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Documents

Environment Statistics: Improvement of Methodologies for Water Statistics

– Action 1: Establishment of a unified methodological system for producing statistics on water abstraction and use

– Action 2: Water use in agriculture, forestry and fishing – Establishment and application of a coefficient method.

Statistics Norway/Division for environmental Statistics

Preface

This document contains the results from two different agreements between Eurostat and Statistics Norway - action 1 and 2 – on the same overall topic, namely improvement of methodologies of water statistics:

- Action 1: Establishment of a unified methodological system for producing statistics on water abstraction and use (agreement number 71301.2006.002-2006.468).
- Action 2: Water use in agriculture, forestry and fishing – Establishment and application of a coefficient approach (agreement number 71301.2006.002-2006.469).

The project is part of Statistics Norway's development of the National Water Accounts for Norway. Action 1 is very broad in coverage, including all industrial sectors, while action 2 is a further adjustment of the methodology suggested in action 1 for water use in industrial activities like agriculture, forestry and fishing. Thus, the figures presented in action 1 for agriculture, forestry and fishing have been adjusted in action 2.

Total amounts of water used (preliminary figures) given in the report represent the year 2006. However, the water use coefficients in action 1 of the project, due to different updating intervals for the data sources, are based on information from the period 2003-2006.

Editor of this report has been the project leader; Mr. Jørn Kristian Undelstvedt, at the Division for Environmental Statistics. Ms. Eva Vinju and Mr. Gisle Berge, both at the Division for Environmental Statistics, have been part of the project group and have contributed in data collection, data processing, analyses and writing.

Contributions on action 1 of the project have also been made by Ms. Anne Vedø at the Division for Statistical Methods and Standards, Mr. Jens Kristian Hvalgård and Mr. Håkon Skullerud, both at the Division for Environmental Statistics.

Statistics Norway would like to thank Eurostat for supporting the development of the Water Accounts for Norway by the contribution of financial funds for this project.

Abstract - action 1

The general purpose of this project has been to set up a model or methodological system for estimation of water use for all industries, and thereby contribute to a holistic and complete information base for water use in Norway. The intention is also to improve Norway's ability to report water use figures in the Eurostat/Joint Questionnaire on Inland Waters. Households were also included in this work.

A combination of sample surveys, customer registers from municipal waterworks and administrative registers formed the basis for input data to the project.

The suggested methodology involves that all industries are to be divided into a set of water use groups – 81 totally – referring to groups of industries (or NACE-codes) that are assumed to follow the same water use patterns. Coefficients for each of these groups were established. The coefficients were combined with structural statistics on employees and economic turnover in order to inflate to national figures.

On the national level it was estimated that roughly 3 billion cubic metres of water was used in the industries or sectors (including households). This should be considered a low estimate since the suggested methodology in this report seems to underestimate the primary industries in particular. However, a follow-up of this project – called "Action 2" – is expected to come up with adjusted figures for the primary industries. Thus, the estimates suggested here should be considered strictly preliminary.

Most of the results, including coefficients and details on water use, are presented in the appendixes of the report, in particular appendix 1 and 2.

Modification of the suggested methodology in this report may be necessary for certain industries like agriculture and to some extent also service sectors in order to achieve best result. This can probably further improve the methodology. But as an overall framework the suggested methodology in this report is believed to be a rational and good tool for developing Norway's water statistics.

Abstract - action 2

Statistics Norway has during the last couple of years developed several areas of water statistics with the primary objective to improve Norway's reporting to the OECD/Eurostat Joint Questionnaire (JQ) on Inland Waters. The coefficient approach has been applied in a pilot study on water use in food processing and the service industries (Grant Agreement 71301.2005.001-2005.014). The experiences from this pilot show that the methodology could be applicable for all parts of the water accounts system.

The above conclusion materialised into a pilot study supported by Eurostat grants (Grant Agreement 71301.2006.002-2006.468), called "Establishment of a unified methodological system for producing statistics on water abstraction and use" (or "Action 1"). The outcome was a system for estimation of water use in all industries based on a set of sector or industry-specific coefficients (economic turnover and number of employees). However, for the primary industries, the preliminary results indicate that there is a need to look more closely at the coefficients applied in Action 1. For some industries it seems necessary to investigate alternative estimation methods based on coefficients for a wider range of features in the primary productions than number of employees and economic turnover.

This pilot study (or "Action 2") can be seen as a test case of the establishment of the methodological system described in Action 1, where the methodology is tuned as to give reliable results for the primary industries.

The outcome of this pilot study is a set of equations for calculation of water use; see chapter 3 for a complete inventory.

Water use in primary industries – Preliminary figures. Million m^3.

Sector \ Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Agriculture												
- Irrigation in agriculture[1]	232.1	188.6	211.2	132.7	143.9	80.0	176.8	113.1	68.5	73.5	102.9	112.8
- of which: surface water	*218.2*	*177.3*	*198.5*	*124.7*	*135.3*	*75.2*	*166.2*	*106.3*	*64.4*	*69.1*	*96.8*	*106.0*
- of which: ground water	*13.9*	*11.3*	*12.7*	*8.0*	*8.6*	*4.8*	*10.6*	*6.8*	*4.1*	*4.4*	*6.2*	*6.8*
- Livestock husbandry, drinking water	35.0	35.4	35.4	35.9	36.6	35.9	34.9	34.7	34.0	33.4	32.3	32.2
Aquaculture												
- Operation of fish hatcheries for stocking			512.1	524.3	585.3	650.3	648.1	660.2	643.9	782.3	587.9	659.7
- On-land fish farming of trout[2]												23.4
Other primary industries (from Action 1.)												16.7
Total volume	**267.1**	**224.0**	**758.8**	**692.9**	**765.9**	**766.3**	**859.7**	**808.0**	**746.4**	**889.2**	**723.1**	**844.9**

1) Irrigation in greenhouses included from 2004 onwards.

2) In this pilot study - data for on-land fish farming of trout is collected for 2006 only. Data for the previous years are not as easy accessible, but should be included in future work on water statistics.

Improvement of calculation methods should be considered for the following areas:
Leakage and spill, irrigation of cropland, on-land fish farming, cleaning of premises, dilution of manure, fishing and catching. On top of that comes the challenge of how to include some interesting dimensions in the statistics. So far, in our attempt to develop a unified system for water statistics, we have neither managed to fully incorporate the dimensions of water source and manner of supply, nor incorporate the distinction between volume abstracted from the source and actual volume used. For Statistics Norway, this is perhaps the greatest challenge among the issues listed for future activities in the field of water statistics.

A plan for updating of coefficients and water use statistics is suggested.

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ACTION 1: ESTABLISHMENT OF A UNIFIED METHODOLOGICAL SYSTEM FOR PRODUCING STATISTICS ON WATER ABSTRACTION AND USE

1 Introduction

1.1 Background

Statistics Norway has during the last couple of years developed several areas of water statistics with the primary objective to improve Norway's reporting to the OECD/Eurostat Joint Questionnaire (JQ) on Inland Waters. The development has been organised as different projects, of which several have been co-financed by Eurostat. The projects have contributed in the development of a comprehensive water accounts system for Norway by providing information on the availability, abstraction and use of water resources in formerly little- or un-explored areas.

Even though the projects have considerably improved Norway's ability to report statistics to the JQ, they have also exposed a need to improve the consistency between the different parts of the water accounts system, and between the different methodologies and data sources used in the different parts.

This project aims to establish a unified coefficient methodology for all parts of the water accounts system. This will ensure consistency between the different parts of the system and provide a basis for an efficient production and updating of future statistics in all parts of the system, including areas to be reported in the JQ. In addition, a unified methodology based on a coefficient approach, will enable Statistics Norway to revise formerly reported figures in the JQ, and to estimate future water use and abstraction.

The coefficient approach has been applied in a former pilot study on water use in food processing and the service industries (Agreement No. ESTAT 71301.2005.001-2005.014), see Stave (2006). The experiences from this pilot have shown that the methodology could be applicable for all parts of the water accounts system under development.

1.2 Objectives

With reference to the work programme in the grant agreement, the objectives of this pilot study are:

- Division of all industries into *water use groups*. The different water use groups shall be divided according to NACE divisions (two-digit level) and by all industrial categories to be reported for in the JQ, or be convertible to such groups.

  This division shall be based on theoretical assumptions on the homogeneity of water use and the "driving force" (e.g. number of employees, number of students, economic turnover, etc.) of water use within different industries.

- Identification of available data sources for collection of data for the different water use groups.

- Identification of available structural statistics for inflation of figures to the national level.

- Selection and attachment of auxiliary data to the different water use groups.

- Establishment of a plan for updating the water use coefficients, including the need for new data collection activities.

  This will be based on an assessment of factors that influence water use in the different water use groups and future stability of these factors.

- An estimation of total water abstraction and use for all industries and the households will be carried out on basis of the data sources available to date.
  - The estimations will provide a basis for calibrating the different parts of the total water accounts system against each other, e.g. abstraction against use, and for integrating the water abstraction and use with the existing sub-models on generation of water resources (JQ table 1) and discharge and treatment of wastewater (JQ table 7).

- Documentation of the established methodological system for production of water statistics in a report.

1.3 Definitions

Central Register of Establishments and Enterprises (CRE)
The CRE is Statistic Norway's register of all enterprises and establishments in public and private sector in Norway. For every unit there are registered data which describes geographical location, type of activity and how many employees that work there.

Employee
An employee is defined as persons with income from work.

Establishment
An establishment is defined as a local kind of activity unit, which mainly conducts activities within a specific industry group.

Nomenclature generale des Activites economiqes dans les Communautes Europeenes (NACE)
NACE Rev 1. is an international standard for industrial classification. The classification system is applied in a range of different statistics in Statistics Norway, in particular in economic statistics.

Subclass
A subclass in this report refers to the 5-digit-level of the NACE coding system, the most detailed level in the NACE hierarchy.

Water use group
A water use group is for the purpose of this project referring to a group of NACE subclasses that is expected to have relatively the same water use per employee or per economic turnover.

2 Methodology

2.1 The data collection and data sources

2.1.1 Data collection

Efforts have been made to identify sources of information on water use or abstraction for as many sectors as possible. The main strategy has been to search for data in central registers on waterworks and in customer registers collected from waterworks of various sizes and regional location. This was considered the best way to in an efficient manner gather an adequate number of reliable records on measured water abstraction or use.

In addition, other kinds of data that can be related to water use have been gathered for a selection of industries. Previous work on water use by Statistics Norway, and other organisations, has also been applied.

Waterworks and water supply systems

Information on waterworks is available in a register at the Food Safety Authority. The register covers both waterworks for self supplied establishments and other types of waterworks reported under the "Drinking water regulation". The register contains information on abstraction (m^3/year), type of water source, owner identification (enables identification of industry/NACE). The reporting is annually. Statistics Norway has received the data upon request – delivered as an Excel-file.

The data received from the Food Safety Authority have been complemented with data from the "Waterworks register" at the National Institute of Public Health. The register contains, among several other parameters, information on abstraction (m^3/year), distribution (m^3/year), type of water source, owner identification (enables identification of industry). The register covers waterworks that supply at least 50 persons or 20 houses/holiday homes. Statistics Norway has received the data upon request – delivered as an Excel-file.

A major contribution to the data input in this pilot study comes directly from waterworks. Nearly 50 waterworks were contacted and asked to report data on establishments or businesses extracted from their customer registers. Private customers should be excluded. Since the waterworks were asked to contribute to a pilot study, the reporting had to be voluntarily. The data in question were customer identification (preferably organisational number), name, address, industry (all kinds of description were welcomed), water use (m^3/year). The data were supposed to be reported in the .csv, .sdv or Excel formats. The waterworks were also asked to include a description of their submitted files.

Existing coefficients and datasets

From previous work in Statistics Norway there are available water use coefficients for the industries in food processing and service (Stave, 2006).

Norwegian Pollution Control Authority has put up guidelines for wastewater treatment plants (SFT, TA-525). The guidelines include coefficients on hydraulic load from service businesses and various public institutions. For the purpose of this pilot study; the notion is that water in equals water out – as often is the case, and this can be used to calculate the water use for some industries. The guidelines, however, are from 1983 and are under revision.

U.S. Geological Survey has published "National Handbook of Recommended Methods for Water Data Acquisition". In Chapter 11, appendix 1, a list of employee-based water use coefficients are available. These are to some extent used for comparison.

For the manufacturing industries data on abstraction and use have been collected by Statistics Norway in annual sample surveys since 2003.

The data search has so far resulted in datasets or other types of information as presented in table 2.1.

Table 2.1. Overview on data and information sources collected for this pilot study

Topic	Source	Year	Type of data/information	Number of records	Industry coverage
Abstraction	Norwegian Food Safety Authority	2006	Register on all approved water supply systems	4 200	Multiple, businesses with self supply waterworks + NACE 41
Abstraction/Use	National Institute of Public Health	2005	Register on waterworks that supplies 50 persons or more, or 20 houses/ holiday homes or cottages	1100	NACE 41 + households
	Statistics Norway	2003 - 2005	Sample surveys	1200	NACE 10 - 37
Use	Statistics Norway	2005	Pilot studies – use coefficients	n.a	NACE 15, 16, 50 - 93
	Norwegian Pollution Control Authority	1983	Coefficients on hydraulic load – in guidelines to wastewater treatment engineering	n.a	Multiple
	Municipal waterworks – 8 customer registers	2006	Use data for establishments or businesses	6 000	Multiple
	U.S. Geological Survey "National Handbook of Recommended Methods for Water Data Acquisition". Chapter 11, appendix 1	Not found	Use coefficients	n.a	Manufacturing

2.2 Coverage

The number of establishments or businesses in Norway extracted from the Central Register of Establishments and Enterprises in Statistics Norway (CRE) and applied in this project was approximately 360 000. These were units with information on employees or economic turnover, and for that reason considered applicable for our purposes. The datasets applied in this study contains roughly 12 500 records on water abstraction or use distributed on various industries. This is 3.4 per cent of all establishments in Norway. The distribution of these records is broken down by 5-digit NACE-codes and the exact coverage is presented in appendix 3.

Waterworks – Customer registers
The response rate itself was not uplifting. Only 8 out of 50 waterworks returned data. That is a response rate of approximately 16 per cent. Still, the total number of records in the dataset (around 6 300) is adequate for the purposes of this pilot study, although more data would have been a valuable contribution to this project.

The overall coverage in terms of business-population is presented in appendix 3.

2.3 Development of calculation methods

The development of calculation methods started with a theoretical assessment of all 699 industries (5-digit NACE-level) in the Standard Industrial Classification 2002 (SIC 2002) in regards to what is the most likely cause (or driving force) to water use. The assessment was based on the description in the classification, the overall experience and competence of the staff taking part in the pilot study, and in some cases, specific knowledge of the various industry characteristics.

Since the actual driving force to water use in many cases is difficult to determine and quantify, a second assessment process was performed in order to identify easily available variables as substitutes to the actual driving force. The two variables that are easiest at hand are "number of employees" and "economic turnover". The main objective in this project has evolved towards investigation of how well number of employees and economic turnover explains water use in all industries.

2.3.1 Considerations Primary industries (NACE A – B)

Water use in agriculture, forestry and fishing will only partly be dealt with in this project. The reason is that a second project – "Action 2" – will deal with this topic in more details. This second project will be addressed soon after the completion of the present project, and for that reason primary industries will be only partly covered in this report.

A streamlined calculation method for all subclasses in the NACE system appears to be the ideal and most desirable way forward, but not all industries follow the same patterns, and describing the "driving force" behind water use may for that reason vary.

The "assumed driving force" for water use has been detected for each subclass of primary industries (NACE 5-digit-level). These "forces" may involve number of heads in livestock, number of fish in aquaculture, irrigation needs for the crops etc. However, in this report, only number of employees and economic turnover as the driving force has been assessed, similar to the methodology applied to the rest of the subclasses in the NACE system. The findings on water use in primary industries in this report must therefore be considered as strictly preliminary as they may be subject to change when the second project is completed.

2.3.2 Data processing and calculations

Water use in industries (NACE 01-99)
The calculation and data processing has been carried out in several steps:

1. Pre-processing and preparation of input datasets from (1) customer registers, (2) Norwegian Food Safety Authority and (3) manufacturing industries sample surveys.

2. For the input datasets derived from customer registers and the Norwegian Food Safety Authority a merging with the Central Register of Establishments and Enterprises in Statistics Norway (CRE) was carried out. The purpose was to acquire data regarding employees and economic turnover and link it with the input datasets from the above mentioned registers.

3. Calculation of water use per employee and per million NOK in economic turnover was carried out for each NACE-level, in addition to corresponding mean, median, coefficient of variation, skewness, kurtosis etc. A preliminary water use coefficient was found based on certain criteria that will be discussed later in this chapter. This preliminary coefficient became basis for establishing a final coefficient for a water use group (described later).

4. Verification and error detection of the chosen water use coefficients and possible solution to improve them. In particular erroneous merging of input datasets with the CRE could potentially lead to under- or overestimation of the true water use for a particular industry.

5. Establishing of water use groups based on the different industry subclasses (5-digit-NACE). For each of these groups, the water use is regarded to be approximately the same, and a final coefficient is established to represent each of these groups. These final coefficients constitute weighted average of the preliminary coefficients from each of the subclasses belonging to that particular water use group.

6. Estimation of water use on a national level for each water use group, based on coefficients.

The data processing, like preparation/restructuring of datasets and calculation of coefficients and water use, was programmed in SAS®. SAS® is the most common statistical software applied by Statistics Norway. For the purpose of this project a SAS-program was developed in order to deal with the preliminary calculations regarding water use (see appendix 5).

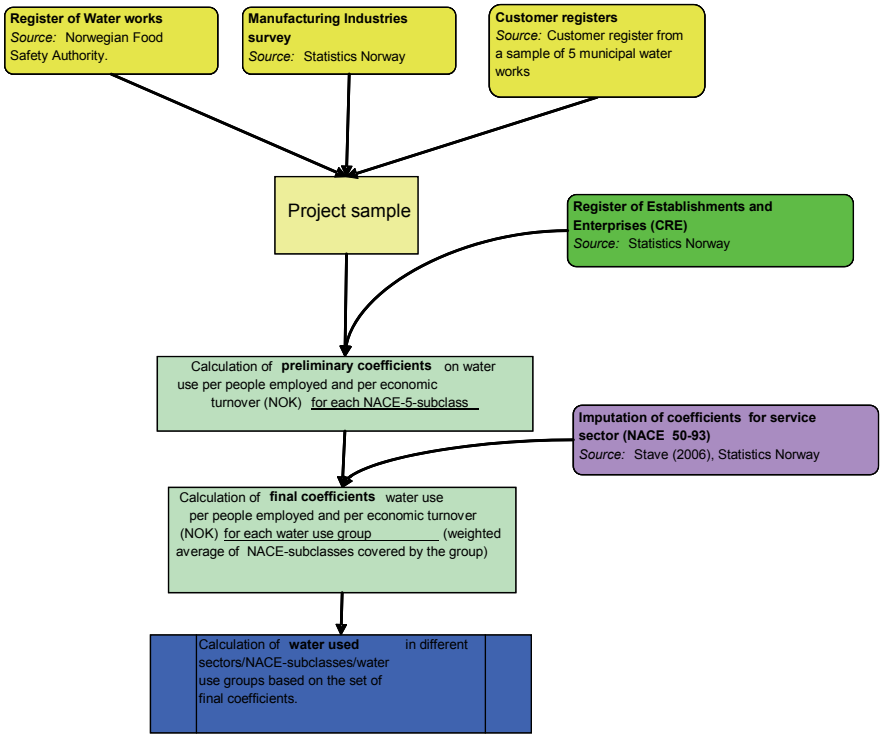
In this study, three different sources of information were used:

(1) Customer registers from waterworks,

(2) Norwegian Food Safety Authority register on waterworks and

(3) Sample surveys on manufacturing industries (Statistics Norway).

Figure 2.1. Information flow and calculation method.



