) of Cadmium from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

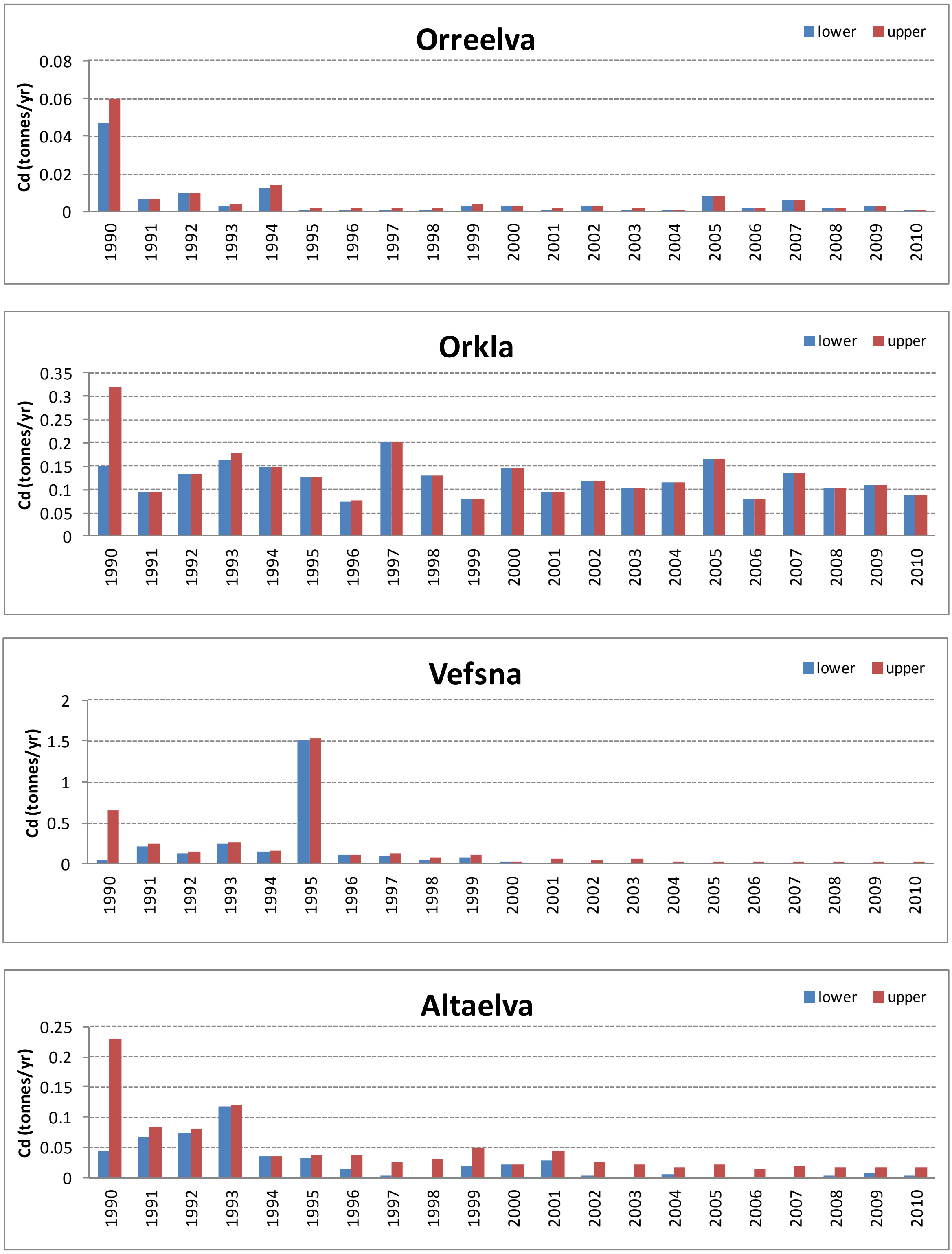


Figure A-V-11b. Annual riverine loads (upper and lower estimates) of Cadmium from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.

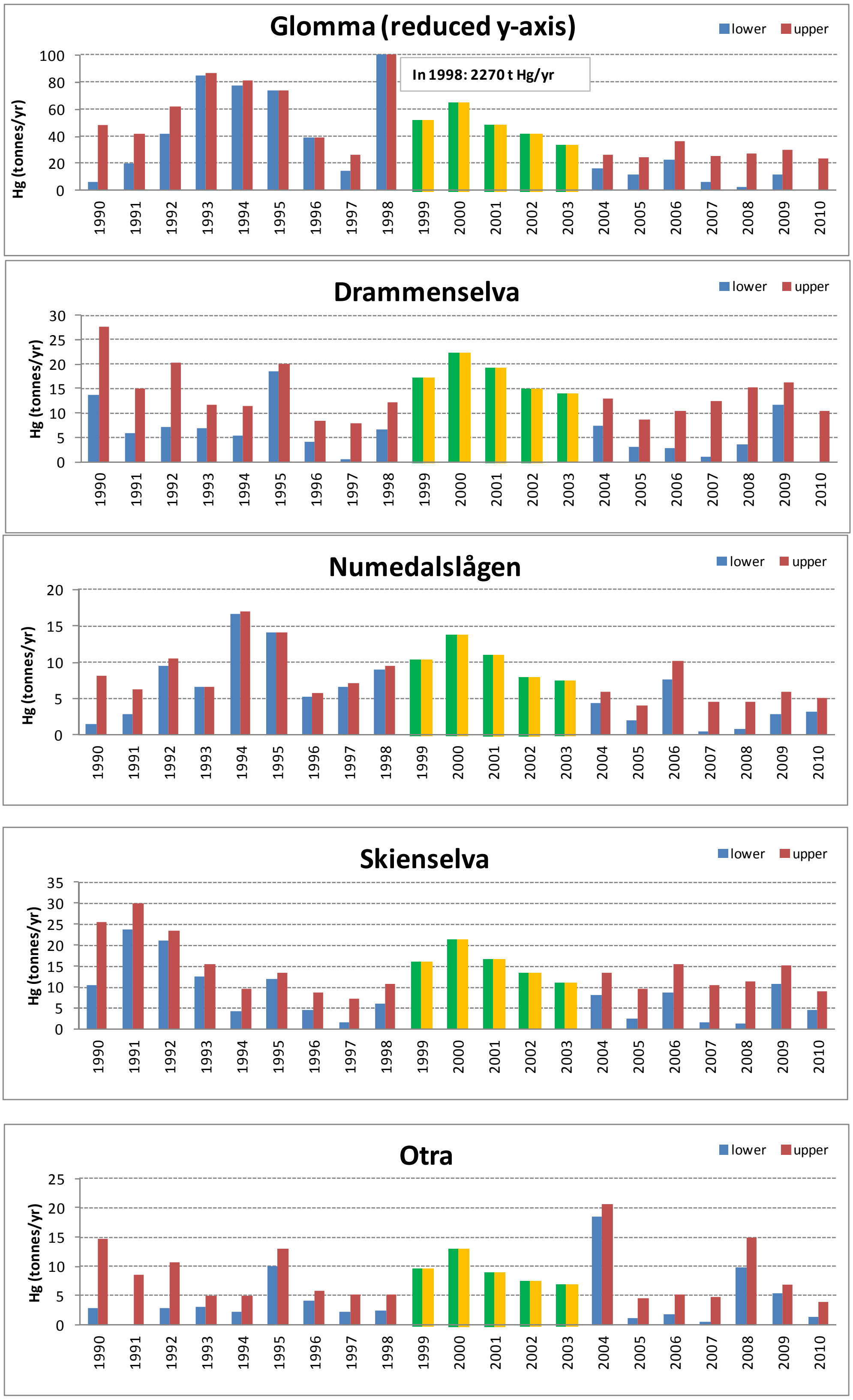


Figure A-V-12a. Annual riverine loads (upper and lower estimates) of Mercury from the five main Norwegian rivers draining to Skagerrak, 1990-2010. Years with interpolated upper and lower estimates are given in green (lower) and yellow (upper).

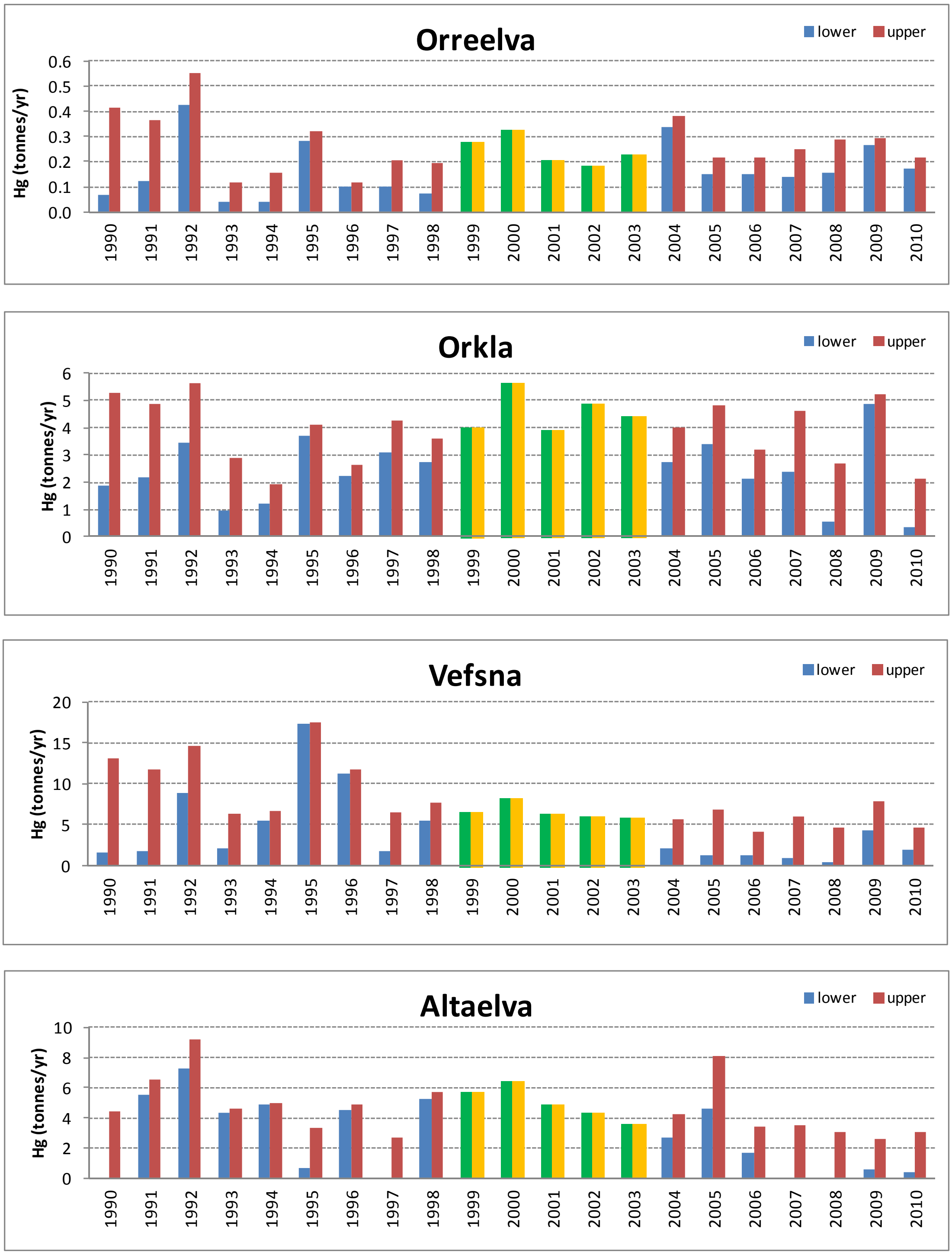


Figure A-V-12b. Annual riverine loads (upper and lower estimates) of <u>*Mercury*</u> *from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010. Years with interpolated upper and lower estimates are given in green (lower) and yellow (upper).*

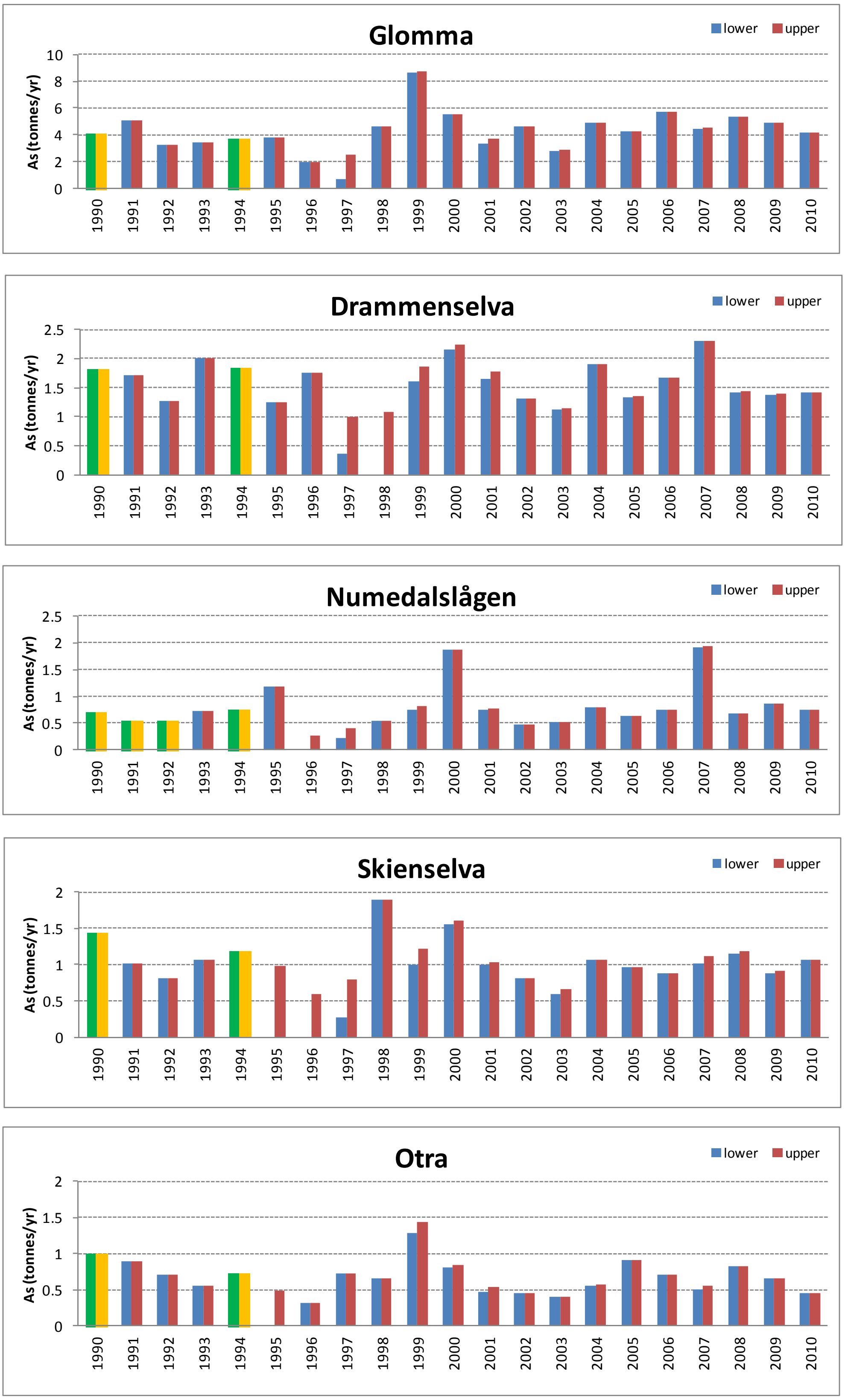


Figure A-V-13a. Annual riverine loads (upper and lower estimates) of Arsenic from the five main Norwegian rivers draining to Skagerrak, 1990-2010. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

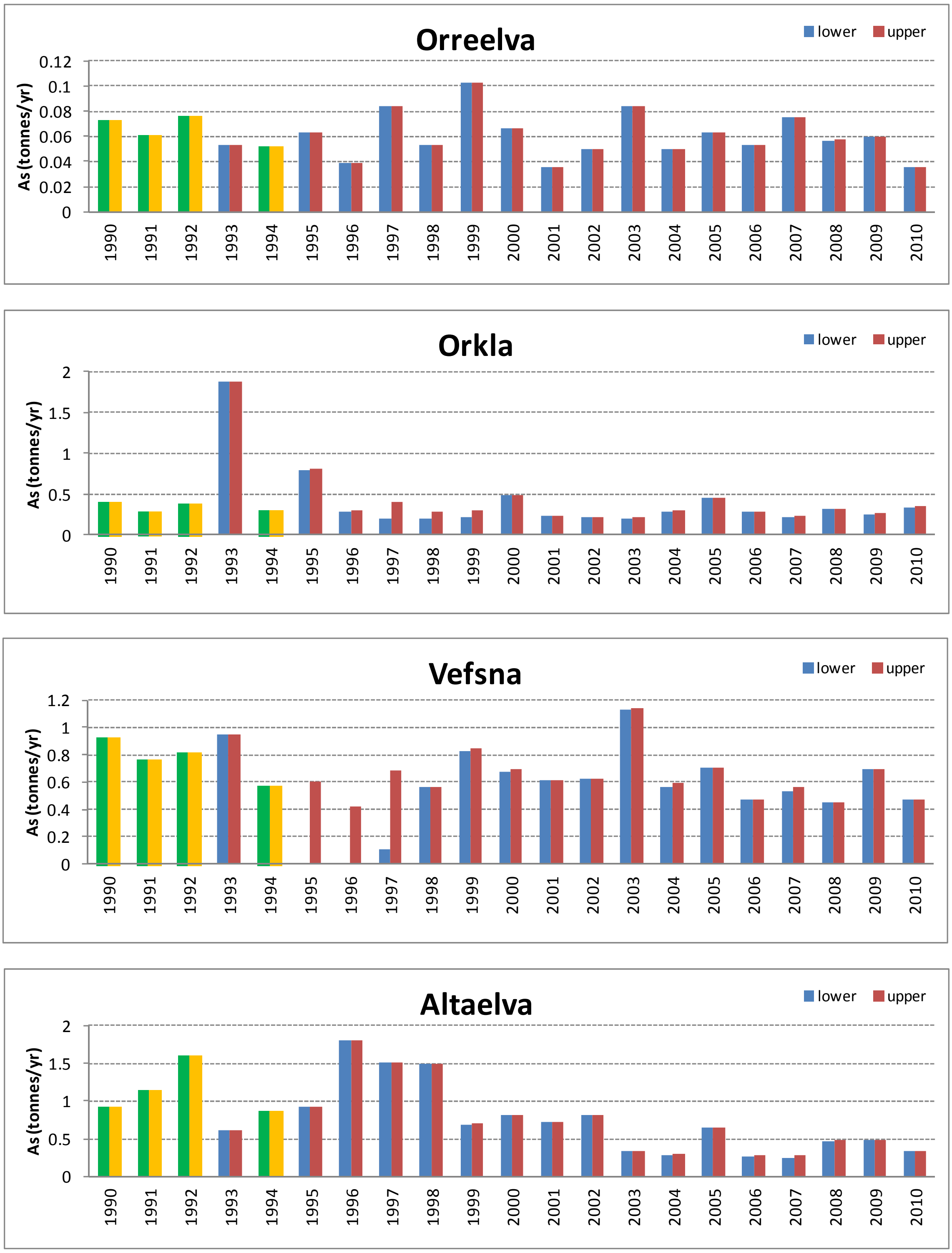


Figure A-V-13b. Annual riverine loads (upper and lower estimates) of Arsenic from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

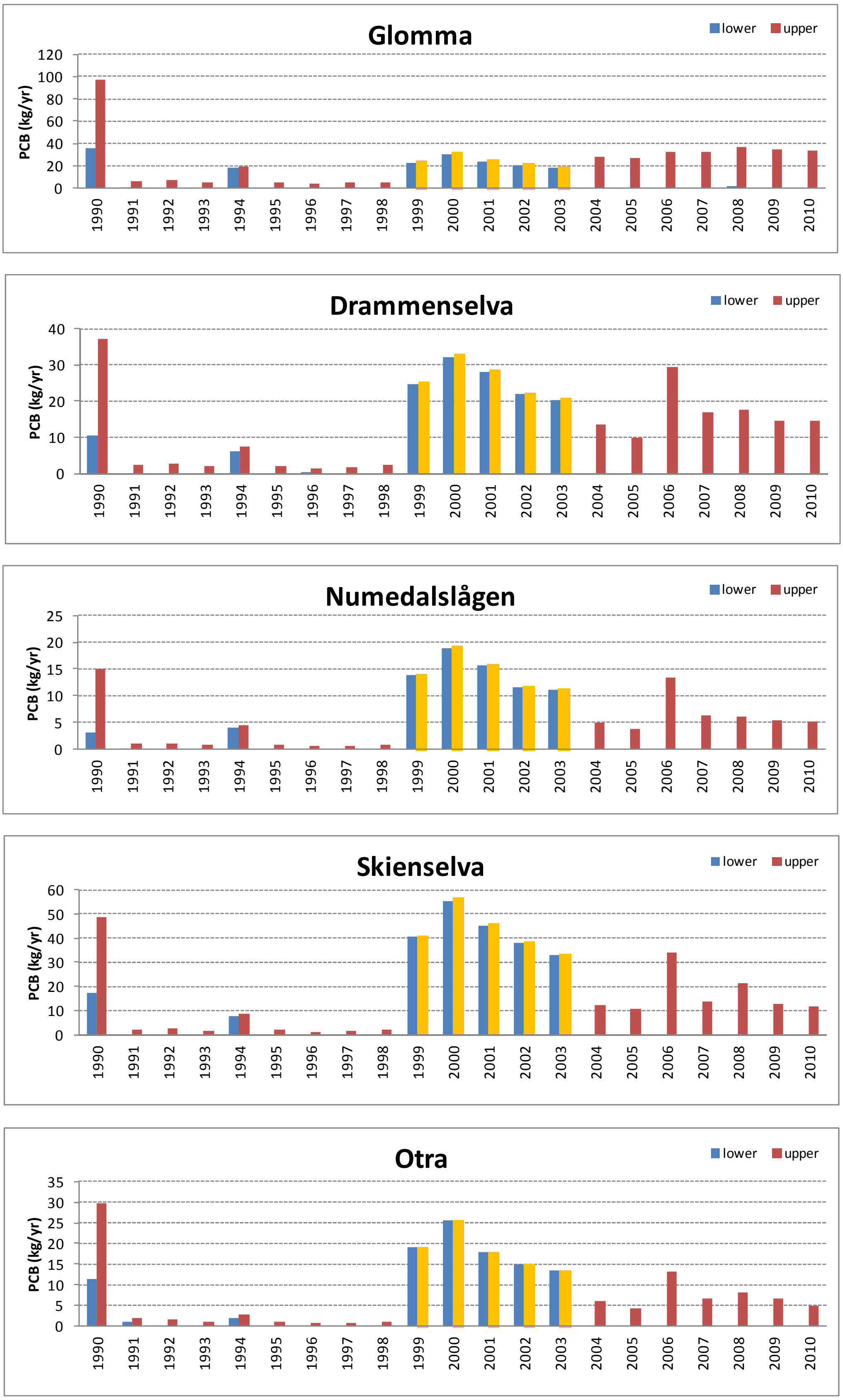


Figure A-V-14a. Annual riverine loads (upper and lower estimates) of <u>*PCB7*</u> *from the five main Norwegian rivers draining to Skagerrak, 1990-2010. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).*

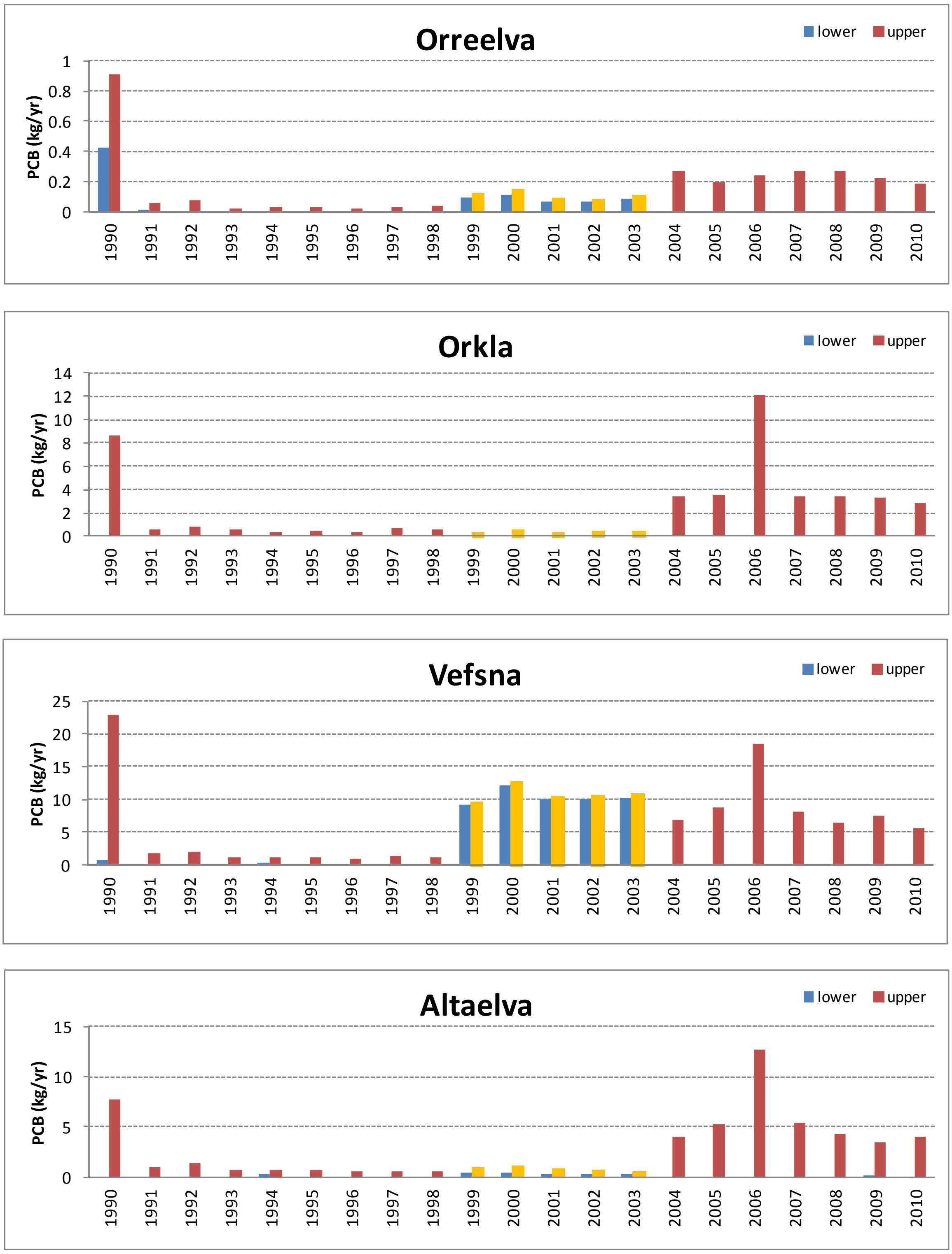


Figure A-V-14b. Annual riverine loads (upper and lower estimates) of PCB7 from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010. Years with extra- or interpolated upper and lower estimates are given in green (lower) and yellow (upper).

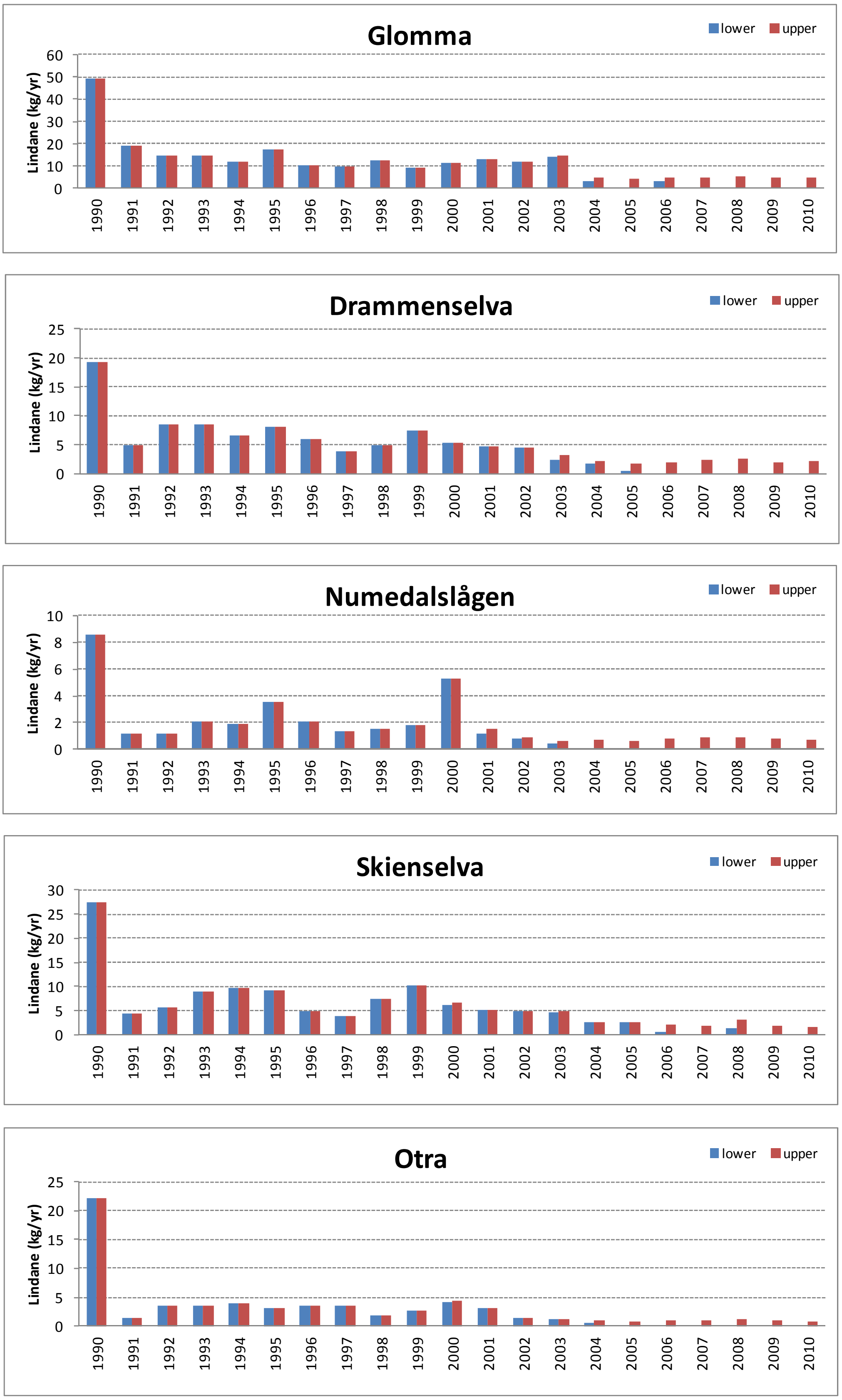


Figure A-V-15a. Annual riverine loads (upper and lower estimates) of <u>Lindane</u> from the five main Norwegian rivers draining to Skagerrak, 1990-2010.

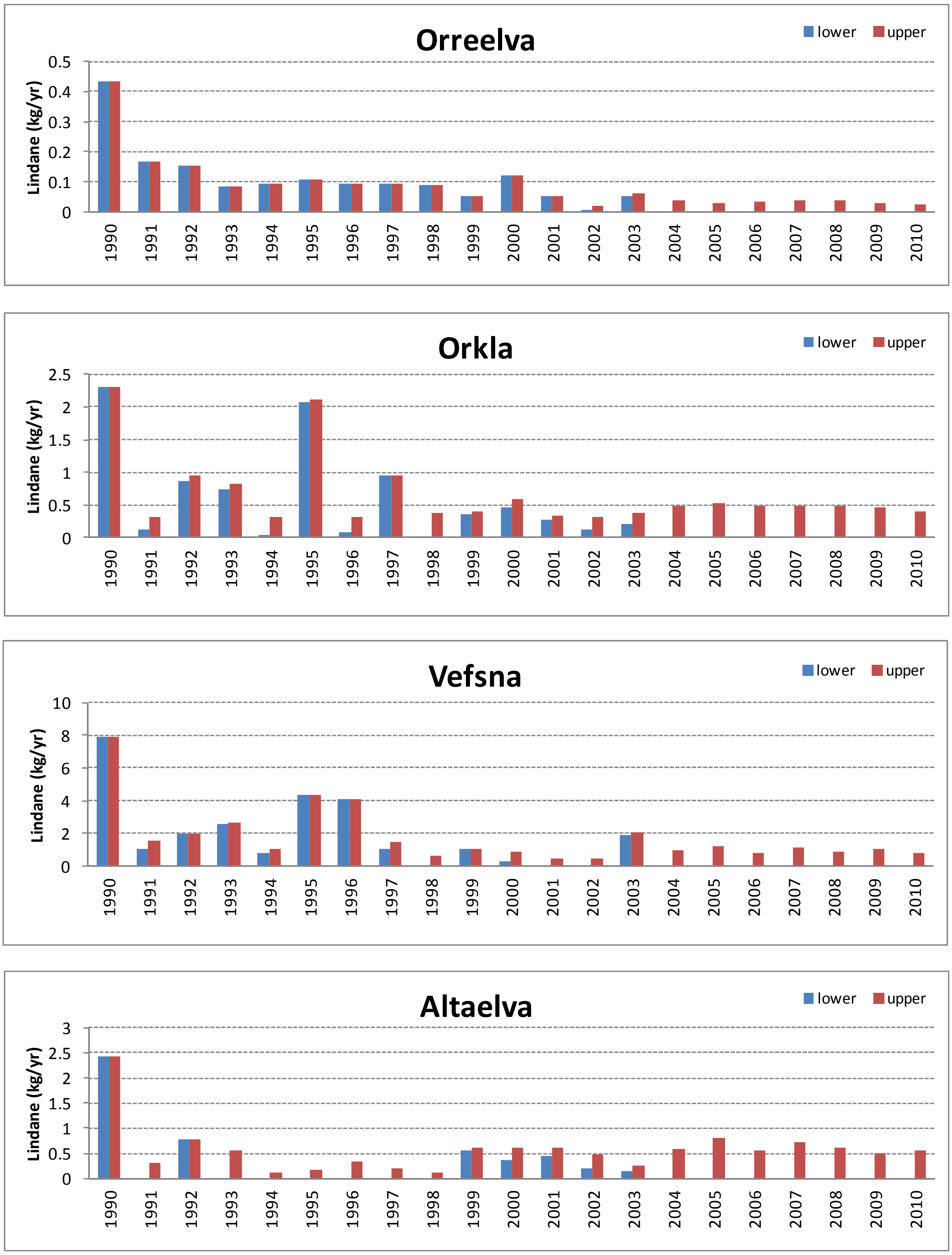


Figure A-V-15b. Annual riverine loads (upper and lower estimates) of <u>*Lindane*</u> *from four main rivers draining to the North Sea, the Norwegian Sea and the Barents Sea, Norway, 1990-2010.*

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Title – English and Norwegian
Riverine inputs and direct discharges to Norwegian coastal waters – 2010
Elvetilførsler og direkte tilførsler til norske kystområder – 2010

Summary
Riverine inputs and direct discharges to Norwegian coastal waters in 2010 have been estimated in accordance with the requirements of the OSPAR Commission. With a few exceptions, riverine inputs of nutrients decreased in 2010 as compared to 2009, mainly due to reduced water discharges. Analyses of long-term (1990-2010) trends indicate that nutrient loads have decreased in several of the main rivers. Fish farming continues to be a major source of nutrients to coastal waters. In terms of metals, there was a significant reduction of riverine loads of mercury, and also reductions of zinc and copper, whereas nickel loads increased slightly. Copper discharges from fish farming could not be calculated due to late data deliveries. For the entire period of 1990-2010, riverine metal loads of zinc, copper and lead have been reduced. Inputs of PCBs and the pesticide lindane were, as in former years, insignificant.

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

Addendum

Data from the 2010 RID Programme

Table 1.
Raw data and summary statistics for the 10 main and 36 tributary rivers in Norway in 2010

Glomma ved Sarpsfossen

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
04.01.2010	627	6.98	4.57	1.19	3.50	2	5	380	28	535	3.72	0.09	0.10	0.01	1.26	3.09	0.58	0.20	<1.00		
08.02.2010	438	7.06	4.97	1.29	3.10	3	6	365	37	585	3.79	0.10	0.21	0.17	1.90	36.60	0.52	0.34	<1.00	<0.20	1.40
08.03.2010	339	7.23	4.79	1.00	3.00	2	5	355	55	560	3.83	0.20	0.13	0.06	1.11	27.90	0.43	0.30	<1.00		
06.04.2010	495	7.04	6.25	17.40	4.60	16	31	625	48	900	4.69	0.33	0.52	0.02	1.96	4.00	1.50	1.70	<1.00		
10.05.2010	599	7.16	4.73	10.10	6.00	8	17	360	28	610	4.54	0.28	0.28	0.02	1.60	4.94	0.87	2.30	<1.00	<0.20	1.40
18.05.2010	730	7.13	4.47	6.62	5.80	5	6	295	36	540	4.36	0.20	0.18	0.01	1.41	3.72	0.62	0.20	<1.00		
25.05.2010	1977	6.99	3.81	20.90	5.90	17	26	175	14	510	4.34	0.20	0.40	0.02	2.78	5.58	0.96	0.56	<1.00		
31.05.2010	1432	7.05	3.35	9.59	4.50	7	15	240	10	430	3.38	0.10	0.34	0.01	1.35	4.28	0.76	0.30	<1.00		
07.06.2010	939	7.28	3.97	4.74	3.70	3	10	230	6	395	3.25	0.20	0.14	0.01	2.37	3.22	0.65	0.61	<1.00		
18.06.2010	1588	7.14	4.18	7.00	3.80	6	13	335	17	550	3.17	0.10	0.19	0.01	1.83	2.73	0.67	0.30	<1.00		
05.07.2010	1068	7.27	4.11	4.57	3.10	2	9	230	40	395	2.87	0.08	0.11	<0.01	1.19	1.80	0.47	<0.10	<1.00		
09.08.2010	990	7.27	4.66	7.28	4.00	6	15	305	9	475	3.49	0.21	0.23	0.01	1.38	1.90	0.79	0.31	<1.00	<0.20	1.40
06.09.2010	980	7.03	4.50	5.14	6.00	6	15	285	10	475	3.70	0.20	0.18	0.01	1.63	2.60	0.82	0.34	<1.00		
04.10.2010	1042	7.13	4.28	8.53	6.90	11	18	315	15	575	4.75	0.23	0.30	0.01	1.82	3.94	0.84	0.41	<1.00	<0.20	1.40
08.11.2010	599	7.20	4.68	7.73	4.70	7	17	390	13	625	4.09	0.20	0.23	0.01	1.36	2.91	0.80	<0.10	<1.00		
06.12.2010	460	7.10	4.81	2.58	4.10	4	10	375	16	565	3.91	0.10	0.12	0.01	1.18	2.36	0.64	0.30	<1.00		
Lower avg.	894	7.13	4.51	7.23	4.54	7	14	329	24	545	3.87	0.18	0.23	0.02	1.63	6.97	0.75	0.51	0.00	0.00	1.40
Upper avg..	894	7.13	4.51	7.23	4.54	7	14	329	24	545	3.87	0.18	0.23	0.02	1.63	6.97	0.75	0.52	1.00	0.20	1.40
Minimum	339	6.98	3.35	1.00	3.00	2	5	175	6	395	2.87	0.08	0.10	0.01	1.11	1.80	0.43	0.10	1.00	0.20	1.40
Maximum	1977	7.28	6.25	20.90	6.90	17	31	625	55	900	4.75	0.33	0.52	0.17	2.78	36.60	1.50	2.30	1.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	yes
n	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	4	4
St.dev	458	0.10	0.63	5.52	1.23	5	7	101	15	118	0.56	0.07	0.12	0.04	0.46	10.05	0.25	0.60	0.00	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]
07.01.2010	314	6.98	3.79	0.86	3.00	<1	5	270	14	405	3.00	0.10	0.08	0.01	0.71	2.48	0.36	0.10	<1.00		
03.02.2010	319	7.11	3.48	0.53	2.50	1	7	250	17	380	2.76	0.09	0.05	0.01	0.64	2.23	0.40	0.10	<1.00	<0.20	1.40
03.03.2010	261	6.97	3.67	0.66	2.50	1	4	265	23	410	2.80	0.10	0.06	0.01	0.57	2.26	0.31	0.20	<1.00		
06.04.2010	274	7.14	5.03	3.40	3.30	4	9	545	19	705	3.57	0.20	0.15	0.01	0.98	4.00	0.67	0.98	<1.00		
07.05.2010	284	7.11	4.02	2.46	3.60	<1	5	265	8	435	2.95	0.27	0.16	0.01	0.88	3.37	0.49	0.20		<0.20	1.40
14.05.2010	278	7.20	4.08	1.60	3.30	1	6	230	7	415	2.93	0.20	0.08	0.01	0.65	2.59	0.42	0.10	<1.00		
20.05.2010	861	7.13	3.33	4.47	3.30	4	9	185	<2	350	2.91	0.20	0.18	0.01	0.84	3.07	0.37	0.10	<1.00		
08.06.2010	413	7.10	3.55	1.33	3.50	1	6	172	18	380	2.80	0.20	0.08	0.01	1.16	4.52	0.52	0.41	<1.00		
15.06.2010	449	7.10	3.23	1.95	3.60	1	6	205	9	345	2.72	0.10	0.07	0.01	0.64	2.19	0.47	<0.10	<1.00		
26.06.2010	200	7.01	3.49	1.55	3.60	3	5	170	15	390	2.63	0.20	0.07	0.01	1.00	2.56	0.52	1.20	<1.00		
07.07.2010	128	7.05	3.24	1.22	3.30	1	6	135	12	315	2.40	0.10	0.06	<0.01	0.65	1.70	0.40	<0.10	<1.00		
04.08.2010	215	7.22	3.55	1.48	3.40	<1	6	190	10	340	2.52	0.20	0.07	0.01	0.65	3.49	0.48	<0.10	<1.00	<0.20	1.40
08.09.2010	439	7.12	3.67	1.54	4.10	1	5	215	12	365	2.78	0.10	0.10	0.01	1.19	3.09	0.47	0.10	<1.00		
06.10.2010	665	7.10	3.05	3.65	4.60	4	7	180	15	380	3.02	0.10	0.17	0.01	0.65	2.66	0.49	<0.10	<1.00	<0.20	1.40
03.11.2010	298	7.23	3.69	0.99	3.80	1	8	260	9	450	3.12	0.10	0.16	0.01	2.13	2.77	0.48	<0.10	<1.00		
07.12.2010	222	7.01	3.87	0.70	3.50	1	4	265	15	445	3.12	0.10	0.05	0.01	0.72	3.32	0.44	0.20	<1.00		
Lower avg.	351	7.10	3.67	1.77	3.43	2	6	238	13	407	2.88	0.15	0.10	0.01	0.88	2.89	0.46	0.23	0.00	0.00	1.40
Upper avg..	351	7.10	3.67	1.77	3.43	2	6	238	13	407	2.88	0.15	0.10	0.01	0.88	2.89	0.46	0.26	1.00	0.20	1.40
Minimum	128	6.97	3.05	0.53	2.50	1	4	135	2	315	2.40	0.09	0.05	0.01	0.57	1.70	0.31	0.10	1.00	0.20	1.40
Maximum	861	7.23	5.03	4.47	4.60	4	9	545	23	705	3.57	0.27	0.18	0.01	2.13	4.52	0.67	1.20	1.00	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes
n	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	15	4	4
St.dev	186	0.08	0.46	1.16	0.52	1	2	92	5	88	0.27	0.06	0.05	0.00	0.39	0.73	0.08	0.34	0.00	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]
07.01.2010	115	6.75	3.01	1.53	2.50	2	5	200	40	355	3.27	0.10	0.14	0.01	0.52	2.80	0.27	0.10	<1.00		
04.02.2010	94	6.70	2.91	1.11	2.10	1	3	220	40	370	3.00	0.10	0.08	0.01	0.37	2.45	0.22	0.10	1.50	<0.20	1.40
04.03.2010	45	6.99	4.08	13.80	2.20	16	21	280	88	540	3.72	0.23	0.65	0.02	2.89	9.25	0.47	0.30	<1.00		
07.04.2010	89	6.87	5.31	5.86	4.40	9	16	715	33	935	5.58	0.20	0.28	0.02	0.88	6.18	0.58	0.10	<1.00		
06.05.2010	115	6.64	2.61	2.43	6.00	2	8	185	18	375	3.49	0.43	0.22	0.02	0.72	4.55	0.32	0.20	<1.00	<0.20	1.40
02.06.2010	96	6.71	2.73	1.40	4.70	1	7	175	25	355	3.23	0.20	0.17	0.01	1.14	3.24	0.44	0.68	<1.00		
06.07.2010	65	6.99	2.45	6.62	3.10	4	12	74	17	245	2.46	0.10	0.10	<0.01	0.47	1.70	0.25	<0.10	<1.00		
04.08.2010	80	7.04	2.52	3.35	5.00	5	11	69	19	250	2.29	0.20	0.16	0.01	0.61	2.13	0.34	0.20	<1.00	<0.20	1.40
06.09.2010	71	6.74	3.34	1.85	7.00	3	8	155	22	375	3.53	0.23	0.29	0.02	0.99	4.89	0.46	0.20	<1.00		
06.10.2010	279	6.81	3.06	6.24	6.10	6	13	185	9	470	4.09	0.21	0.39	0.02	0.82	4.26	0.43	<0.10	2.50	<0.20	1.40
04.11.2010	142	6.83	3.29	4.40	6.00	5	12	290	22	560	4.62	0.20	0.28	0.02	0.72	4.33	0.41	<0.10	<1.00		
02.12.2010	193	6.81	2.79	2.11	2.90	3	8	160	37	340	3.34	0.20	0.31	<0.01	0.56	2.43	0.35	0.20	1.50		
Lower avg.	115	6.82	3.17	4.23	4.33	5	10	226	31	431	3.55	0.20	0.26	0.01	0.89	4.02	0.38	0.17	0.46	0.00	1.40
Upper avg..	115	6.82	3.17	4.23	4.33	5	10	226	31	431	3.55	0.20	0.26	0.01	0.89	4.02	0.38	0.20	1.21	0.20	1.40
Minimum	45	6.64	2.45	1.11	2.10	1	3	69	9	245	2.29	0.10	0.08	0.01	0.37	1.70	0.22	0.10	1.00	0.20	1.40
Maximum	279	7.04	5.31	13.80	7.00	16	21	715	88	935	5.58	0.43	0.65	0.02	2.89	9.25	0.58	0.68	2.50	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	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	64	0.13	0.81	3.61	1.73	4	5	168	21	186	0.90	0.09	0.15	0.01	0.67	2.12	0.11	0.17	0.45	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]
12.01.2010	305	6.71	2.01	0.75	2.70	1	4	175	12	255	2.31	0.10	0.11	0.01	0.41	1.90	0.10	<0.10	<1.00		
03.02.2010	302	6.86	2.11	0.54	2.40	1	6	160	9	265	2.27	0.09	0.06	0.01	0.36	2.14	0.20	0.10	<1.00	<0.20	1.40
10.03.2010	303	6.83	1.87	0.44	2.30	<1	3	145	12	275	2.16	0.10	0.04	0.01	0.47	1.80	0.20	0.30	<1.00		
06.04.2010	305	6.73	2.04	0.81	2.20	<1	3	165	10	255	2.29	0.10	0.05	0.01	0.39	2.01	0.22	1.10	1.00		
07.05.2010	282	6.71	1.96	0.57	2.20	<1	3	160	10	245	2.29	0.27	0.04	0.01	0.60	2.28	0.20	0.10	<1.00	<0.20	1.40
02.06.2010	175	6.68	2.17	0.26	2.40	<1	3	160	12	250	2.13	0.10	0.05	0.01	1.06	2.81	0.28	0.60	<1.00		
30.06.2010	62	6.78	2.01	0.84	2.70	<1	3	110	12	250	2.08	0.09	0.06	0.01	0.33	2.27	0.23	<0.10	1.00		
05.08.2010	156	6.88	1.89	0.56	2.20	2	3	98	23	225	1.78	0.10	0.03	0.01	0.37	1.50	0.20	0.20	<1.00	<0.20	1.40
06.09.2010	207	6.70	1.91	5.29	2.60	3	5	99	16	225	1.95	0.10	0.04	0.01	0.48	1.50	0.24	<0.10	<1.00		
12.10.2010	492	6.72	1.98	2.26	3.10	1	4	145	14	295	2.20	0.20	0.11	0.01	0.46	2.11	0.23	<0.10	1.50	<0.20	1.40
01.11.2010	316	6.91	2.09	1.02	3.10	<1	5	150	12	310	2.33	0.10	0.07	0.01	0.39	2.16	0.21	<0.10	1.00		
06.12.2010	230	6.73	2.00	0.49	3.00	1	3	155	12	290	2.27	0.09	0.06	0.01	0.96	2.50	0.25	<0.10	1.00		
Lower avg.	261	6.77	2.00	1.15	2.58	1	4	144	13	262	2.17	0.12	0.06	0.01	0.52	2.08	0.21	0.20	0.46	0.00	1.40
Upper avg..	261	6.77	2.00	1.15	2.58	1	4	144	13	262	2.17	0.12	0.06	0.01	0.52	2.08	0.21	0.25	1.04	0.20	1.40
Minimum	62	6.68	1.87	0.26	2.20	1	3	98	9	225	1.78	0.09	0.03	0.01	0.33	1.50	0.10	0.10	1.00	0.20	1.40
Maximum	492	6.91	2.17	5.29	3.10	3	6	175	23	310	2.33	0.27	0.11	0.01	1.06	2.81	0.28	1.10	1.50	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	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	107	0.08	0.09	1.40	0.35	1	1	26	4	27	0.17	0.06	0.03	0.00	0.24	0.38	0.04	0.31	0.14	0.00	0.00