Data on water use from the waterworks customer registers and the Norwegian Food Safety Authority waterworks register were merged with the Central Register of Establishments and Enterprises (CRE). This was necessary in order to link information like employees and economic turnover from CRE with the information available in the two datasets containing water data, and importantly establishing a basis for calculation of coefficients.

A successful merging was crucial since this would provide variables like NACE, employees and economic turnover for each establishment – information intended to be used in the calculation of water use coefficients. This was not quite straightforward since the two data sources did not contain organisational numbers (establishment ID). Hence, the process of merging the water data with information in CRE had to be based on names of establishments, addresses, location etc – which is a much more inaccurate exercise - and later on was subject for error detection.

Statistics Norway had already started with a similar merging task in the field of waste statistics. Thus considerable programming and ideas already existed, and was applied on the water data in this project. Obviously, some modifications were necessary to mainstream the existing work with this pilot project, but it proved to be a good starting point for further development of the SAS-programmes.

After the merging was completed, all the three input data sources were assembled into one dataset. There were mainly two alternative ways to analyse and to estimate water use coefficients. The most obvious data available were:

- Water use per economic turnover (unit: m^3/1 million NOK)
- Water use per employee. (unit: m^3/employee).

For each of the two variables above, the following figures were calculated for each NACE-code:

1) Weighted average: **∑Total water use / ∑Auxiliary data**

- where auxiliary data was either number of employees or economic turnover.

2) Median: the middle value in the distribution

The first option is in accordance with the method suggested by Stave (2006), while the use of median is an additional approach suggested in this project.

The median values were applied for calculation of the coefficients for those subclasses (NACE5) that showed highly skewed distribution and a high variation (high coefficient of variation). The criteria for when median was preferred are presented here:

- skewness in the distribution higher than 1 or less than -1 (< ←,-1> or <1, → >)
- coefficient of variation (CV) more than 100 per cent

Therefore, the NACE-specific coefficients presented in this report are a mixture of (1) median values and (2) coefficients based on "total water use" divided by "total number of employees" or "economic turnover".

A few examples were detected of relatively extensive water use compared to the rest of establishments in some subclasses, mainly in the oil and gas sector (NACE 11.100). The water use was real, but due to their high influence on the NACE-specific coefficients, they had to be treated as "exceptions" to the general calculation framework. Alternatively, according to the method suggested here then median would have been preferred for represent the whole subclass, and the total water use would have been hugely underestimated for that particular NACE. Therefore those establishments where taken out before calculations of the NACE coefficient, but added in again when the water use was calculated.

The decision of which of the two auxiliary data – employees or economic turnover – that should constitute the nominator in the coefficient depended mainly on the content of the total sample of water data. In the process of deriving a representative preliminary coefficient for a NACE5 subclass, a coefficient based on water use per employee was generally favoured. However, there exists one exception. Due to occasionally small numbers of establishments represented in the sample for certain NACE5 subclasses and the fact that information in CRE not always existed for every establishment, a coefficient based on use per economic turnover was favoured if data availability was considered better compared to a coefficient based on use per employee.

Data on number of employees and economic turnover of establishments in CRE are collected through different surveys, thus, the kind of information in subclasses may vary depending on which survey the data originates. Economic turnover may exist in one survey, but not in another, and for this reason, availability of data differs.

It was not possible within the frames of this project, to manually assess all the different subclasses, in order to decide whether a coefficient based on employees or economic turnover was best at explaining water use in a certain subclass. If it was possible, for a given subclass in the NACE system, to establish a coefficient for both water use per economic turnover and water use per number of employees then an automatic selection procedure entered into force. The critical issue was the number of possible establishments that could form the basis for a coefficient – the higher the better.

Therefore, for each NACE5 subclass, the number of establishments containing information on number of employees and economic turnover in the sample was calculated. If the number of establishments with information on employees or economic turnover contained data for 15 per cent or more

establishments, compared to the other one, then that information was chosen as explaining factor and to represent the coefficient for that particular subclass.

Before the final calculation of water use, all industries was aggregated into so-called *water use groups* – 81 totally – which are groups of industries that could be considered equal in regards to driving force behind the water use. Thus, every NACE-code was assigned to a water use group, and a weighted average based on the subclass NACE-5-digit-level within the use group gave the final coefficient. A water use group is comprised by a selection of NACE subclasses (see appendix 2 for details) and for each of these subclasses total number of employees and economic turnover in CRE was calculated. The preliminary coefficients for each subclass were then weighted against these totals, and the result constituted a weighted average for each water use group (see appendix 5 for SAS program). The weighting was carried out in order to establish a final coefficient for the whole of the water use group, and which best reflects the representation of subclasses within that group.

Important here is that the final calculation of water use was carried out at the water use group level and not at a NACE level.

After the coefficients were established the estimated water use for each water use group was found by multiplying the coefficient with total (national) number of employees or economic turnover from the CRE.

Depending on whether the coefficient was calculated based on economic turnover or number of employees, the calculation was carried out like this:

(1) Economic turnover:
Water use (m^3/year) = water use coefficient (m^3/million NOK) * total economic turnover (1000 NOK) / 1000

(2) Number of employees:
Water use (m3/year) = water use coefficient (m3/employee) * total number of employees

Water use in water supply (NACE 41) – a special case
Establishments in NACE 41 – Water supply - may use water in the treatment process. Waterworks may use water if they make use of technologies like backwashing etc. The register of waterworks, at National Institute of Public Health, provides some information about this type of water use (see table 2.1), but it does not provide a complete picture for all waterworks in the country. Only a minimum level of the actual amounts of water have been provided here in this project for NACE 41 based on a selection of waterworks that actually report this type of water use.

Water use in the service industries (NACE 50-93) – a special case
The original idea was to let the service industries be subject to the methodology suggested earlier in this chapter. But due to the lack of a clear ID variable (organisation number) in the customer datasets that constituted the main source of information about the service industries, it gave rise to some uncertainty in the calculations. The crucial point was the merging process with auxiliary data from CRE. There was an obvious risk for erroneous linking of data.

Stave (2006) has carried out a comparable study on water use in the service sector, and an assessment and comparison of the possible differences between the results in his study and the methodology suggested in this report was carried out. The result of this assessment showed that the merging process did not always provide a satisfactorily result.

For that reason it was decided that the coefficients suggested by Stave (2006) should be applied in the calculation of water use in the service sector (NACE 50-93).

Water use in households
Calculation of water use in households deviates from the above methodology. The explaining factor for water use is assumed to be the number of persons in the household (country population in this project). The estimation of water use is given by the following formula:

Water use (m^3) = (population * average water use in litres per person per day) * 365 / 1 000

Population is the total Norwegian population and the factor "water use per person" has been set to 210 litres/(person * day) (National Institute of Public Health 2007).

Water use by source
Sources of water use can be groundwater, river systems, lake or sea water. In this project, estimations of water use by source have been made for (1) the industry sector, including mining and quarrying (NACE 10-37) and (2) households. Information is less available and reliable for the service sector and agriculture and for that reason has not been attempted here.

Households
Estimations on water use in households were calculated by using the register of approved water supply systems by the Norwegian Food Safety Authority (see earlier, table 2.1). This project calculates water use in households based on the assumption that one can multiply a water use coefficient (water use per person) with the number of inhabitants in the country. This should give a rough estimate for water use in households. Therefore it was necessary to distribute the inhabitants on the different sources. This type of information may be derived from the register mentioned above.

Type of source is among the parameters provided in the dataset. If information about source was missing in the register (most common for small supply systems), a source was assigned if it could be derived from other auxiliary information in the dataset. However, if that was not possible, the remaining option was to use the proportion among sources derived for those water supply systems that actually contained information in regards to source, and apply this information for the dataset as a whole.

Manufacturing industries (NACE 10-37)
Estimating the water sources in manufacturing is in this project solely based on the information contained in the manufacturing industry survey (see earlier, table 2.1). This piece of information enters into the survey and is readily available. The sample thus forms the basis for saying something general about the manufacturing sector as a whole.

The manufacturing survey differentiate between the following categories of water sources: sea water, surface water, groundwater and water bought. The latter category constitute water bough from other industries, normally a waterworks. Information about water used in manufacturing for each individual waterworks in addition to source of water abstraction is available in the National Institute of Public Health's register of waterworks (see table 2.1), and was applied in the task of also estimating the distribution of water bought by industries in NACE 10-37.

The industry survey does, however, not distinguish between lake and river systems, but treat these two under one category, namely surface water. A differentiation between lake and river systems has thus not been possible here.

3 Results

The expected results from this project, as stated in the grant agreement, are:

- Equations for calculating water use coefficients for all industries (NACE 01-99) and the households. This includes:
    - Division of the industries into water use groups based on the homogeneity of water use and the type of auxiliary data that is considered to be most related to water use in the group
    - Identification of data sources for collection of water use data
    - Selection of auxiliary variables for different water use groups
    - Identification of available structural statistics for the inflation of figures
- A plan for updating of the coefficients, including a timetable for new data collection activities.
- Identification and collection of alternative statistics, i.e. water supply from public water supply and available survey results, for comparisons and calibrations of the different parts of the total water accounts system against each other.
- A report documenting the methodological system including:
    - Equations for each water use group
    - Data sources, auxiliary data and structural statistics attributed to each water use group
    - Conversion procedures to NACE divisions/JQ categories
- Reporting of new and improved figures for all categories in JQ tables 2.1, 2.2, 3.1 and 3.2 as soon as all the data identified in this project have been collected.

3.1 Equations for calculation of water use coefficients

All calculations in this pilot have been carried out in SAS, and the specifications regarding the programming are attached in appendix 5. The calculations are based on a coefficient approach.

For coefficients referring to economic turnover:

- Reflects yearly use
- The unit is cubic metres per 1 million Norwegian kroner (m^3/ 1 mill. NOK)

For coefficients referring to number of employees:

- Reflects yearly use
- The unit is cubic metres per employee (m^3/employee)

3.2 Water use groups and corresponding coefficients

The water use coefficients are presented on two levels, subclasses (NACE5) and water uses groups. The use groups are aggregations of the subclasses in the NACE-system, and all the water use coefficients are presented in appendixes 2 and 3.

The use groups, and their corresponding coefficients related to number of employees or economic turnover, are developed in an attempt to simplify the calculation of water use, on both the national level and an aggregated industry level. The intention is that this system could be applied in situations where there is no industry-specific information on water use available. The groups and coefficients are listed in appendix 2.

3.3 Correspondence table for use groups, Joint Questionnaire-categories and NACE-codes

A table for conversion between the various aggregations of industries is provided in appendix 4. Some of the OECD/Eurostat Joint Questionnaire categories do not correspond exactly to the water use groups. Methods to handle this have so far not been incorporated in the SAS-programme for calculations of use.

3.4 Water use – preliminary results

The calculations on total water use in Norway, and figures broken down by industries are strictly preliminary and based on the data included in the project calculations as of date.

Estimates on water use (in m^3/year) for the different water use groups suggested in the project are provided in appendix 1. The results are summarised in table 3.1 and figure 3.1 for the different sectors.

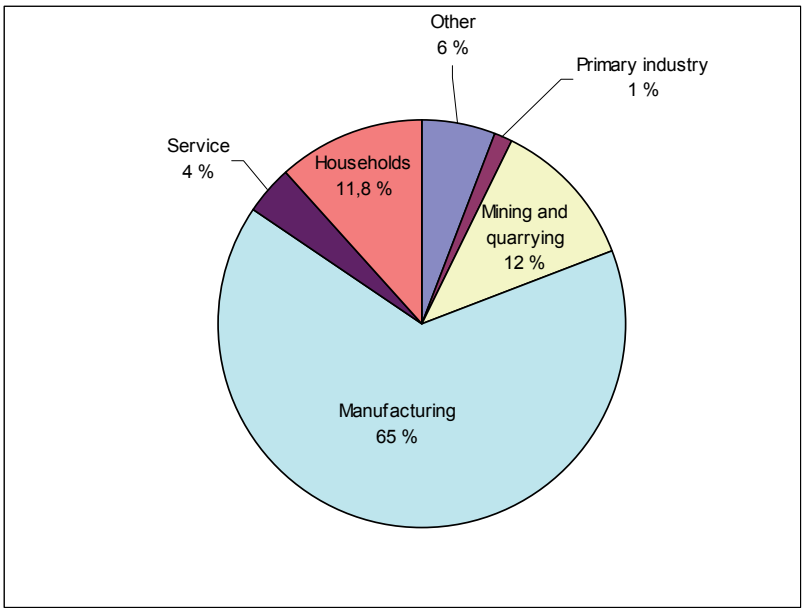
Table 3.1. Water use by industrial sectors, included households. 2005.

	Water use (m^3)
Total water use	*3 052 776 554*
Primary industry	42 707 513
Mining and quarrying	362 611 928
Manufacturing	1 993 470 718
Service	116 181 798
Households	358 806 315
Other	178 998 280

Use of salt water (seawater and brackish water) is included the figures. The use of salt water is limited to certain industries where salt water is used for cooling, in cleaning or as process water. The distribution by aggregated industries is dominated by the large amount of salt water included.

A more detailed aggregation on water use level is provided in appendix 1, but with water use in households excluded.

Figure 3.1. Water use by industry[1] and households. Norway. 2005.



[1] Primary industries (NACE 01-05), Mining and quarrying (NACE 10-14), Manufacturing (NACE 15-37) and Service (NACE 50-93).

The 1 per cent share of water use in the primary industries (agricultural sector, fishing and aquaculture) is significantly lower than would be expected, and most likely erroneous. This indicates a need for a different methodological approach for the primary industries. This issue will be further investigated in action 2 of the project. Alternative calculations will be suggested there, and the results presented in this report will be adjusted on the basis of those findings.

3.4.1 Water use in NACE 41 – water supply

Water use in NACE 41 does not provide a complete picture, but as a very minimum 59 100 000 m^3 is suggested here. This figure is based solely on data reported to the waterworks register at the National Institute of Public Health. It represent 25 per cent of the around 1 200 waterworks that have reported, and around 46 per cent of the reported water abstraction.

However, it is possible that not all the water used in NACE 41 has been accounted for in the number suggested above. Thus, some uncertainty remains regarding the coverage of water used in this industry.

3.5 Water use by source

The result on water use show that surface waters constitute the most common type of source in the households, and lakes are estimated to supply around 80 per cent of the population (table 3.2).

Table 3.2. Water use by source. Households. 2005.

	Per cent (%)	Water (m^3)
Total water	*100*	*358 806 315*
Groundwater	12	43 056 758
River	8	28 704 505
Lake	80	287 045 052

For manufacturing, mining and quarrying, the picture is a little different due to large intake of sea water in certain industries for cooling water purposes or water injections into drilling installations in

the oil and gas sector. It is estimated that use of fresh surface water and sea water are relatively the same, constituting 46 and 45 per cent correspondingly of the total water use (table 3.3).

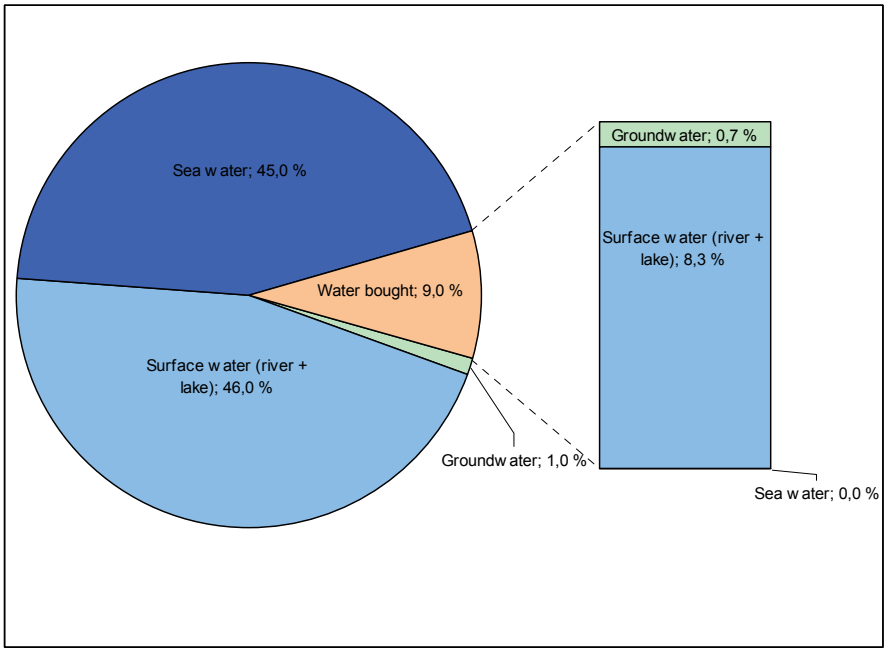
Table 3.3. Water use by source for NACE 10-37. 2005.

	Per cent (%)	Water (m^3)
Total water	100	2 356 082 646
Water bought	9	212 047 438
Groundwater	1	23 560 826
Surface water (river + lake)	46	1 083 798 017
Sea water	45	1 060 237 191

The category "water bought" includes water bought by the industry from water works in NACE 41 etc. An estimation on sources for "water bought" was attempted, and the distribution between surface water, groundwater and sea water is illustrated in figure 3.2. Surface water (freshwater) is considered the main type of this water with 8.3 out of the totally 9 per cent water bought, while groundwater is estimated to constitute around 0.7 per cent.

Consequently, this means that the overall distribution between sources in manufacturing, mining and quarrying is 45 per cent sea water, 54.3 per cent surface water (46 + 8.3 per cent) and 1.7 per cent groundwater (1 + 0.7 per cent).

Figure 3.2. Water use by source for NACE 10-37. 2005.



4 Assessments and further work

4.1 Assessment of the results

Estimated total water use
Water use estimated in this project, including households, totals to around 3 billion cubic metres. The real level is probably higher mainly because the primary industries are greatly underestimated in the suggested methodology. However, water use from agriculture, fishing and forestry will be more addressed in details in action 2 of this project, and the results presented for the primary industries here should be considered preliminary.

The water use in the other sectors is considered more probable and certain.

Merging water data with CRE - uncertainty
In this project, customer data from waterworks and register data from Norwegian Food Safety Authority did not contain information about NACE subclasses, people employed and economic turnover. This was considered essential information, and necessary to include for the success of this project.

Therefore the two datasets had to be merged with databases that could link this type of information to the water data. The most apparent source for this information is the Central Register of Establishments and Enterprises (CRE) administered by Statistics Norway. The challenge however was that the two mentioned datasets did not contain recognised ID (organisation number) that readily could be applied to merge the establishments with information from the CRE.

The second best option was to merge the data based on the information available, like name of establishment, addresses etc. This task was carried out in SAS. The CRE contain a range of different addresses and names which potentially could be linked with the water datasets. The risk of erroneous merging was an obvious risk here, and had to be dealt with.

The critical point was on what criteria that merging should be carried out. If the criteria for merging records with an establishment in CRE are too rigid and strict very few observations would actually be merged. On the other side, if the criteria are less strict, the merging may lead to wrong establishments are being merged, which is highly unsatisfactory. A balance was attempted and experimenting with which criteria that gave the best merging result was an important task here.

The measures done to avoid merging errors were to check the criteria that had been applied. NACE-subclasses that showed a rather deviating value compared to comparable groups was one way to check this. Checking the name of the establishment before and after the merging was another way to examine this.

The data set that form the basis for calculation of manufacturing, mining and quarrying (NACE 10-37) is considered more certain than what was the case with the service sector (NACE 50-93). The reason is because the service sector in this project is only covered in customer registers from selected water works. These registers lack a clear id that could identify them easily with the CRE. NACE 10-37 generally does not possess this disadvantage since these data originate from specific industry surveys with sampling derived from the CRE itself, which contains proper IDs.

Coverage of industries
The coverage of the sample is difficult to control because the sample is at mercy of the information sources mentioned in chapter 2. A good and complete coverage of all the different subclasses in the CRE can only be expected in a very large sample, or if one has control with the coverage of the sample in regards to the subclasses.

The sample in this project is relatively large, but it is still far from a complete coverage for many of the subclasses (5-digit NACE). The number of establishments represented in each subclass is listed in appendix 3, while a small summary of the coverage is provided in table 3.4 below.

Table 3.4. Number of establishments represented in each subclass (NACE-5-digits).

Number of establishments represented in the sample	Number of subclasses (NACE 5)
0	256
1-2	178
3-5	102
More than 5	163

Coefficients - quality
The coefficients suggested so far in this development of a unified system for producing water statistics are due to the problems described above (merging and coverage) not to be considered permanent. Statistics Norway will continue to develop the system suggested in this pilot, and will hopefully come up with modifications of the calculations in the final report for Action 2.

Use by source
Estimations on use by source have in this project been carried out for the manufacturing industries and households, but not for the service sector or primary industries as originally planned. The reason for this is lack of the necessary information in the input data in this project.

4.2 Recommendations and further work

4.2.1 Calculation methods

In addition to the factor based method described in chapter 2, linear regression constituted another alternative to calculate water use. A linear mathematical expression between water use and number of employees or economic turnover could be established for each of the water use groups. However, very good and linear relationships were difficult to pin out for more than just a minority of groups. Larger samples may be needed to take full advantage of this "tool" (provided that linear relationships truly exist).

Statistics Norway has developed a SAS application named "STRUKTUR". This application is used to estimate totals and uncertainty, and calculations of weights for inflation and control and revision. It is possible to use "STRUKTUR" also in water statistics. Preliminary testing with the dataset in this project has been carried out, and it is likely that the calculations carried out in this project in the future may be carried out with "STRUKTUR".

A large enough sample as input to the analysis is crucial for a project like this. It is a drawback that the method as carried out here has little control of the sample, in particular control of the different subclasses represented in the input dataset. For example the coverage of subclasses in the customer register data supplied from the waterworks is random, and a representative sample for analysis is largely beyond the control of statisticians. A large sample removes some of the uncertainty compared to small samples, and with reference to this project, a better coverage of certain subclasses is believed to greatly improve final results of such a study.

Calibrating the calculations in the system under development in regards to resources, abstraction, use, water sources (types of water), discharges and treatment is not yet performed, and attempts to do this is considered useful to postpone until Action 2 – when the detailed calculations for the primary industries are included.

Further work is also suggested for those subclasses in the NACE system that showed a large variation in values (high coefficient of variation, CV). This may indicate uncertainty regarding the suggested coefficients, and deserves to be looked into also after the completion of this study.

4.2.2 Alternative calculations of water use for some industries

An important part of the future development of the system is to include more industry-specific information that reflects the true driving force to water use. This is the idea of Action 2, where water use in the primary industries will be subject to an estimation approach different to the one investigated in this study. For example will detailed information on the water needs for various groups of livestock be basis for the calculations.

This "alternative" approach is clearly useful for industries where the relation between use and number of employees or turnover is weak.

4.2.3 Plan for updating of coefficients and water use statistics

Statistics Norway aims at the following timetable for updating of water use statistics:

- updating of data collection – **see table 4.1 below**
- updating of use coefficients equations – **2011 and every fourth year onwards**
- updating of water use statistics – **2010 and every second year onwards**

Due to limitations in capacity at Statistics Norway, but also the general official policy of restricting the response burden on all sectors, the collection of waterworks customer data will have to be exercised every four years. Still, we believe that this will be sufficient in terms of maintaining the quality of the statistics.

Since the water use coefficients so far are founded on "number of employees" and "economic turnover" only, the coefficients will not be able to reflect alterations in technology or other characteristics that may instantly inflict on water use in the various industries. This is of course not an optimal solution, but so far, the best one available. In this respect, it should be sufficient with an update of the statistics every second year.

The annual updates of data from national registers are not resource demanding operations, and can be established as routines in agreements between Statistics Norway and the responsible institutions. In order to avoid misunderstandings and incomplete datasets (in staff turnover situations) it is useful to maintain an annual routine.

Table 4.1. Data collection – time table

Data source	Type of data/information	Industry coverage	Frequency of data collection
Norwegian Food Safety Authority	Register on all approved water supply systems	Multiple, businesses with self supply waterworks + NACE 41(water supp.)	**Annually**
National Institute of Public Health	Register on waterworks that supplies 50 persons or more, or 20 houses/ holiday homes or cottages	NACE 41 (water supp.) + households	**Annually**
Statistics Norway	Sample surveys	NACE 10 – 37 (quarr., mining and manuf.)	**Annually**
Waterworks – customer registers	Use data for establishments or businesses	Multiple	2011 and every **fourth** year onwards
Various	Various information for calculation of coefficients and total water use	Multiple	2011 and every **fourth** year onwards

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http://pubs.usgs.gov/chapter11/ (downloaded 15. February 2008)

Appendix 1 – Water use

Estimated water use in cubic metres per year for each water use group. See appendix 2 for exact relationship between water use groups and NACE-codes.

Water use group	Number of establishments	Water use (m3)
Total water use	366 077	2 693 970 239
0	10	77 805
Accommodation	2 805	7 758 028
Building and construction	34 259	25 207 718
Caretaker services	716	113 472
Casting of iron	18	3 011 580
Casting of other metals	29	159 460
Casting of steel	6	1 104 264
Coal mining	3	253 240
Coll. and treatment of other waste	460	1 630 810
Coll. and treatment of sewage	286	553 585
Cultural activities	3 950	958 208
Defence activities	154	3 724 672
Designers activities	2 001	52 532
Domestic services	386	1 324 683
Education	7 243	17 810 315
Farming	30 271	16 390 979
Fish farming	564	3 285 200
Fishing and catching	5 347	12 485 640
Forestry	6 755	750 992
Growing	19 430	5 540 164
Growing of vegetables	604	384 936
Hairdressers, other beauty treatment	6 075	923 308
Health care and medical practice	15 274	12 419 392
Light manufacturing	10 765	22 730 031
Manuf. of paper and paperboard	26	116 355 232
Manufacture of articles of fur etc.	40	123 424
Manufacture of beverages	99	4 590 482
Manufacture of chem. processed pulp	6	92 623 624
Manufacture of chemical compunds	112	839 849 787
Manufacture of chemical products	198	2 277 338
Manufacture of crude fish oils and fats	32	425 372
Manufacture of dairy products	121	5 153 956
Manufacture of fish products	594	11 255 866
Manufacture of fruit and vegetables	87	1 643 821
Manufacture of grain mill products	185	2 862 248
Manufacture of industrial gases	18	10 916 085
Manufacture of meat products and cooking oil	1 173	5 192 282
Manufacture of mechanical pulp	6	3 727 304
Manufacture of refined petroleum prod.	14	368 359 992
Manufacture of starch and starch prod.	3	59 011
Manufacture of textiles	1 065	648 103
Manufacture of transport equipment	1 187	1 966 575
Manufacturing	932	22 909 202
Mining of ores	8	23 191 168
Motion picture, radio and TV	1 525	553 536
Office activities	87 135	17 254 039
Oil and gas extraction	76	327 775 120
Oil and gas extraction services	385	585 900
Operation of entertainment facilities	38	360 924
Operation of hatcheries	197	420 000
Operation of sports arenas and activities	2 156	3 253 511
Other recreational serv. n.e.c.	78	15 488
Peat extraction	12	3 366

Water use group	Number of establishments	Water use (m3)
Physical well-being activities	924	647 017
Printing	1 538	336 538
Processing of nuclear fuel	-	-
Production of electricity	387	91 703 768
Production of ethyl alcohol	3	13 803
Quarrying	687	10 803 134
Recycling	160	1 707 397
Repair and retail sale of parts	4 350	2 506 746
Reproduction of recordings	74	-
Rescue activities	541	162 300
Sanitation, remedist. and sim. act.	293	96 195
Service activities for primary industries	2 914	3 449 603
Serving of food and beverages	7 714	16 861 648
Smelting plants	72	471 405 678
Social welfare, leisure and services	4 011	6 320 562
Social work	8 508	424 036
Spinning and weaving	62	320 360
Steam and hot water supply	48	1 474 863
Stone cutting,shaping and finishing	178	1 042 526
Terminals and harbours	1 292	1 045 696
Transmission and distribution of electricity	110	11 445
Transport	18 363	8 602 272
Unknown	248	2 947
Veterinary activities	616	18 452
Washing,dryclean. of textiles etc.	338	245 026
Water supply	213	59 099 151
Welfare institutions	925	1 501 027
Wholesale and retail sale	66 589	11 164 278

Appendix 2 – Water use groups and coefficients

Coefficients applied in this project for each water use group. The coefficients are created with basis in either (1) water use per economic turnover (m^3 of water used per 1 million kroner) or (2) water use per employee (m^3 per employee).

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
0	16.000	Tobacco products	.	195
Unknown	00.000	Unknown	27	.
Growing	01.110	Growing of cereals etc.	.	254
	01.122	Growing of nursery prod.	.	254
	01.130	Growing of fruit, berries etc.	2 696	.
Growing of vegetables	01.121	Outdoor growing of vegetables etc.	.	373
Farming	01.210	Farming of cattle, dairy farming	.	433
	01.220	Farming of sheep, goates, horses etc.	3 107	.
	01.230	Farming of swine	.	433
	01.240	Farming of poultry	.	433
	01.250	Other farming of animals	3 107	.
	01.300	Mixed farming	.	254
Service activities for primary industries	01.410	Agricultural service activities	.	319
	01.420	Animal husbandry service act.	.	319
	01.500	Hunting and rel. serv. activities	.	319
	02.020	Forestry and logging rel. serv act.	1 628	.
	05.023	Fish farming rel. serv. activities	.	319
Forestry	02.011	Logging	.	136
	02.012	Other forestry activities	.	136
Fishing and catching	05.011	Ocean and coastal waters fishing	1 196	.
	05.012	Whaling	.	.
	05.013	Fishing in inland water	1 196	.
Fish farming	05.021	Operation of fish farms	.	1 075
Operation of hatcheries	05.022	Operation of hatcheries	.	500
Coal mining	10.100	Hard coal mining	.	974
	10.200	Lignite mining	.	.
Peat extraction	10.300	Peat extraction	.	153
Oil and gas extraction	11.100	Oil and gas extraction	.	180
Oil and gas extraction services	11.200	Oil and gas extraction services	.	35
Mining of ores	12.000	Mining of uranium and thorium ores	.	.
	13.100	Mining of iron ores	.	64 064
	13.200	Mining of non-ferrous metal ores	.	64 064
Quarrying	14.110	Quarr. of ornam. and building stone	95	.
	14.120	Quarr. of limestone,gypsum,chalk	.	3 653
	14.130	Quarrying of slate	.	3 653
	14.210	Operation of gravel,sand pits	.	3 653
	14.220	Mining of clays and kaolin	.	.
	14.300	Mining of chem. fertilizer minerals	.	3 653
	14.400	Salt production	.	.
	14.500	Other mining and quarrying n.e.c.	.	3 653
Manufacture of meat products and cooking oil	15.110	Prod. and preserv. of meat	92	.
	15.120	Prod. and preserv. of poultry meat	92	.
	15.130	Prod. of meat and poultry meat prod.	92	.
	15.720	Manuf. of prepared pet foods	92	.
	15.810	Manuf. of bread and cakes	92	.
	15.820	Manuf. of rusks and biscuits	92	.
	15.830	Manuf. of sugar	.	.
	15.840	Manuf. of cocoa, chocolate etc.	92	.
	15.850	Manuf. of macaroni, noodles etc.	92	.
	15.860	Processing of tea and coffee	92	.
	15.870	Manuf. of condiments and seasonings	92	.

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	15.880	Manuf. of dietetic food etc.	92	.
	15.890	Manuf. of other food prod. n.e.c.	92	.
Manufacture of fish products	15.201	Drying and salting of fish	476	.
	15.202	Freezing of fish, fishfillets etc.	476	.
	15.203	Canning of fish and fishproducts	476	.
	15.209	Other process.,preserv. of fish etc.	476	.
Manufacture of fruit and vegetables	15.310	Proc. and preserve of potatoes	449	.
	15.320	Manuf. of fruit and vegetable juice	449	.
	15.330	Processing of fruit,veget. n.e.c.	449	.
Manufacture of crude fish oils and fats	15.411	Manuf. of crude fish oils and fats	125	.
	15.419	Manuf. of other crude oils and fats	.	.
	15.421	Manuf. of refined oils from animals	125	.
	15.422	Manuf. of refined oils from vegetab	.	.
	15.430	Manuf. of margarine,sim. edible fats	125	.
Manufacture of dairy products	15.510	Oper. of dairies,cheese making	314	.
	15.520	Manuf. of ice cream	314	.
Manufacture of grain mill products	15.610	Manuf. of grain mill products	212	.
	15.710	Manuf. of prep. feeds for farm anim.	212	.
Manufacture of starch and starch prod.	15.620	Manuf. of starch and starch prod.	449	.
Manufacture of beverages	15.910	Manuf. of dist. potable alco. bev.	317	.
	15.930	Manuf. of wines	.	.
	15.940	Manuf. of cider and fruit wines	317	.
	15.950	Manuf. of other non-distilled bev.	.	.
	15.960	Manuf. of beer	317	.
	15.970	Manuf. of malt	.	.
	15.980	Prod. of mineral waters etc.	317	.
Production of ethyl alcohol	15.920	Prod. of ethyl alcohol	317	.
Spinning and weaving	17.110	Prep./spinn. of cotton-type fibres	.	.
	17.120	Prep./spinn. of woollen-type fibres	.	556
	17.130	Prep./spinn. of worsted-type fibres	.	556
	17.140	Prep./spinn. of flax-type fibres	.	.
	17.150	Throwing and prep. of silk	.	.
	17.160	Manuf. of sewing threads	.	.
	17.170	Prep./spinn. of other text. fibres	.	556
	17.210	Cotton-type weaving	.	556
	17.220	Woollen-type weaving	.	556
	17.230	Worsted-type weaving	.	556
	17.240	Silk-type weaving	.	.
	17.250	Other textile weaving	204	.
Manufacture of textiles	17.300	Finishing of textiles	.	177
	17.401	Manuf. of household linens	.	177
	17.409	Manuf. of other made-up text.art.	.	177
	17.510	Manuf. of carpets and rugs	.	177
	17.530	Manuf. of non-wovens and -articles	.	177
	17.540	Manuf. of other textiles n.e.c.	.	177
	17.600	Manuf. knitted and crocheted fabr.	.	177
	17.710	Manuf. knitted and crocheted hosiery	.	177
	17.720	Manuf. of pullovers, cardigans etc.	144	.
	18.100	Manuf. of leather clothes	.	177
	18.210	Manuf. of workwear	.	177
	18.220	Manuf. of other outerwear	.	177
	18.230	Manuf. of underwear	.	177
	18.240	Manuf. of wearing apparel n.e.c.	.	177
	19.200	Manuf. of luggage,handbags etc.	.	177
	19.300	Manuf. of footwear	144	.
Manufacture of articles of fur etc.	18.300	Manuf. of articles of fur etc.	.	464
	19.100	Tanning and dressing of leather	.	464
Light manufacturing	17.520	Manuf. of cordage, rope etc.	.	240

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	20.101	Sawmilling and planing of wood	.	240
	20.102	Impregnation of wood	.	240
	20.200	Manuf. of panels and boards	.	240
	20.301	Manuf. of wooden prefabr. buildings	.	240
	20.302	Manuf. of other builders'. carpentry	.	240
	20.400	Manuf. of wooden containers	.	240
	20.510	Manuf. of other products of wood	.	240
	20.520	Manuf. of articles of cork etc.	.	240
	21.210	Manuf. of corrugat. paper and -board	.	240
	21.230	Manuf. of paper stationery	.	240
	21.240	Manuf. of wallpaper	.	240
	21.250	Manuf. of other art. of paper	.	240
	22.230	Bookbinding	.	240
	23.100	Manuf. of coke oven products	.	240
	25.220	Manuf. of plastic packing goods	.	240
	25.230	Manuf. of builders'. ware of plastic	.	240
	25.240	Manuf. of other plastic products	.	240
	26.120	Shaping, processing of flat glass	.	240
	26.130	Manuf. of hollow glass	.	240
	28.110	Manuf. of metal structures, parts	.	240
	28.120	Manuf. of build. carpentry of metal	.	240
	28.210	Manuf. of metal tanks and reservoirs	81	.
	28.220	Manuf. of centr. heating reservoirs	.	240
	28.300	Manuf. of steam generators etc.	.	240
	28.400	Powder metallurgy etc.	.	240
	28.510	Treatment and coating of metals	.	240
	28.520	General mechanical engineering	.	240
	28.610	Manuf. of cutlery	.	240
	28.620	Manuf. of tools	.	240
	28.630	Manuf. of locks and hinges	.	240
	28.710	Manuf. of steel drums etc.	.	240
	28.720	Manuf. of light metal pack.	.	240
	28.730	Manuf. of wire products	81	.
	28.740	Manuf. of fasteners etc.	.	240
	28.750	Manuf. of other fabr. metal prod.	81	.
	29.111	Manuf. of marine engines and parts	.	240
	29.119	Manuf. of other engines,turbines	.	240
	29.120	Manuf. of pumps and compressors	.	240
	29.130	Manuf. of taps and valves	.	240
	29.140	Manuf. of bearings, gears etc.	.	240
	29.210	Manuf. of furnaces,furnace burners	.	240
	29.221	Manuf. of marine lift.,handl. equip.	.	240
	29.229	Mnauf. of other lift.,handl. equip.	.	240
	29.230	Manuf. of non-dom. ventil equip.	.	240
	29.240	Manuf. of other gen. purp. machin.	.	240
	29.310	Manuf. of agric. tractors	.	240
	29.320	Manuf. of other agric. machinery	.	240
	29.410	Portable hand held power tools	.	240
	29.420	Other metal working machine tools	.	240
	29.430	Other machine tools n.e.c.	.	240
	29.510	Manuf. of metallurgy mach.	.	240
	29.520	Manuf. of mining ang quarry. mach.	.	240
	29.530	Manuf. of food,beverage proc. mach.	.	240
	29.540	Manuf. of textile prod. mach. etc.	.	240
	29.550	Manuf. of paper prod. mach. etc.	.	240
	29.560	Other spec. purpose machinery	.	240
	29.600	Manuf. of weapons and ammunition	.	240
	29.710	Mnauf. of electric dom. appliances	.	240

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	29.720	Manuf. of non-el. dom. appliances	.	240
	30.010	Manuf. of office machinery	.	240
	30.020	Manuf. of computers etc.	.	240
	31.100	Manuf. of elec. motors,generators etc.	81	.
	31.200	Manuf. of el. distr. and contr.app.	.	240
	31.300	Manuf. of insul. wire and cable	.	240
	31.400	Manuf. accumulators,batteries etc.	.	240
	31.500	Manuf. lighting equip. and lamps	.	240
	31.610	Manuf. of el. equip. for engines	.	240
	31.620	Manuf. of other el. equipment	.	240
	32.100	Manuf. of electronic components	.	240
	32.200	Manuf. of radio and TV-transmitters	.	240
	32.300	Manuf. of TV,recording app. etc.	.	240
	33.100	Medical and surgical equip. etc.	.	240
	33.200	Manuf. testing instruments,app.	81	.
	33.300	Industrial proc. control equip.	.	240
	33.400	Optical and photograph. instruments	.	240
	33.500	Manuf. of watches and clocks	.	240
	34.100	Manuf. of motor vehicles	.	240
	34.200	Manuf. of bodies for motors etc.	.	240
	34.300	Manuf. of parts for motor vehicles	.	240
	36.110	Manuf. of chairs and seats	.	240
	36.120	Manuf. of other office,shop furnit.	.	240
	36.130	Manuf. of other kitchen furniture	.	240
	36.140	Manuf. of other furniture	81	.
	36.150	Manuf. of mattresses	.	240
	36.210	Striking of coins and medals	.	240
	36.220	Manuf. of jewellery and relat. art.	.	240
	36.300	Manuf. of musical instruments	.	240
	36.400	Manuf. of sports goods	.	240
	36.500	Manuf. of games and toys	.	240
	36.610	Manuf. of imitation jewellery	.	240
	36.620	Manuf. of brooms and brushes	.	240
	36.630	Other manufacturing n.e.c.	.	240
Manufacture of mechanical pulp	21.111	Manuf. of mechanical pulp	.	18 452
Manufacture of chem. processed pulp	21.112	Manuf. of chem. processed pulp	.	107 452
Manuf. of paper and paperboard	21.120	Manuf. of paper and paperboard	.	31 136
	21.220	Manuf. of househ. and sanitary goods	.	31 136
Office activities	22.110	Publishing of books	.	36
	22.120	Publishing of newspapers	.	36
	22.130	Publ. of journals and periodicals	.	36
	22.140	Publ. of sound recordings	.	36
	22.150	Other publishing	10	.
	40.130	Distrib. and trade of electricity	.	36
	40.220	Distrib. and trade of gas	.	36
	63.211	Centr. agen. for goods,transp. proc	.	36
	63.212	Parking places and -houses	.	36
	63.213	Toll bar stations	.	36
	63.219	Other serv. allied to land transp.	.	36
	63.402	Ship brokerage services	.	36
	63.403	Aircraft brokerage services	.	36
	63.409	Other forwarding services	.	36
	64.210	Fixed telcomm. carriers	.	36
	64.220	Mobile telecomm. carriers	.	36
	64.230	Internet service providers	.	36
	64.240	Other telecomm. activities	.	36
	65.110	Central banking	.	36
	65.120	Other monetary intermediation	.	36