Otra

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.01.2010	122	6.34	1.42	0.54	2.10	<1	3	93	50	250	1.67	0.10	0.17	0.01	1.75	3.02	0.38	0.10	<1.00		
09.02.2010	135	6.19	1.39	0.85	2.10	<1	3	88	20	240	1.69	0.09	0.19	0.02	0.48	2.62	0.28	<0.10	<1.00	<0.20	1.40
10.03.2010	124	6.77	1.51	0.36	1.40	1	2	86	12	175	1.50	0.08	0.09	0.01	0.55	1.80	0.20	0.20	<1.00		
07.04.2010	120	6.15	2.08	0.54	2.90	<1	7	140	21	285	1.97	0.20	0.31	0.03	0.82	4.28	0.60	0.93	1.50		
05.05.2010	90	6.27	1.51	0.64	2.10	<1	2	97	7	205	1.49	0.10	0.16	0.01	0.76	2.54	0.65	0.20	<1.00	<0.20	1.40
09.06.2010	62	6.43	1.38	0.80	1.80	<1	3	63	5	185	1.09	0.20	0.12	0.01	1.80	2.91	0.38	0.10	<1.00		
01.07.2010	61	6.35	1.32	0.81	1.80	<1	3	44	9	165	0.90	0.09	0.11	0.01	0.74	2.07	0.21	<0.10	<1.00		
10.08.2010	59	6.40	1.32	1.18	1.80	1	1	62	8	180	1.05	0.10	0.13	0.01	0.43	1.80	0.25	0.10	<1.00	<0.20	1.40
08.09.2010	118	6.18	1.24	1.16	2.50	<1	5	54	6	170	1.24	0.10	0.17	0.01	0.93	2.30	0.54	0.10	<1.00		
06.10.2010	242	6.07	1.88	1.46	4.10	1	5	92	21	305	1.83	0.20	0.43	0.02	0.83	6.95	0.55	<0.10	1.50	<0.20	1.40
09.11.2010	125	6.19	1.58	1.10	3.50	<1	5	95	12	240	1.85	0.10	0.30	0.02	0.60	3.39	0.69	<0.10	<1.00		
06.12.2010	94	6.25	1.58	0.55	2.50	<1	7	94	16	235	1.71	0.10	0.17	0.01	0.64	2.89	0.47	<0.10	<1.00		
Lower avg.	113	6.30	1.52	0.83	2.38	0	4	84	16	220	1.50	0.12	0.20	0.01	0.86	3.05	0.43	0.14	0.25	0.00	1.40
Upper avg..	113	6.30	1.52	0.83	2.38	1	4	84	16	220	1.50	0.12	0.20	0.01	0.86	3.05	0.43	0.19	1.08	0.20	1.40
Minimum	59	6.07	1.24	0.36	1.40	1	1	44	5	165	0.90	0.08	0.09	0.01	0.43	1.80	0.20	0.10	1.00	0.20	1.40
Maximum	242	6.77	2.08	1.46	4.10	1	7	140	50	305	1.97	0.20	0.43	0.03	1.80	6.95	0.69	0.93	1.50	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	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	49	0.18	0.24	0.33	0.78	0	2	25	12	47	0.35	0.05	0.10	0.01	0.45	1.41	0.17	0.24	0.20	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]
05.01.2010	3	7.46	18.90	1.60	5.30	26	42	1450	82	1830									<1.00		
02.02.2010	6	7.30	20.30	4.90	5.20	26	49	1450	49	1970	7.25	0.22	0.24	0.01	1.76	5.73	0.99	0.30	<1.00	<0.20	1.40
02.03.2010	1	7.28	21.30	4.02	5.10	26	51	1800	165	2240	7.25	0.38	0.17	0.01	1.95	6.34	1.00	0.98	<1.00		
06.04.2010	5	7.76	18.30	4.63	4.60	10	43	900	10	1470	4.02	0.24	0.15	0.01	1.56	3.42	1.10	1.50	<1.00		
03.05.2010	2	8.09	19.60	4.06	4.20	8	31	335	27	875	0.79	0.10	0.14	0.01	1.40	1.30	0.64	<0.10	<1.00	<0.20	1.40
08.06.2010	0	8.06	20.90	1.79	4.70	2	23	1	8	520	0.17	0.31	0.05	0.01	1.57	1.60	0.97	0.68	<1.00		
05.07.2010	0	8.34	32.00	2.95	7.80	4	38	<1	7	680	1.41	0.34	0.12	0.01	1.08	2.11	0.97	<0.10	<1.00		
11.08.2010	2	8.05	21.00	2.03	4.80	4	22	<1	20	470	0.81	0.30	0.03	0.01	1.00	0.77	1.10	0.37	<1.00	<0.20	1.40
06.09.2010	2	8.20	19.40	4.66	4.90	8	39	20	13	420	3.23	0.24	0.02	0.01	1.02	0.92	1.10	0.47	<1.00		
04.10.2010	25	7.76	19.20	13.10	5.50	21	69	325	40	1160	2.78	0.28	0.24	0.01	1.58	3.77	1.10	0.31	1.50	<0.20	1.40
01.11.2010	9	7.78	19.40	10.80	5.40	13	75	535	10	1255	2.02	0.31	0.50	0.01	3.55	7.43	1.90	0.31	1.50		
06.12.2010	2	7.37	19.60	2.34	5.70	12	37	1200	26	1760	4.30	0.20	0.09	<0.01	1.54	2.51	1.10	0.30	8.00		
Lower avg.	5	7.79	20.82	4.74	5.27	13	43	668	38	1221	3.09	0.27	0.16	0.01	1.64	3.26	1.09	0.47	0.92	0.00	1.40
Upper avg..	5	7.79	20.82	4.74	5.27	13	43	668	38	1221	3.09	0.27	0.16	0.01	1.64	3.26	1.09	0.49	1.67	0.20	1.40
Minimum	0	7.28	18.30	1.60	4.20	2	22	1	7	420	0.17	0.10	0.02	0.01	1.00	0.77	0.64	0.10	1.00	0.20	1.40
Maximum	25	8.34	32.00	13.10	7.80	26	75	1800	165	2240	7.25	0.38	0.50	0.01	3.55	7.43	1.90	1.50	8.00	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	11	11	11	11	11	11	11	11	12	4	4
St.dev	7	0.37	3.63	3.60	0.90	9	16	663	46	635	2.45	0.08	0.14	0.00	0.70	2.31	0.30	0.42	2.00	0.00	0.00

Vosso(Bolstadelvi)

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
12.01.2010	5	6.47	1.39	0.30	0.88	1	3	100	10	185	0.83	0.07	0.04	0.01	0.36	1.90	0.26	<0.10	<1.00		
02.02.2010	3	6.52	1.31	0.22	0.70	<1	4	100	8	160	0.77	<0.05	0.02	<0.01	0.19	2.16	0.27	<0.10	<1.00	<0.20	1.40
08.03.2010	2	6.56	1.72	0.37	0.60	<1	2	91	4	155	0.60	0.10	0.04	0.01	0.80	2.51	0.37	0.20	<1.00		
06.04.2010	21	6.48	1.79	0.58	1.30	<1	3	225	11	290	1.26	0.10	0.06	0.01	0.36	1.50	0.42	1.20	1.50		
03.05.2010	104	6.45	1.67	0.52	1.40	1	3	185	<2	270	1.20	0.08	0.04	<0.01	0.39	1.30	0.39	0.20	<1.00	<0.20	1.40
07.06.2010	123	6.62	1.33	1.09	1.10	<1	4	135	5	225	1.01	0.10	0.08	0.01	0.90	1.50	0.32	0.30	<1.00		
12.07.2010	82	6.54	0.92	0.33	0.91	<1	3	50	3	119	0.56	<0.05	0.05	<0.01	0.33	1.50	0.22	<0.10	<1.00		
03.08.2010	74	6.63	1.00	0.74	1.20	<1	1	75	5	150	0.71	0.07	0.03	0.01	0.40	13.60	0.23	<0.10	<1.00	<0.20	1.40
09.09.2010	15	6.68	1.14	1.36	1.10	2	3	77	9	146	0.79	0.08	0.10	0.01	0.42	0.75	0.26	<0.10	<1.00		
04.10.2010	60	6.69	1.27	0.51	1.50	2	4	115	13	215	1.07	0.07	0.06	<0.01	0.72	2.08	0.32	0.10	1.00	<0.20	1.40
03.11.2010	221	6.63	1.43	0.64	1.80	2	6	150	11	280	1.28	0.07	0.07	0.01	0.44	1.20	0.36	<0.10	<1.00		
30.11.2010	7	6.49	1.45	0.45	1.50	<1	3	170	11	265	1.16	0.09	0.04	0.01	0.67	4.80	0.42	<0.10	<1.00		
Lower avg.	60	6.56	1.37	0.59	1.17	1	3	123	8	205	0.94	0.07	0.05	0.00	0.50	2.90	0.32	0.17	0.21	0.00	1.40
Upper avg..	60	6.56	1.37	0.59	1.17	1	3	123	8	205	0.94	0.08	0.05	0.01	0.50	2.90	0.32	0.23	1.04	0.20	1.40
Minimum	2	6.45	0.92	0.22	0.60	1	1	50	2	119	0.56	0.05	0.02	0.01	0.19	0.75	0.22	0.10	1.00	0.20	1.40
Maximum	221	6.69	1.79	1.36	1.80	2	6	225	13	290	1.28	0.10	0.10	0.01	0.90	13.60	0.42	1.20	1.50	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	66	0.08	0.27	0.34	0.36	0	1	52	4	60	0.26	0.02	0.02	0.00	0.22	3.52	0.07	0.31	0.14	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]
04.01.2010	20	7.37	6.20	1.69	1.80	2	4	124	14	230	2.97	0.20	0.04	0.02	3.84	8.77	0.58	0.35	<1.00		
04.02.2010	15	7.33	8.48	0.72	1.70	1	3	315	25	450	3.55	0.09	0.03	0.10	9.29	34.00	0.70	0.20	<1.00	<0.20	1.40
10.03.2010	17	7.44	8.46	2.49	1.90	12	16	300	59	510	3.38	0.10	0.07	0.07	11.90	24.60	0.83	0.46	<1.00		
07.04.2010	59	7.55	8.60	2.93	4.10	3	17	285	7	480	3.59	0.20	0.08	0.09	11.20	31.70	0.96	1.20	<1.00		
10.05.2010	70	7.55	6.51	1.67	4.90	1	5	125	5	350	2.74	0.20	0.05	0.08	9.96	28.70	1.00	1.20	<1.00	<0.20	1.40
07.06.2010	164	7.38	4.73	0.91	2.90	<1	3	100	5	250	2.11	0.20	0.02	0.02	6.72	8.33	0.73	0.56	<1.00		
01.07.2010	139	7.22	3.55	10.40	5.60	4	11	54	5	245	2.33	0.20	0.14	0.03	4.55	10.60	0.99	<0.10	<1.00		
05.08.2010	71	7.39	4.91	1.88	4.80	3	6	110	5	280	2.35	0.20	0.04	0.04	5.80	12.30	0.87	0.30	1.50	<0.20	1.40
07.09.2010	52	7.26	6.87	0.96	3.10	2	3	175	<2	275	2.65	0.20	0.02	0.08	11.10	31.30	1.00	0.31	<1.00		
05.10.2010	42	7.70	7.98	0.82	2.70	3	2	285	8	440	3.34	0.10	0.02	0.04	7.93	15.10	0.85	0.20	<1.00	<0.20	1.40
09.11.2010	48	7.51	5.78	1.06	2.40	<1	4	150	7	290	2.78	<0.05	0.01	0.04	5.26	13.30	0.73	<0.10	<1.00		
07.12.2010	21	7.46	6.00	3.51	2.00	3	8	110	11	255	2.74	0.09	0.05	0.03	7.32	10.80	0.78	0.30	<1.00		
Lower avg.	60	7.43	6.51	2.42	3.16	3	7	178	13	338	2.88	0.15	0.05	0.05	7.91	19.13	0.84	0.42	0.12	0.00	1.40
Upper avg..	60	7.43	6.51	2.42	3.16	3	7	178	13	338	2.88	0.15	0.05	0.05	7.91	19.13	0.84	0.44	1.04	0.20	1.40
Minimum	15	7.22	3.55	0.72	1.70	1	2	54	2	230	2.11	0.05	0.01	0.02	3.84	8.33	0.58	0.10	1.00	0.20	1.40
Maximum	164	7.70	8.60	10.40	5.60	12	17	315	59	510	3.59	0.20	0.14	0.10	11.90	34.00	1.00	1.20	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	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	4	4
St.dev	47	0.14	1.64	2.67	1.36	3	5	92	16	103	0.50	0.06	0.04	0.03	2.77	10.05	0.14	0.38	0.14	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]
12.01.2010	41	7.42	12.10	0.52	0.98	<1	1	110	6	245	2.70	0.21	0.21	0.01	0.51	5.26	0.08	0.30			
01.02.2010	41	7.68	9.35	0.57	1.20	<1	2	125	9	210	2.14	0.10	0.01	<0.01	0.96	0.79	0.05	0.20	<1.00		
05.03.2010	33	7.68	9.68	0.47	1.00	<1	2	140	11	235	2.09	0.20	0.02	0.01	0.41	0.95	<0.05	0.30	<1.00	<0.20	1.40
06.04.2010	46	7.55	7.71	1.86	2.40	<1	4	76	2	180	1.93	0.10	0.03	<0.01	0.33	0.68	0.20	<0.10	<1.00		
03.05.2010	64	7.71	8.14	1.13	3.20	1	4	33	4	160	1.61	0.10	0.10	0.01	0.56	1.00	0.36	0.30	1.50	<0.20	1.40
02.06.2010	379	7.45	4.11	1.72	1.60	<1	4	39	4	108	1.20	0.10	0.05	<0.01	0.39	0.55	0.45	0.55	1.50		
06.07.2010	263	7.38	2.95	1.69	0.95	1	2	16	2	74	0.75	0.10	0.04	<0.01	0.16	0.24	0.20	<0.10	<1.00		
16.08.2010	94	7.64	4.48	3.35	1.10	3	2	22	<2	81	1.13	0.20	0.13	<0.01	0.39	0.39	0.33	0.20	<1.00	<0.20	1.40
06.09.2010	63	7.36	6.19	0.37	1.20	<1	2	29	2	106	1.33	0.10	0.05	0.01	0.37	0.43	0.28	<0.10	<1.00		
04.10.2010	55	7.61	6.56	0.46	1.20	2	<1	36	<2	110	1.35	0.10	0.02	<0.01	0.26	0.24	0.24	<0.10	<1.00	<0.20	1.40
01.11.2010	233	7.38	3.81	2.22	2.80	1	6	21	2	141	1.37	0.10	0.09	0.01	0.36	0.57	0.26	<0.10	<1.00		
30.11.2010	47	7.68	8.66	0.56	1.40	<1	3	99	3	195	2.03	0.20	0.08	<0.01	0.51	1.20	0.10	0.20	<1.00		
Lower avg.	113	7.54	6.98	1.24	1.59	1	3	62	4	154	1.63	0.13	0.07	0.00	0.44	1.03	0.21	0.17	0.27	0.00	1.40
Upper avg..	113	7.54	6.98	1.24	1.59	1	3	62	4	154	1.63	0.13	0.07	0.01	0.44	1.03	0.22	0.21	1.09	0.20	1.40
Minimum	33	7.36	2.95	0.37	0.95	1	1	16	2	74	0.75	0.10	0.01	0.01	0.16	0.24	0.05	0.10	1.00	0.20	1.40
Maximum	379	7.71	12.10	3.35	3.20	3	6	140	11	245	2.70	0.21	0.21	0.01	0.96	5.26	0.45	0.55	1.50	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	11	4	4
St.dev	114	0.14	2.79	0.94	0.77	1	1	45	3	59	0.55	0.05	0.06	0.00	0.20	1.37	0.13	0.14	0.20	0.00	0.00

Altaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
07.01.2010	29	7.37	7.25	1.56	3.00	<1	5	54	9	200	5.01	0.35	0.35	0.01	1.45	5.32	0.30	0.42	<1.00		
08.02.2010	21	7.30	7.59	2.98	3.00	1	5	85	25	385	5.20	0.53	0.85	0.01	1.87	16.80	0.33	0.47			
12.03.2010	21	7.26	7.90	1.22	2.60	1	4	72	13	245	5.43	0.20	0.10	<0.01	0.48	1.40	<0.05	0.31	<1.00	<0.20	1.40
06.04.2010	21	6.50	5.13	1.15	2.10	29	38	150	50	375	0.30	0.10	0.35	0.02	0.47	2.72	0.27	<0.10	<1.00		
10.05.2010	55	7.71	9.11	0.68	2.70	<1	4	54	<2	180	5.88	0.10	<0.01	0.01	0.35	0.21	0.09	<0.10	<1.00	<0.20	1.40
07.06.2010	176	7.37	4.47	0.68	4.00	<1	8	23	7	200	3.38	0.10	0.01	<0.01	0.93	0.42	0.35	0.41	<1.00		
07.07.2010	166	7.31	4.29	0.79	3.20	<1	4	15	<2	141	2.95	0.10	0.01	<0.01	0.48	0.31	0.31	<0.10	<1.00		
09.08.2010	179	7.54	4.84	0.71	3.50	<1	5	22	5	160	3.36	0.10	0.01	<0.01	0.58	0.20	0.36	0.30	<1.00	<0.20	1.40
08.09.2010	73	7.41	5.37	0.50	3.00	<1	3	25	6	136	3.47	0.10	0.01	<0.01	0.50	0.10	0.27	0.20	<1.00		
08.10.2010	56	7.62	5.87	0.39	3.20	3	5	32	<2	190	3.64	0.10	0.01	<0.01	0.47	0.08	0.23	0.10	<1.00	<0.20	1.40
09.11.2010	46	7.33	6.04	0.54	1.60	<1	3	105	<2	180	4.17	0.10	<0.01	<0.01	0.52	0.20	0.32	<0.10	2.50		
06.12.2010	34	7.24	6.25	0.30	1.30	<1	3	110	<2	185	4.36	0.07	<0.01	<0.01	0.43	0.28	0.21	0.10	<1.00		
Lower avg.	73	7.33	6.18	0.96	2.77	3	7	62	10	215	3.93	0.16	0.14	0.00	0.71	2.34	0.25	0.19	0.23	0.00	1.40
Upper avg..	73	7.33	6.18	0.96	2.77	4	7	62	10	215	3.93	0.16	0.14	0.01	0.71	2.34	0.26	0.23	1.14	0.20	1.40
Minimum	21	6.50	4.29	0.30	1.30	1	3	15	2	136	0.30	0.07	0.01	0.01	0.35	0.08	0.05	0.10	1.00	0.20	1.40
Maximum	179	7.71	9.11	2.98	4.00	29	38	150	50	385	5.88	0.53	0.85	0.02	1.87	16.80	0.36	0.47	2.50	0.20	1.40
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	no	no	no	yes
n	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	11	4	4
St.dev	63	0.30	1.50	0.74	0.77	8	10	43	14	82	1.48	0.14	0.26	0.00	0.47	4.81	0.10	0.15	0.45	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]
08.02.2010	5	6.82	5.70	2.88	8.70	6	14	485	3	830	4.69	0.31	0.25	0.01	1.45	3.12	0.78	0.64	<1.00		
10.05.2010	26	6.80	5.19	4.05	8.30	4	13	520	2	730	3.94	0.35	0.23	0.02	1.18	3.25	0.71	0.48	<1.00		
09.08.2010	24	7.05	5.25	2.87	8.40	3	15	370	8	715	3.25	0.30	0.21	0.02	1.00	2.06	0.69	0.38	<1.00		
04.10.2010	28	7.01	5.23	1.40	8.60	3	11	390	18	715	2.67	0.29	0.36	0.02	2.69	7.98	0.85	0.56	<1.00		
Lower avg.	21	6.92	5.34	2.80	8.50	4	13	441	8	748	3.64	0.31	0.26	0.02	1.58	4.10	0.76	0.52	0.00	0.00	0.00
Upper avg..	21	6.92	5.34	2.80	8.50	4	13	441	8	748	3.64	0.31	0.26	0.02	1.58	4.10	0.76	0.52	1.00	0.00	0.00
Minimum	5	6.80	5.19	1.40	8.30	3	11	370	2	715	2.67	0.29	0.21	0.01	1.00	2.06	0.69	0.38	1.00	0.00	0.00
Maximum	28	7.05	5.70	4.05	8.70	6	15	520	18	830	4.69	0.35	0.36	0.02	2.69	7.98	0.85	0.64	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	11	0.13	0.24	1.09	0.18	1	2	73	7	55	0.87	0.03	0.07	0.01	0.76	2.64	0.07	0.11	0.00	0.00	0.00

Tokkeelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
08.02.2010	8	6.07	2.13	0.92	6.40	<1	5	150	<2	335	3.08	0.20	0.27	0.03	0.63	5.72	0.42	0.30	<1.00		
10.05.2010	26	6.31	1.99	1.32	5.90	<1	6	155	2	320	2.93	0.21	0.21	0.03	0.44	5.47	0.37	0.30	<1.00		
02.08.2010	12	6.46	2.12	1.96	6.10	2	6	65	<2	265	2.50	0.21	0.14	0.02	0.52	4.13	0.38	0.30	<1.00		
11.10.2010	45	6.28	2.03	1.11	5.90	<1	4	120	15	350	2.78	0.20	0.30	0.03	0.55	5.94	0.53	0.10	2.00		
Lower avg.	22	6.28	2.07	1.33	6.07	1	5	123	4	318	2.82	0.20	0.23	0.03	0.53	5.32	0.42	0.25	0.50	0.00	0.00
Upper avg..	22	6.28	2.07	1.33	6.07	1	5	123	5	318	2.82	0.20	0.23	0.03	0.53	5.32	0.42	0.25	1.25	0.00	0.00
Minimum	8	6.07	1.99	0.92	5.90	1	4	65	2	265	2.50	0.20	0.14	0.02	0.44	4.13	0.37	0.10	1.00	0.00	0.00
Maximum	45	6.46	2.13	1.96	6.40	2	6	155	15	350	3.08	0.21	0.30	0.03	0.63	5.94	0.53	0.30	2.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	17	0.16	0.07	0.45	0.24	1	1	41	7	37	0.25	0.01	0.07	0.01	0.08	0.81	0.07	0.10	0.50	0.00	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]
09.02.2010	42	6.38	1.84	0.52	2.50	2	4	165	26	280	2.35	0.20	0.17	0.02	0.66	3.47	0.20	0.10	<1.00		
10.05.2010	130	6.57	1.69	0.83	3.20	1	3	175	8	255	2.02	0.20	0.23	0.02	0.59	3.84	0.20	<0.10	<1.00		
02.08.2010	58	6.59	1.40	0.57	2.40	<1	1	125	10	230	1.45	0.10	0.08	0.01	0.66	2.28	0.20	<0.10	<1.00		
05.10.2010	463	6.62	1.89	8.70	5.10	7	9	97	17	370	2.46	0.22	0.76	0.03	1.02	5.62	0.44	0.20	<1.00		
Lower avg.	173	6.54	1.70	2.66	3.30	3	4	141	15	284	2.07	0.18	0.31	0.02	0.73	3.80	0.26	0.08	0.00	0.00	0.00
Upper avg..	173	6.54	1.70	2.66	3.30	3	4	141	15	284	2.07	0.18	0.31	0.02	0.73	3.80	0.26	0.12	1.00	0.00	0.00
Minimum	42	6.38	1.40	0.52	2.40	1	1	97	8	230	1.45	0.10	0.08	0.01	0.59	2.28	0.20	0.10	1.00	0.00	0.00
Maximum	463	6.62	1.89	8.70	5.10	7	9	175	26	370	2.46	0.22	0.76	0.03	1.02	5.62	0.44	0.20	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	197	0.11	0.22	4.03	1.25	3	3	36	8	61	0.46	0.05	0.30	0.01	0.20	1.38	0.12	0.05	0.00	0.00	0.00

Tovdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
09.02.2010	22	6.48	2.14	1.17	4.50	1	5	135	56	380	2.27	0.23	0.48	0.03	1.32	6.35	0.35	<0.10	1.00		
04.05.2010	59	6.64	2.04	2.98	4.40	2	5	130	26	345	2.22	0.20	0.41	0.03	0.39	4.67	0.31	0.30	2.00		
10.08.2010	24	6.93	1.98	1.00	3.00	<1	2	48	3	205	0.92	0.21	0.10	0.01	0.37	1.40	0.23	0.20	<1.00		
06.10.2010	117	6.41	2.15	0.20	6.00	3	6	84	43	345	2.11	0.25	0.62	0.04	0.89	8.22	0.46	<0.10	<1.00		
Lower avg.	56	6.62	2.08	1.34	4.47	2	5	99	32	319	1.88	0.22	0.40	0.03	0.74	5.16	0.34	0.12	0.75	0.00	0.00
Upper avg..	56	6.62	2.08	1.34	4.47	2	5	99	32	319	1.88	0.22	0.40	0.03	0.74	5.16	0.34	0.18	1.25	0.00	0.00
Minimum	22	6.41	1.98	0.20	3.00	1	2	48	3	205	0.92	0.20	0.10	0.01	0.37	1.40	0.23	0.10	1.00	0.00	0.00
Maximum	117	6.93	2.15	2.98	6.00	3	6	135	56	380	2.27	0.25	0.62	0.04	1.32	8.22	0.46	0.30	2.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	44	0.23	0.08	1.17	1.23	1	2	41	23	78	0.64	0.02	0.22	0.01	0.45	2.90	0.10	0.10	0.50	0.00	0.00

Mandalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2010	27	6.29	2.21	1.97	3.70	2	7	120	18	300	1.51	0.10	0.52	0.02	1.31	3.89	0.20	<0.10	1.50		
10.05.2010	66	6.70	2.02	1.14	3.20	2	4	175	22	315	1.47	0.10	0.36	0.02	0.46	2.90	0.20	0.10	<1.00		
09.08.2010	32	6.57	1.57	2.20	2.90	2	5	98	10	320	0.68	0.10	0.24	0.01	0.37	2.68	0.28	<0.10	<1.00		
11.10.2010	98	6.27	2.52	2.08	6.30	2	7	165	24	420	2.04	0.29	0.62	0.03	0.79	5.54	0.29	0.10	3.00		
Lower avg.	56	6.46	2.08	1.85	4.03	2	6	140	19	339	1.42	0.15	0.44	0.02	0.73	3.75	0.24	0.05	1.12	0.00	0.00
Upper avg..	56	6.46	2.08	1.85	4.03	2	6	140	19	339	1.42	0.15	0.44	0.02	0.73	3.75	0.24	0.10	1.62	0.00	0.00
Minimum	27	6.27	1.57	1.14	2.90	2	4	98	10	300	0.69	0.10	0.24	0.01	0.37	2.68	0.20	0.10	1.00	0.00	0.00
Maximum	98	6.70	2.52	2.20	6.30	2	7	175	24	420	2.04	0.29	0.62	0.03	1.31	5.54	0.29	0.10	3.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	33	0.21	0.40	0.48	1.55	0	2	37	6	55	0.56	0.10	0.17	0.01	0.42	1.30	0.05	0.00	0.95	0.00	0.00

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]
10.02.2010	11	6.48	4.08	1.62	3.40	4	8	370	43	595	3.59	0.20	0.29	0.03	1.72	5.93	0.10	<0.10	<1.00		
10.05.2010	21	6.73	2.42	0.58	3.40	1	4	170	3	275	0.68	0.21	0.30	0.02	0.58	3.04	0.10	<0.10	1.00		
09.08.2010	12	6.87	2.55	2.29	3.20	2	5	145	3	320	1.07	0.21	0.25	0.02	0.54	2.32	0.20	0.10	<1.00		
11.10.2010	33	6.39	2.29	1.17	4.90	2	7	190	23	430	1.78	0.23	0.47	0.03	1.58	5.66	0.20	<0.10	<1.00		
Lower avg.	19	6.62	2.84	1.42	3.72	2	6	219	18	405	1.78	0.21	0.33	0.02	1.11	4.24	0.15	0.02	0.25	0.00	0.00
Upper avg..	19	6.62	2.84	1.42	3.72	2	6	219	18	405	1.78	0.21	0.33	0.02	1.11	4.24	0.15	0.10	1.00	0.00	0.00
Minimum	11	6.39	2.29	0.58	3.20	1	4	145	3	275	0.69	0.20	0.25	0.02	0.54	2.32	0.10	0.10	1.00	0.00	0.00
Maximum	33	6.87	4.08	2.29	4.90	4	8	370	43	595	3.59	0.23	0.47	0.03	1.72	5.93	0.20	0.10	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	10	0.22	0.84	0.72	0.79	1	2	103	19	142	1.29	0.01	0.10	0.00	0.63	1.83	0.06	0.00	0.00	0.00	0.00

Kvina

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2010	22	6.57	3.13	1.53	3.00	5	8	275	67	525	2.76	0.10	0.35	0.02	1.50	4.44	0.10	<0.10	<1.00		
10.05.2010	45	6.75	2.42	0.98	3.50	2	6	195	7	325	0.71	0.20	0.38	0.02	3.66	6.60	0.20	0.10	1.00		
09.08.2010	26	6.70	1.98	8.22	4.40	3	9	64	10	340	0.62	0.25	0.31	0.02	2.07	2.84	0.23	0.10	<1.00		
11.10.2010	80	6.03	2.09	1.83	6.80	3	12	145	15	420	1.78	0.28	0.79	0.02	3.68	5.13	1.80	0.20	<1.00		
Lower avg.	43	6.51	2.40	3.14	4.42	3	9	170	25	403	1.47	0.21	0.45	0.02	2.73	4.75	0.58	0.10	0.25	0.00	0.00
Upper avg..	43	6.51	2.40	3.14	4.42	3	9	170	25	403	1.47	0.21	0.45	0.02	2.73	4.75	0.58	0.12	1.00	0.00	0.00
Minimum	22	6.03	1.98	0.98	3.00	2	6	64	7	325	0.62	0.10	0.31	0.02	1.50	2.84	0.10	0.10	1.00	0.00	0.00
Maximum	80	6.75	3.13	8.22	6.80	5	12	275	67	525	2.76	0.28	0.79	0.02	3.68	6.60	1.80	0.20	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	26	0.33	0.52	3.41	1.69	1	3	89	28	92	1.01	0.08	0.22	0.00	1.11	1.56	0.81	0.05	0.00	0.00	0.00

Sira

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
10.02.2010	42	5.79	1.20	0.99	1.60	2	4	91	42	245	0.81	0.10	0.25	0.01	0.79	3.26	0.09	<0.10	<1.00		
10.05.2010	92	5.73	1.23	0.40	1.40	<1	2	125	25	205	0.83	0.10	0.21	0.01	0.91	2.33	0.10	<0.10	<1.00		
09.08.2010	59	5.99	1.33	1.42	1.70	1	4	110	23	255	0.88	0.10	0.24	0.01	0.57	2.05	0.10	0.10	<1.00		
11.10.2010	162	5.65	1.26	0.90	2.50	1	5	94	20	245	1.20	0.10	0.31	0.01	0.80	2.50	0.10	<0.10	1.50		
Lower avg.	89	5.79	1.25	0.93	1.80	1	4	105	28	238	0.93	0.10	0.25	0.01	0.77	2.54	0.10	0.02	0.38	0.00	0.00
Upper avg..	89	5.79	1.25	0.93	1.80	1	4	105	28	238	0.93	0.10	0.25	0.01	0.77	2.54	0.10	0.10	1.12	0.00	0.00
Minimum	42	5.65	1.20	0.40	1.40	1	2	91	20	205	0.81	0.10	0.21	0.01	0.57	2.05	0.09	0.10	1.00	0.00	0.00
Maximum	162	5.99	1.33	1.42	2.50	2	5	125	42	255	1.20	0.10	0.31	0.01	0.91	3.26	0.10	0.10	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	53	0.15	0.06	0.42	0.48	1	1	16	10	22	0.18	0.00	0.05	0.00	0.14	0.52	0.01	0.00	0.25	0.00	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]
09.02.2010	15	6.50	3.60	0.71	1.20	<1	4	435	9	500	2.02	0.10	0.18	0.02	0.31	2.85	0.10	<0.10	<1.00		
10.05.2010	35	6.78	3.25	0.35	1.30	1	4	330	5	370	1.22	0.10	0.12	0.02	0.22	1.90	0.10	<0.10	<1.00		
05.08.2010	26	6.66	3.17	1.14	1.50	2	4	305	11	395	1.22	0.10	0.18	0.01	0.36	2.30	0.26	0.10	<1.00		
05.10.2010	92	6.50	3.40	1.42	2.40	9	12	350	23	585	1.66	0.10	0.35	0.02	0.42	2.81	0.24	<0.10	1.50		
Lower avg.	42	6.61	3.36	0.90	1.60	3	6	355	12	463	1.53	0.10	0.21	0.02	0.33	2.46	0.18	0.02	0.38	0.00	0.00
Upper avg..	42	6.61	3.36	0.90	1.60	3	6	355	12	463	1.53	0.10	0.21	0.02	0.33	2.46	0.18	0.10	1.12	0.00	0.00
Minimum	15	6.50	3.17	0.35	1.20	1	4	305	5	370	1.22	0.10	0.12	0.01	0.22	1.90	0.10	0.10	1.00	0.00	0.00
Maximum	92	6.78	3.60	1.42	2.40	9	12	435	23	585	2.02	0.10	0.35	0.02	0.42	2.85	0.26	0.10	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	34	0.14	0.19	0.47	0.55	4	4	56	8	99	0.39	0.00	0.10	0.01	0.08	0.45	0.09	0.00	0.25	0.00	0.00

Figgjoelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
02.02.2010	2	7.00	14.50	2.55	2.80	16	24	1300	135	1520	5.43	0.20	0.22	0.02	3.78	5.31	0.45	0.30	2.50		
03.05.2010	4	7.46	10.70	3.55	2.80	5	17	860	14	1170	2.00	0.10	0.65	0.01	0.99	3.32	0.43	0.10	<1.00		
11.08.2010	4	7.20	9.88	1.87	2.70	6	13	435	12	770	1.11	0.21	0.20	0.01	0.78	2.40	0.35	0.20	<1.00		
04.10.2010	6	7.13	11.90	21.60	6.20	62	99	1350	120	1945	4.13	0.36	1.31	0.03	3.38	13.70	1.20	0.57	5.00		
Lower avg.	4	7.20	11.74	7.39	3.62	22	38	986	70	1351	3.17	0.22	0.60	0.02	2.23	6.18	0.61	0.29	1.88	0.00	0.00
Upper avg..	4	7.20	11.74	7.39	3.62	22	38	986	70	1351	3.17	0.22	0.60	0.02	2.23	6.18	0.61	0.29	2.38	0.00	0.00
Minimum	2	7.00	9.88	1.87	2.70	5	13	435	12	770	1.11	0.10	0.20	0.01	0.78	2.40	0.35	0.10	1.00	0.00	0.00
Maximum	6	7.46	14.50	21.60	6.20	62	99	1350	135	1945	5.43	0.36	1.31	0.03	3.78	13.70	1.20	0.57	5.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	2	0.19	2.02	9.50	1.72	27	41	428	66	501	1.97	0.11	0.52	0.01	1.57	5.16	0.40	0.20	1.89	0.00	0.00

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]
21.02.2010	4	6.64	2.80	<0.10	0.49	<1	<1	220	2	250	3.25	<0.05	0.05	0.01	0.14	0.82	<0.05	0.20	<1.00		
09.05.2010	9	6.87	1.85	0.10	0.71	<1	1	175	3	190	1.16	0.07	0.09	0.01	0.25	1.80	0.07	0.10	<1.00		
08.08.2010	6	6.77	1.66	0.17	0.97	<1	<1	80	<2	155	1.41	0.06	0.10	0.01	0.18	0.66	0.05	<0.10	<1.00		
17.10.2010	6	6.67	2.07	0.14	0.85	<1	1	145	6	215	2.48	<0.05	0.06	0.01	0.24	1.20	0.08	<0.10	<1.00		
Lower avg.	6	6.74	2.10	0.10	0.76	0	1	155	3	203	2.08	0.03	0.08	0.01	0.20	1.12	0.05	0.08	0.00	0.00	0.00
Upper avg..	6	6.74	2.10	0.13	0.76	1	1	155	3	203	2.08	0.06	0.08	0.01	0.20	1.12	0.06	0.12	1.00	0.00	0.00
Minimum	4	6.64	1.66	0.10	0.49	1	1	80	2	155	1.16	0.05	0.05	0.01	0.14	0.66	0.05	0.10	1.00	0.00	0.00
Maximum	9	6.87	2.80	0.17	0.97	1	1	220	6	250	3.25	0.07	0.10	0.01	0.25	1.80	0.08	0.20	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	2	0.10	0.50	0.03	0.21	0	0	59	2	40	0.97	0.01	0.03	0.00	0.05	0.51	0.02	0.05	0.00	0.00	0.00

Årdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
17.02.2010	11	6.46	2.90	0.96	0.62	<1	2	365	6	430	2.93	0.05	0.05	0.01	0.18	1.70	0.08	<0.10	<1.00		
18.05.2010	44	6.62	1.60	0.42	2.10	<1	3	125	13	215	1.39	0.07	0.22	0.01	0.88	3.87	0.20	0.34	<1.00		
17.08.2010	12	6.65	2.03	0.29	1.40	3	3	165	3	265									<1.00		
12.10.2010	30	6.56	1.98	0.42	1.50	2	1	165	2	260	1.46	<0.05	0.15	0.01	0.47	2.96	0.20	<0.10	13.00		
Lower avg.	24	6.57	2.13	0.52	1.40	1	2	205	6	293	1.93	0.04	0.14	0.01	0.51	2.84	0.16	0.11	3.25	0.00	0.00
Upper avg..	24	6.57	2.13	0.52	1.40	2	2	205	6	293	1.93	0.06	0.14	0.01	0.51	2.84	0.16	0.18	4.00	0.00	0.00
Minimum	11	6.46	1.60	0.29	0.62	1	1	125	2	215	1.39	0.05	0.05	0.01	0.18	1.70	0.08	0.10	1.00	0.00	0.00
Maximum	44	6.65	2.90	0.96	2.10	3	3	365	13	430	2.93	0.07	0.22	0.01	0.88	3.87	0.20	0.34	13.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	4	0	0
St.dev	16	0.08	0.55	0.30	0.61	1	1	108	5	94	0.87	0.01	0.08	0.00	0.35	1.09	0.07	0.14	6.00	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]
17.02.2010	10	6.77	2.99	0.31	0.32	<1	1	145	3	175	3.57	0.06	0.21	0.01	0.25	1.70	0.07	0.20	<1.00		
18.05.2010	37	6.31	1.96	0.22	1.60	2	2	55	<2	113	1.46	0.07	0.07	0.01	0.24	0.92	0.07	0.47	<1.00		
17.08.2010	11	6.86	3.47	0.85	2.50	2	4	175	10	290									<1.00		
12.10.2010	23	6.90	2.04	0.55	1.30	1	4	71	13	185	2.14	0.05	0.05	<0.01	0.26	0.73	0.06	0.10	<1.00		
Lower avg.	20	6.71	2.62	0.48	1.43	1	3	112	7	191	2.39	0.06	0.11	0.01	0.25	1.12	0.07	0.26	0.00	0.00	0.00
Upper avg..	20	6.71	2.62	0.48	1.43	2	3	112	7	191	2.39	0.06	0.11	0.01	0.25	1.12	0.07	0.26	1.00	0.00	0.00
Minimum	10	6.31	1.96	0.22	0.32	1	1	55	2	113	1.46	0.05	0.05	0.01	0.24	0.73	0.06	0.10	1.00	0.00	0.00
Maximum	37	6.90	3.47	0.85	2.50	2	4	175	13	290	3.57	0.07	0.21	0.01	0.26	1.70	0.07	0.47	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	3	3	3	3	3	3	3	3	4	0	0
St.dev	13	0.27	0.74	0.28	0.90	1	2	58	5	73	1.08	0.01	0.09	0.00	0.01	0.51	0.01	0.19	0.00	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]
08.02.2010	22	6.55	2.08	0.20	0.46	<1	1	185	4	205	0.90	0.06	0.02	0.01	0.28	1.20	0.10	0.20	6.00		
04.05.2010	33	6.68	1.75	0.54	1.00	<1	6	155	<2	210	0.98	<0.05	0.05	0.01	0.19	1.30	0.10	0.10	<1.00		
02.08.2010	77	6.71	1.23	1.32	1.00	<1	2	100	<2	160	0.77	0.08	0.07	0.01	<0.01	0.77	0.10	<0.10	<1.00		
04.10.2010	60	6.69	1.49	2.79	0.82	3	4	140	9	210	0.98	0.08	0.21	0.01	0.51	3.86	0.21	<0.10	<1.00		
Lower avg.	48	6.66	1.64	1.21	0.82	1	3	145	3	196	0.91	0.06	0.09	0.01	0.24	1.78	0.13	0.08	1.50	0.00	0.00
Upper avg..	48	6.66	1.64	1.21	0.82	2	3	145	4	196	0.91	0.07	0.09	0.01	0.25	1.78	0.13	0.12	2.25	0.00	0.00
Minimum	22	6.55	1.23	0.20	0.46	1	1	100	2	160	0.77	0.05	0.02	0.01	0.01	0.77	0.10	0.10	1.00	0.00	0.00
Maximum	77	6.71	2.08	2.79	1.00	3	6	185	9	210	0.98	0.08	0.21	0.01	0.51	3.86	0.21	0.20	6.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	25	0.07	0.36	1.15	0.26	1	2	35	3	24	0.10	0.02	0.09	0.00	0.21	1.40	0.06	0.05	2.50	0.00	0.00

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]
02.02.2010	8	6.29	3.16	0.82	0.50	3	6	735	19	840	2.16	0.07	0.09	0.01	0.40	2.70	0.20	0.30	<1.00		
04.05.2010	30	6.20	1.40	0.21	0.93	1	2	180	3	235	0.94	0.06	0.07	0.01	0.36	1.90	0.10	<0.10	<1.00		
02.08.2010	15	6.43	0.96	0.41	1.50	<1	1	51	5	140	0.73	0.10	0.10	0.01	1.31	1.10	0.20	<0.10	<1.00		
04.10.2010	20	6.27	0.93	1.70	1.30	2	5	72	2	165	0.71	0.07	0.23	0.01	0.58	1.80	0.20	<0.10	2.50		
Lower avg.	19	6.30	1.61	0.78	1.06	2	4	260	7	345	1.13	0.08	0.12	0.01	0.66	1.87	0.18	0.08	0.62	0.00	0.00
Upper avg..	19	6.30	1.61	0.78	1.06	2	4	260	7	345	1.13	0.08	0.12	0.01	0.66	1.87	0.18	0.15	1.38	0.00	0.00
Minimum	8	6.20	0.93	0.21	0.50	1	1	51	2	140	0.71	0.06	0.07	0.01	0.36	1.10	0.10	0.10	1.00	0.00	0.00
Maximum	30	6.43	3.16	1.70	1.50	3	6	735	19	840	2.16	0.10	0.23	0.01	1.31	2.70	0.20	0.30	2.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	9	0.10	1.05	0.66	0.44	1	2	322	8	332	0.69	0.02	0.07	0.00	0.44	0.66	0.05	0.10	0.75	0.00	0.00

Vikedalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
01.02.2010	3	6.61	4.02	5.05	1.20	5	10	350	39	540	2.02	0.40	0.12	0.05	0.90	4.30	0.49	0.10	<1.00		
03.05.2010	9	6.67	2.52	2.44	1.30	<1	4	205	13	315	0.98	0.20	0.18	0.01	1.15	3.48	0.36	0.20	<1.00		
16.08.2010	4	6.73	2.78	0.30	1.80	2	7	220	30	360	0.90	0.32	0.15	0.01	0.77	2.27	0.36	0.10	<1.00		
04.10.2010	8	6.78	3.08	38.50	3.60	42	78	300	49	750	1.66	0.72	1.19	0.04	2.26	6.76	0.78	0.30	<1.00		
Lower avg.	6	6.70	3.10	11.57	1.98	12	25	269	33	491	1.39	0.41	0.41	0.02	1.27	4.20	0.50	0.18	0.00	0.00	0.00
Upper avg..	6	6.70	3.10	11.57	1.98	13	25	269	33	491	1.39	0.41	0.41	0.02	1.27	4.20	0.50	0.18	1.00	0.00	0.00
Minimum	3	6.61	2.52	0.30	1.20	1	4	205	13	315	0.90	0.20	0.12	0.01	0.77	2.27	0.36	0.10	1.00	0.00	0.00
Maximum	9	6.78	4.02	38.50	3.60	42	78	350	49	750	2.02	0.72	1.19	0.05	2.26	6.76	0.78	0.30	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	3	0.07	0.66	18.06	1.12	20	36	68	15	198	0.54	0.22	0.52	0.02	0.68	1.90	0.20	0.10	0.00	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]
16.02.2010	13	6.78	4.44	0.52	0.36	<1	2	290	5	335	5.35	<0.05	0.03	<0.01	0.40	0.54	<0.05	<0.10	<1.00		
19.05.2010	42	6.72	1.49	5.98	1.00	3	7	115	<2	170	2.27	<0.05	0.10	0.01	0.55	1.40	0.30	0.65	3.00		
04.08.2010	124	6.52	0.74	15.40	0.46	18	18	9	4	99	2.20	<0.05	0.27	<0.01	0.71	2.81	0.62	0.77	<1.00		
11.10.2010	102	6.69	1.37	28.20	0.63	<1	25	100	3	175	5.07	<0.05	0.64	0.01	2.11	7.57	1.30	1.80	1.00		
Lower avg.	70	6.68	2.01	12.52	0.61	5	13	129	3	195	3.72	0.00	0.26	0.00	0.94	3.08	0.55	0.80	1.00	0.00	0.00
Upper avg..	70	6.68	2.01	12.52	0.61	6	13	129	4	195	3.72	0.05	0.26	0.01	0.94	3.08	0.57	0.83	1.50	0.00	0.00
Minimum	13	6.52	0.74	0.52	0.36	1	2	9	2	99	2.20	0.05	0.03	0.01	0.40	0.54	0.05	0.10	1.00	0.00	0.00
Maximum	124	6.78	4.44	28.20	1.00	18	25	290	5	335	5.35	0.05	0.64	0.01	2.11	7.57	1.30	1.80	3.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	51	0.11	1.65	12.12	0.28	8	10	117	1	100	1.72	0.00	0.27	0.00	0.79	3.14	0.54	0.71	1.00	0.00	0.00