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	65.210	Financial leasing	.	36
	65.220	Other credit granting	.	36
	65.231	Unit trust	.	.
	65.238	Portfolio investments	.	36
	65.239	Other security management	.	36
	66.010	Life insurance	.	36
	66.020	Pension funding	.	36
	66.030	Non-life insurance	.	36
	67.110	Adm. of financial markets	.	36
	67.120	Security broking,fund management	.	36
	67.130	Act. aux. to fin. intermed. n.e.c.	.	36
	67.200	Act. aux. to insurance,pens. fund.	.	36
	70.111	House building cooperative	.	36
	70.112	Other develop.,sale of real estate	.	36
	70.120	Buying,selling of own real estate	.	36
	70.201	House cooperative	.	36
	70.202	Other letting of own property	.	36
	70.310	Real estate agencies	.	36
	70.321	Manag. of real estate on a fee etc.	.	36
	72.100	Hardware consultancy	.	36
	72.210	Publishing og software	.	36
	72.220	Other software cons. and supply	.	36
	72.300	Data processing	.	36
	72.400	Database activities	.	36
	72.600	Other computer related activities	.	36
	73.100	R&D, natural science	.	36
	73.200	R&D, social science	.	36
	74.110	Legal activities	.	36
	74.121	Accounting and book-keeping	.	36
	74.122	Auditing	.	36
	74.123	Tax consultancy services	.	36
	74.130	Market research,publ opin. polling	.	36
	74.140	Business,managemant consult. act.	.	36
	74.150	Managemant act. of holding comp.	.	36
	74.201	Architectural activities	.	36
	74.202	Civil engineering activities	.	36
	74.203	Geological surveying	.	36
	74.209	Other tech. consult. activities	.	36
	74.300	Technical testing and analysis	.	36
	74.400	Advertising	.	36
	74.501	Labour recruit. of personnel	.	36
	74.502	Provision of personnel	.	36
	74.600	Investigation and security act.	.	36
	74.700	Industrial cleaning	.	36
	74.810	Photographic activities	.	36
	74.820	Packaging activities	.	36
	74.851	Secretarial activities	.	36
	74.852	Translation activities	.	36
	74.860	Callcentre activities	.	36
	74.871	Bill coll. and credit grant. act.	.	36
	74.874	Appraisal activities	.	36
	74.875	Model agencies activities	.	36
	74.876	Impresario activities	.	36
	75.110	General public service act.	.	36
	75.120	Act. provid. health care, educ. etc.	.	36
	75.130	Reg. of operation of business	.	36
	75.140	Supp. serv. act. for the governm.	.	36
	75.210	Foreign affairs	.	36

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	75.230	Justice and judicial activities	.	36
	75.240	Publ. security, law and order act.	.	36
	75.300	Comp. social security activity	.	36
	85.340	Soc. charitable foundations	.	36
	91.110	Act. of business,emplyers org.	.	36
	91.120	Act. of professional org.	.	36
	91.200	Activities of trade unions	.	36
	91.310	Activities of religious org.	.	36
	91.320	Activities of political org.	.	36
	91.330	Act. of other membership org. n.e.c.	.	36
	92.710	Gambling and betting activities	.	36
	92.721	Act. and adventure companies	.	36
	92.722	Leisure establishments	.	36
	93.030	Funeral and related activities	.	36
Printing	22.210	Printing of newspapers	25	.
	22.220	Printing n.e.c.	.	41
	22.240	Pre-press activities	.	41
	22.250	Anc. activities related to printing	.	41
Reproduction of recordings	22.310	Reprod. of sound recording	.	.
	22.320	Reprod. of video recording	.	.
	22.330	Reprod. of computer media	.	.
Manufacture of refined petroleum prod.	23.200	Manuf. of refined petroleum prod.	.	346 203
Processing of nuclear fuel	23.300	Processing of nuclear fuel	.	.
Manufacture of industrial gases	24.110	Manuf. of industrial gases	.	17 245
Manufacture of chemical compunds	24.120	Manuf. of dyes and pigments	.	117 973
	24.131	Manuf. of carbides	.	117 973
	24.139	Manuf. of other inorg. basic chem.	.	117 973
	24.140	Manuf. of other organ. basic chem.	.	117 973
	24.150	Manuf. of fertilizers etc.	.	117 973
	24.160	Manuf. of plastics in primary forms	.	117 973
	24.610	Manuf. of explosives	.	117 973
Manufacture of chemical products	24.170	Manuf. of synthetic rubber	.	.
	24.200	Manuf. of pesticides,agro-chem. prod.	.	430
	24.301	Manuf. of paints, varnishes etc.	.	430
	24.302	Manuf. of printing inks and mastics	.	430
	24.410	Manuf. of basic pharm. products	.	430
	24.420	Maunf. of pharm. preparations	.	430
	24.510	Manuf. of clean. and polish. prep.	.	430
	24.520	Manuf. of perfumes and toilet prep.	124	.
	24.620	Manuf. of glues and gelatines	.	430
	24.630	Manuf. of essential oils	.	430
	24.640	Manuf. of photogr. chem. material	.	.
	24.650	Manuf. of prepared unrec. media	.	430
	24.660	Manuf. of other chem. prod. n.e.c.	124	.
	24.700	Manuf. of man-made fibres	.	.
Manufacturing	25.110	Manuf. of rubber tyres and tubes	348	.
	25.120	Retread., rebuild. of rubber tyres	348	.
	25.130	Manuf. of other rubber products	.	1 957
	25.210	Manuf. of plastic plates etc.	.	1 957
	26.110	Manuf. of flat glass	.	1 957
	26.140	Manuf. of glass fibres	.	1 957
	26.150	Manuf. and process. of other glass	.	1 957
	26.210	Manuf. of ceramic household art.	.	1 957
	26.220	Manuf. of ceram. san. fixtures	.	1 957
	26.230	Manuf. of ceram. insulators etc.	.	1 957
	26.240	Manuf. of other tech. ceram prod..	.	1 957
	26.250	Manuf. of other ceramic prod.	.	1 957
	26.260	Manuf. of refract. ceramic prod.	.	1 957

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	26.300	Manuf. of ceramic tiles and flags	.	.
	26.400	Construction prod. in baked clay	.	1 957
	26.510	Manuf. of cement	.	1 957
	26.520	Manuf. of lime	.	1 957
	26.530	Manuf. of plaster	.	.
	26.610	Manuf. of concrete products	.	1 957
	26.620	Manuf. of plaster products	348	.
	26.630	Manuf. of ready-mixed concrete	.	1 957
	26.640	Manuf. of mortars	.	1 957
	26.650	Manuf. of fibre cement	.	1 957
	26.660	Manuf. of other art. of concrete	.	1 957
	26.810	Prod. of abrasive products	.	1 957
	26.820	Manuf. of other non-met. min. prod.	.	1 957
	27.210	Manuf. of cast iron tubes	.	1 957
	27.220	Manuf. of steel tubes	.	1 957
	27.310	Cold drawing	.	.
	27.320	Cold rolling of narrow strips	.	.
	27.330	Cold forming and folding	.	1 957
	27.340	Wire drawing	.	.
	27.410	Precious metals production	.	1 957
	27.422	Prod. of first transf. of aluminium	.	1 957
Stone cutting,shaping and finishing	26.700	Stone cutting,shaping and finishing	.	1 361
Smelting plants	27.100	Mnauf,basic iron,steel,ferr-alloys	.	51 837
	27.421	Prod. of primary aluminium	.	51 837
	27.430	Lead, zinc and tin production	.	51 837
	27.440	Copper production	.	51 837
	27.450	Other non-ferrous metal production	.	51 837
Casting of iron	27.510	Casting of iron	.	3 380
Casting of steel	27.520	Casting of steel	.	4 382
Casting of other metals	27.530	Casting of light metals	.	340
	27.540	Casting of other non-ferr. metals	.	340
Manufacture of transport equipment	35.111	Build. and rep. of ships (>100)	.	65
	35.112	Install.,compl. work on ships (>100)	.	65
	35.113	Build. and rep. of ships (<100)	.	65
	35.114	Build.,rep. of oil-platforms etc.	.	65
	35.115	Install.,compl. work on oil platf.	.	65
	35.116	Manuf. of other floating equip.	.	65
	35.120	Building,repairing of sport. boats	.	65
	35.201	Manuf. of railway, tramway etc.	.	65
	35.202	Rep. of railway, tramway etc.	.	65
	35.300	Manuf. of aircraft and spacecraft	.	65
	35.410	Manuf. of motorcycles	.	.
	35.420	Manuf. of bicycles	.	65
	35.430	Manuf. of invalid carriages	.	65
	35.500	Other transport equipment n.e.c.	.	65
Recycling	37.100	Recycling of metal waste and scrap	.	1 387
	37.200	Recycling,non-met. waste and scrap	.	1 387
Production of electricity	40.110	Prod. of electricity	.	13 364
	40.210	Manuf. of gas	.	13 364
Transmission and distribution of electricity	40.120	Transmission of electricity	.	3
Steam and hot water supply	40.300	Steam and hot water supply	.	2 909
Water supply	41.000	Water supply	.	.
Building and construction	45.110	Dem./wreck. of build..earth moving	433	.
	45.120	Test drilling and boring	.	80
	45.211	General construction of buildings	.	80
	45.212	Gen. construction of civil eng. works	.	80
	45.221	Tinsmith work	.	80
	45.229	Other erec. of roof covering,frame	.	80

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	45.230	Constr. of highways, roads etc.	.	80
	45.240	Constr. of water projects	.	80
	45.250	Other constr. work inv. spec. trades	.	80
	45.310	Install. of electr. wiring,fittings	433	.
	45.320	Insulation work activities	.	80
	45.330	Plumbing	.	80
	45.340	Other buiding installation	.	80
	45.410	Plastering	.	80
	45.420	Joinery installation	.	80
	45.430	Floor and wall covering	.	80
	45.441	Painting	.	80
	45.442	Glazing	.	80
	45.450	Other building completion	.	80
Wholesale and retail sale	45.500	Rent. of constr.equip. w. operator	.	31
	50.101	Comm.-,wholesale of motor vehicles	.	31
	50.102	Retail sale of motor vehicles	.	31
	50.301	Comm.-,w.sale of motorveh.,parts	.	31
	50.302	Ret. sale of motorvehicle parts etc	.	31
	50.500	Retail sale of automotive fuel	.	31
	51.110	Agents in agric., raw materials etc.	.	31
	51.120	Agents in fuels, ores, metal etc.	.	31
	51.130	Agents in timber,build. materials	.	31
	51.140	Agents in machin., ind. equip. etc.	.	31
	51.150	Agents in furniture, hardware etc.	.	31
	51.160	Agents in textiles, clothing etc.	.	31
	51.170	Agents in food, beverages etc.	.	31
	51.180	Agents in spec. particular products	.	31
	51.190	Agents in variety of goods	.	31
	51.210	W.sale of grain,seeds,anim. feeds	.	31
	51.220	W.sale of flowers and plants	.	31
	51.230	W.sale of live animals	.	31
	51.240	W.sale of hides,skins and leather	.	31
	51.250	W.sale of unmanuf. tobacco	.	.
	51.310	W.sale of fruit and vegetables	.	31
	51.320	W.sale of meat and meat products	.	31
	51.330	W.sale of dairy prod. eggs etc.	.	31
	51.341	W.sale of wines and spirits	.	31
	51.349	W.sale of beverages n.e.c.	.	31
	51.350	W.sale of tobacco products	.	31
	51.360	W.sale sugar, chocolate etc.	.	31
	51.370	W.sale coffee, tea, cocoa etc.	.	31
	51.381	W.sale of fish and crustaceans	.	31
	51.389	W.sale of molluscs n.e.c.	.	31
	51.390	Non-spec. w.sale of food,bev.,tob.	.	31
	51.410	W.sale of textiles	.	31
	51.421	W.sale of clothing	.	31
	51.422	W.sale of footwear	.	31
	51.431	W.sale of lighting equip.	.	31
	51.432	W.sale of el. househ. applian. etc.	.	31
	51.433	W.sale of radio,television goods	.	31
	51.434	W.sale of records, tapes, CD'.s etc.	.	31
	51.441	W.sale of china and glassware	.	31
	51.442	W.sale of wallpaper,clean. material	.	31
	51.450	W.sale of perfume and cosmetics	.	31
	51.460	W.sale of pharmaceutical goods	.	31
	51.471	W.sale of books,newspapers,magaz.	.	31
	51.472	W.sale of furniture etc.	.	31
	51.473	W.sale of floor coverings,carpets	.	31

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	51.474	W.sale of travel accessories etc.	.	31
	51.475	W.sale of watches,photo,opt. goods	.	31
	51.476	W.sale of gold and silver ware	.	31
	51.477	W.sale of sports goods,games,toys	.	31
	51.479	W.sale of household-,pers. goods	.	31
	51.510	W.sale of soli,liquid,gass. fuels	.	31
	51.520	W.sale of metals and metal ores	.	31
	51.531	W.sale of timber	.	31
	51.532	W.sale of lumber	.	31
	51.533	W.sale of paints and varnish	.	31
	51.539	W.sale of constr. materials n.e.c.	.	31
	51.540	W.sale of hardware, plumb.,heat. equip.	.	31
	51.550	W.sale of chemical products	.	31
	51.561	W.sale of paper and paperboard	.	31
	51.569	W.sale of intermed. prod. n.e.c.	.	31
	51.570	W.sale of waste and scrap	.	31
	51.810	W.sale of machine tools	.	31
	51.820	W.sale of constr. machinery	.	31
	51.830	W.sale of mach. for textile ind. etc.	.	31
	51.840	W.sale of computers etc.	.	31
	51.850	W.sale of other office machinery	.	31
	51.860	W.sale of other electron. parts etc.	.	31
	51.871	W.sale of energy prod. mach.,equip.	.	31
	51.872	W.sale of shipping equip. etc.	.	31
	51.873	W.sale of oil,gas extract. equip.	.	31
	51.874	W.sale of trade,transp. equip.	.	31
	51.880		.	31
	51.900	Other wholesale	.	31
	52.110	Non-spec. stores w.food, bev.etc.	.	31
	52.120	Other ret. sale in non-spec. stores	.	31
	52.210	Ret. sale of fruit and vegetables	.	31
	52.220	Ret. sale of meat and meat prod.	.	31
	52.230	Ret. sale of fish, crustaceans etc.	.	31
	52.241	Ret. sale of bread, cakes etc.	.	31
	52.242	Ret. sale of sugar confectionery	.	31
	52.251	Ret. sale of wines and spirits	.	31
	52.252	Ret. sale of beverages n.e.c.	.	31
	52.260	Ret. sale of tobacco prod.	.	31
	52.271	Ret. sale of health foods	.	31
	52.272	Ret. sale of coffee and tea	.	31
	52.279	Ret.sale in spec.stores of food etc.	.	31
	52.310	Dispensing chemists	.	31
	52.320	Ret. sale of med.,ortophaed goods	.	31
	52.330	Ret. sale of cosmetic and toil. art.	.	31
	52.410	Ret. sale of textiles	.	31
	52.420	Ret. sale of clothing	.	31
	52.431	Ret. sale of footwear	.	31
	52.432	Ret. sale of travel access. etc.	.	31
	52.441	Ret. sale of lighting equip.	.	31
	52.442	Ret. sale of china and glassware	.	31
	52.443	Ret. sale of furniture	.	31
	52.449	Ret. sale of non-el. household art.	.	31
	52.451	Ret. sale of househ.appl.,radio,TV	.	31
	52.452	Ret. sale of records, tapes, CD'.s etc.	.	31
	52.453	Ret. sale of musical instr.,-notes	.	31
	52.461	Ret. sale of variety of hardware etc.	.	31
	52.462	Ret. sale of hardware	.	31
	52.463	Ret. sale of paints and varnish	.	31

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	52.464	Ret. sale of wood	.	31
	52.469	Ret. sale hardw.,paints,glass n.e.c.	.	31
	52.471	Ret. sale of books and stationery	.	31
	52.472	Ret. sale of newspapers,magazines	.	31
	52.481	Ret. sale watches,photo.-,opt.goods	.	31
	52.482	Ret. sale of gold and silver ware	.	31
	52.483	Ret. sale of sport goods, games etc.	.	31
	52.484	Ret. sale of flower and plants	.	31
	52.485	Ret. sale of office equipment etc.	.	31
	52.486	Ret. sale of wallpaper,floor cover.	.	31
	52.487	Ret. sale of carpets	.	31
	52.489	Ret. sale in spec. stores	.	31
	52.501	Ret. sale of antiques	.	31
	52.502	Ret. sale of second-hand clothes	.	31
	52.509	Ret. sale sec-hand goods n.e.c.	.	31
	52.611	Moh.ret.sale of variety of goods	.	31
	52.612	Moh.ret.sale of textiles etc.	.	31
	52.613	Moh.ret.sale of non-el. househ. art.	.	31
	52.614	Moh.ret.sale el.househ. art.	.	31
	52.615	Moh.ret.sale of books, paper etc.	.	31
	52.619	Other moh.ret.sale of spec. assort.	.	31
	52.620	Ret. sale via stalls and markets	.	31
	52.630	Other non-stores retail sale	.	31
	52.710	Repair of bootes, shooes etc.	.	31
	52.720	Repair of electr. household goods	.	31
	52.730	Repair of watches,clocks,jewellery	.	31
	52.740	Repair n.e.c.	.	31
	63.301	Travel agencies	.	31
	63.302	Tourist offices	.	31
	63.303	Tour operator	.	31
	63.304	Tour guides and leaders	.	31
	63.305	Adventure, event and act. operators	.	31
	63.309	Tourist related act. n.e.c.	.	31
	71.100	Renting of automobiles	.	31
	71.210	Rent. of other land transp. equip.	.	31
	71.220	Rent. of water transp. equip.	.	31
	71.230	Rent. of air transp. equip.	.	31
	71.310	Rent. of agric. machinery,equip.	.	31
	71.320	Rent. of constr.,civ. engin. mach.	.	31
	71.330	Rent. of office machinery etc.	.	31
	71.340	Rent. of machinery,equip. n.e.c.	.	31
	71.400	Renting of personal-,househ. goods	.	31
	74.877	Fair,exhib. and congress organizers	.	31
	74.879	Other business act. n.e.c.	.	31
	93.050	Other service activities n.e.c.	.	31
Repair and retail sale of parts	50.200	Repair of motor vehicles	.	114
	50.401	Comm.-,w.sale of motorcycl.,parts	.	114
	50.402	Ret. sale of motorcycl.,parts	.	114
	50.403	Maint. and rep. of motorcycles	.	114
	72.500	Repair of computing machinery etc.	.	114
Accommodation	55.101	Hotels and motels with restaurant	.	284
	55.102	Hotels,motels without restaurant	.	284
	55.210	Youth hostels and mountain refuges	.	284
	55.220	Camp. sites incl caravan sites	.	284
	55.230	Other provision of lodgings n.e.c.	.	284
	85.337	Recept. centres for asylum seekers	.	284
Serving of food and beverages	55.301	Oper. of restaurants and cafés	.	284
	55.302	Oper. of snackbars, saladbars etc.	.	284

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	55.401	Pubs	.	284
	55.402	Coffee- and tea bars	.	284
	55.510	Canteens	.	284
	55.520	Catering	.	284
Transport	60.100	Transport via railways	.	51
	60.211	Sched. motor bus transport	.	51
	60.212	Tramway,suburban transp.	.	51
	60.213	Cableway transport	.	51
	60.220	Taxi operation	.	51
	60.230	Other land passenger transport	.	51
	60.240	Freight transport by road	.	51
	60.300	Transport via pipelines	.	51
	61.101	Ocean transport	.	51
	61.103	Domestic freight transport	.	51
	61.104	Sched. long. dist. inland transp.	.	51
	61.106	Tug- and supllyvessels	.	51
	61.109	Other coast water transp. in Norw.	.	51
	61.200	Inland water transport	.	51
	62.100	Scheduled air transport	.	51
	62.200	Non-scheduled air transport	.	51
	62.300	Space transport	.	.
	64.110	National post activities	.	51
	64.120	Other courier activities	.	51
Terminals and harbours	63.110	Cargo handling	.	64
	63.120	Storage and warehousing	.	64
	63.221	Operations of harbours	.	64
	63.223	Rescue services	.	64
	63.224	Offshore supply terminal	.	64
	63.229	Other supp. water transp. act.	.	64
	63.230	Other supp. air transp. activities	.	64
	63.401	Freight forwarding services	.	64
Caretaker services	70.322	Caretaker services	.	64
Designers activities	74.872	Designers activities	.	23
	74.873	Interior decorators activities	.	23
Defence activities	75.220	Defence activities	.	224
Rescue activities	75.250	Fire service activities	.	20
	85.147	Ambulance services	.	20
Education	80.101	Pre-primary education	.	95
	80.102	Primary,lower secondary education	.	95
	80.103	Spec. education for the handicapped	.	95
	80.104	Comp.centre etc.	.	95
	80.105	Educ. and psyc. counselling services	.	95
	80.210	General secondary education	.	95
	80.220	Tech.,vocation. secondary educ.	.	95
	80.301	Education at universities	.	95
	80.302	Education at state colleges	.	95
	80.303	Education at military colleges	.	95
	80.309	Education at other colleges	.	95
	80.410	Driving school activities	.	95
	80.421	Folk high school education	.	95
	80.422	Labour market training	.	95
	80.423	Act. of adult educ. associationsl	.	95
	80.424	Act. of municipal music scholls	.	95
	80.425	Educ. charitable foundations	.	95
	80.429	Other education	.	95
Health care and medical practice	85.111	General hospitals	.	41
	85.112	Speciality hospitals	.	41
	85.113	Speciality nursing homes	.	41

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
	85.114	Rehabilitation institutions	.	41
	85.115	Other spec. health institutions	.	41
	85.116	Mental health hospital for adults	.	41
	85.117	Ment. health hosp.. for children etc.	.	41
	85.118	Nursing homes	.	41
	85.121	General practitioners	.	41
	85.122	Physic. spec. other than psychiat.	.	41
	85.123	Out-patient clinics	.	41
	85.124	Psychiatrists	.	41
	85.125	Out-pat. ment. health clin.,adults	.	41
	85.126	Out-pat. ment. health clin., child	.	41
	85.127	Outpatient drug treatment units	.	41
	85.130	Dental practice activities	.	41
	85.141	Home nursing care	.	41
	85.142	Physiotherapy services	.	41
	85.143	School health services, etc.	.	41
	85.144	Other preventive health care	.	41
	85.145	Psychologists	.	41
	85.146	Medical laboratories	.	41
	85.149	Other health activities	.	41
	85.151	Drug treatment units	.	41
	85.321	Home help	.	41
Veterinary activities	85.200	Veterinary activities	.	14
Welfare institutions	85.311	Child welfare institutions	.	61
	85.312	Inst. for alcohol. and drug adicts	.	61
	85.313	Inst. for elderly and disabled	.	61
	85.319	Other social care institutions	.	61
Social work	85.322	Dwell. w. accomm., elderly/disabled	.	4
	85.323	Child welfare services	.	4
	85.324	Soc.welf.serv.,alcoh.,drug addicts	.	4
	85.325	Family counselling services	.	4
	85.326	Munic. soc. serv. offices act.	.	4
	85.327	Early childh. educ. and care inst.	.	4
	85.328	Play groups	.	4
Social welfare, leisure and services	85.331	School-age child care	.	142
	85.332	Leis. time club act. child./adolesc.	.	142
	85.333	Day care act., elderly/disabl.	.	142
	85.334	Train. work act.for ord. lab.market	.	142
	85.335	Perm. sheltered work act.	.	142
	85.336	Soc. welfare org. activities	.	142
	85.338	Empl./train. for work under munic.	.	142
	85.339	Other soc. work act. without accom.	.	142
Coll. and treatment of sewage	90.010	Coll. and treatment of sewage	.	265
Coll. and treatment of other waste	90.020	Coll. and treatment of other waste	.	265
Sanitation, remedist. and sim. act.	90.030	Sanitation, remedist. and sim. act.	.	265
Motion picture, radio and TV	92.110	Motion picture and video prod.	.	64
	92.120	Motion picture and video distrib.	.	64
	92.130	Motion picture projection	.	64
	92.200	Radio and television activities	.	64
Cultural activities	92.310	Art.,lit. creation and interpret.	.	64
	92.320	Operation of arts facilities	.	64
	92.340	Other entertainment act. n.e.c.	.	64
	92.510	Library and archives activities	.	64
	92.521	Museums activities	.	64
	92.522	Preserv.of hist. sites and build.	.	64
	92.530	Bot.,zool. gardens,nat. reserve act.	.	64
	92.400	News agency activities	.	36
Operation of entertainment facilities	92.330	Fair and amusement park act.	884	.

Water use group	NACE5	Title	Factor (m^3 per 1 million NOK and year)	Factor (m^3 per employee and year)
Operation of sports arenas and activities	92.610	Oper. of sports arenas,stadiums	652	.
	92.621	Sports clubs and associations	652	.
	92.622	Oper. of arenas by sports clubs etc.	652	.
	92.629	Other sporting act. n.e.c.	652	.
Other recreational serv. n.e.c.	92.729	Other recreational serv. n.e.c.	.	64
Washing,dryclean. of textiles etc.	93.010	Washing,dryclean. of textiles etc.	151	.
Hairdressers, other beauty treatment	93.020	hairdress,other beauty treatment	176	.
Physical well-being activities	93.040	Physical well-being activities	344	.
Domestic services	95.000	Domestic services	.	1 429
	99.000	Extra-territorial org. and bodies	.	36

Appendix 3 – Details on subclasses (NACE5)

The column with "coefficient calculation" has been assigned a value 1 or 2, depending on whether it has been calculated with basis on (1) median value for subclass or (2) the result of sum of water use divided by sum of employees or economic turnover. The value E is assigned if the sample does not contain any observation for that particular code. Final calculations will then be based on an "estimated" water use based on data from establishments in the same water use group (see appendix 1). Some coefficients have been imputated based on previous studies and has been marked with Stave (2006) in the coefficient calculation column in this appendix.

The column "N (CRE)" refers to the number of establishments in the the Central Register of Establishments and Enterprises (total population) while the column "N (sample)" refers to the number of establishments in the sample of this project.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
00.000	Unknown		Economic turnover	27	.	2	248	22	8,9
01.110	Growing of cereals etc.	Precipitation and irrigation needs	Number of employees	.	272	1	15161	75	0,5
01.121	Outdoor growing of vegetables etc.	Precipitation and irrigation needs	Number of employees	.	373	1	604	2	0,3
01.122	Growing of nursery prod.	Irrigation needs	Number of employees	.	58	1	692	2	0,3
01.130	Growing of fruit, berries etc.	Precipitation and irrigation needs	Economic turnover	2696	.	1	716	3	0,4
01.210	Farming of cattle, dairy farming	No. of animals	Number of employees	.	432	1	19506	73	0,4
01.220	Farming of sheep, goates, horses etc.	No. of animals	Economic turnover	3467	.	1	8518	7	0,1
01.230	Farming of swine	No. of animals	Number of employees	.	452	2	1182	8	0,7
01.240	Farming of poultry	No. of animals		.	.	E	430	.	.
01.250	Other farming of animals	No. of animals	Economic turnover	231	.	1	635	6	0,9
01.300	Mixed farming	No. of animals	Number of employees	.	365	1	2861	15	0,5
01.410	Agricultural service activities	No. of employees	Number of employees	.	378	1	1407	2	0,1
01.420	Animal husbandry service act.	No. of employees	Number of employees	.	121	1	724	2	0,3
01.500	Hunting and rel. serv. activities	No. of employees		.	.	E	14	.	.
02.011	Logging	No. of employees	Number of employees	.	148	1	6463	15	0,2
02.012	Other forestry activities	No. of employees	Number of employees	.	25	1	292	1	0,3
02.020	Forestry and logging rel. serv act.	No. of employees	Economic turnover	1628	.	1	716	2	0,3
05.011	Ocean and coastal waters fishing	No. of tonnes catched	Economic turnover	1196	.	1	5321	3	0,1
05.012	Whaling	No. of tonnes catched		.	.		.	.	.
05.013	Fishing in inland water	No. of tonnes catched		.	.	E	26	.	.
05.021	Operation of fish farms	No. of fish	Number of employees	.	1075	1	564	7	1,2

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
05.022	Operation of hatcheries	No. of fish	Number of employees	.	500	1	197	1	0,5
05.023	Fish farming rel. serv. activities	No. of employees		.	.	E	53	.	.
10.100	Hard coal mining	No. of employees	Number of employees	.	974	2	3	2	66,7
10.200	Lignite mining	No. of employees		.	.		.	.	.
10.300	Peat extraction	No. of employees	Number of employees	.	153	2	12	5	41,7
11.100	Oil and gas extraction	No. of cubicmetres produced and process	Number of employees	.	180	2	76	11	14,5
11.200	Oil and gas extraction services	No. of employees	Number of employees	.	35	2	385	36	9,4
12.000	Mining of uranium and thorium ores	No. of employees		.	.		.	.	.
13.100	Mining of iron ores	No. of employees	Number of employees	.	417	2	2	2	100
13.200	Mining of non-ferrous metal ores	No. of employees	Number of employees	.	81260	2	6	2	33,3
14.110	Quarr. of ornam. and building stone	No. of employees	Economic turnover	95	.	2	101	9	8,9
14.120	Quarr. of limestone,gypsum,chalk	No. of employees	Number of employees	.	152	2	27	9	33,3
14.130	Quarrying of slate	No. of employees	Number of employees	.	191	2	53	2	3,8
14.210	Operation of gravel,sand pits	No. of employees	Number of employees	.	1433	2	466	49	10,5
14.220	Mining of clays and kaolin	No. of employees		.	.		.	.	.
14.300	Mining of chem. fertilizer minerals	No. of employees	Number of employees	.	510	2	18	4	22,2
14.400	Salt production	No. of employees		.	.		.	.	.
14.500	Other mining and quarrying n.e.c.	No. of employees	Number of employees	.	29109	2	22	5	22,7
15.110	Prod. and preserv. of meat	No. of animals	Economic turnover	125	.	Stave (2006)	137	n.a.	n.a.
15.120	Prod. and preserv. of poultry meat	No. of animals	Economic turnover	125	.	Stave (2006)	15	n.a.	n.a.
15.130	Prod. of meat and poultry meat prod.	No. of cubicmetres produced and cleaning	Economic turnover	125	.	Stave (2006)	192	n.a.	n.a.
15.201	Drying and salting of fish	No. of cubicmetres produced and cleaning	Economic turnover	476	.	Stave (2006)	174	n.a.	n.a.
15.202	Freezing of fish, fishfillets etc.	No. of cubicmetres produced and cleaning	Economic turnover	476	.	Stave (2006)	125	n.a.	n.a.
15.203	Canning of fish and fishproducts	No. of cubicmetres produced and cleaning	Economic turnover	476	.	Stave (2006)	12	n.a.	n.a.
15.209	Other process.,preserv. of fish etc.	No. of cubicmetres produced and cleaning	Economic turnover	476	.	Stave (2006)	283	n.a.	n.a.
15.310	Proc. and preserve of potatoes	No. of cubicmetres produced and cleaning	Economic turnover	449	.	Stave (2006)	35	n.a.	n.a.
15.320	Manuf. of fruit and vegetable juice	No. of cubicmetres produced and cleaning	Economic turnover	449	.	Stave (2006)	11	n.a.	n.a.
15.330	Processing of fruit,veget. n.e.c.	No. of cubicmetres produced and cleaning	Economic turnover	449	.	Stave (2006)	41	n.a.	n.a.
15.411	Manuf. of crude fish oils and fats	No. of cubicmetres produced and cleaning	Economic turnover	125	.	Stave (2006)	20	n.a.	n.a.
15.419	Manuf. of other crude oils and fats	No. of cubicmetres produced and cleaning	Economic turnover	125	.	Stave (2006)	.	n.a.	n.a.
15.421	Manuf. of refined oils from animals	No. of cubicmetres produced and cleaning	Economic turnover	125	.	Stave (2006)	6	n.a.	n.a.
15.422	Manuf. of refined oils from vegetab	No. of cubicmetres produced and cleaning	Economic turnover	125	.	Stave (2006)	.	n.a.	n.a.
15.430	Manuf. of margarine,sim. edible fats	No. of cubicmetres produced and cleaning	Economic turnover	125	.	Stave (2006)	6	n.a.	n.a.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
15.510	Oper. of dairies,cheese making	No. of cubicmetres produced and cleaning	Economic turnover	314	.	Stave (2006)	94	n.a.	n.a.
15.520	Manuf. of ice cream	No. of cubicmetres produced and cleaning	Economic turnover	314	.	Stave (2006)	27	n.a.	n.a.
15.610	Manuf. of grain mill products	No. of cubicmetres produced and cleaning	Economic turnover	449	.	Stave (2006)	68	n.a.	n.a.
15.620	Manuf. of starch and starch prod.	No. of cubicmetres produced and cleaning	Economic turnover	449	.	Stave (2006)	3	n.a.	n.a.
15.710	Manuf. of prep. feeds for farm anim.	No. of cubicmetres produced and cleaning	Economic turnover	154	.	Stave (2006)	117	n.a.	n.a.
15.720	Manuf. of prepared pet foods	No. of cubicmetres produced and cleaning	Economic turnover	154	.	Stave (2006)	10	n.a.	n.a.
15.810	Manuf. of bread and cakes	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	659	n.a.	n.a.
15.820	Manuf. of rusks and biscuits	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	23	n.a.	n.a.
15.830	Manuf. of sugar	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	.	n.a.	n.a.
15.840	Manuf. of cocoa, chocolate etc.	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	30	n.a.	n.a.
15.850	Manuf. of macaroni, noodles etc.	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	4	n.a.	n.a.
15.860	Processing of tea and coffee	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	13	n.a.	n.a.
15.870	Manuf. of condiments and seasonings	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	14	n.a.	n.a.
15.880	Manuf. of dietetic food etc.	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	15	n.a.	n.a.
15.890	Manuf. of other food prod. n.e.c.	No. of cubicmetres produced and cleaning	Economic turnover	17	.	Stave (2006)	61	n.a.	n.a.
15.910	Manuf. of dist. potable alco. bev.	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	4	n.a.	n.a.
15.920	Prod. of ethyl alcohol	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	3	n.a.	n.a.
15.930	Manuf. of wines	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	.	n.a.	n.a.
15.940	Manuf. of cider and fruit wines	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	4	n.a.	n.a.
15.950	Manuf. of other non-distilled bev.	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	.	n.a.	n.a.
15.960	Manuf. of beer	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	27	n.a.	n.a.
15.970	Manuf. of malt	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	.	n.a.	n.a.
15.980	Prod. of mineral waters etc.	No. of cubicmetres produced and cleaning	Economic turnover	317	.	Stave (2006)	64	n.a.	n.a.
16.000	Tobacco products	No. of cubicmetres produced and cleaning	Number of employees	.	195	2	10	2	20
17.110	Prep./spinn. of cotton-type fibres	No. of employees		.	.		.	.	.
17.120	Prep./spinn. of woollen-type fibres	No. of employees	Number of employees	.	508	2	10	2	20
17.130	Prep./spinn. of worsted-type fibres	No. of employees	Number of employees	.	721	2	2	2	100
17.140	Prep./spinn. of flax-type fibres	No. of employees		.	.		.	.	.
17.150	Throwing and prep. of silk	No. of employees		.	.		.	.	.
17.160	Manuf. of sewing threads	No. of employees		.	.		.	.	.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
17.170	Prep./spinn. of other text. fibres	No. of employees		.	.	E	1	.	.
17.210	Cotton-type weaving	No. of employees		.	.	E	6	.	.
17.220	Woollen-type weaving	No. of employees	Number of employees	.	448	2	4	1	25
17.230	Worsted-type weaving	No. of employees	Number of employees	.	496	2	10	2	20
17.240	Silk-type weaving	No. of employees		.	.		.	.	.
17.250	Other textile weaving	No. of employees	Economic turnover	204	.	2	29	4	13,8
17.300	Finishing of textiles	No. of employees	Number of employees	.	11	2	41	2	4,9
17.401	Manuf. of household linens	No. of employees	Number of employees	.	299	2	129	7	5,4
17.409	Manuf. of other made-up text.art.	No. of employees	Number of employees	.	19	2	166	8	4,8
17.510	Manuf. of carpets and rugs	No. of employees		.	.	E	10	.	.
17.520	Manuf. of cordage, rope etc.	No. of employees	Number of employees	.	543	2	94	11	11,7
17.530	Manuf. of non-wovens and -articles	No. of employees		.	.	E	6	.	.
17.540	Manuf. of other textiles n.e.c.	No. of employees	Number of employees	.	946	2	87	4	4,6
17.600	Manuf. knitted and crocheted fabr.	No. of employees	Number of employees	.	67	2	18	2	11,1
17.710	Manuf. knitted and crocheted hosiery	No. of employees		.	.	E	7	1	14,3
17.720	Manuf. of pullovers, cardigans etc.	No. of employees	Economic turnover	214	.	2	56	4	7,1
18.100	Manuf. of leather clothes	No. of employees		.	.	E	11	.	.
18.210	Manuf. of workwear	No. of employees	Number of employees	.	29	2	27	7	25,9
18.220	Manuf. of other outerwear	No. of employees	Number of employees	.	21	2	300	5	1,7
18.230	Manuf. of underwear	No. of employees	Number of employees	.	264	2	16	1	6,3
18.240	Manuf. of wearing apparel n.e.c.	No. of employees	Number of employees	.	36	2	132	6	4,5
18.300	Manuf. of articles of fur etc.	No. of employees	Number of employees	.	601	2	36	2	5,6
19.100	Tanning and dressing of leather	No. of employees	Number of employees	.	342	2	4	2	50
19.200	Manuf. of luggage,handbags etc.	No. of employees	Number of employees	.	12	2	38	3	7,9
19.300	Manuf. of footwear	No. of employees	Economic turnover	9	.	2	21	4	19
20.101	Sawmilling and planing of wood	No. of employees	Number of employees	.	570	2	746	38	5,1
20.102	Impregnation of wood	No. of cubicmetres timber	Number of employees	.	22	2	19	1	5,3
20.200	Manuf. of panels and boards	No. of employees	Number of employees	.	1586	2	28	13	46,4
20.301	Manuf. of wooden prefabr. buildings	No. of employees	Number of employees	.	16	2	169	19	11,2
20.302	Manuf. of other builders'. carpentry	No. of employees	Number of employees	.	44	2	666	46	6,9
20.400	Manuf. of wooden containers	No. of employees	Number of employees	.	18	2	79	2	2,5
20.510	Manuf. of other products of wood	No. of employees	Number of employees	.	12	2	345	1	0,3
20.520	Manuf. of articles of cork etc.	No. of employees		.	.	E	2	.	.
21.111	Manuf. of mechanical pulp	No. of cubicmetres timber	Number of employees	.	18452	2	6	3	50
21.112	Manuf. of chem. processed pulp	No. of cubicmetres raw material	Number of employees	.	107452	2	6	4	66,7