Gaular

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.02.2010	14	6.25	1.50	0.26	1.20	<1	3	110	10	165	1.11	<0.05	0.03	<0.01	0.32	1.10	0.10	0.30	<1.00		
10.05.2010	34	6.34	1.60	0.65	2.00	2	5	44	3	205	1.01	0.05	0.04	0.01	0.26	1.20	0.10	<0.10	<1.00		
17.08.2010	31	6.29	1.16	0.50	1.30	1	4	20	7	122	0.64	<0.05	0.03	<0.01	0.24	0.44	0.10	0.10	<1.00		
05.10.2010	51	6.14	1.51	0.99	4.60	6	12	35	4	280	1.37	<0.05	0.12	<0.01	0.42	1.50	0.20	<0.10	5.00		
Lower avg.	33	6.26	1.44	0.60	2.28	2	6	52	6	193	1.03	0.01	0.05	0.00	0.31	1.06	0.12	0.10	1.25	0.00	0.00
Upper avg..	33	6.26	1.44	0.60	2.28	3	6	52	6	193	1.03	0.05	0.05	0.00	0.31	1.06	0.12	0.15	2.00	0.00	0.00
Minimum	14	6.14	1.16	0.26	1.20	1	3	20	3	122	0.64	0.05	0.03	0.01	0.24	0.44	0.10	0.10	1.00	0.00	0.00
Maximum	51	6.34	1.60	0.99	4.60	6	12	110	10	280	1.37	0.05	0.12	0.01	0.42	1.50	0.20	0.30	5.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	15	0.09	0.19	0.31	1.59	2	4	40	3	67	0.30	0.00	0.05	0.00	0.08	0.45	0.05	0.10	2.00	0.00	0.00

Jølstra

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.02.2010	16	6.64	2.38	0.61	1.00	1	4	245	9	325	1.81	<0.05	0.03	0.01	0.36	1.40	0.08	0.10	<1.00		
10.05.2010	40	6.45	1.77	0.45	1.30	2	4	115	3	205	1.05	<0.05	0.02	0.01	0.21	1.20	0.09	<0.10	<1.00		
17.08.2010	30	5.92	2.00	0.41	0.91	1	3	80	10	175	0.71	<0.05	0.02	<0.01	0.19	0.81	0.06	<0.10	<1.00		
08.10.2010	89	6.44	1.49	0.65	2.00	2	4	83	4	235	1.05	<0.05	0.04	<0.01	0.20	1.00	0.08	<0.10	<1.00		
Lower avg.	44	6.36	1.91	0.53	1.30	2	4	131	7	235	1.15	0.00	0.03	0.00	0.24	1.10	0.08	0.02	0.00	0.00	0.00
Upper avg..	44	6.36	1.91	0.53	1.30	2	4	131	7	235	1.15	0.05	0.03	0.01	0.24	1.10	0.08	0.10	1.00	0.00	0.00
Minimum	16	5.92	1.49	0.41	0.91	1	3	80	3	175	0.71	0.05	0.02	0.01	0.19	0.81	0.06	0.10	1.00	0.00	0.00
Maximum	89	6.64	2.38	0.65	2.00	2	4	245	10	325	1.81	0.05	0.04	0.01	0.36	1.40	0.09	0.10	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	32	0.31	0.38	0.12	0.49	1	1	78	4	65	0.47	0.00	0.01	0.00	0.08	0.25	0.01	0.00	0.00	0.00	0.00

Nausta

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.02.2010	6	6.41	2.54	0.43	1.10	2	4	285	42	410	3.00	<0.05	0.04	<0.01	0.36	1.30	0.10	0.10	<1.00		
06.05.2010	16	6.27	1.31	0.68	1.70	1	4	<1	5	165	1.09	<0.05	0.04	0.01	0.20	0.87	0.10	<0.10	<1.00		
17.08.2010	12	6.61	1.25	0.33	1.70	4	6	<1	12	160	0.58	0.06	0.05	<0.01	0.26	0.39	0.08	<0.10	<1.00		
08.10.2010	34	6.39	1.08	0.78	2.50	3	6	63	3	190	1.13	<0.05	0.07	<0.01	0.19	0.76	0.10	<0.10	<1.00		
Lower avg.	17	6.42	1.54	0.56	1.75	3	5	87	16	231	1.45	0.02	0.05	0.00	0.25	0.83	0.10	0.02	0.00	0.00	0.00
Upper avg..	17	6.42	1.54	0.56	1.75	3	5	88	16	231	1.45	0.05	0.05	0.01	0.25	0.83	0.10	0.10	1.00	0.00	0.00
Minimum	6	6.27	1.08	0.33	1.10	1	4	1	3	160	0.58	0.05	0.04	0.01	0.19	0.39	0.08	0.10	1.00	0.00	0.00
Maximum	34	6.61	2.54	0.78	2.50	4	6	285	42	410	3.00	0.06	0.07	0.01	0.36	1.30	0.10	0.10	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	no	yes	no	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	12	0.14	0.67	0.21	0.57	1	1	135	18	120	1.06	0.01	0.01	0.00	0.08	0.38	0.01	0.00	0.00	0.00	0.00

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]
05.03.2010	10	6.56	2.19	0.78	0.91	1	3	250	5	320	1.72	<0.05	0.01	<0.01	0.36	1.00	0.10	0.30	<1.00		
02.06.2010	49	6.56	1.83	0.47	0.86	<1	2	185	<2	265	1.30	0.05	0.01	<0.01	0.67	0.82	0.20	<0.10	<1.00		
22.08.2010	49	6.84	1.33	1.21	0.81	2	5	81	5	165	0.58	<0.05	0.02	<0.01	0.28	0.50	0.10	<0.10	<1.00		
15.10.2010	26	6.64	1.54	1.28	0.85	3	3	160	6	235	1.09	<0.05	0.04	<0.01	0.35	0.77	0.20	<0.10	<1.00		
Lower avg.	33	6.65	1.72	0.94	0.86	2	3	169	4	246	1.17	0.01	0.02	0.00	0.42	0.77	0.15	0.08	0.00	0.00	0.00
Upper avg..	33	6.65	1.72	0.94	0.86	2	3	169	5	246	1.17	0.05	0.02	0.00	0.42	0.77	0.15	0.15	1.00	0.00	0.00
Minimum	10	6.56	1.33	0.47	0.81	1	2	81	2	165	0.58	0.05	0.01	0.01	0.28	0.50	0.10	0.10	1.00	0.00	0.00
Maximum	49	6.84	2.19	1.28	0.91	3	5	250	6	320	1.72	0.05	0.04	0.01	0.67	1.00	0.20	0.30	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	no	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	19	0.13	0.37	0.38	0.04	1	1	70	2	65	0.48	0.00	0.02	0.00	0.17	0.21	0.06	0.10	0.00	0.00	0.00

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]
02.03.2010	17	7.09	3.02	0.34	0.91	<1	1	138	4	215	2.48	0.06	<0.01	<0.01	0.31	0.21	0.10	0.20	<1.00		
10.05.2010	37	7.45	4.42	1.54	2.00	1	5	160	10	280	2.31	0.08	0.01	<0.01	0.72	0.33	0.22	0.20	<1.00		
24.08.2010	52	7.29	3.32	0.58	0.80	1	4	84	2	165	2.40	<0.05	0.01	<0.01	1.32	0.33	0.10	0.10	<1.00		
07.10.2010	40	7.19	3.40	1.22	0.92	3	2	73	<2	160	2.89	<0.05	0.02	<0.01	0.97	0.25	0.10	<0.10	<1.00		
Lower avg.	36	7.26	3.54	0.92	1.16	1	3	114	4	205	2.52	0.04	0.01	0.00	0.83	0.28	0.13	0.12	0.00	0.00	0.00
Upper avg..	36	7.26	3.54	0.92	1.16	2	3	114	5	205	2.52	0.06	0.01	0.00	0.83	0.28	0.13	0.15	1.00	0.00	0.00
Minimum	17	7.09	3.02	0.34	0.80	1	1	73	2	160	2.31	0.05	0.01	0.01	0.31	0.21	0.10	0.10	1.00	0.00	0.00
Maximum	52	7.45	4.42	1.54	2.00	3	5	160	10	280	2.89	0.08	0.02	0.01	1.32	0.33	0.22	0.20	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	15	0.15	0.61	0.56	0.56	1	2	42	4	56	0.26	0.01	0.01	0.00	0.43	0.06	0.06	0.06	0.00	0.00	0.00

Surna

Date DD.MM.YYYY	Qs [m3/s]	pH []	KOND [mS/m]	SPM [mg/l]	TOC [mg/l C]	PO4-P [µg/l P]	TOTP [µg/l P]	NO3-N [µg/l N]	NH4-N [µg/l N]	TOTN [µg/l N]	SiO2 [mg/l SiO2]	As [µg/l]	Pb [µg/l]	Cd [µg/l]	Cu [µg/l]	Zn [µg/l]	Ni [µg/l]	Cr [µg/l]	Hg [ng/l]	HCHG [ng/l]	SUMPCB [ng/l]
15.02.2010	13	6.88	2.00	0.27	1.40	<1	2	59	7	125	1.86	<0.05	0.01	<0.01	0.26	0.30	0.09	<0.10	<1.00		
05.05.2010	54	7.23	5.30	0.93	3.10	2	6	260	5	410	2.52	0.06	0.02	<0.01	0.95	0.76	0.67	0.42	<1.00		
03.08.2010	40	6.98	2.36	1.27	3.70	<1	5	90	2	225	1.54	0.06	0.02	<0.01	0.67	0.23	0.44	0.20	<1.00		
18.10.2010	28	6.97	2.99	0.77	3.00	1	2	120	3	250	1.88	<0.05	0.02	<0.01	0.57	0.38	0.37	0.20	<1.00		
Lower avg.	34	7.02	3.16	0.81	2.80	1	4	132	4	253	1.95	0.03	0.02	0.00	0.61	0.42	0.39	0.20	0.00	0.00	0.00
Upper avg..	34	7.02	3.16	0.81	2.80	1	4	132	4	253	1.95	0.05	0.02	0.00	0.61	0.42	0.39	0.23	1.00	0.00	0.00
Minimum	13	6.88	2.00	0.27	1.40	1	2	59	2	125	1.55	0.05	0.01	0.01	0.26	0.23	0.09	0.10	1.00	0.00	0.00
Maximum	54	7.23	5.30	1.27	3.70	2	6	260	7	410	2.52	0.06	0.02	0.01	0.95	0.76	0.67	0.42	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	17	0.15	1.48	0.42	0.98	1	2	89	2	118	0.41	0.01	0.01	0.00	0.29	0.24	0.24	0.14	0.00	0.00	0.00

Gaula

Date DD.MM.YYYY	Qs [m3/s]	pH []	KOND [mS/m]	SPM [mg/l]	TOC [mg/l C]	PO4-P [µg/l P]	TOTP [µg/l P]	NO3-N [µg/l N]	NH4-N [µg/l N]	TOTN [µg/l N]	SiO2 [mg/l SiO2]	As [µg/l]	Pb [µg/l]	Cd [µg/l]	Cu [µg/l]	Zn [µg/l]	Ni [µg/l]	Cr [µg/l]	Hg [ng/l]	HCHG [ng/l]	SUMPCB [ng/l]
04.02.2010	20	7.39	11.90	1.67	1.90	4	6	335	115	610	4.81	0.20	0.09	0.01	0.93	2.92	0.97	0.40	<1.00		
03.05.2010	94	7.36	10.50	8.65	5.90	4	11	230	<2	465	3.89	0.20	0.16	0.01	2.01	3.73	2.28	0.86	<1.00		
09.08.2010	70	7.76	15.30	5.17	2.70	4	5	125	5	270	3.32	0.20	0.09	0.01	1.84	1.40	1.60	0.93	<1.00		
21.10.2010	56	7.35	14.50	1.47	5.70	2	4	115	7	350	3.53	0.10	0.10	0.01	1.68	2.59	1.30	0.62	1.50		
Lower avg.	60	7.46	13.05	4.24	4.05	4	7	201	32	424	3.89	0.18	0.11	0.01	1.61	2.66	1.54	0.70	0.38	0.00	0.00
Upper avg..	60	7.46	13.05	4.24	4.05	4	7	201	32	424	3.89	0.18	0.11	0.01	1.61	2.66	1.54	0.70	1.12	0.00	0.00
Minimum	20	7.35	10.50	1.47	1.90	2	4	115	2	270	3.32	0.10	0.09	0.01	0.93	1.40	0.97	0.40	1.00	0.00	0.00
Maximum	94	7.76	15.30	8.65	5.90	4	11	335	115	610	4.81	0.20	0.16	0.01	2.01	3.73	2.28	0.93	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	31	0.20	2.24	3.40	2.05	1	3	103	55	148	0.66	0.05	0.03	0.00	0.48	0.97	0.56	0.24	0.25	0.00	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]
04.02.2010	21	7.18	3.18	0.42	2.40	1	4	93	4	195	1.93	0.10	0.05	<0.01	0.76	1.00	0.62	0.30	<1.00		
03.05.2010	95	7.18	3.73	2.95	2.80	2	5	95	<2	235	2.29	0.10	0.06	<0.01	0.77	1.20	0.85	0.51	<1.00		
09.08.2010	65	7.27	2.96	1.69	2.90	<1	4	55	6	205	1.57	0.10	0.03	<0.01	0.67	0.89	0.82	0.20	<1.00		
21.10.2010	57	7.15	3.35	0.84	2.90	1	3	96	3	230	1.94	0.08	0.03	<0.01	1.69	0.89	0.81	0.20	1.00		
Lower avg.	59	7.20	3.30	1.48	2.75	1	4	85	3	216	1.93	0.10	0.04	0.00	0.97	1.00	0.78	0.30	0.25	0.00	0.00
Upper avg..	59	7.20	3.30	1.48	2.75	1	4	85	4	216	1.93	0.10	0.04	0.00	0.97	1.00	0.78	0.30	1.00	0.00	0.00
Minimum	21	7.15	2.96	0.42	2.40	1	3	55	2	195	1.57	0.08	0.03	0.01	0.67	0.89	0.62	0.20	1.00	0.00	0.00
Maximum	95	7.27	3.73	2.95	2.90	2	5	96	6	235	2.29	0.10	0.06	0.01	1.69	1.20	0.85	0.51	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	30	0.05	0.33	1.12	0.24	1	1	20	2	19	0.29	0.01	0.01	0.00	0.48	0.15	0.11	0.15	0.00	0.00	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]
04.02.2010	14	7.01	3.24	26.20	2.50	10	25	67	14	220	1.75	0.10	0.38	0.02	1.99	7.89	0.76	0.69	<1.00		
03.05.2010	86	7.07	3.74	4.95	4.70	4	8	130	<2	280	1.89	0.10	0.11	0.01	3.17	3.58	0.78	0.44	<1.00		
09.08.2010	42	7.35	4.17	1.32	3.50	<1	4	86	3	245	1.09	0.10	0.04	0.01	2.22	2.37	0.55	0.20	<1.00		
21.10.2010	38	7.09	3.94	4.47	5.50	3	5	130	<2	310	2.00	0.06	0.07	0.01	2.98	5.92	0.77	0.20	1.50		
Lower avg.	45	7.13	3.77	9.24	4.05	4	11	103	4	264	1.68	0.09	0.15	0.01	2.59	4.94	0.72	0.38	0.38	0.00	0.00
Upper avg..	45	7.13	3.77	9.24	4.05	5	11	103	5	264	1.68	0.09	0.15	0.01	2.59	4.94	0.72	0.38	1.12	0.00	0.00
Minimum	14	7.01	3.24	1.32	2.50	1	4	67	2	220	1.09	0.06	0.04	0.01	1.99	2.37	0.55	0.20	1.00	0.00	0.00
Maximum	86	7.35	4.17	26.20	5.50	10	25	130	14	310	2.00	0.10	0.38	0.02	3.17	7.89	0.78	0.69	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	30	0.15	0.40	11.42	1.32	4	10	32	6	39	0.41	0.02	0.16	0.01	0.57	2.46	0.11	0.23	0.25	0.00	0.00

Verdalselva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
04.02.2010	12	7.45	12.50	2.30	3.10	<1	4	280	44	495	3.51	0.20	0.16	0.01	3.32	9.72	0.44	0.42	<1.00		
03.05.2010	65	7.18	3.76	5.03	4.40	4	6	89	4	235	1.95	0.10	0.11	<0.01	1.04	1.40	0.71	0.37	<1.00		
13.08.2010	25	7.50	7.15	1.69	3.20	2	6	115	5	270	1.52	0.10	0.05	<0.01	1.70	0.55	0.54	0.30	<1.00		
21.10.2010	29	7.28	4.23	0.92	4.70	<1	3	105	<2	275	1.80	0.10	0.05	<0.01	1.72	1.10	0.55	0.20	1.50		
Lower avg.	33	7.35	6.91	2.48	3.85	2	5	147	13	319	2.20	0.12	0.09	0.00	1.94	3.19	0.56	0.32	0.38	0.00	0.00
Upper avg..	33	7.35	6.91	2.48	3.85	2	5	147	14	319	2.20	0.12	0.09	0.01	1.94	3.19	0.56	0.32	1.12	0.00	0.00
Minimum	12	7.18	3.76	0.92	3.10	1	3	89	2	235	1.52	0.10	0.05	0.01	1.04	0.55	0.44	0.20	1.00	0.00	0.00
Maximum	65	7.50	12.50	5.03	4.70	4	6	280	44	495	3.51	0.20	0.16	0.01	3.32	9.72	0.71	0.42	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	23	0.15	4.02	1.79	0.82	1	2	89	20	119	0.89	0.05	0.05	0.00	0.97	4.37	0.11	0.10	0.25	0.00	0.00

Snåsavassdraget

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
04.02.2010	8	7.17	5.13	1.03	4.00	<1	3	190	3	320	1.54	0.10	0.04	<0.01	1.05	1.40	0.43	0.33	<1.00		
03.05.2010	46	7.22	5.18	2.49	4.60	2	6	200	3	390	1.80	0.10	0.06	<0.01	1.32	1.40	0.47	0.20	<1.00		
13.08.2010	14	7.21	4.85	0.92	4.10	2	6	86	11	255	1.09	0.09	0.03	<0.01	1.88	0.51	0.43	0.30	<1.00		
21.10.2010	16	7.20	4.70	0.76	4.40	<1	4	155	2	315	1.39	0.10	0.04	<0.01	1.43	1.00	0.44	<0.10	1.00		
Lower avg.	21	7.20	4.96	1.30	4.28	1	5	158	5	320	1.46	0.10	0.04	0.00	1.42	1.08	0.44	0.21	0.25	0.00	0.00
Upper avg..	21	7.20	4.96	1.30	4.28	2	5	158	5	320	1.46	0.10	0.04	0.00	1.42	1.08	0.44	0.23	1.00	0.00	0.00
Minimum	8	7.17	4.70	0.76	4.00	1	3	86	2	255	1.09	0.09	0.03	0.01	1.05	0.51	0.43	0.10	1.00	0.00	0.00
Maximum	46	7.22	5.18	2.49	4.60	2	6	200	11	390	1.80	0.10	0.06	0.01	1.88	1.40	0.47	0.33	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	17	0.02	0.23	0.80	0.28	1	2	52	4	55	0.30	0.01	0.01	0.00	0.35	0.42	0.02	0.10	0.00	0.00	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]
08.02.2010	9	6.94	4.03	0.67	1.30	2	3	110	11	190	1.22	0.06	0.08	0.01	0.95	4.13	2.33	0.20	<1.00		
10.05.2010	29	7.02	3.45	3.79	4.50	2	6	70	9	225	2.20	0.10	0.10	0.01	0.76	1.70	0.60	0.48	1.00		
09.08.2010	32	7.09	3.22	1.77	5.10	1	5	36	4	205	1.43	0.10	0.08	<0.01	0.70	0.86	0.48	0.30	<1.00		
11.10.2010	18	6.97	3.40	2.68	4.10	2	5	39	7	200	2.00	0.20	0.25	0.02	1.00	2.66	0.82	0.45	1.50		
Lower avg.	22	7.00	3.53	2.23	3.75	2	5	64	8	205	1.71	0.12	0.13	0.01	0.85	2.34	1.06	0.36	0.62	0.00	0.00
Upper avg..	22	7.00	3.53	2.23	3.75	2	5	64	8	205	1.71	0.12	0.13	0.01	0.85	2.34	1.06	0.36	1.12	0.00	0.00
Minimum	9	6.94	3.22	0.67	1.30	1	3	36	4	190	1.22	0.06	0.08	0.01	0.70	0.86	0.48	0.20	1.00	0.00	0.00
Maximum	32	7.09	4.03	3.79	5.10	2	6	110	11	225	2.20	0.20	0.25	0.02	1.00	4.13	2.33	0.48	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	10	0.07	0.35	1.33	1.68	1	1	34	3	15	0.47	0.06	0.08	0.01	0.14	1.40	0.86	0.13	0.25	0.00	0.00

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]
01.02.2010	35	7.82	5.01	<0.10	0.80	<1	3	60	3	107	0.90	0.09	0.01	<0.01	0.38	1.50	0.44	0.10	<1.00		
14.05.2010	68	7.33	4.28	0.38	0.96	<1	4	44	<2	102	0.88	0.06	0.04	<0.01	0.30	2.30	0.40	0.36	<1.00		
16.08.2010	86	7.49	3.90	0.28	0.93	3	2	29	2	92	0.71	0.10	0.02	<0.01	0.32	1.10	0.39	0.10	<1.00		
06.10.2010	38	7.35	3.74	1.22	0.84	1	<1	45	3	113	0.79	<0.05	0.04	<0.01	0.22	0.93	0.38	<0.10	<1.00		
Lower avg.	57	7.50	4.23	0.47	0.88	1	2	45	2	104	0.82	0.06	0.02	0.00	0.31	1.46	0.40	0.14	0.00	0.00	0.00
Upper avg..	57	7.50	4.23	0.50	0.88	2	3	45	3	104	0.82	0.08	0.02	0.00	0.31	1.46	0.40	0.16	1.00	0.00	0.00
Minimum	35	7.33	3.74	0.10	0.80	1	1	29	2	92	0.71	0.05	0.01	0.01	0.22	0.93	0.38	0.10	1.00	0.00	0.00
Maximum	86	7.82	5.01	1.22	0.96	3	4	60	3	113	0.90	0.10	0.04	0.01	0.38	2.30	0.44	0.36	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	25	0.23	0.57	0.50	0.08	1	1	13	1	9	0.09	0.02	0.02	0.00	0.07	0.61	0.03	0.13	0.00	0.00	0.00

Ranaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
01.02.2010	61	7.38	4.08	0.48	0.76	1	14	44	12	108	1.33	0.10	0.02	<0.01	0.43	3.07	0.32	0.20	1.50		
14.05.2010	116	7.58	6.95	3.37	1.60	<1	5	35	<2	132	1.59	0.08	0.08	<0.01	0.48	1.30	0.43	0.48	<1.00		
16.08.2010	226	7.44	3.76	0.66	0.96	3	2	21	<2	84	1.09	0.08	0.03	<0.01	0.34	0.44	0.32	0.20	<1.00		
06.10.2010	82	7.33	3.79	1.68	0.73	<1	2	41	5	113	1.11	<0.05	0.02	<0.01	0.33	0.54	0.32	<0.10	<1.00		
Lower avg.	121	7.43	4.65	1.55	1.01	1	6	35	4	109	1.28	0.06	0.04	0.00	0.40	1.34	0.35	0.22	0.38	0.00	0.00
Upper avg..	121	7.43	4.65	1.55	1.01	2	6	35	5	109	1.28	0.08	0.04	0.00	0.40	1.34	0.35	0.24	1.12	0.00	0.00
Minimum	61	7.33	3.76	0.48	0.73	1	2	21	2	84	1.09	0.05	0.02	0.01	0.33	0.44	0.32	0.10	1.00	0.00	0.00
Maximum	226	7.58	6.95	3.37	1.60	3	14	44	12	132	1.59	0.10	0.08	0.01	0.48	3.07	0.43	0.48	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	74	0.11	1.54	1.33	0.41	1	6	10	5	20	0.23	0.02	0.03	0.00	0.07	1.22	0.06	0.16	0.25	0.00	0.00