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
21.120	Manuf. of paper and paperboard	No. of cubicmetres raw material	Number of employees	.	31864	2	23	18	78,3
21.210	Manuf. of corrugat. paper and -board	No. of cubicmetres raw material	Number of employees	.	61	2	36	18	50
21.220	Manuf. of househ. and sanitary goods	No. of cubicmetres raw material	Number of employees	.	14213	2	3	1	33,3
21.230	Manuf. of paper stationery	No. of cubicmetres raw material	Number of employees	.	38	2	11	3	27,3
21.240	Manuf. of wallpaper	No. of cubicmetres raw material	Number of employees	.	30	2	3	1	33,3
21.250	Manuf. of other art. of paper	No. of employees	Number of employees	.	1788	2	33	8	24,2
22.110	Publishing of books	No. of employees	Number of employees	.	26	2	421	14	3,3
22.120	Publishing of newspapers	No. of employees	Number of employees	.	22	2	400	49	12,3
22.130	Publ. of journals and periodicals	No. of employees	Number of employees	.	8	2	310	7	2,3
22.140	Publ. of sound recordings	No. of employees		.	.	E	184	.	.
22.150	Other publishing	No. of employees	Economic turnover	10	.	2	268	4	1,5
22.210	Printing of newspapers	No. of employees	Economic turnover	25	.	2	51	7	13,7
22.220	Printing n.e.c.	No. of employees	Number of employees	.	43	2	853	40	4,7
22.230	Bookbinding	No. of employees	Number of employees	.	22	2	35	2	5,7
22.240	Pre-press activities	No. of employees	Number of employees	.	20	2	91	1	1,1
22.250	Anc. activities related to printing	No. of employees	Number of employees	.	37	2	543	7	1,3
22.310	Reprod. of sound recording	No. of employees		.	.		33	.	.
22.320	Reprod. of video recording	No. of employees		.	.		22	.	.
22.330	Reprod. of computer media	No. of employees		.	.		19	.	.
23.100	Manuf. of coke oven products	No. of employees		.	.	E	2	.	.
23.200	Manuf. of refined petroleum prod.	No. of cubicmetres cooling water	Number of employees	.	346203	2	14	7	50
23.300	Processing of nuclear fuel	No. of cubicmetres cooling water		.	.		.	.	.
24.110	Manuf. of industrial gases	No. of cubicmetres produced and process	Number of employees	.	17245	2	18	7	38,9
24.120	Manuf. of dyes and pigments	No. of cubicmetres produced and process	Number of employees	.	37184	2	3	3	100
24.131	Manuf. of carbides	No. of cubicmetres produced and process	Number of employees	.	7285	2	6	3	50
24.139	Manuf. of other inorg. basic chem.	No. of cubicmetres produced and process	Number of employees	.	39536	2	31	14	45,2
24.140	Manuf. of other organ. basic chem.	No. of cubicmetres produced and process	Number of employees	.	141433	2	28	13	46,4
24.150	Manuf. of fertilizers etc.	No. of cubicmetres produced and process	Number of employees	.	281595	2	21	5	23,8
24.160	Manuf. of plastics in primary forms	No. of cubicmetres produced and process	Number of employees	.	53043	2	17	10	58,8
24.170	Manuf. of synthetic rubber	No. of cubicmetres produced and process		.	.		.	.	.
24.200	Manuf. of pesticides,agro-chem. prod.	No. of cubicmetres produced and process		.	.	E	3	.	.
24.301	Manuf. of paints, varnishes etc.	No. of cubicmetres produced and process	Number of employees	.	680	2	31	9	29

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
24.302	Manuf. of printing inks and mastics	No. of cubicmetres produced and process	Number of employees	.	67	2	7	2	28,6
24.410	Manuf. of basic pharm. products	No. of cubicmetres produced and process	Number of employees	.	283	2	13	4	30,8
24.420	Maunf. of pharm. preparations	No. of cubicmetres produced and process	Number of employees	.	318	2	30	14	46,7
24.510	Manuf. of clean. and polish. prep.	No. of cubicmetres produced and process	Number of employees	.	670	2	36	7	19,4
24.520	Manuf. of perfumes and toilet prep.	No. of cubicmetres produced and process	Economic turnover	102	.	2	23	2	8,7
24.610	Manuf. of explosives	No. of cubicmetres produced and process	Number of employees	.	67407	2	6	1	16,7
24.620	Manuf. of glues and gelatines	No. of cubicmetres produced and process		.	.	E	1	.	.
24.630	Manuf. of essential oils	No. of cubicmetres produced and process		.	.	E	3	.	.
24.640	Manuf. of photogr. chem. material	No. of cubicmetres produced and process		.	.		.	.	.
24.650	Manuf. of prepared unrec. media	No. of cubicmetres produced and process	Number of employees	.	90	2	6	1	16,7
24.660	Manuf. of other chem. prod. n.e.c.	No. of cubicmetres produced and process	Economic turnover	131	.	2	45	5	11,1
24.700	Manuf. of man-made fibres	No. of cubicmetres produced and process		.	.		.	.	.
25.110	Manuf. of rubber tyres and tubes	No. of cubicmetres produced and process		.	.	E	1	.	.
25.120	Retread., rebuild. of rubber tyres	No. of employees	Economic turnover	141	.	2	20	5	25
25.130	Manuf. of other rubber products	No. of cubicmetres produced and process	Number of employees	.	14764	2	42	4	9,5
25.210	Manuf. of plastic plates etc.	No. of cubicmetres produced and process	Number of employees	.	728	2	101	22	21,8
25.220	Manuf. of plastic packing goods	No. of cubicmetres produced and process	Number of employees	.	1242	2	66	18	27,3
25.230	Manuf. of builders'. ware of plastic	No. of cubicmetres produced and process	Number of employees	.	37	2	63	10	15,9
25.240	Manuf. of other plastic products	No. of cubicmetres produced and process	Number of employees	.	46	2	159	13	8,2
26.110	Manuf. of flat glass	No. of cubicmetres produced and process		.	.	E	12	.	.
26.120	Shaping, processing of flat glass	No. of cubicmetres produced and process	Number of employees	.	270	2	45	12	26,7
26.130	Manuf. of hollow glass	No. of cubicmetres produced and process	Number of employees	.	81	2	43	2	4,7
26.140	Manuf. of glass fibres	No. of cubicmetres produced and process	Number of employees	.	5067	2	20	6	30
26.150	Manuf. and process. of other glass	No. of cubicmetres produced and process	Number of employees	.	225	2	8	2	25
26.210	Manuf. of ceramic household art.	No. of cubicmetres produced and process	Number of employees	.	116	2	154	7	4,5
26.220	Manuf. of ceram. san. fixtures	No. of cubicmetres produced and process	Number of employees	.	231	2	6	2	33,3
26.230	Manuf. of ceram. insulators etc.	No. of cubicmetres produced and process	Number of employees	.	355	2	1	1	100
26.240	Manuf. of other tech. ceram prod..	No. of cubicmetres produced and process		.	.	E	3	.	.
26.250	Manuf. of other ceramic prod.	No. of cubicmetres produced and process		.	.	E	4	.	.
26.260	Manuf. of refract. ceramic prod.	No. of cubicmetres	Number of employees	.	1568	2	9	1	11,1

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
		produced and process							
26.300	Manuf. of ceramic tiles and flags	No. of cubicmetres produced and process		.	.		.	.	.
26.400	Construction prod. in baked clay	No. of cubicmetres produced and process		.	.	E	2	.	.
26.510	Manuf. of cement	No. of cubicmetres produced and process	Number of employees	.	2675	2	15	3	20
26.520	Manuf. of lime	No. of cubicmetres produced and process	Number of employees	.	346	2	6	1	16,7
26.530	Manuf. of plaster	No. of cubicmetres produced and process		.	.		.	.	.
26.610	Manuf. of concrete products	No. of cubicmetres produced and process	Number of employees	.	166	2	160	40	25
26.620	Manuf. of plaster products	No. of cubicmetres produced and process	Economic turnover	433	.	2	3	4	133,3
26.630	Manuf. of ready-mixed concrete	No. of cubicmetres produced and process	Number of employees	.	1983	2	172	54	31,4
26.640	Manuf. of mortars	No. of cubicmetres produced and process	Number of employees	.	21	2	10	2	20
26.650	Manuf. of fibre cement	No. of cubicmetres produced and process		.	.	E	2	.	.
26.660	Manuf. of other art. of concrete	No. of cubicmetres produced and process	Number of employees	.	42	2	17	2	11,8
26.700	Stone cutting,shaping and finishing	No. of cubicmetres cooling water	Number of employees	.	1361	2	178	11	6,2
26.810	Prod. of abrasive products	No. of cubicmetres produced and process	Number of employees	.	168	2	2	1	50
26.820	Manuf. of other non-met. min. prod.	No. of cubicmetres produced and process	Number of employees	.	2160	2	94	41	43,6
27.100	Mnauf,basic iron,steel,ferr-alloys	No. of cubicmetres cooling water	Number of employees	.	43729	2	44	17	38,6
27.210	Manuf. of cast iron tubes	No. of cubicmetres cooling water	Number of employees	.	47	2	3	1	33,3
27.220	Manuf. of steel tubes	No. of cubicmetres cooling water	Number of employees	.	113	2	45	9	20
27.310	Cold drawing	No. of employees		.	.		.	.	.
27.320	Cold rolling of narrow strips	No. of employees		.	.		.	.	.
27.330	Cold forming and folding	No. of employees		.	.	E	1	.	.
27.340	Wire drawing	No. of employees		.	.		.	.	.
27.410	Precious metals production	No. of cubicmetres produced and process	Number of employees	.	265	2	4	1	25
27.421	Prod. of primary aluminium	No. of cubicmetres cooling water	Number of employees	.	57825	2	20	10	50
27.422	Prod. of first transf. of aluminium	No. of cubicmetres cooling water	Number of employees	.	2325	2	15	6	40
27.430	Lead, zinc and tin production	No. of cubicmetres cooling water	Number of employees	.	42217	2	3	2	66,7
27.440	Copper production	No. of cubicmetres cooling water		.	.	E	1	.	.
27.450	Other non-ferrous metal production	No. of cubicmetres cooling water	Number of employees	.	44219	2	4	2	50
27.510	Casting of iron	No. of cubicmetres cooling water	Number of employees	.	3380	2	18	8	44,4
27.520	Casting of steel	No. of cubicmetres cooling water	Number of employees	.	4382	2	6	2	33,3

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
27.530	Casting of light metals	No. of cubicmetres cooling water	Number of employees	.	184	2	15	5	33,3
27.540	Casting of other non-ferr. metals	No. of cubicmetres cooling water	Number of employees	.	496	2	14	3	21,4
28.110	Manuf. of metal structures, parts	No. of employees	Number of employees	.	83	2	401	48	12
28.120	Manuf. of build. carpentry of metal	No. of employees	Number of employees	.	120	2	145	12	8,3
28.210	Manuf. of metal tanks and reservoirs	No. of employees	Economic turnover	33	.	2	28	4	14,3
28.220	Manuf. of centr. heating reservoirs	No. of employees	Number of employees	.	29	2	2	1	50
28.300	Manuf. of steam generators etc.	No. of employees	Number of employees	.	23	2	5	2	40
28.400	Powder metallurgy etc.	No. of employees	Number of employees	.	77	2	29	2	6,9
28.510	Treatment and coating of metals	No. of employees	Number of employees	.	310	2	355	12	3,4
28.520	General mechanical engineering	No. of employees	Number of employees	.	21	2	815	21	2,6
28.610	Manuf. of cutlery	No. of employees	Number of employees	.	51	2	20	2	10
28.620	Manuf. of tools	No. of employees	Number of employees	.	45	2	60	4	6,7
28.630	Manuf. of locks and hinges	No. of employees	Number of employees	.	33	2	67	6	9
28.710	Manuf. of steel drums etc.	No. of employees	Number of employees	.	533	2	7	1	14,3
28.720	Manuf. of light metal pack.	No. of employees	Number of employees	.	27	2	2	1	50
28.730	Manuf. of wire products	No. of employees	Economic turnover	547	.	2	23	5	21,7
28.740	Manuf. of fasteners etc.	No. of employees	Number of employees	.	474	2	42	5	11,9
28.750	Manuf. of other fabr. metal prod.	No. of employees	Economic turnover	18	.	2	344	25	7,3
29.111	Manuf. of marine engines and parts	No. of employees	Number of employees	.	56	2	45	2	4,4
29.119	Manuf. of other engines,turbines	No. of employees	Number of employees	.	87	2	59	9	15,3
29.120	Manuf. of pumps and compressors	No. of employees	Number of employees	.	690	2	96	8	8,3
29.130	Manuf. of taps and valves	No. of employees	Number of employees	.	89	2	35	8	22,9
29.140	Manuf. of bearings, gears etc.	No. of employees	Number of employees	.	27	2	10	2	20
29.210	Manuf. of furnaces,furnace burners	No. of employees	Number of employees	.	27	2	22	3	13,6
29.221	Manuf. of marine lift.,handl. equip.	No. of employees	Number of employees	.	192	2	60	10	16,7
29.229	Mnauf. of other lift.,handl. equip.	No. of employees	Number of employees	.	62	2	193	16	8,3
29.230	Manuf. of non-dom. ventil equip.	No. of employees	Number of employees	.	15	2	116	21	18,1
29.240	Manuf. of other gen. purp. machin.	No. of employees	Number of employees	.	135	2	646	24	3,7
29.310	Manuf. of agric. tractors	No. of employees	Number of employees	.	847	2	132	1	0,8
29.320	Manuf. of other agric. machinery	No. of employees	Number of employees	.	78	2	484	28	5,8
29.410	Portable hand held power tools	No. of employees	Number of employees	.	1516	2	17	2	11,8
29.420	Other metal working machine tools	No. of employees		.	.	E	20	.	.
29.430	Other machine tools n.e.c.	No. of employees	Number of employees	.	39	2	48	2	4,2
29.510	Manuf. of metallurgy mach.	No. of employees		.	.	E	6	.	.
29.520	Manuf. of mining ang quarry. mach.	No. of employees	Number of employees	.	24	2	167	12	7,2

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
29.530	Manuf. of food,beverage proc. mach.	No. of employees	Number of employees	.	64	2	147	6	4,1
29.540	Manuf. of textile prod. mach. etc.	No. of employees		.	.	E	29	.	.
29.550	Manuf. of paper prod. mach. etc.	No. of employees	Number of employees	.	4	2	8	1	12,5
29.560	Other spec. purpose machinery	No. of employees	Number of employees	.	153	2	115	8	7
29.600	Manuf. of weapons and ammunition	No. of employees	Number of employees	.	241	2	43	4	9,3
29.710	Mnauf. of electric dom. appliances	No. of employees	Number of employees	.	84	2	38	6	15,8
29.720	Manuf. of non-el. dom. appliances	No. of employees	Number of employees	.	104	2	23	1	4,3
30.010	Manuf. of office machinery	No. of employees		.	.	E	6	.	.
30.020	Manuf. of computers etc.	No. of employees	Number of employees	.	19	2	25	5	20
31.100	Manuf. of elec. motors,generators etc.	No. of employees	Economic turnover	36	.	2	68	11	16,2
31.200	Manuf. of el. distr. and contr.app.	No. of employees	Number of employees	.	20	2	103	19	18,4
31.300	Manuf. of insul. wire and cable	No. of employees	Number of employees	.	1126	2	28	13	46,4
31.400	Manuf. accumulators,batteries etc.	No. of employees		.	.	E	5	.	.
31.500	Manuf. lighting equip. and lamps	No. of employees	Number of employees	.	176	2	67	7	10,4
31.610	Manuf. of el. equip. for engines	No. of employees		.	.	E	11	.	.
31.620	Manuf. of other el. equipment	No. of employees	Number of employees	.	30	2	244	16	6,6
32.100	Manuf. of electronic components	No. of employees	Number of employees	.	64	2	71	23	32,4
32.200	Manuf. of radio and TV-transmitters	No. of employees	Number of employees	.	34	2	30	9	30
32.300	Manuf. of TV,recording app. etc.	No. of employees	Number of employees	.	53	2	45	8	17,8
33.100	Medical and surgical equip. etc.	No. of employees	Number of employees	.	34	2	439	22	5
33.200	Manuf. testing instruments,app.	No. of employees	Economic turnover	74	.	2	139	26	18,7
33.300	Industrial proc. control equip.	No. of employees	Number of employees	.	4	2	38	8	21,1
33.400	Optical and photograph. instruments	No. of employees	Number of employees	.	115	2	15	1	6,7
33.500	Manuf. of watches and clocks	No. of employees		.	.	E	5	.	.
34.100	Manuf. of motor vehicles	No. of employees	Number of employees	.	15	2	6	2	33,3
34.200	Manuf. of bodies for motors etc.	No. of employees	Number of employees	.	47	2	78	16	20,5
34.300	Manuf. of parts for motor vehicles	No. of employees	Number of employees	.	1506	2	74	28	37,8
35.111	Build. and rep. of ships (>100)	No. of employees	Number of employees	.	161	2	159	60	37,7
35.112	Install.,compl. work on ships (>100)	No. of employees	Number of employees	.	13	2	90	17	18,9
35.113	Build. and rep. of ships (<100)	No. of employees	Number of employees	.	148	2	295	20	6,8
35.114	Build.,rep. of oil-platforms etc.	No. of employees	Number of employees	.	61	2	83	39	47
35.115	Install.,compl. work on oil platf.	No. of employees	Number of employees	.	11	2	62	20	32,3
35.116	Manuf. of other floating equip.	No. of employees	Number of employees	.	137	2	28	1	3,6
35.120	Building,repairing of sport. boats	No. of employees	Number of employees	.	18	2	390	14	3,6
35.201	Manuf. of railway, tramway etc.	No. of employees		.	.	E	2	.	.
35.202	Rep. of railway, tramway etc.	No. of employees	Number of employees	.	62	2	9	4	44,4