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]
10.02.2010	16	7.54	10.50	0.70	0.64	<1	5	125	35	265	5.20	0.10	0.08	0.01	0.68	1.50	0.32	0.20	<1.00		
21.05.2010	107	7.05	2.92	13.10	1.50	10	14	<1	12	124	2.22	0.10	0.13	0.01	0.63	1.90	0.68	0.33	1.50		
25.08.2010	43	7.36	3.70	4.19	0.63	6	10	10	8	93	2.01	0.09	0.04	<0.01	0.45	1.10	0.55	0.20	<1.00		
20.10.2010	50	7.14	3.83	8.74	3.20	7	10	22	2	160	2.67	0.08	0.09	<0.01	0.75	1.60	1.00	0.46	<1.00		
Lower avg.	54	7.27	5.24	6.68	1.49	6	10	39	14	161	3.03	0.09	0.08	0.00	0.63	1.52	0.64	0.30	0.38	0.00	0.00
Upper avg..	54	7.27	5.24	6.68	1.49	6	10	40	14	161	3.03	0.09	0.08	0.01	0.63	1.52	0.64	0.30	1.12	0.00	0.00
Minimum	16	7.05	2.92	0.70	0.63	1	5	1	2	93	2.01	0.08	0.04	0.01	0.45	1.10	0.32	0.20	1.00	0.00	0.00
Maximum	107	7.54	10.50	13.10	3.20	10	14	125	35	265	5.20	0.10	0.13	0.01	0.75	1.90	1.00	0.46	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	38	0.22	3.53	5.40	1.21	4	4	58	14	75	1.47	0.01	0.04	0.00	0.13	0.33	0.28	0.12	0.25	0.00	0.00

Målselv

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
02.02.2010	32	7.45	9.72	18.90	0.77	12	18	88	2	180	3.23	0.08	0.14	<0.01	0.80	5.00	0.27	0.43	<1.00		
17.05.2010	406	6.93	4.15	73.30	3.70	90	119	<1	39	285	4.13	0.10	0.41	0.02	3.45	3.22	1.20	0.35	<1.00		
03.08.2010	141	7.78	6.83	1.35	1.20	2	3	19	<2	87	1.99	<0.05	0.01	0.01	0.51	0.24	0.44	0.10	<1.00		
11.10.2010	95	7.67	7.29	2.50	2.60	3	6	27	2	155	2.57	0.06	0.03	<0.01	0.65	0.38	0.43	0.30	1.00		
Lower avg.	168	7.46	7.00	24.01	2.07	27	37	34	11	177	2.98	0.06	0.15	0.01	1.35	2.21	0.58	0.30	0.25	0.00	0.00
Upper avg..	168	7.46	7.00	24.01	2.07	27	37	34	11	177	2.98	0.07	0.15	0.01	1.35	2.21	0.58	0.30	1.00	0.00	0.00
Minimum	32	6.93	4.15	1.35	0.77	2	3	1	2	87	1.99	0.05	0.01	0.01	0.51	0.24	0.27	0.10	1.00	0.00	0.00
Maximum	406	7.78	9.72	73.30	3.70	90	119	88	39	285	4.13	0.10	0.41	0.02	3.45	5.00	1.20	0.43	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	164	0.38	2.28	33.82	1.34	42	55	38	19	82	0.92	0.02	0.19	0.01	1.40	2.31	0.42	0.14	0.00	0.00	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]
17.02.2010	24	7.93	30.40	6.52	1.60	4	9	140	28	340	7.81	0.10	0.14	0.03	1.68	50.70	0.32	0.66			
17.05.2010	368	6.99	4.60	104.00	3.60	83	104	<1	7	265	5.13	0.10	0.53	0.01	3.02	3.48	1.20	0.60	<1.00		
03.08.2010	128	7.89	11.50	3.13	1.50	3	6	33	<2	131	2.11	0.06	0.08	<0.01	0.82	0.72	0.63	0.40	<1.00		
11.10.2010	86	7.70	8.40	6.86	2.20	6	10	35	<2	155	2.67	0.10	0.11	<0.01	0.93	0.75	0.66	0.44	1.50		
Lower avg.	152	7.63	13.72	30.13	2.22	24	32	52	9	223	4.43	0.09	0.21	0.01	1.61	13.91	0.70	0.52	0.50	0.00	0.00
Upper avg..	152	7.63	13.72	30.13	2.22	24	32	52	10	223	4.43	0.09	0.21	0.01	1.61	13.91	0.70	0.52	1.17	0.00	0.00
Minimum	24	6.99	4.60	3.13	1.50	3	6	1	2	131	2.11	0.06	0.08	0.01	0.82	0.72	0.32	0.40	1.00	0.00	0.00
Maximum	368	7.93	30.40	104.00	3.60	83	104	140	28	340	7.81	0.10	0.53	0.03	3.02	50.70	1.20	0.66	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	0	0
St.dev	151	0.44	11.47	49.28	0.97	39	48	61	12	98	2.61	0.02	0.21	0.01	1.01	24.56	0.37	0.13	0.29	0.00	0.00

Tanaelva

Date	Qs	pH	KOND	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
DD.MM.YYYY	[m3/s]	[]	[mS/m]	[mg/l]	[mg/l C]	[µg/l P]	[µg/l P]	[µg/l N]	[µg/l N]	[µg/l N]	[mg/l SiO2]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[µg/l]	[ng/l]	[ng/l]	[ng/l]
05.02.2010	33	7.05	7.96	0.39	1.40	2	4	130	10	215	10.76	0.10	0.48	0.04	1.74	6.47	0.20	0.31	<1.00		
05.05.2010	84	7.40	5.89	2.33	3.30	3	9	<1	27	225	6.52	0.10	0.63	0.02	1.11	5.35	0.52	0.60	<1.00		
02.08.2010	292	7.40	3.86	0.98	4.50	3	6	11	7	165	5.52	0.10	0.02	<0.01	0.63	0.92	0.45	0.40	<1.00		
06.10.2010	89	7.33	4.75	1.68	2.70	2	3	23	4	147	7.30	<0.05	0.08	0.03	0.96	5.03	0.42	<0.10	1.00		
Lower avg.	124	7.30	5.62	1.34	2.97	3	6	41	12	188	7.53	0.08	0.30	0.02	1.11	4.44	0.40	0.33	0.25	0.00	0.00
Upper avg..	124	7.30	5.62	1.34	2.97	3	6	41	12	188	7.53	0.09	0.30	0.02	1.11	4.44	0.40	0.35	1.00	0.00	0.00
Minimum	33	7.05	3.86	0.39	1.40	2	3	1	4	147	5.52	0.05	0.02	0.01	0.63	0.92	0.20	0.10	1.00	0.00	0.00
Maximum	292	7.40	7.96	2.33	4.50	3	9	130	27	225	10.76	0.10	0.63	0.04	1.74	6.47	0.52	0.60	1.00	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	115	0.17	1.77	0.84	1.29	1	3	60	10	38	2.28	0.03	0.30	0.02	0.47	2.43	0.14	0.21	0.00	0.00	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]
06.02.2010	37	7.01	3.51	0.19	2.50	<1	3	175	10	280	5.52	0.10	0.03	<0.01	0.50	0.72	0.48	0.10	<1.00		
05.05.2010	268	6.79	1.53	1.61	1.10	1	5	41	13	104	1.90	0.89	0.67	0.03	9.47	6.70	12.40	0.20	1.50		
02.08.2010	228	6.99	3.58	1.82	4.00	3	8	<1	10	195	4.24	0.29	0.08	0.01	3.21	1.70	9.37	0.30	<1.00		
06.10.2010	103	7.24	3.46	1.53	3.20	2	5	5	6	165	4.75	0.08	0.01	<0.01	0.98	0.52	5.18	<0.10	<1.00		
Lower avg.	159	7.01	3.02	1.29	2.70	2	5	55	10	186	4.10	0.34	0.20	0.01	3.54	2.41	6.86	0.15	0.38	0.00	0.00
Upper avg..	159	7.01	3.02	1.29	2.70	2	5	56	10	186	4.10	0.34	0.20	0.01	3.54	2.41	6.86	0.18	1.12	0.00	0.00
Minimum	37	6.79	1.53	0.19	1.10	1	3	1	6	104	1.90	0.08	0.01	0.01	0.50	0.52	0.48	0.10	1.00	0.00	0.00
Maximum	268	7.24	3.58	1.82	4.00	3	8	175	13	280	5.52	0.89	0.67	0.03	9.47	6.70	12.40	0.30	1.50	0.00	0.00
More than 70%LOD	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no	no	no
n	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	0	0
St.dev	108	0.18	1.00	0.74	1.23	1	2	82	3	73	1.56	0.38	0.32	0.01	4.13	2.91	5.18	0.10	0.25	0.00	0.00

Table 2.
Riverine inputs from the 10 main and 36 + 109 tributary rivers in Norway in 2010

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.*	64 840	169 353	109 737	159	339	7 748	517	12 797	90 765	4.157	5.341	0.462	38.002	132.726	17.873	10.715	0.000	0.000	0.000
	upper avg.	64 840	169 353	109 737	159	339	7 748	517	12 797	90 765	4.157	5.341	0.474	38.002	132.726	17.873	11.110	23.666	4.733	33.133
Drammenselva	*lower avg.*	28 664	21 161	37 241	19	66	2 547	136	4 304	30 686	1.425	1.174	0.085	9.465	30.929	4.796	1.913	0.000	0.000	0.000
	upper avg.	28 664	21 161	37 241	21	66	2 547	137	4 304	30 686	1.425	1.174	0.086	9.465	30.929	4.796	2.266	10.462	2.092	14.647
Numedalslågen	*lower avg.*	9 947	14 182	16 388	16	37	786	98	1 560	13 245	0.745	0.981	0.047	2.836	13.586	1.386	0.548	3.151	0.000	0.000
	upper avg.	9 947	14 182	16 388	16	37	786	98	1 560	13 245	0.745	0.981	0.051	2.836	13.586	1.386	0.669	5.146	0.726	5.083
Skienselva	*lower avg.*	23 219	10 145	21 768	6	32	1 223	105	2 224	18 271	1.058	0.525	0.079	4.368	17.253	1.770	1.615	4.471	0.000	0.000
	upper avg.	23 219	10 145	21 768	10	32	1 223	105	2 224	18 271	1.058	0.525	0.079	4.368	17.253	1.770	2.046	8.928	1.662	11.637
Otra	*lower avg.*	9 706	3 165	9 321	1	15	311	59	826	5 642	0.452	0.810	0.056	2.872	12.464	1.623	0.469	1.415	0.000	0.000
	upper avg.	9 706	3 165	9 321	4	15	311	59	826	5 642	0.452	0.810	0.056	2.872	12.464	1.623	0.653	4.014	0.709	4.960
Orreelva	*lower avg.*	360	1 184	694	2	8	79	4	169	450	0.035	0.033	0.001	0.250	0.572	0.157	0.055	0.171	0.000	0.000
	upper avg.	360	1 184	694	2	8	79	4	169	450	0.035	0.033	0.001	0.250	0.572	0.157	0.056	0.216	0.026	0.184
Vosso(Bolstadelvi)	*lower avg.*	5 330	1 333	2 674	2	8	255	13	443	2 027	0.138	0.117	0.010	1.032	5.228	0.632	0.255	0.229	0.000	0.000
	upper avg.	5 330	1 333	2 674	3	8	255	14	443	2 027	0.149	0.117	0.013	1.032	5.228	0.632	0.361	1.972	0.389	2.723
Orkla	*lower avg.*	5 516	6 523	7 640	5	14	286	15	623	5 311	0.343	0.111	0.089	14.813	33.827	1.753	0.878	0.343	0.000	0.000
	upper avg.	5 516	6 523	7 640	5	14	286	15	623	5 311	0.350	0.111	0.089	14.813	33.827	1.753	0.931	2.128	0.403	2.819
Vefsna	*lower avg.*	11 113	6 668	6 567	3	13	160	12	490	5 216	0.473	0.251	0.008	1.447	2.531	1.150	0.852	1.972	0.000	0.000
	upper avg.	11 113	6 668	6 567	5	13	160	13	490	5 216	0.473	0.251	0.023	1.447	2.531	1.155	1.049	4.714	0.811	5.679
Altaelva	*lower avg.*	7 813	2 143	8 963	3	16	111	15	516	10 332	0.336	0.135	0.004	1.819	2.522	0.837	0.564	0.362	0.000	0.000
	upper avg.	7 813	2 143	8 963	5	16	111	17	516	10 332	0.336	0.137	0.016	1.819	2.522	0.841	0.659	3.069	0.570	3.992
TRIBUTARY RIVERS (36)																				
Tista utløp Femsjøen	*lower avg.*	1 782	1 705	5 507	2	8	280	7	472	2 143	0.203	0.181	0.014	1.157	3.210	0.499	0.324	0.000		
	upper avg.	1 782	1 705	5 507	2	8	280	7	472	2 143	0.203	0.181	0.014	1.157	3.210	0.499	0.324	0.650		
Tokkeelva	*lower avg.*	2 074	933	4 510	0	4	95	7	252	2 130	0.154	0.197	0.021	0.397	4.259	0.354	0.140	0.874		
	upper avg.	2 074	933	4 510	1	4	95	7	252	2 130	0.154	0.197	0.021	0.397	4.259	0.354	0.140	1.194		
Nidelva(Rykene)	*lower avg.*	8 323	20 181	13 765	17	22	345	48	1 033	7 076	0.635	1.852	0.081	2.784	15.353	1.149	0.466	0.000		
	upper avg.	8 323	20 181	13 765	17	22	345	48	1 033	7 076	0.635	1.852	0.081	2.784	15.353	1.149	0.529	3.038		
Tovdalselva	*lower avg.*	3 773	1 391	7 229	3	7	132	51	463	2 823	0.321	0.708	0.043	1.048	9.171	0.546	0.121	0.771		
	upper avg.	3 773	1 391	7 229	3	7	132	51	463	2 823	0.321	0.708	0.043	1.048	9.171	0.546	0.215	1.707		
Mandalselva	*lower avg.*	4 499	2 997	7 884	3	10	255	35	604	2 752	0.324	0.815	0.042	1.158	7.104	0.419	0.129	2.771		

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.	4 499	2 997	7 884	3	10	255	35	604	2 752	0.324	0.815	0.042	1.158	7.104	0.419	0.164	3.405		
Lyngdalselva	*lower avg.*	1 621	721	2 443	1	4	119	11	235	970	0.129	0.223	0.014	0.720	2.733	0.096	0.007	0.147		
	upper avg.	1 621	721	2 443	1	4	119	11	235	970	0.129	0.223	0.014	0.720	2.733	0.096	0.059	0.592		
Kvina	*lower avg.*	3 441	2 952	6 670	4	12	203	23	501	1 874	0.298	0.732	0.027	4.078	6.451	1.313	0.179	0.301		
	upper avg.	3 441	2 952	6 670	4	12	203	23	501	1 874	0.298	0.732	0.027	4.078	6.451	1.313	0.193	1.256		
Sira	*lower avg.*	6 831	2 139	5 086	2	10	257	59	590	2 567	0.249	0.677	0.025	1.986	6.178	0.247	0.033	1.972		
	upper avg.	6 831	2 139	5 086	3	10	257	59	590	2 567	0.249	0.677	0.025	1.986	6.178	0.247	0.249	3.151		
Bjerkreimselva	*lower avg.*	2 746	1 147	2 018	6	9	348	17	520	1 560	0.100	0.280	0.019	0.367	2.598	0.207	0.011	0.955		
	upper avg.	2 746	1 147	2 018	6	9	348	17	520	1 560	0.100	0.280	0.019	0.367	2.598	0.207	0.100	1.321		
Figgjoelva	*lower avg.*	404	1 646	633	5	8	154	11	217	464	0.037	0.120	0.003	0.341	1.177	0.112	0.052	0.369		
	upper avg.	404	1 646	633	5	8	154	11	217	464	0.037	0.120	0.003	0.341	1.177	0.112	0.052	0.434		
Lyseelva	*lower avg.*	624	25	176	0	0	35	1	45	439	0.008	0.018	0.002	0.049	0.279	0.013	0.015	0.000		
	upper avg.	624	29	176	0	0	35	1	45	439	0.013	0.018	0.002	0.049	0.279	0.015	0.026	0.228		
Årdalselva	*lower avg.*	1 739	296	1 053	1	1	107	5	164	990	0.024	0.111	0.005	0.407	2.085	0.120	0.104	2.947		
	upper avg.	1 739	296	1 053	1	1	107	5	164	990	0.038	0.111	0.005	0.407	2.085	0.120	0.137	3.355		
Ulladalsåna (Ulla)	*lower avg.*	1 594	238	843	1	2	49	3	95	1 130	0.035	0.045	0.003	0.145	0.536	0.038	0.171	0.000		
	upper avg.	1 594	238	843	1	2	49	4	95	1 130	0.035	0.045	0.004	0.145	0.536	0.038	0.171	0.582		
Suldalslågen	*lower avg.*	3 807	2 334	1 213	2	5	186	6	268	1 257	0.090	0.163	0.009	0.368	2.996	0.201	0.050	0.836		
	upper avg.	3 807	2 334	1 213	3	5	186	7	268	1 257	0.102	0.163	0.009	0.372	2.996	0.201	0.153	2.086		
Saudaelva	*lower avg.*	1 675	502	683	1	2	104	3	152	570	0.044	0.082	0.005	0.368	1.102	0.098	0.017	0.536		
	upper avg.	1 675	502	683	1	2	104	3	152	570	0.044	0.082	0.005	0.368	1.102	0.098	0.072	0.933		
Vikedalselva	*lower avg.*	559	3 285	456	3	7	52	6	103	270	0.088	0.113	0.004	0.306	0.946	0.108	0.044	0.000		
	upper avg.	559	3 285	456	3	7	52	6	103	270	0.088	0.113	0.004	0.306	0.946	0.108	0.044	0.204		
Jostedøla	*lower avg.*	4 471	31 435	994	11	31	129	5	253	6 011	0.000	0.656	0.007	2.152	7.663	1.401	1.943	1.437		
	upper avg.	4 471	31 435	994	12	31	129	5	253	6 011	0.082	0.656	0.011	2.152	7.663	1.405	1.951	2.089		
Gaular	*lower avg.*	3 465	940	3 793	4	10	53	6	279	1 413	0.017	0.091	0.002	0.423	1.507	0.185	0.059	2.921		
	upper avg.	3 465	940	3 793	5	10	53	6	279	1 413	0.063	0.091	0.006	0.423	1.507	0.185	0.150	3.601		
Jølstra	*lower avg.*	3 786	790	2 245	2	5	141	7	314	1 470	0.000	0.045	0.003	0.295	1.452	0.110	0.011	0.000		
	upper avg.	3 786	790	2 245	2	5	141	7	314	1 470	0.069	0.045	0.008	0.295	1.452	0.110	0.138	1.382		
Nausta	*lower avg.*	1 458	357	1 119	1	3	30	4	105	633	0.004	0.030	0.001	0.114	0.414	0.052	0.004	0.000		
	upper avg.	1 458	357	1 119	1	3	30	4	105	633	0.027	0.030	0.003	0.114	0.414	0.052	0.053	0.532		

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.*	2 875	956	889	1	3	162	4	245	1 132	0.020	0.020	0.000	0.473	0.767	0.170	0.029	0.000		
	upper avg.	2 875	956	889	2	3	162	4	245	1 132	0.052	0.020	0.005	0.473	0.767	0.170	0.124	1.049		
Driva	*lower avg.*	5 780	2 110	2 429	3	7	223	8	418	5 373	0.057	0.025	0.000	1.970	0.610	0.274	0.220	0.000		
	upper avg.	5 780	2 110	2 429	3	7	223	9	418	5 373	0.124	0.026	0.011	1.970	0.610	0.274	0.289	2.110		
Surna	*lower avg.*	3 535	1 188	3 977	1	6	204	5	376	2 615	0.050	0.026	0.000	0.917	0.610	0.613	0.340	0.000		
	upper avg.	3 535	1 188	3 977	2	6	204	5	376	2 615	0.073	0.026	0.006	0.917	0.610	0.613	0.352	1.290		
Gaula	*lower avg.*	7 098	13 689	12 197	9	19	461	29	1 014	9 593	0.448	0.312	0.020	4.663	7.092	4.510	2.026	1.054		
	upper avg.	7 098	13 689	12 197	9	19	461	31	1 014	9 593	0.448	0.312	0.020	4.663	7.092	4.510	2.026	2.942		
Nidelva(Tr.heim)	*lower avg.*	6 432	4 367	6 629	3	10	200	6	524	4 661	0.222	0.098	0.000	2.353	2.398	1.912	0.776	0.655		
	upper avg.	6 432	4 367	6 629	3	10	200	8	524	4 661	0.222	0.098	0.012	2.353	2.398	1.912	0.776	2.348		
Stjørdalselva	*lower avg.*	4 193	8 318	6 879	5	12	178	2	422	2 656	0.138	0.157	0.013	4.352	6.383	1.113	0.530	0.560		
	upper avg.	4 193	8 318	6 879	5	12	178	5	422	2 656	0.138	0.157	0.013	4.352	6.383	1.113	0.530	1.717		
Verdalselva	*lower avg.*	3 087	3 627	4 701	3	6	126	7	305	2 209	0.121	0.101	0.001	1.688	2.049	0.699	0.360	0.426		
	upper avg.	3 087	3 627	4 701	3	6	126	8	305	2 209	0.121	0.101	0.006	1.688	2.049	0.699	0.360	1.268		
Snåsavassdraget	*lower avg.*	1 734	1 112	2 805	1	3	109	3	220	1 000	0.062	0.032	0.000	0.893	0.743	0.287	0.115	0.138		
	upper avg.	1 734	1 112	2 805	1	3	109	3	220	1 000	0.062	0.032	0.003	0.893	0.743	0.287	0.129	0.633		
Namsen	*lower avg.*	2 557	2 408	3 994	2	5	51	7	195	1 698	0.114	0.120	0.008	0.769	1.794	0.732	0.364	0.679		
	upper avg.	2 557	2 408	3 994	2	5	51	7	195	1 698	0.114	0.120	0.010	0.769	1.794	0.732	0.364	1.056		
Røssåga	*lower avg.*	6 451	1 106	2 124	3	6	99	4	240	1 905	0.151	0.063	0.000	0.711	3.583	0.938	0.390	0.000		
	upper avg.	6 451	1 140	2 124	4	6	99	6	240	1 905	0.176	0.063	0.012	0.711	3.583	0.938	0.439	2.355		
Ranaelva	*lower avg.*	13 037	7 589	5 040	6	20	152	12	505	5 984	0.309	0.188	0.000	1.843	4.801	1.664	1.104	0.853		
	upper avg.	13 037	7 589	5 040	8	20	152	18	505	5 984	0.361	0.188	0.024	1.843	4.801	1.664	1.208	5.043		
Beiarelva	*lower avg.*	2 461	8 702	1 545	7	11	14	9	124	2 258	0.084	0.091	0.004	0.570	1.497	0.640	0.298	0.698		
	upper avg.	2 461	8 702	1 545	7	11	15	9	124	2 258	0.084	0.091	0.006	0.570	1.497	0.640	0.298	1.131		
Målselv	*lower avg.*	7 801	130 643	8 392	159	212	34	68	636	9 806	0.213	0.751	0.037	6.626	6.493	2.536	0.860	0.515		
	upper avg.	7 801	130 643	8 392	159	212	36	69	636	9 806	0.237	0.751	0.040	6.626	6.493	2.536	0.860	2.847		
Barduelva	*lower avg.*	7 084	163 461	7 424	131	167	48	14	577	10 952	0.240	0.904	0.018	5.611	11.543	2.475	1.386	0.463		
	upper avg.	7 084	163 461	7 424	131	167	49	16	577	10 952	0.240	0.904	0.023	5.611	11.543	2.475	1.386	2.740		
Tanaelva	*lower avg.*	14 363	7 077	19 209	14	30	101	52	912	33 788	0.396	0.878	0.065	4.511	15.882	2.305	1.737	1.283		
	upper avg.	14 363	7 077	19 209	14	30	102	52	912	33 788	0.460	0.878	0.079	4.511	15.882	2.305	1.865	5.242		
Pasvikelva	*lower avg.*	13 886	8 027	12 826	9	30	139	53	784	17 405	2.466	1.567	0.086	26.423	17.703	46.985	0.926	3.192		

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.	13 886	8 027	12 826	9	30	141	53	784	17 405	2.466	1.567	0.093	26.423	17.703	46.985	1.035	6.132		
TRIBUTARY RIVERS(109)																				
Mosselva	*lower avg.*	685	1 683	1 931	1	7	109	4	229	105	0.094	0.065	0.001	0.375	0.373	0.255	0.000	0.375		
	upper avg.	685	1 683	1 931	1	7	109	4	229	105	0.094	0.065	0.001	0.375	0.373	0.255	0.002	0.375		
Hølenelva	*lower avg.*	109	265	397	1	3	56	2	77	352	0.027	0.021	0.000	0.097	0.172	0.113	0.000	0.100		
	upper avg.	109	265	397	1	3	56	2	77	352	0.027	0.021	0.000	0.097	0.172	0.113	0.000	0.100		
Årungelva	*lower avg.*	49	51	105	0	1	50	0	62	44	0.003	0.001	0.000	0.034	0.017	0.021	0.000	0.027		
	upper avg.	49	51	105	0	1	50	0	62	44	0.003	0.001	0.000	0.034	0.017	0.021	0.000	0.027		
Gjersjøelva	*lower avg.*	84	26	219	0	0	35	1	46	152	0.008	0.002	0.000	0.046	0.012	0.065	0.000	0.069		
	upper avg.	84	26	219	0	0	35	1	46	152	0.008	0.002	0.000	0.046	0.012	0.065	0.000	0.069		
Ljanselva	*lower avg.*	50	109	97	1	2	17	1	22	116	0.010	0.004	0.000	0.044	0.000	0.046	0.009	0.054		
	upper avg.	50	109	97	1	2	17	1	22	116	0.010	0.004	0.000	0.044	0.000	0.046	0.009	0.054		
Loelva	*lower avg.*	84	487	180	2	4	34	7	54	220	0.017	0.029	0.001	0.133	0.285	0.053	0.024	0.000		
	upper avg.	84	487	180	2	4	34	7	54	220	0.017	0.029	0.001	0.133	0.285	0.053	0.024	0.031		
Akerselva	*lower avg.*	273	116	407	0	2	21	3	41	354	0.025	0.063	0.001	0.137	0.497	0.032	0.007	0.424		
	upper avg.	273	116	407	0	2	21	3	41	354	0.025	0.063	0.001	0.137	0.497	0.032	0.007	0.424		
Frognerelva	*lower avg.*	24	27	39	0	0	11	1	15	54	0.004	0.000	0.000	0.042	0.016	0.014	0.002	0.031		
	upper avg.	24	27	39	0	0	11	1	15	54	0.004	0.000	0.000	0.042	0.016	0.014	0.002	0.031		
Lysakerelva	*lower avg.*	233	88	475	0	0	16	1	25	197	0.028	0.008	0.000	0.000	0.040	0.004	0.009	0.170		
	upper avg.	233	88	475	0	0	16	1	25	197	0.028	0.008	0.000	0.001	0.040	0.004	0.009	0.170		
Sandvikselva	*lower avg.*	242	103	459	0	2	16	1	28	411	0.032	0.000	0.000	0.052	0.000	0.030	0.042	0.000		
	upper avg.	242	103	459	0	2	16	1	28	411	0.032	0.000	0.000	0.052	0.001	0.030	0.042	0.000		
Åroselva	*lower avg.*	149	688	386	1	1	86	2	98	367	0.036	0.052	0.002	0.120	0.202	0.059	0.065	0.095		
	upper avg.	149	688	386	1	1	86	2	98	367	0.036	0.052	0.002	0.120	0.202	0.059	0.065	0.095		
Lierelva	*lower avg.*	399	5 395	1 059	2	7	115	0	133	1 038	0.119	0.204	0.007	0.360	1.964	0.179	0.276	0.519		
	upper avg.	399	5 395	1 059	2	7	115	0	133	1 038	0.119	0.204	0.007	0.360	1.964	0.179	0.276	0.519		
Sandeelva	*lower avg.*	243	740	396	0	1	37	2	58	326	0.068	0.122	0.011	0.293	3.215	0.111	0.063	0.133		
	upper avg.	243	740	396	0	1	37	2	58	326	0.068	0.122	0.011	0.293	3.215	0.111	0.063	0.133		
Aulielva	*lower avg.*	412	2 100	949	7	25	219	16	260	1 278	0.139	0.077	0.009	0.408	0.757	0.410	0.110	0.658		
	upper avg.	412	2 100	949	7	25	219	16	260	1 278	0.139	0.077	0.009	0.408	0.757	0.410	0.110	0.658		
Farriselva-Siljanvassdraget	*lower avg.*	1 071	270	1 863	1	1	131	2	194	1 478	0.059	0.000	0.017	0.000	3.983	0.033	0.008	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.	1 071	270	1 863	1	1	131	2	194	1 478	0.059	0.002	0.017	0.003	3.983	0.033	0.008	0.391		
Gjerstadelva	*lower avg.*	771	339	1 538	0	2	49	8	99	478	0.068	0.132	0.003	0.142	1.327	0.167	0.017	0.422		
	upper avg.	771	339	1 538	0	2	49	8	99	478	0.068	0.132	0.003	0.142	1.327	0.167	0.017	0.422		
Vegårdselva	*lower avg.*	799	377	1 583	1	2	40	3	91	286	0.080	0.082	0.007	0.175	0.064	0.158	0.029	0.291		
	upper avg.	799	377	1 583	1	2	40	3	91	286	0.080	0.082	0.007	0.175	0.064	0.158	0.029	0.291		
Søgneelva-Songdalselva	*lower avg.*	480	169	771	0	2	69	4	103	112	0.046	0.069	0.009	0.095	0.936	0.092	0.000	0.175		
	upper avg.	480	169	771	0	2	69	4	103	112	0.046	0.069	0.009	0.095	0.936	0.092	0.001	0.175		
Audnedalselva	*lower avg.*	782	271	1 042	0	1	86	3	138	261	0.056	0.123	0.008	0.087	1.637	0.097	0.000	0.357		
	upper avg.	782	271	1 042	0	1	86	3	138	261	0.056	0.123	0.008	0.087	1.637	0.097	0.002	0.357		
Soknedalselva	*lower avg.*	1 069	492	730	1	3	98	7	139	461	0.062	0.113	0.009	0.195	1.251	0.939	0.028	0.488		
	upper avg.	1 069	492	730	1	3	98	7	139	461	0.062	0.113	0.009	0.195	1.251	0.939	0.028	0.488		
Hellelandselva	*lower avg.*	936	368	798	1	2	100	5	147	356	0.051	0.133	0.007	0.126	1.136	0.108	0.026	0.427		
	upper avg.	936	368	798	1	2	100	5	147	356	0.051	0.133	0.007	0.126	1.136	0.108	0.026	0.427		
Håelva	*lower avg.*	296	289	512	2	4	106	8	185	278	0.048	0.018	0.001	0.095	0.435	0.058	0.000	0.162		
	upper avg.	296	289	512	2	4	106	8	185	278	0.048	0.018	0.001	0.095	0.435	0.058	0.001	0.162		
Imselva	*lower avg.*	237	81	294	0	1	46	1	63	3	0.009	0.008	0.001	0.045	0.165	0.041	0.000	0.086		
	upper avg.	237	81	294	0	1	46	1	63	3	0.009	0.008	0.001	0.045	0.165	0.041	0.001	0.086		
Oltedalselva,utløp Ragsvatnet	*lower avg.*	421	105	255	0	0	43	2	52	315	0.010	0.023	0.003	0.062	0.456	0.063	0.017	0.000		
	upper avg.	421	105	255	0	0	43	2	52	315	0.010	0.023	0.003	0.062	0.456	0.063	0.017	0.154		
Dirdalsåna	*lower avg.*	659	93	397	0	1	60	1	80	239	0.026	0.044	0.002	0.064	0.308	0.177	0.000	0.301		
	upper avg.	659	93	397	0	1	60	1	80	239	0.026	0.044	0.002	0.064	0.308	0.177	0.002	0.301		
Frafjordelva	*lower avg.*	743	134	429	0	1	53	3	68	251	0.019	0.062	0.003	0.084	0.259	0.014	0.025	0.271		
	upper avg.	743	134	429	0	1	53	3	68	251	0.019	0.062	0.003	0.084	0.259	0.014	0.025	0.271		
Espedalselva	*lower avg.*	576	114	292	0	1	37	1	59	300	0.011	0.027	0.001	0.012	0.142	0.037	0.041	0.210		
	upper avg.	576	114	292	0	1	37	1	59	300	0.011	0.027	0.001	0.012	0.142	0.037	0.041	0.210		
Førrelva	*lower avg.*	661	121	424	0	1	15	0	22	389	0.014	0.035	0.001	0.026	0.103	0.055	0.021	0.000		
	upper avg.	661	121	424	0	1	15	0	22	389	0.014	0.035	0.001	0.026	0.103	0.055	0.021	0.483		
Åbøelva	*lower avg.*	389	60	128	0	0	13	0	18	47	0.010	0.009	0.001	0.019	0.133	0.027	0.038	0.178		
	upper avg.	389	60	128	0	0	13	0	18	47	0.010	0.009	0.001	0.019	0.133	0.027	0.038	0.178		
Etneelva	*lower avg.*	901	249	384	0	1	102	1	130	227	0.057	0.025	0.005	0.127	0.360	0.270	0.378	0.576		
	upper avg.	901	249	384	0	1	102	1	130	227	0.057	0.025	0.005	0.127	0.360	0.270	0.378	0.576		

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.*	2 601	2 690	791	3	2	89	10	150	1 128	0.191	0.380	0.000	0.238	1.514	0.324	0.000	0.000		
	upper avg.	2 601	2 690	791	3	2	89	10	150	1 128	0.191	0.380	0.000	0.238	1.514	0.324	0.008	0.949		
Tysso	*lower avg.*	1 674	232	996	1	0	91	3	123	448	0.068	0.031	0.003	0.517	2.105	0.403	0.078	0.917		
	upper avg.	1 674	232	996	1	0	91	3	123	448	0.068	0.031	0.003	0.517	2.105	0.403	0.078	0.917		
Kinso	*lower avg.*	897	324	186	1	0	9	3	29	64	0.033	0.016	0.000	0.000	0.024	0.036	0.090	0.327		
	upper avg.	897	324	186	1	0	9	3	29	64	0.033	0.016	0.000	0.000	0.024	0.036	0.090	0.327		
Veig	*lower avg.*	1 583	347	570	1	1	16	2	52	773	0.027	0.027	0.001	0.047	0.000	0.246	0.133	0.578		
	upper avg.	1 583	347	570	1	1	16	2	52	773	0.027	0.027	0.001	0.047	0.006	0.246	0.133	0.578		
Bjoreio	*lower avg.*	1 889	493	1 452	1	2	29	3	73	709	0.063	0.050	0.000	0.243	0.160	0.414	0.000	0.690		
	upper avg.	1 889	493	1 452	1	2	29	3	73	709	0.063	0.050	0.000	0.243	0.160	0.414	0.006	0.690		
Sima	*lower avg.*	463	129	71	0	0	14	1	22	380	0.012	0.005	0.000	0.017	0.122	0.051	0.007	0.169		
	upper avg.	463	129	71	0	0	14	1	22	380	0.012	0.005	0.000	0.017	0.122	0.051	0.007	0.169		
Austdøla	*lower avg.*	382	89	44	0	0	11	1	16	42	0.008	0.008	0.001	0.017	0.063	0.015	0.006	0.174		
	upper avg.	382	89	44	0	0	11	1	16	42	0.008	0.008	0.001	0.017	0.063	0.015	0.006	0.174		
Nordøla /Austdøla	*lower avg.*	114	41	8	0	0	5	0	6	51	0.004	0.002	0.000	0.005	0.000	0.021	0.002	0.000		
	upper avg.	114	41	8	0	0	5	0	6	51	0.004	0.002	0.000	0.005	0.000	0.021	0.002	0.042		
Tysselvi Samnangervassdraget	*lower avg.*	1 168	265	721	1	1	36	3	75	102	0.039	0.070	0.006	0.124	0.597	0.102	0.000	0.426		
	upper avg.	1 168	265	721	1	1	36	3	75	102	0.039	0.070	0.006	0.124	0.597	0.102	0.003	0.426		
Oselva	*lower avg.*	525	205	628	1	2	27	2	62	181	0.029	0.050	0.004	0.192	0.000	0.102	0.000	0.000		
	upper avg.	525	205	628	1	2	27	2	62	181	0.029	0.050	0.004	0.192	0.002	0.102	0.002	0.192		
DaleelviBergsdalsvassdraget	*lower avg.*	1 076	272	442	1	1	32	3	69	201	0.032	0.075	0.005	0.133	0.652	0.096	0.000	0.000		
	upper avg.	1 076	272	442	1	1	32	3	69	201	0.032	0.075	0.005	0.133	0.652	0.096	0.003	0.393		
Ekso -Storelvi	*lower avg.*	2 295	586	1 245	2	3	45	6	134	161	0.028	0.105	0.008	0.000	0.000	0.142	0.054	0.000		
	upper avg.	2 295	586	1 245	2	3	45	6	134	161	0.028	0.105	0.008	0.006	0.008	0.142	0.054	0.838		
Modalselva -Moelvi	*lower avg.*	2 243	409	701	0	3	71	4	106	452	0.025	0.106	0.008	0.000	0.193	0.170	0.149	0.000		
	upper avg.	2 243	409	701	0	3	71	4	106	452	0.025	0.106	0.008	0.006	0.193	0.170	0.149	0.819		
Nærøydalselvi	*lower avg.*	936	275	208	1	1	25	2	51	819	0.017	0.000	0.000	0.078	0.295	0.030	0.073	0.342		
	upper avg.	936	275	208	1	1	25	2	51	819	0.017	0.002	0.000	0.078	0.295	0.030	0.073	0.342		
Flåmselvi	*lower avg.*	672	303	105	0	0	14	2	25	151	0.024	0.006	0.000	0.027	0.153	0.069	0.047	0.000		
	upper avg.	672	303	105	0	0	14	2	25	151	0.024	0.006	0.000	0.027	0.153	0.069	0.047	0.245		
Aurlandselvi	*lower avg.*	1 953	688	427	1	1	63	3	93	759	0.057	0.107	0.000	0.236	0.604	0.172	0.035	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.	1 953	688	427	1	1	63	3	93	759	0.057	0.107	0.000	0.236	0.604	0.172	0.035	0.713		
Erdalselvi	*lower avg.*	270	52	94	0	0	0	0	8	57	0.005	0.004	0.000	0.008	0.008	0.008	0.024	0.000		
	upper avg.	270	52	94	0	0	0	0	8	57	0.005	0.004	0.000	0.008	0.008	0.008	0.024	0.099		
Lærdalselva /Mjeldo	*lower avg.*	2 295	524	662	1	2	71	3	140	925	0.056	0.050	0.000	0.268	0.337	0.182	0.137	0.000		
	upper avg.	2 295	524	662	1	2	71	3	140	925	0.056	0.050	0.000	0.268	0.337	0.182	0.137	0.838		
Årdalselvi	*lower avg.*	2 213	549	565	1	2	54	4	92	1 337	0.032	0.015	0.004	0.808	0.283	0.213	0.000	2.423		
	upper avg.	2 213	549	565	1	2	54	4	92	1 337	0.032	0.015	0.004	0.808	0.283	0.213	0.000	2.423		
Fortundalselva	*lower avg.*	1 603	1 591	266	1	2	53	2	74	838	0.089	0.035	0.007	0.505	0.670	0.155	0.082	1.170		
	upper avg.	1 603	1 591	266	1	2	53	2	74	838	0.089	0.035	0.007	0.505	0.670	0.155	0.082	1.170		
Mørkrisdalselvi	*lower avg.*	890	1 409	139	0	0	19	1	34	600	0.023	0.042	0.000	0.178	0.565	0.164	0.115	0.000		
	upper avg.	890	1 409	139	0	0	19	1	34	600	0.023	0.042	0.000	0.178	0.565	0.164	0.115	0.325		
Årøyelva	*lower avg.*	1 824	821	506	1	2	45	4	86	959	0.037	0.051	0.000	0.044	0.474	0.088	0.113	0.000		
	upper avg.	1 824	821	506	1	2	45	4	86	959	0.037	0.051	0.000	0.044	0.474	0.088	0.113	0.666		
Sogndalselva	*lower avg.*	704	172	310	1	1	21	2	41	105	0.023	0.026	0.003	0.051	0.418	0.016	0.098	0.000		
	upper avg.	704	172	310	1	1	21	2	41	105	0.023	0.026	0.003	0.051	0.418	0.016	0.098	0.257		
Oselva	*lower avg.*	1 700	422	1 551	0	3	33	9	96	366	0.102	0.060	0.000	0.199	1.055	0.195	0.000	0.931		
	upper avg.	1 700	422	1 551	0	3	33	9	96	366	0.102	0.060	0.000	0.199	1.055	0.195	0.005	0.931		
Hopselva	*lower avg.*	489	135	125	0	0	16	1	23	43	0.010	0.016	0.002	0.005	0.185	0.013	0.073	0.179		
	upper avg.	489	135	125	0	0	16	1	23	43	0.010	0.016	0.002	0.005	0.185	0.013	0.073	0.179		
Åäelva (Gjengedalselva)	*lower avg.*	1 126	325	613	0	2	25	2	50	125	0.034	0.025	0.000	0.076	0.321	0.038	0.078	0.802		
	upper avg.	1 126	325	613	0	2	25	2	50	125	0.034	0.025	0.000	0.076	0.321	0.038	0.078	0.802		
Oldenelva	*lower avg.*	958	507	271	0	1	45	4	70	400	0.073	0.037	0.003	0.105	0.228	0.050	0.038	0.000		
	upper avg.	958	507	271	0	1	45	4	70	400	0.073	0.037	0.003	0.105	0.228	0.050	0.038	0.350		
Loelvi	*lower avg.*	1 107	626	202	0	2	35	2	56	556	0.088	0.029	0.004	0.116	0.059	0.032	0.099	0.000		
	upper avg.	1 107	626	202	0	2	35	2	56	556	0.088	0.029	0.004	0.116	0.059	0.032	0.099	0.404		
Stryneelva	*lower avg.*	2 257	1 057	412	1	3	79	5	145	969	0.091	0.049	0.005	0.498	0.741	0.160	0.143	0.824		
	upper avg.	2 257	1 057	412	1	3	79	5	145	969	0.091	0.049	0.005	0.498	0.741	0.160	0.143	0.824		
Hornindalselva(Horndøla)	*lower avg.*	1 679	460	736	0	3	74	5	109	712	0.070	0.018	0.003	0.175	0.493	0.188	0.000	0.613		
	upper avg.	1 679	460	736	0	3	74	5	109	712	0.070	0.018	0.003	0.175	0.493	0.188	0.005	0.613		
Ørstaelva	*lower avg.*	797	241	455	3	6	29	4	60	487	0.027	0.005	0.000	0.094	0.274	0.081	0.000	0.291		
	upper avg.	797	241	455	3	6	29	4	60	487	0.027	0.005	0.000	0.094	0.274	0.081	0.002	0.291		