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
35.300	Manuf. of aircraft and spacecraft	No. of employees	Number of employees	.	40	2	32	4	12,5
35.410	Manuf. of motorcycles	No. of employees		.	.		.	.	.
35.420	Manuf. of bicycles	No. of employees		.	.	E	3	.	.
35.430	Manuf. of invalid carriages	No. of employees	Number of employees	.	27	2	24	3	12,5
35.500	Other transport equipment n.e.c.	No. of employees		.	.	E	10	.	.
36.110	Manuf. of chairs and seats	No. of employees	Number of employees	.	20	2	366	16	4,4
36.120	Manuf. of other office,shop furnit.	No. of employees	Number of employees	.	81	2	99	8	8,1
36.130	Manuf. of other kitchen furniture	No. of employees	Number of employees	.	58	2	196	6	3,1
36.140	Manuf. of other furniture	No. of employees	Economic turnover	13	.	2	452	14	3,1
36.150	Manuf. of mattresses	No. of employees	Number of employees	.	31	2	13	5	38,5
36.210	Striking of coins and medals	No. of employees	Number of employees	.	66	2	3	1	33,3
36.220	Manuf. of jewellery and relat. art.	No. of employees	Number of employees	.	33	2	207	9	4,3
36.300	Manuf. of musical instruments	No. of employees		.	.	E	33	.	.
36.400	Manuf. of sports goods	No. of employees	Number of employees	.	190	2	57	5	8,8
36.500	Manuf. of games and toys	No. of employees	Number of employees	.	27	2	37	1	2,7
36.610	Manuf. of imitation jewellery	No. of employees		.	.	E	11	.	.
36.620	Manuf. of brooms and brushes	No. of employees	Number of employees	.	18	2	8	1	12,5
36.630	Other manufacturing n.e.c.	No. of employees	Number of employees	.	18	2	238	12	5
37.100	Recycling of metal waste and scrap	No. of employees	Number of employees	.	74	2	80	20	25
37.200	Recycling,non-met. waste and scrap	No. of employees	Number of employees	.	3213	2	80	10	12,5
40.110	Prod. of electricity	No. of running hours	Number of employees	.	13364	1	386	2	0,5
40.120	Transmission of electricity	No. of employees	Number of employees	.	3	1	110	2	1,8
40.130	Distrib. and trade of electricity	No. of employees		.	.	E	196	.	.
40.210	Manuf. of gas	No. of cubicmetres produced and process		.	.	E	1	.	.
40.220	Distrib. and trade of gas	No. of employees		.	.	E	8	.	.
40.300	Steam and hot water supply	No. of squaremetres to be heated	Number of employees	.	2909	1	48	2	4,2
41.000	Water supply	No. of cubicmetres produced and process	Special calculation	.	.		213	.	.
45.110	Dem./wreck. of build..earth moving	No. of employees	Economic turnover	4	.	1	3942	5	0,1
45.120	Test drilling and boring	No. of running hours		.	.	E	1	.	.
45.211	General construction of buildings	No. of employees	Number of employees	.	77	1	10558	36	0,3
45.212	Gen. construction of civil eng. works	No. of employees		.	.	E	552	.	.
45.221	Tinsmith work	No. of employees		.	.	E	613	.	.
45.229	Other erec. of roof covering,frame	No. of employees	Number of employees	.	17	1	268	1	0,4
45.230	Constr. of highways, roads etc.	No. of employees	Number of employees	.	50	1	801	1	0,1
45.240	Constr. of water projects	No. of employees		.	.	E	18	.	.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
45.250	Other constr. work inv. spec. trades	No. of employees	Number of employees	.	99	1	3545	6	0,2
45.310	Install. of electr. wiring,fittings	No. of employees	Economic turnover	696	.	1	2948	4	0,1
45.320	Insulation work activities	No. of employees		.	.	E	99	.	.
45.330	Plumbing	No. of employees	Number of employees	.	19	1	3177	9	0,3
45.340	Other buiding installation	No. of employees		.	.	E	78	.	.
45.410	Plastering	No. of employees		.	.	E	4	.	.
45.420	Joinery installation	No. of employees	Number of employees	.	265	2	4523	10	0,2
45.430	Floor and wall covering	No. of employees	Number of employees	.	517	1	653	1	0,2
45.441	Painting	No. of employees	Number of employees	.	39	1	1970	5	0,3
45.442	Glazing	No. of employees	Number of employees	.	67	1	276	1	0,4
45.450	Other building completion	No. of employees		.	.	E	233	.	.
45.500	Rent. of constr.equip. w. operator	No. of employees	Number of employees	.	22	1	467	1	0,2
50.101	Comm.-,wholesale of motor vehicles	No. of employees	Number of employees	.	27	Stave (2006)	296	n.a.	n.a.
50.102	Retail sale of motor vehicles	No. of employees	Number of employees	.	27	Stave (2006)	2245	n.a.	n.a.
50.200	Repair of motor vehicles	No. of employees	Number of employees	.	117	Stave (2006)	3837	n.a.	n.a.
50.301	Comm.-,w.sale of motorveh.,parts	No. of employees	Number of employees	.	27	Stave (2006)	357	n.a.	n.a.
50.302	Ret. sale of motorvehicle parts etc	No. of employees	Number of employees	.	27	Stave (2006)	798	n.a.	n.a.
50.401	Comm.-,w.sale of motorcycl.,parts	No. of employees	Number of employees	.	117	Stave (2006)	28	n.a.	n.a.
50.402	Ret. sale of motorcycl.,parts	No. of employees	Number of employees	.	117	Stave (2006)	212	n.a.	n.a.
50.403	Maint. and rep. of motorcycles	No. of employees	Number of employees	.	117	Stave (2006)	44	n.a.	n.a.
50.500	Retail sale of automotive fuel	No. of employees	Number of employees	.	117	Stave (2006)	1790	n.a.	n.a.
51.110	Agents in agric., raw materials etc.	No. of employees	Number of employees	.	27	Stave (2006)	7	n.a.	n.a.
51.120	Agents in fuels, ores, metal etc.	No. of employees	Number of employees	.	27	Stave (2006)	71	n.a.	n.a.
51.130	Agents in timber,build. materials	No. of employees	Number of employees	.	27	Stave (2006)	100	n.a.	n.a.
51.140	Agents in machin., ind. equip. etc.	No. of employees	Number of employees	.	27	Stave (2006)	150	n.a.	n.a.
51.150	Agents in furniture, hardware etc.	No. of employees	Number of employees	.	27	Stave (2006)	266	n.a.	n.a.
51.160	Agents in textiles, clothing etc.	No. of employees	Number of employees	.	27	Stave (2006)	428	n.a.	n.a.
51.170	Agents in food, beverages etc.	No. of employees	Number of employees	.	27	Stave (2006)	151	n.a.	n.a.
51.180	Agents in spec. particular products	No. of employees	Number of employees	.	27	Stave (2006)	786	n.a.	n.a.
51.190	Agents in variety of goods	No. of employees	Number of employees	.	27	Stave (2006)	96	n.a.	n.a.
51.210	W.sale of grain,seeds,anim. feeds	No. of employees	Number of employees	.	27	Stave (2006)	247	n.a.	n.a.
51.220	W.sale of flowers and plants	No. of employees	Number of employees	.	27	Stave (2006)	106	n.a.	n.a.
51.230	W.sale of live animals	No. of animals	Number of employees	.	27	Stave (2006)	7	n.a.	n.a.
51.240	W.sale of hides,skins and leather	No. of employees	Number of employees	.	27	Stave (2006)	22	n.a.	n.a.
51.250	W.sale of unmanuf. tobacco	No. of employees	Number of employees	.	27	Stave (2006)	.	n.a.	n.a.
51.310	W.sale of fruit and vegetables	No. of employees	Number of employees	.	27	Stave (2006)	195	n.a.	n.a.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
51.320	W.sale of meat and meat products	No. of employees	Number of employees	.	27	Stave (2006)	69	n.a.	n.a.
51.330	W.sale of dairy prod. eggs etc.	No. of employees	Number of employees	.	27	Stave (2006)	21	n.a.	n.a.
51.341	W.sale of wines and spirits	No. of employees	Number of employees	.	27	Stave (2006)	92	n.a.	n.a.
51.349	W.sale of beverages n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	29	n.a.	n.a.
51.350	W.sale of tobacco products	No. of employees	Number of employees	.	27	Stave (2006)	9	n.a.	n.a.
51.360	W.sale sugar, chocolate etc.	No. of employees	Number of employees	.	27	Stave (2006)	54	n.a.	n.a.
51.370	W.sale coffee, tea, cocoa etc.	No. of employees	Number of employees	.	27	Stave (2006)	50	n.a.	n.a.
51.381	W.sale of fish and crustaceans	No. of employees	Number of employees	.	27	Stave (2006)	424	n.a.	n.a.
51.389	W.sale of molluscs n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	329	n.a.	n.a.
51.390	Non-spec. w.sale of food,bev.,tob.	No. of employees	Number of employees	.	27	Stave (2006)	304	n.a.	n.a.
51.410	W.sale of textiles	No. of employees	Number of employees	.	27	Stave (2006)	330	n.a.	n.a.
51.421	W.sale of clothing	No. of employees	Number of employees	.	27	Stave (2006)	593	n.a.	n.a.
51.422	W.sale of footwear	No. of employees	Number of employees	.	27	Stave (2006)	65	n.a.	n.a.
51.431	W.sale of lighting equip.	No. of employees	Number of employees	.	27	Stave (2006)	136	n.a.	n.a.
51.432	W.sale of el. househ. applian. etc.	No. of employees	Number of employees	.	27	Stave (2006)	109	n.a.	n.a.
51.433	W.sale of radio,television goods	No. of employees	Number of employees	.	27	Stave (2006)	93	n.a.	n.a.
51.434	W.sale of records, tapes, CD'.s etc.	No. of employees	Number of employees	.	27	Stave (2006)	79	n.a.	n.a.
51.441	W.sale of china and glassware	No. of employees	Number of employees	.	27	Stave (2006)	110	n.a.	n.a.
51.442	W.sale of wallpaper,clean. material	No. of employees	Number of employees	.	27	Stave (2006)	51	n.a.	n.a.
51.450	W.sale of perfume and cosmetics	No. of employees	Number of employees	.	27	Stave (2006)	203	n.a.	n.a.
51.460	W.sale of pharmaceutical goods	No. of employees	Number of employees	.	27	Stave (2006)	567	n.a.	n.a.
51.471	W.sale of books,newspapers,magaz.	No. of employees	Number of employees	.	27	Stave (2006)	42	n.a.	n.a.
51.472	W.sale of furniture etc.	No. of employees	Number of employees	.	27	Stave (2006)	320	n.a.	n.a.
51.473	W.sale of floor coverings,carpets	No. of employees	Number of employees	.	27	Stave (2006)	48	n.a.	n.a.
51.474	W.sale of travel accessories etc.	No. of employees	Number of employees	.	27	Stave (2006)	23	n.a.	n.a.
51.475	W.sale of watches,photo,opt. goods	No. of employees	Number of employees	.	27	Stave (2006)	122	n.a.	n.a.
51.476	W.sale of gold and silver ware	No. of employees	Number of employees	.	27	Stave (2006)	55	n.a.	n.a.
51.477	W.sale of sports goods,games,toys	No. of employees	Number of employees	.	27	Stave (2006)	695	n.a.	n.a.
51.479	W.sale of household-,pers. goods	No. of employees	Number of employees	.	27	Stave (2006)	553	n.a.	n.a.
51.510	W.sale of soli,liquid,gass. fuels	No. of employees	Number of employees	.	27	Stave (2006)	287	n.a.	n.a.
51.520	W.sale of metals and metal ores	No. of employees	Number of employees	.	27	Stave (2006)	150	n.a.	n.a.
51.531	W.sale of timber	No. of employees	Number of employees	.	27	Stave (2006)	84	n.a.	n.a.
51.532	W.sale of lumber	No. of employees	Number of employees	.	27	Stave (2006)	355	n.a.	n.a.
51.533	W.sale of paints and varnish	No. of employees	Number of employees	.	27	Stave (2006)	109	n.a.	n.a.
51.539	W.sale of constr. materials n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	821	n.a.	n.a.
51.540	W.sale of hardware, plumb.,heat. equip.	No. of employees	Number of employees	.	27	Stave (2006)	729	n.a.	n.a.

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51.550	W.sale of chemical products	No. of employees	Number of employees	.	27	Stave (2006)	298	n.a.	n.a.
51.561	W.sale of paper and paperboard	No. of employees	Number of employees	.	27	Stave (2006)	143	n.a.	n.a.
51.569	W.sale of intermed. prod. n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	66	n.a.	n.a.
51.570	W.sale of waste and scrap	No. of employees	Number of employees	.	27	Stave (2006)	130	n.a.	n.a.
51.810	W.sale of machine tools	No. of employees	Number of employees	.	27	Stave (2006)	255	n.a.	n.a.
51.820	W.sale of constr. machinery	No. of employees	Number of employees	.	27	Stave (2006)	448	n.a.	n.a.
51.830	W.sale of mach. for textile ind. etc.	No. of employees	Number of employees	.	27	Stave (2006)	8	n.a.	n.a.
51.840	W.sale of computers etc.	No. of employees	Number of employees	.	27	Stave (2006)	936	n.a.	n.a.
51.850	W.sale of other office machinery	No. of employees	Number of employees	.	27	Stave (2006)	719	n.a.	n.a.
51.860	W.sale of other electron. parts etc.	No. of employees	Number of employees	.	27	Stave (2006)	241	n.a.	n.a.
51.871	W.sale of energy prod. mach.,equip.	No. of employees	Number of employees	.	27	Stave (2006)	299	n.a.	n.a.
51.872	W.sale of shipping equip. etc.	No. of employees	Number of employees	.	27	Stave (2006)	256	n.a.	n.a.
51.873	W.sale of oil,gas extract. equip.	No. of employees	Number of employees	.	27	Stave (2006)	729	n.a.	n.a.
51.874	W.sale of trade,transp. equip.	No. of employees	Number of employees	.	27	Stave (2006)	1187	n.a.	n.a.
51.880		No. of employees	Number of employees	.	27	Stave (2006)	537	n.a.	n.a.
51.900	Other wholesale	No. of employees	Number of employees	.	27	Stave (2006)	1067	n.a.	n.a.
52.110	Non-spec. stores w.food, bev.etc.	No. of employees	Number of employees	.	27	Stave (2006)	6310	n.a.	n.a.
52.120	Other ret. sale in non-spec. stores	No. of employees	Number of employees	.	27	Stave (2006)	1257	n.a.	n.a.
52.210	Ret. sale of fruit and vegetables	No. of employees	Number of employees	.	27	Stave (2006)	81	n.a.	n.a.
52.220	Ret. sale of meat and meat prod.	No. of employees	Number of employees	.	27	Stave (2006)	61	n.a.	n.a.
52.230	Ret. sale of fish, crustaceans etc.	No. of employees	Number of employees	.	27	Stave (2006)	100	n.a.	n.a.
52.241	Ret. sale of bread, cakes etc.	No. of employees	Number of employees	.	27	Stave (2006)	470	n.a.	n.a.
52.242	Ret. sale of sugar confectionery	No. of employees	Number of employees	.	27	Stave (2006)	46	n.a.	n.a.
52.251	Ret. sale of wines and spirits	No. of employees	Number of employees	.	27	Stave (2006)	220	n.a.	n.a.
52.252	Ret. sale of beverages n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	46	n.a.	n.a.
52.260	Ret. sale of tobacco prod.	No. of employees	Number of employees	.	27	Stave (2006)	7	n.a.	n.a.
52.271	Ret. sale of health foods	No. of employees	Number of employees	.	27	Stave (2006)	438	n.a.	n.a.
52.272	Ret. sale of coffee and tea	No. of employees	Number of employees	.	27	Stave (2006)	30	n.a.	n.a.
52.279	Ret.sale in spec.stores of food etc.	No. of employees	Number of employees	.	27	Stave (2006)	85	n.a.	n.a.
52.310	Dispensing chemists	No. of employees	Number of employees	.	27	Stave (2006)	541	n.a.	n.a.
52.320	Ret. sale of med.,ortophaed goods	No. of employees	Number of employees	.	27	Stave (2006)	91	n.a.	n.a.
52.330	Ret. sale of cosmetic and toil. art.	No. of employees	Number of employees	.	27	Stave (2006)	555	n.a.	n.a.
52.410	Ret. sale of textiles	No. of employees	Number of employees	.	27	Stave (2006)	986	n.a.	n.a.
52.420	Ret. sale of clothing	No. of employees	Number of employees	.	27	Stave (2006)	4643	n.a.	n.a.
52.431	Ret. sale of footwear	No. of employees	Number of employees	.	27	Stave (2006)	807	n.a.	n.a.
52.432	Ret. sale of travel access. etc.	No. of employees	Number of employees	.	27	Stave (2006)	183	n.a.	n.a.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
52.441	Ret. sale of lighting equip.	No. of employees	Number of employees	.	27	Stave (2006)	171	n.a.	n.a.
52.442	Ret. sale of china and glassware	No. of employees	Number of employees	.	27	Stave (2006)	413	n.a.	n.a.
52.443	Ret. sale of furniture	No. of employees	Number of employees	.	27	Stave (2006)	710	n.a.	n.a.
52.449	Ret. sale of non-el. household art.	No. of employees	Number of employees	.	27	Stave (2006)	482	n.a.	n.a.
52.451	Ret. sale of househ.appl.,radio,TV	No. of employees	Number of employees	.	27	Stave (2006)	880	n.a.	n.a.
52.452	Ret. sale of records, tapes, CD'.s etc.	No. of employees	Number of employees	.	27	Stave (2006)	269	n.a.	n.a.
52.453	Ret. sale of musical instr.,-notes	No. of employees	Number of employees	.	27	Stave (2006)	160	n.a.	n.a.
52.461	Ret. sale of variety of hardware etc.	No. of employees	Number of employees	.	27	Stave (2006)	791	n.a.	n.a.
52.462	Ret. sale of hardware	No. of employees	Number of employees	.	27	Stave (2006)	236	n.a.	n.a.
52.463	Ret. sale of paints and varnish	No. of employees	Number of employees	.	27	Stave (2006)	391	n.a.	n.a.
52.464	Ret. sale of wood	No. of employees	Number of employees	.	27	Stave (2006)	72	n.a.	n.a.
52.469	Ret. sale hardw.,paints,glass n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	317	n.a.	n.a.
52.471	Ret. sale of books and stationery	No. of employees	Number of employees	.	27	Stave (2006)	679	n.a.	n.a.
52.472	Ret. sale of newspapers,magazines	No. of employees	Number of employees	.	27	Stave (2006)	1	n.a.	n.a.
52.481	Ret. sale watches,photo.-,opt.goods	No. of employees	Number of employees	.	27	Stave (2006)	1054	n.a.	n.a.
52.482	Ret. sale of gold and silver ware	No. of employees	Number of employees	.	27	Stave (2006)	596	n.a.	n.a.
52.483	Ret. sale of sport goods, games etc.	No. of employees	Number of employees	.	27	Stave (2006)	1239	n.a.	n.a.
52.484	Ret. sale of flower and plants	No. of employees	Number of employees	.	27	Stave (2006)	1275	n.a.	n.a.
52.485	Ret. sale of office equipment etc.	No. of employees	Number of employees	.	27	Stave (2006)	612	n.a.	n.a.
52.486	Ret. sale of wallpaper,floor cover.	No. of employees	Number of employees	.	27	Stave (2006)	66	n.a.	n.a.
52.487	Ret. sale of carpets	No. of employees	Number of employees	.	27	Stave (2006)	47	n.a.	n.a.
52.489	Ret. sale in spec. stores	No. of employees	Number of employees	.	27	Stave (2006)	2112	n.a.	n.a.
52.501	Ret. sale of antiques	No. of employees	Number of employees	.	27	Stave (2006)	122	n.a.	n.a.
52.502	Ret. sale of second-hand clothes	No. of employees	Number of employees	.	27	Stave (2006)	17	n.a.	n.a.
52.509	Ret. sale sec-hand goods n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	257	n.a.	n.a.
52.611	Moh.ret.sale of variety of goods	No. of employees	Number of employees	.	27	Stave (2006)	33	n.a.	n.a.
52.612	Moh.ret.sale of textiles etc.	No. of employees	Number of employees	.	27	Stave (2006)	83	n.a.	n.a.
52.613	Moh.ret.sale of non-el. househ. art.	No. of employees	Number of employees	.	27	Stave (2006)	6	n.a.	n.a.
52.614	Moh.ret.sale el.househ. art.	No. of employees	Number of employees	.	27	Stave (2006)	38	n.a.	n.a.
52.615	Moh.ret.sale of books, paper etc.	No. of employees	Number of employees	.	27	Stave (2006)	22	n.a.	n.a.
52.619	Other moh.ret.sale of spec. assort.	No. of employees	Number of employees	.	27	Stave (2006)	360	n.a.	n.a.
52.620	Ret. sale via stalls and markets	No. of employees	Number of employees	.	27	Stave (2006)	114	n.a.	n.a.
52.630	Other non-stores retail sale	No. of employees	Number of employees	.	27	Stave (2006)	1835	n.a.	n.a.
52.710	Repair of bootes, shooes etc.	No. of employees	Number of employees	.	27	Stave (2006)	96	n.a.	n.a.
52.720	Repair of electr. household goods	No. of employees	Number of employees	.	27	Stave (2006)	507	n.a.	n.a.
52.730	Repair of watches,clocks,jewellery	No. of employees	Number of employees	.	27	Stave (2006)	67	n.a.	n.a.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
52.740	Repair n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	363	n.a.	n.a.
55.101	Hotels and motels with restaurant	No. of guests	Number of employees	.	284	Stave (2006)	1155	n.a.	n.a.
55.102	Hotels,motels without restaurant	No. of guests	Number of employees	.	284	Stave (2006)	138	n.a.	n.a.
55.210	Youth hostels and mountain refuges	No. of guests	Number of employees	.	284	Stave (2006)	237	n.a.	n.a.
55.220	Camp. sites incl caravan sites	No. of guests	Number of employees	.	284	Stave (2006)	721	n.a.	n.a.
55.230	Other provision of lodgings n.e.c.	No. of guests	Number of employees	.	284	Stave (2006)	469	n.a.	n.a.
55.301	Oper. of restaurants and cafés	No. of guests	Number of employees	.	284	Stave (2006)	4924	n.a.	n.a.
55.302	Oper. of snackbars, saladbars etc.	No. of guests	Number of employees	.	284	Stave (2006)	924	n.a.	n.a.
55.401	Pubs	No. of guests	Number of employees	.	284	Stave (2006)	338	n.a.	n.a.
55.402	Coffee- and tea bars	No. of guests	Number of employees	.	284	Stave (2006)	93	n.a.	n.a.
55.510	Canteens	No. of guests	Number of employees	.	284	Stave (2006)	799	n.a.	n.a.
55.520	Catering	No. of plates	Number of employees	.	284	Stave (2006)	636	n.a.	n.a.
60.100	Transport via railways	No. of employees	Number of employees	.	43	Stave (2006)	118	n.a.	n.a.
60.211	Sched. motor bus transport	No. of employees	Number of employees	.	43	Stave (2006)	289	n.a.	n.a.
60.212	Tramway,suburban transp.	No. of employees	Number of employees	.	43	Stave (2006)	5	n.a.	n.a.
60.213	Cableway transport	No. of employees	Number of employees	.	43	Stave (2006)	9	n.a.	n.a.
60.220	Taxi operation	No. of employees	Number of employees	.	43	Stave (2006)	5424	n.a.	n.a.
60.230	Other land passenger transport	No. of employees	Number of employees	.	43	Stave (2006)	358	n.a.	n.a.
60.240	Freight transport by road	No. of employees	Number of employees	.	43	Stave (2006)	8673	n.a.	n.a.
60.300	Transport via pipelines	No. of employees	Number of employees	.	43	Stave (2006)	5	n.a.	n.a.
61.101	Ocean transport	No. of employees	Number of employees	.	43	Stave (2006)	846	n.a.	n.a.
61.103	Domestic freight transport	No. of employees	Number of employees	.	43	Stave (2006)	196	n.a.	n.a.
61.104	Sched. long. dist. inland transp.	No. of employees	Number of employees	.	43	Stave (2006)	110	n.a.	n.a.
61.106	Tug- and supllyvessels	No. of employees	Number of employees	.	43	Stave (2006)	140	n.a.	n.a.
61.109	Other coast water transp. in Norw.	No. of employees	Number of employees	.	43	Stave (2006)	236	n.a.	n.a.
61.200	Inland water transport	No. of employees	Number of employees	.	43	Stave (2006)	19	n.a.	n.a.
62.100	Scheduled air transport	No. of employees	Number of employees	.	43	Stave (2006)	98	n.a.	n.a.
62.200	Non-scheduled air transport	No. of employees	Number of employees	.	43	Stave (2006)	66	n.a.	n.a.
62.300	Space transport	No. of employees	Number of employees	.	43	Stave (2006)	.	n.a.	n.a.
63.110	Cargo handling	No. of employees	Number of employees	.	64	Stave (2006)	89	n.a.	n.a.
63.120	Storage and warehousing	No. of employees	Number of employees	.	64	Stave (2006)	132	n.a.	n.a.
63.211	Centr. agen. for goods,transp. proc	No. of employees	Number of employees	.	64	Stave (2006)	301	n.a.	n.a.
63.212	Parking places and -houses	No. of employees	Number of employees	.	64	Stave (2006)	111	n.a.	n.a.
63.213	Toll bar stations	No. of employees	Number of employees	.	64	Stave (2006)	49	n.a.	n.a.
63.219	Other serv. allied to land transp.	No. of employees	Number of employees	.	64	Stave (2006)	88	n.a.	n.a.
63.221	Operations of harbours	No. of employees	Number of employees	.	64	Stave (2006)	156	n.a.	n.a.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
63.223	Rescue services	No. of employees	Number of employees	.	64	Stave (2006)	62	n.a.	n.a.
63.224	Offshore supply terminal	No. of employees	Number of employees	.	64	Stave (2006)	12	n.a.	n.a.
63.229	Other supp. water transp. act.	No. of employees	Number of employees	.	64	Stave (2006)	164	n.a.	n.a.
63.230	Other supp. air transp. activities	No. of employees	Number of employees	.	64	Stave (2006)	114	n.a.	n.a.
63.301	Travel agencies	No. of employees	Number of employees	.	64	Stave (2006)	481	n.a.	n.a.
63.302	Tourist offices	No. of employees	Number of employees	.	64	Stave (2006)	127	n.a.	n.a.
63.303	Tour operator	No. of employees	Number of employees	.	64	Stave (2006)	323	n.a.	n.a.
63.304	Tour guides and leaders	No. of employees	Number of employees	.	64	Stave (2006)	123	n.a.	n.a.
63.305	Adventure, event and act. operators	No. of employees	Number of employees	.	64	Stave (2006)	112	n.a.	n.a.
63.309	Tourist related act. n.e.c.	No. of employees	Number of employees	.	64	Stave (2006)	60	n.a.	n.a.
63.401	Freight forwarding services	No. of employees	Number of employees	.	64	Stave (2006)	563	n.a.	n.a.
63.402	Ship brokerage services	No. of employees	Number of employees	.	64	Stave (2006)	317	n.a.	n.a.
63.403	Aircraft brokerage services	No. of employees	Number of employees	.	64	Stave (2006)	11	n.a.	n.a.
63.409	Other forwarding services	No. of employees	Number of employees	.	64	Stave (2006)	64	n.a.	n.a.
64.110	National post activities	No. of employees	Number of employees	.	64	Stave (2006)	1083	n.a.	n.a.
64.120	Other courier activities	No. of employees	Number of employees	.	64	Stave (2006)	688	n.a.	n.a.
64.210	Fixed telcomm. carriers	No. of employees	Number of employees	.	64	Stave (2006)	120	n.a.	n.a.
64.220	Mobile telecomm. carriers	No. of employees	Number of employees	.	64	Stave (2006)	46	n.a.	n.a.
64.230	Internet service providers	No. of employees	Number of employees	.	64	Stave (2006)	71	n.a.	n.a.
64.240	Other telecomm. activities	No. of employees	Number of employees	.	64	Stave (2006)	497	n.a.	n.a.
65.110	Central banking	No. of employees	Number of employees	.	64	Stave (2006)	5	n.a.	n.a.
65.120	Other monetary intermediation	No. of employees	Number of employees	.	64	Stave (2006)	1232	n.a.	n.a.
65.210	Financial leasing	No. of employees	Number of employees	.	64	Stave (2006)	2	n.a.	n.a.
65.220	Other credit granting	No. of employees	Number of employees	.	64	Stave (2006)	131	n.a.	n.a.
65.231	Unit trust	No. of employees	Number of employees	.	64	Stave (2006)	.	n.a.	n.a.
65.238	Portfolio investments	No. of employees	Number of employees	.	64	Stave (2006)	241	n.a.	n.a.
65.239	Other security management	No. of employees	Number of employees	.	64	Stave (2006)	57	n.a.	n.a.
66.010	Life insurance	No. of employees	Number of employees	.	64	Stave (2006)	51	n.a.	n.a.
66.020	Pension funding	No. of employees	Number of employees	.	64	Stave (2006)	20	n.a.	n.a.
66.030	Non-life insurance	No. of employees	Number of employees	.	64	Stave (2006)	347	n.a.	n.a.
67.110	Adm. of financial markets	No. of employees	Number of employees	.	64	Stave (2006)	11	n.a.	n.a.
67.120	Security broking,fund management	No. of employees	Number of employees	.	64	Stave (2006)	134	n.a.	n.a.
67.130	Act. aux. to fin. intermed. n.e.c.	No. of employees	Number of employees	.	64	Stave (2006)	69	n.a.	n.a.
67.200	Act. aux. to insurance,pens. fund.	No. of employees	Number of employees	.	64	Stave (2006)	430	n.a.	n.a.
70.111	House building cooperative	No. of employees	Number of employees	.	64	Stave (2006)	116	n.a.	n.a.
70.112	Other develop.,sale of real estate	No. of employees	Number of employees	.	64	Stave (2006)	1782	n.a.	n.a.