River	Estimate	Flow rate	SPM	TOC	PO4-P	TOTP	NO3-N	NH4-N	TOTN	SiO2	As	Pb	Cd	Cu	Zn	Ni	Cr	Hg	HCHG	SUMPCB
		1000 m3/d	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[tonnes]	[kg]	[kg]	[kg]
Valldøla	*lower avg.*	1 526	334	287	0	1	0	3	0	406	0.028	0.003	0.001	0.106	0.391	0.050	0.031	0.000		
	upper avg.	1 526	334	287	0	1	0	3	6	406	0.028	0.003	0.001	0.106	0.391	0.050	0.031	0.557		
Rauma	*lower avg.*	4 303	895	951	1	3	27	8	87	1 200	0.089	0.052	0.000	0.478	0.793	0.266	0.000	0.000		
	upper avg.	4 303	895	951	1	3	27	8	87	1 200	0.089	0.052	0.000	0.478	0.793	0.266	0.013	1.571		
Isa	*lower avg.*	633	184	126	0	1	3	1	4	361	0.012	0.000	0.000	0.072	0.008	0.051	0.056	0.231		
	upper avg.	633	184	126	0	1	3	1	4	361	0.012	0.001	0.000	0.072	0.008	0.051	0.056	0.231		
Eira	*lower avg.*	3 901	0	837	1	2	150	6	211	2 838	0.142	0.018	0.000	0.406	0.377	0.171	0.356	2.136		
	upper avg.	3 901	71	837	1	2	150	6	211	2 838	0.142	0.018	0.000	0.406	0.377	0.171	0.356	2.136		
Litledalselva	*lower avg.*	783	163	172	0	0	40	1	45	1 024	0.016	0.000	0.000	0.010	0.014	0.189	0.080	0.000		
	upper avg.	783	163	172	0	0	40	1	45	1 024	0.016	0.001	0.000	0.010	0.014	0.189	0.080	0.286		
Ålvunda	*lower avg.*	653	346	421	0	1	31	2	55	460	0.010	0.019	0.000	0.199	0.179	0.047	0.013	0.298		
	upper avg.	653	346	421	0	1	31	2	55	460	0.010	0.019	0.000	0.199	0.179	0.047	0.013	0.298		
Toåa	*lower avg.*	824	174	378	0	1	5	1	29	324	0.009	0.014	0.000	0.135	0.066	0.014	0.000	0.000		
	upper avg.	824	174	378	0	1	5	1	29	324	0.009	0.014	0.000	0.135	0.066	0.014	0.002	0.301		
Bøvra	*lower avg.*	716	196	666	0	0	33	2	67	353	0.021	0.007	0.002	0.062	0.060	0.046	0.011	0.000		
	upper avg.	716	196	666	0	0	33	2	67	353	0.021	0.007	0.002	0.062	0.060	0.046	0.011	0.261		
Børselva	*lower avg.*	194	312	394	0	1	22	2	42	96	0.015	0.004	0.000	0.099	0.000	0.099	0.011	0.248		
	upper avg.	194	312	394	0	1	22	2	42	96	0.015	0.004	0.000	0.099	0.001	0.099	0.011	0.248		
Vigda	*lower avg.*	292	1 120	397	0	1	20	1	38	213	0.019	0.006	0.000	0.099	0.000	0.000	0.000	0.240		
	upper avg.	292	1 120	397	0	1	20	1	38	213	0.019	0.006	0.000	0.099	0.001	0.001	0.001	0.240		
Homla	*lower avg.*	326	81	797	0	1	5	2	26	190	0.058	0.002	0.001	0.077	0.000	0.059	0.000	0.238		
	upper avg.	326	81	797	0	1	5	2	26	190	0.058	0.002	0.001	0.077	0.001	0.059	0.001	0.238		
Gråe	*lower avg.*	184	153	369	0	1	30	2	48	13	0.022	0.000	0.000	0.073	0.000	0.026	0.017	0.000		
	upper avg.	184	153	369	0	1	30	2	48	13	0.022	0.000	0.000	0.073	0.001	0.026	0.017	0.067		
Figgja	*lower avg.*	449	1 040	1 252	1	2	61	1	76	246	0.046	0.027	0.001	0.180	0.107	0.139	0.061	0.000		
	upper avg.	449	1 040	1 252	1	2	61	1	76	246	0.046	0.027	0.001	0.180	0.107	0.139	0.061	0.164		
Årgårdselva	*lower avg.*	1 146	1 168	2 788	1	7	41	7	155	635	0.018	0.040	0.000	0.284	0.132	0.187	0.000	1.328		
	upper avg.	1 146	1 168	2 788	1	7	41	7	155	635	0.018	0.040	0.000	0.284	0.132	0.187	0.003	1.328		
Moelva(Salsvatenelva)	*lower avg.*	1 234	232	895	0	0	26	3	55	450	0.046	0.009	0.002	0.000	0.462	0.057	0.000	0.000		
	upper avg.	1 234	232	895	0	0	26	3	55	450	0.046	0.009	0.002	0.003	0.462	0.057	0.004	0.450		
Åelva(Åbjøra)	*lower avg.*	1 817	495	681	1	2	20	6	62	267	0.049	0.030	0.000	0.106	0.431	0.161	0.067	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.	1 817	495	681	1	2	20	6	62	267	0.049	0.030	0.000	0.106	0.431	0.161	0.067	0.663		
Skjerva	*lower avg.*	303	205	370	1	2	11	8	48	145	0.027	0.034	0.002	0.117	0.222	0.165	0.006	0.221		
	upper avg.	303	205	370	1	2	11	8	48	145	0.027	0.034	0.002	0.117	0.222	0.165	0.006	0.221		
Fusta	*lower avg.*	1 999	646	648	1	3	10	15	83	331	0.094	0.013	0.015	0.100	0.504	0.164	0.000	0.730		
	upper avg.	1 999	646	648	1	3	10	15	83	331	0.094	0.013	0.015	0.100	0.504	0.164	0.006	0.730		
Drevja	*lower avg.*	648	354	176	0	0	4	1	20	73	0.006	0.000	0.004	0.054	0.088	0.014	0.000	0.000		
	upper avg.	648	354	176	0	0	4	1	20	73	0.006	0.001	0.004	0.054	0.088	0.014	0.002	0.237		
Bjerkaelva	*lower avg.*	1 190	410	828	1	0	11	4	44	356	0.019	0.037	0.001	0.219	0.296	0.275	0.015	1.086		
	upper avg.	1 190	410	828	1	0	11	4	44	356	0.019	0.037	0.001	0.219	0.296	0.275	0.015	1.086		
Dalselva	*lower avg.*	715	166	408	0	1	2	2	18	210	0.000	0.009	0.000	0.098	0.002	0.126	0.021	0.718		
	upper avg.	715	166	408	0	1	2	2	18	210	0.003	0.009	0.000	0.098	0.002	0.126	0.021	0.718		
Fykanåga	*lower avg.*	1 274	862	232	1	1	17	3	38	162	0.088	0.000	0.000	0.053	0.239	0.053	0.000	0.000		
	upper avg.	1 274	862	232	1	1	17	3	38	162	0.088	0.002	0.000	0.053	0.239	0.053	0.004	0.465		
Saltelva	*lower avg.*	2 938	4 408	523	2	0	24	5	90	2 011	0.105	0.000	0.000	0.250	1.245	0.300	2.456	0.000		
	upper avg.	2 938	4 408	523	2	1	24	5	90	2 011	0.105	0.005	0.000	0.250	1.245	0.300	2.456	1.072		
SulitjelmavassdragetUtl Øvrevt	*lower avg.*	2 474	0	948	2	0	10	7	54	582	0.000	0.000	0.000	0.000	0.000	0.141	5.729	2.031		
	upper avg.	2 474	45	948	2	0	10	7	54	582	0.009	0.005	0.000	0.006	0.009	0.141	5.729	2.031		
Kobbelva	*lower avg.*	1 306	355	191	0	0	13	2	33	516	0.043	0.003	0.007	0.024	0.006	0.074	0.000	0.000		
	upper avg.	1 306	355	191	0	0	13	2	33	516	0.043	0.003	0.007	0.024	0.006	0.074	0.004	0.477		
Elvegårdselva	*lower avg.*	2 665	2 157	1 080	1	3	9	8	61	1 748	0.071	0.123	0.014	0.413	0.885	0.608	0.657	1.702		
	upper avg.	2 665	2 157	1 080	1	3	9	8	61	1 748	0.071	0.123	0.014	0.413	0.885	0.608	0.657	1.702		
Spanselva	*lower avg.*	432	98	89	0	0	5	1	14	231	0.008	0.011	0.002	0.074	0.077	0.158	0.000	0.000		
	upper avg.	432	98	89	0	0	5	1	14	231	0.008	0.011	0.002	0.074	0.077	0.158	0.001	0.158		
Salangselva	*lower avg.*	1 699	324	657	1	1	10	5	38	486	0.000	0.022	0.012	0.155	0.186	0.281	0.397	0.000		
	upper avg.	1 699	324	657	1	1	10	5	38	486	0.006	0.022	0.012	0.155	0.186	0.281	0.397	0.620		
Lakselva(Rossfjordelva)	*lower avg.*	463	147	295	0	0	0	1	17	103	0.009	0.006	0.001	0.025	0.031	0.068	0.000	0.338		
	upper avg.	463	147	295	0	0	0	1	17	103	0.009	0.006	0.001	0.025	0.031	0.068	0.001	0.338		
Nordkjoselva	*lower avg.*	480	143	201	0	0	3	1	13	356	0.021	0.007	0.002	0.045	0.073	0.000	0.131	0.000		
	upper avg.	480	143	201	0	0	3	1	13	356	0.021	0.007	0.002	0.045	0.073	0.002	0.131	0.175		
Signaldalselva	*lower avg.*	1 089	383	735	1	1	7	3	24	823	0.035	0.000	0.004	0.207	0.006	0.163	0.000	0.000		
	upper avg.	1 089	383	735	1	1	7	3	24	823	0.035	0.002	0.004	0.207	0.006	0.163	0.003	0.398		

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.*	1 179	302	710	0	0	10	2	26	693	0.027	0.006	0.006	0.186	0.000	0.446	0.301	1.075		
	upper avg.	1 179	302	710	0	0	10	2	26	693	0.027	0.006	0.006	0.186	0.004	0.446	0.301	1.075		
Kåfjordelva	*lower avg.*	800	117	204	0	0	18	1	33	438	0.008	0.015	0.004	0.285	0.025	0.190	0.060	0.000		
	upper avg.	800	117	204	0	0	18	1	33	438	0.008	0.015	0.004	0.285	0.025	0.190	0.060	0.292		
Reisaelva	*lower avg.*	4 490	1 358	2 822	3	3	59	11	168	3 966	0.125	0.126	0.018	1.185	1.250	1.135	0.000	5.736		
	upper avg.	4 490	1 358	2 822	3	3	59	11	168	3 966	0.125	0.126	0.018	1.185	1.250	1.135	0.013	5.736		
Mattiselva	*lower avg.*	330	77	430	0	0	1	0	12	177	0.014	0.000	0.002	0.079	0.023	0.036	0.145	0.000		
	upper avg.	330	77	430	0	0	1	0	12	177	0.014	0.001	0.002	0.079	0.023	0.036	0.145	0.120		
Tverrelva	*lower avg.*	236	86	497	0	0	4	1	18	185	0.008	0.001	0.001	0.066	0.042	0.030	0.012	0.000		
	upper avg.	236	86	497	0	0	4	1	18	185	0.008	0.001	0.001	0.066	0.042	0.030	0.012	0.086		
Repparfjordelva	*lower avg.*	2 435	524	4 494	1	1	14	9	108	1 028	0.060	0.000	0.009	1.173	0.281	0.267	0.052	1.778		
	upper avg.	2 435	524	4 494	1	1	14	9	108	1 028	0.060	0.004	0.009	1.173	0.281	0.267	0.052	1.778		
Stabburselva	*lower avg.*	1 540	129	1 349	1	1	10	3	35	1 205	0.030	0.005	0.003	0.064	0.318	0.056	0.233	0.000		
	upper avg.	1 540	129	1 349	1	1	10	3	35	1 205	0.030	0.005	0.003	0.064	0.318	0.056	0.233	0.562		
Lakseelv	*lower avg.*	1 268	1 299	1 341	0	2	5	3	48	954	0.025	0.017	0.005	0.254	0.000	0.275	0.253	0.000		
	upper avg.	1 268	1 299	1 341	0	2	5	3	48	954	0.025	0.017	0.005	0.254	0.005	0.275	0.253	0.463		
Børselva	*lower avg.*	1 251	456	456	0	0	2	6	36	1 296	0.002	0.050	0.003	0.091	0.241	0.099	0.288	0.000		
	upper avg.	1 251	456	456	0	0	2	6	36	1 296	0.002	0.050	0.003	0.091	0.241	0.099	0.288	0.456		
Mattusjåkka	*lower avg.*	147	26	70	0	0	3	1	4	64	0.003	0.022	0.002	0.022	0.206	0.043	0.130	0.000		
	upper avg.	147	26	70	0	0	3	1	4	64	0.003	0.022	0.002	0.022	0.206	0.043	0.130	0.054		
Stuorrajåkka	*lower avg.*	1 005	0	257	0	0	9	1	33	864	0.033	0.081	0.009	0.000	0.312	0.060	0.159	0.000		
	upper avg.	1 005	18	257	0	0	9	1	33	864	0.033	0.081	0.009	0.003	0.312	0.060	0.159	0.367		
Soussjåkka	*lower avg.*	134	0	64	0	0	1	0	4	134	0.001	0.004	0.001	0.004	0.020	0.002	0.035	0.000		
	upper avg.	134	2	64	0	0	1	0	4	134	0.001	0.004	0.001	0.004	0.020	0.002	0.035	0.049		
Adamselva	*lower avg.*	1 088	26	635	0	0	1	3	37	889	0.050	0.016	0.008	0.042	0.326	0.000	0.000	1.191		
	upper avg.	1 088	26	635	0	0	1	3	37	889	0.050	0.016	0.008	0.042	0.326	0.004	0.003	1.191		
Syltefjordelva(Vesterelva)	*lower avg.*	1 182	0	345	1	1	3	4	26	947	0.070	0.000	0.007	0.025	0.078	0.000	0.759	0.863		
	upper avg.	1 182	22	345	1	1	3	4	26	947	0.070	0.002	0.007	0.025	0.078	0.004	0.759	0.863		
Jakobselv	*lower avg.*	1 133	150	1 158	1	1	0	2	52	1 467	0.031	0.000	0.004	0.031	0.000	0.004	0.014	0.000		
	upper avg.	1 133	150	1 158	1	1	0	2	52	1 467	0.031	0.002	0.004	0.031	0.004	0.004	0.014	0.414		
Neidenelva	*lower avg.*	3 211	1 348	5 620	2	2	21	14	223	2 344	0.076	0.000	0.023	0.609	0.000	0.264	0.680	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.	3 211	1 348	5 620	2	2	21	14	223	2 344	0.076	0.006	0.023	0.609	0.012	0.264	0.680	1.172		
Grense Jakobselv	*lower avg.*	315	87	415	0	0	0	1	15	343	0.020	0.007	0.002	0.258	0.218	0.893	0.341	0.345		
	upper avg.	315	87	415	0	0	0	1	15	343	0.020	0.007	0.002	0.258	0.218	0.893	0.341	0.345		

Table 3.
Total inputs from Norway 2010

TOTAL INPUTS

Discharge region	Estimate	Flow rate (km^3/d)	SPM [tonnes]	TOC [tonnes]	PO4-P [tonnes]	TOTP [tonnes]	NO3-N [tonnes]	NH4-N [tonnes]	TOTN [tonnes]	SiO2 [tonnes]	As [tonnes]	Pb [tonnes]	Cd [tonnes]	Cu [tonnes]	Zn [tonnes]	Ni [tonnes]	Cr [tonnes]	Hg [kg]	HCHG [kg]	SUMPCB [kg]
INPUTS TO OSPAR REGION: TOTAL NORWAY																				
RIVERINE INPUTS																				
Main Rivers	low avg.	166 506	235 857	220 992	216	547	13 505	973	23 952	181 945	9.16	9.48	0.84	76.90	251.64	31.98	17.86	12	0	0
	upp avg.		235 857	220 992	229	547	13 505	979	23 952	181 945	9.18	9.48	0.89	76.90	251.64	31.98	19.80	64	12	85
Tributary Rivers (36)	low avg.	161 045	440 394	169 380	427	703	5 378	595	14 166	151 578	7.85	12.47	0.58	83.04	161.16	75.12	15.34	27		
	upp avg.		440 432	169 380	438	704	5 384	617	14 166	151 578	8.39	12.48	0.71	83.04	161.16	75.13	16.96	72		
Tributary Rivers (109)	low avg.	114 610	55 190	73 694	79	174	3 858	362	7 379	59 596	4.37	3.90	0.36	17.10	43.06	15.66	16.49	40		
	upp avg.		55 349	73 694	79	177	3 859	362	7 384	59 596	4.38	3.93	0.36	17.12	43.12	15.67	16.59	60		
Total Riverine Inputs	**low avg.**	442 161	731 441	464 066	721	1 425	22 741	1 930	45 496	393 119	21.38	25.85	1.78	177.04	455.86	122.75	49.69	79	0	0
	upp avg.		731 637	464 066	746	1 428	22 748	1 958	45 502	393 119	21.96	25.89	1.96	177.07	455.92	122.78	53.36	196	12	85
Sewage Effluents	low avg.		8 429	3 922	562	937	609	9 134	12 179		0.20	0.52	0.02	5.10	13.20	1.79	0.77	6		100
	upp avg.																			
Industrial Effluents	low avg.		30 040	569	155	258	129	1 941	2 588		0.46	2.84	0.15	9.27	19.75	9.30	1.06	14		1
	upp avg.																			
Fish Farming	low avg.				5 379	7 795	4 816	35 025	43 781					691.82						
	upp avg.																			
Total Direct Inputs	**low avg.**		38 470	4 491	6 096	8 990	5 554	46 100	58 548		0.66	3.36	0.17	706.19	32.95	11.09	1.83	20		101
	upp avg.		38 470	4 491	6 096	8 990	5 554	46 100	58 548		0.66	3.36	0.17	706.19	32.95	11.09	1.83	20		101
Unmonitored Areas	low avg.	310 265			166	676	21 781	1 917	34 850											
	upp avg.																			
REGION TOTAL	**low avg.**	752 426	769 910	468 556	6 984	11 091	50 076	49 947	138 895	393 119	22	29	2	883	489	134	52	99	0	101
	upp avg.		770 107	468 556	7 008	11 095	50 083	49 975	138 900	393 119	23	29	2	883	489	134	55	216	12	186

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.	136 375	218 006	194 454	202	488	12 615	914	21 710	158 609	7.84	8.83	0.73	57.54	206.96	27.45	15.26	9	0	0
	upp avg.		218 006	194 454	209	488	12 615	916	21 710	158 609	7.84	8.83	0.75	57.54	206.96	27.45	16.74	52	10	69
Tributary Rivers (36)	low avg.	20 450	27 207	38 895	25	51	1 108	146	2 824	16 923	1.64	3.75	0.20	6.54	39.10	2.97	1.18	4		
	upp avg.		27 207	38 895	26	51	1 108	147	2 824	16 923	1.64	3.75	0.20	6.54	39.10	2.97	1.37	10		
Tributary Rivers (109)	low avg.	6 939	13 306	13 893	18	63	1 198	60	1 773	7 627	0.92	1.05	0.08	2.64	15.50	1.94	0.66	4		
	upp avg.		13 306	13 893	18	63	1 198	60	1 773	7 627	0.92	1.06	0.08	2.64	15.50	1.94	0.67	4		
Total Riverine Inputs	**low avg.**	163 764	258 519	247 242	245	603	14 921	1 120	26 307	183 159	10.39	13.64	1.01	66.73	261.55	32.35	17.10	17	0	0
	upp avg.		258 519	247 242	254	603	14 921	1 122	26 307	183 159	10.39	13.64	1.02	66.73	261.56	32.35	18.78	67	10	69
Sewage Effluents	low avg.		2 785	2 376	60	101	230	3 457	4 609		0.12	0.20	0.01	2.42	7.96	1.31	0.27	2		100
	upp avg.																			
Industrial Effluents	low avg.		3 348	193	49	82	63	951	1 268		0.26	0.37	0.05	7.54	6.42	2.94	1.03	7		1
	upp avg.																			
Fish Farming	low avg.				0	0	0	3	4					0.07						
	upp avg.																			
Total Direct Inputs	**low avg.**		6 133	2 569	110	183	294	4 411	5 881		0.39	0.57	0.06	10.03	14.38	4.24	1.30	9		101
	upp avg.																			
Unmonitored Areas	low avg.	6 463			18	73	1 837	162	2 938											
	upp avg.																			
REGION TOTAL	**low avg.**	170 227	264 652	249 812	373	859	17 052	5 693	35 127	183 159	11	14	1	77	276	37	18	26	0	101
	upp avg.		264 652	249 812	382	859	17 052	5 695	35 127	183 159	11	14	1	77	276	37	20	76	10	170

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: North Sea																				
RIVERINE INPUTS																				
Main Rivers	low avg.	5 689	2 517	3 367	4	15	334	17	612	2 478	0.17	0.15	0.01	1.28	5.80	0.79	0.31	0	0	0
	upp avg.		2 517	3 367	5	15	334	18	612	2 478	0.18	0.15	0.01	1.28	5.80	0.79	0.42	2	0	3
Tributary Rivers (36)	low avg.	41 097	49 763	30 315	46	112	2 130	170	4 090	22 751	1.14	3.41	0.13	12.59	38.88	4.47	2.73	12		
	upp avg.		49 767	30 315	50	112	2 131	173	4 090	22 751	1.43	3.41	0.15	12.60	38.88	4.48	3.67	23		
Tributary Rivers (109)	low avg.	46 475	18 102	19 687	28	55	1 821	121	3 071	17 280	1.71	1.99	0.10	5.77	17.07	5.68	2.25	13		
	upp avg.		18 102	19 687	28	56	1 821	122	3 071	17 280	1.71	1.99	0.10	5.78	17.08	5.68	2.29	21		
Total Riverine Inputs	**low avg.**	93 261	70 382	53 370	78	182	4 285	309	7 773	42 509	3.03	5.55	0.24	19.64	61.75	10.95	5.29	26	0	0
	upp avg.		70 386	53 370	83	183	4 285	313	7 773	42 509	3.32	5.55	0.27	19.66	61.77	10.95	6.38	46	0	3
Sewage Effluents	low avg.		4 277		217	362	181	2 713	3 617		0.05	0.28	0.01	2.10	3.77	0.30	0.20	4		1
	upp avg.																			
Industrial Effluents	low avg.		9 388	325	54	90	19	282	376		0.14	0.89	0.05	1.53	11.54	4.47	0.02	4		
	upp avg.																			
Fish Farming	low avg.				1 842	2 670	1 651	12 009	15 011					236.76						
	upp avg.																			
Total Direct Inputs	**low avg.**		13 665	325	2 114	3 122	1 851	15 004	19 004		0.18	1.17	0.06	240.39	15.31	4.77	0.23	7		1
	upp avg.																			
Unmonitored Areas	low avg.	86 613			51	206	7 999	704	12 798											
	upp avg.																			
REGION TOTAL	**low avg.**	179 874	84 048	53 695	2 243	3 511	14 135	16 017	39 576	42 509	3	7	0	260	77	16	6	33	0	1
	upp avg.		84 051	53 695	2 247	3 512	14 135	16 021	39 576	42 509	4	7	0	260	77	16	7	53	0	4

TOTAL INPUTS																				
Discharge region	**Estimate**	**Flow rate (km^3/d)**	**SPM [tonnes]**	**TOC [tonnes]**	**PO4-P [tonnes]**	**TOTP [tonnes]**	**NO3-N [tonnes]**	**NH4-N [tonnes]**	**TOTN [tonnes]**	**SiO2 [tonnes]**	**As [tonnes]**	**Pb [tonnes]**	**Cd [tonnes]**	**Cu [tonnes]**	**Zn [tonnes]**	**Ni [tonnes]**	**Cr [tonnes]**	**Hg [kg]**	**HCHG [kg]**	**SUMPCB [kg]**
INPUTS TO OSPAR REGION: Norwegian Sea																				
RIVERINE INPUTS																				
Main Rivers	low avg.	16 629	13 191	14 207	7	27	445	27	1 113	10 526	0.82	0.36	0.10	16.26	36.36	2.90	1.73	2	0	0
	upp avg.		13 191	14 207	10	27	445	28	1 113	10 526	0.82	0.36	0.11	16.26	36.36	2.91	1.98	7	1	8
Tributary Rivers (36)	low avg.	71 250	348 319	68 135	332	481	1 900	174	5 555	60 711	2.21	2.87	0.10	32.97	49.60	18.39	8.77	6		
	upp avg.		348 353	68 135	338	481	1 903	193	5 555	60 711	2.40	2.87	0.19	32.97	49.60	18.39	9.02	27		
Tributary Rivers (109)	low avg.	45 922	19 571	22 981	25	48	765	131	1 884	22 793	1.31	0.65	0.10	5.97	8.43	6.00	10.48	19		
	upp avg.		19 687	22 981	25	49	765	131	1 890	22 793	1.33	0.67	0.10	5.98	8.45	6.01	10.54	27		
Total Riverine Inputs	**low avg.**	133 801	381 081	105 324	364	556	3 110	332	8 553	94 030	4.34	3.88	0.30	55.20	94.38	27.30	20.98	27	0	0
	upp avg.		381 232	105 324	373	558	3 114	352	8 558	94 030	4.55	3.90	0.40	55.21	94.40	27.31	21.53	61	1	8
Sewage Effluents	low avg.		1 362	1 545	265	442	185	2 778	3 703		0.03	0.04	0.00	0.57	1.47	0.18	0.29	0		0
	upp avg.																			
Industrial Effluents	low avg.		17 305	50	51	86	47	708	944		0.05	1.59	0.05	0.21	1.80	1.89	0.01	2		
	upp avg.																			
Fish Farming	low avg.				3 204	4 644	2 866	20 847	26 059					412.19						
	upp avg.																			
Total Direct Inputs	**low avg.**		18 666	1 595	3 521	5 172	3 099	24 333	30 707		0.09	1.63	0.05	412.97	3.26	2.07	0.30	3		0
	upp avg.																			
Unmonitored Areas	low avg.	175 583			88	356	10 452	920	16 723											
	upp avg.																			
REGION TOTAL	**low avg.**	309 384	399 747	106 919	3 973	6 083	16 660	25 585	55 982	94 030	4	6	0	468	98	29	21	30	0	0
	upp avg.		399 898	106 919	3 981	6 085	16 665	25 605	55 988	94 030	5	6	0	468	98	29	22	64	1	8

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.	7 813	2 143	8 963	3	16	111	15	516	10 332	0.34	0.13	0.00	1.82	2.52	0.84	0.56	0	0	0
	upp avg.		2 143	8 963	5	16	111	17	516	10 332	0.34	0.14	0.02	1.82	2.52	0.84	0.66	3	1	4
Tributary Rivers (36)	low avg.	28 249	15 104	32 035	23	59	240	105	1 697	51 193	2.86	2.45	0.15	30.93	33.59	49.29	2.66	4		
	upp avg.		15 104	32 035	23	59	242	105	1 697	51 193	2.93	2.45	0.17	30.93	33.59	49.29	2.90	11		
Tributary Rivers (109)	low avg.	15 274	4 211	17 132	8	8	74	49	650	11 897	0.42	0.20	0.08	2.72	2.06	2.03	3.10	4		
	upp avg.		4 253	17 132	8	9	74	49	650	11 897	0.42	0.22	0.08	2.72	2.08	2.04	3.10	8		
Total Riverine Inputs	**low avg.**	51 335	21 458	58 130	33	83	425	169	2 863	73 421	3.62	2.78	0.23	35.47	38.17	52.16	6.33	9	0	0
	upp avg.		21 500	58 130	36	84	427	171	2 863	73 421	3.69	2.80	0.27	35.48	38.19	52.17	6.66	22	1	4
Sewage Effluents	low avg.		5		19	32	12	187	249											
	upp avg.																			
Industrial Effluents	low avg.			1	0	0	0	0	0							0.00	0.00	1		
	upp avg.																			
Fish Farming	low avg.				332	481	298	2 166	2 707					42.80						
	upp avg.																			
Total Direct Inputs	**low avg.**		5	1	351	513	310	2 352	2 956					42.80		0.00	0.00	1		
	upp avg.																			
Unmonitored Areas	low avg.	41 607			10	41	1 494	131	2 390											
	upp avg.																			
REGION TOTAL	**low avg.**	92 942	21 463	58 131	395	638	2 229	2 652	8 209	73 421	4	3	0	78	38	52	6	10	0	0
	upp avg.		21 505	58 131	397	639	2 231	2 655	8 209	73 421	4	3	0	78	38	52	7	23	1	4

Statlig program for forurensningsovervåking

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Om Statlig program for forurensningsovervåking

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

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

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

SPFO-rapport 1107/2011

TA-2856/2011