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70.120	Buying,selling of own real estate	No. of employees	Number of employees	.	64	Stave (2006)	3558	n.a.	n.a.
70.201	House cooperative	No. of employees	Number of employees	.	64	Stave (2006)	608	n.a.	n.a.
70.202	Other letting of own property	No. of employees	Number of employees	.	64	Stave (2006)	21942	n.a.	n.a.
70.310	Real estate agencies	No. of employees	Number of employees	.	64	Stave (2006)	1229	n.a.	n.a.
70.321	Manag. of real estate on a fee etc.	No. of employees	Number of employees	.	64	Stave (2006)	1598	n.a.	n.a.
70.322	Caretaker services	No. of employees	Number of employees	.	64	Stave (2006)	716	n.a.	n.a.
71.100	Renting of automobiles	No. of employees	Number of employees	.	27	Stave (2006)	378	n.a.	n.a.
71.210	Rent. of other land transp. equip.	No. of employees	Number of employees	.	27	Stave (2006)	163	n.a.	n.a.
71.220	Rent. of water transp. equip.	No. of employees	Number of employees	.	27	Stave (2006)	104	n.a.	n.a.
71.230	Rent. of air transp. equip.	No. of employees	Number of employees	.	27	Stave (2006)	41	n.a.	n.a.
71.310	Rent. of agric. machinery,equip.	No. of employees	Number of employees	.	27	Stave (2006)	80	n.a.	n.a.
71.320	Rent. of constr.,civ. engin. mach.	No. of employees	Number of employees	.	27	Stave (2006)	514	n.a.	n.a.
71.330	Rent. of office machinery etc.	No. of employees	Number of employees	.	27	Stave (2006)	36	n.a.	n.a.
71.340	Rent. of machinery,equip. n.e.c.	No. of employees	Number of employees	.	27	Stave (2006)	516	n.a.	n.a.
71.400	Renting of personal-,househ. goods	No. of employees	Number of employees	.	27	Stave (2006)	496	n.a.	n.a.
72.100	Hardware consultancy	No. of employees	Number of employees	.	23	Stave (2006)	106	n.a.	n.a.
72.210	Publishing og software	No. of employees	Number of employees	.	23	Stave (2006)	810	n.a.	n.a.
72.220	Other software cons. and supply	No. of employees	Number of employees	.	23	Stave (2006)	6110	n.a.	n.a.
72.300	Data processing	No. of employees	Number of employees	.	23	Stave (2006)	211	n.a.	n.a.
72.400	Database activities	No. of employees	Number of employees	.	23	Stave (2006)	579	n.a.	n.a.
72.500	Repair of computing machinery etc.	No. of employees	Number of employees	.	23	Stave (2006)	229	n.a.	n.a.
72.600	Other computer related activities	No. of employees	Number of employees	.	23	Stave (2006)	24	n.a.	n.a.
73.100	R&D, natural science	No. of employees	Number of employees	.	23	Stave (2006)	368	n.a.	n.a.
73.200	R&D, social science	No. of employees	Number of employees	.	23	Stave (2006)	112	n.a.	n.a.
74.110	Legal activities	No. of employees	Number of employees	.	23	Stave (2006)	2245	n.a.	n.a.
74.121	Accounting and book-keeping	No. of employees	Number of employees	.	23	Stave (2006)	3905	n.a.	n.a.
74.122	Auditing	No. of employees	Number of employees	.	23	Stave (2006)	1048	n.a.	n.a.
74.123	Tax consultancy services	No. of employees	Number of employees	.	23	Stave (2006)	54	n.a.	n.a.
74.130	Market research,publ opin. polling	No. of employees	Number of employees	.	23	Stave (2006)	118	n.a.	n.a.
74.140	Business,managemant consult. act.	No. of employees	Number of employees	.	23	Stave (2006)	5409	n.a.	n.a.
74.150	Managemant act. of holding comp.	No. of employees	Number of employees	.	23	Stave (2006)	11	n.a.	n.a.
74.201	Architectural activities	No. of employees	Number of employees	.	23	Stave (2006)	1480	n.a.	n.a.
74.202	Civil engineering activities	No. of employees	Number of employees	.	23	Stave (2006)	2528	n.a.	n.a.
74.203	Geological surveying	No. of employees	Number of employees	.	23	Stave (2006)	250	n.a.	n.a.
74.209	Other tech. consult. activities	No. of employees	Number of employees	.	23	Stave (2006)	3805	n.a.	n.a.
74.300	Technical testing and analysis	No. of employees	Number of employees	.	23	Stave (2006)	789	n.a.	n.a.

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74.400	Advertising	No. of employees	Number of employees	.	23	Stave (2006)	2144	n.a.	n.a.
74.501	Labour recruit. of personnel	No. of employees	Number of employees	.	23	Stave (2006)	319	n.a.	n.a.
74.502	Provision of personnel	No. of employees	Number of employees	.	23	Stave (2006)	746	n.a.	n.a.
74.600	Investigation and security act.	No. of employees	Number of employees	.	23	Stave (2006)	537	n.a.	n.a.
74.700	Industrial cleaning	No. of employees	Number of employees	.	23	Stave (2006)	2116	n.a.	n.a.
74.810	Photographic activities	No. of employees	Number of employees	.	23	Stave (2006)	1251	n.a.	n.a.
74.820	Packaging activities	No. of employees	Number of employees	.	23	Stave (2006)	55	n.a.	n.a.
74.851	Secretarial activities	No. of employees	Number of employees	.	23	Stave (2006)	380	n.a.	n.a.
74.852	Translation activities	No. of employees	Number of employees	.	23	Stave (2006)	711	n.a.	n.a.
74.860	Callcentre activities	No. of employees	Number of employees	.	23	Stave (2006)	318	n.a.	n.a.
74.871	Bill coll. and credit grant. act.	No. of employees	Number of employees	.	23	Stave (2006)	186	n.a.	n.a.
74.872	Designers activities	No. of employees	Number of employees	.	23	Stave (2006)	1616	n.a.	n.a.
74.873	Interior decorators activities	No. of employees	Number of employees	.	23	Stave (2006)	385	n.a.	n.a.
74.874	Appraisal activities	No. of employees	Number of employees	.	23	Stave (2006)	101	n.a.	n.a.
74.875	Model agencies activities	No. of employees	Number of employees	.	23	Stave (2006)	35	n.a.	n.a.
74.876	Impresario activities	No. of employees	Number of employees	.	23	Stave (2006)	216	n.a.	n.a.
74.877	Fair,exhib. and congress organizers	No. of employees	Number of employees	.	23	Stave (2006)	245	n.a.	n.a.
74.879	Other business act. n.e.c.	No. of employees	Number of employees	.	23	Stave (2006)	5100	n.a.	n.a.
75.110	General public service act.	No. of employees	Number of employees	.	23	Stave (2006)	870	n.a.	n.a.
75.120	Act. provid. health care, educ. etc.	No. of employees	Number of employees	.	23	Stave (2006)	1178	n.a.	n.a.
75.130	Reg. of operation of business	No. of employees	Number of employees	.	23	Stave (2006)	1035	n.a.	n.a.
75.140	Supp. serv. act. for the governm.	No. of employees	Number of employees	.	23	Stave (2006)	780	n.a.	n.a.
75.210	Foreign affairs	No. of employees	Number of employees	.	23	Stave (2006)	89	n.a.	n.a.
75.220	Defence activities	No. of employees	Number of employees	.	224	Stave (2006)	154	n.a.	n.a.
75.230	Justice and judicial activities	No. of employees	Number of employees	.	126	1	229	3	1,3
75.240	Publ. security, law and order act.	No. of employees	Number of employees	.	23	Stave (2006)	465	n.a.	n.a.
75.250	Fire service activities	No. of employees	Number of employees	.	23	Stave (2006)	309	n.a.	n.a.
75.300	Comp. social security activity	No. of employees	Number of employees	.	23	Stave (2006)	513	n.a.	n.a.
80.101	Pre-primary education	No. of students	Number of employees	.	95	Stave (2006)	5	n.a.	n.a.
80.102	Primary,lower secondary education	No. of students	Number of employees	.	95	Stave (2006)	3196	n.a.	n.a.
80.103	Spec. education for the handicapped	No. of students	Number of employees	.	95	Stave (2006)	109	n.a.	n.a.
80.104	Comp.centre etc.	No. of students	Number of employees	.	95	Stave (2006)	75	n.a.	n.a.
80.105	Educ. and psyc. counselling services	No. of students	Number of employees	.	95	Stave (2006)	264	n.a.	n.a.
80.210	General secondary education	No. of students	Number of employees	.	95	Stave (2006)	236	n.a.	n.a.
80.220	Tech.,vocation. secondary educ.	No. of students	Number of employees	.	95	Stave (2006)	424	n.a.	n.a.
80.301	Education at universities	No. of students	Number of employees	.	95	Stave (2006)	38	n.a.	n.a.

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80.302	Education at state colleges	No. of students	Number of employees	.	95	Stave (2006)	122	n.a.	n.a.
80.303	Education at military colleges	No. of students	Number of employees	.	95	Stave (2006)	3	n.a.	n.a.
80.309	Education at other colleges	No. of students	Number of employees	.	95	Stave (2006)	72	n.a.	n.a.
80.410	Driving school activities	No. of students	Number of employees	.	95	Stave (2006)	661	n.a.	n.a.
80.421	Folk high school education	No. of students	Number of employees	.	95	Stave (2006)	77	n.a.	n.a.
80.422	Labour market training	No. of students	Number of employees	.	95	Stave (2006)	5	n.a.	n.a.
80.423	Act. of adult educ. associationsl	No. of students	Number of employees	.	95	Stave (2006)	180	n.a.	n.a.
80.424	Act. of municipal music scholls	No. of students	Number of employees	.	95	Stave (2006)	388	n.a.	n.a.
80.425	Educ. charitable foundations	No. of employees	Number of employees	.	95	Stave (2006)	4	n.a.	n.a.
80.429	Other education	No. of students	Number of employees	.	95	Stave (2006)	1384	n.a.	n.a.
85.111	General hospitals	No. of patients	Number of employees	.	51	Stave (2006)	111	n.a.	n.a.
85.112	Speciality hospitals	No. of patients	Number of employees	.	51	Stave (2006)	20	n.a.	n.a.
85.113	Speciality nursing homes	No. of patients	Number of employees	.	51	Stave (2006)	17	n.a.	n.a.
85.114	Rehabilitation institutions	No. of patients	Number of employees	.	51	Stave (2006)	123	n.a.	n.a.
85.115	Other spec. health institutions	No. of patients	Number of employees	.	51	Stave (2006)	9	n.a.	n.a.
85.116	Mental health hospital for adults	No. of patients	Number of employees	.	51	Stave (2006)	171	n.a.	n.a.
85.117	Ment. health hosp.. for children etc.	No. of patients	Number of employees	.	51	Stave (2006)	52	n.a.	n.a.
85.118	Nursing homes	No. of patients	Number of employees	.	51	Stave (2006)	935	n.a.	n.a.
85.121	General practitioners	No. of employees	Number of employees	.	14	Stave (2006)	3384	n.a.	n.a.
85.122	Physic. spec. other than psychiat.	No. of employees	Number of employees	.	14	Stave (2006)	799	n.a.	n.a.
85.123	Out-patient clinics	No. of employees	Number of employees	.	14	Stave (2006)	18	n.a.	n.a.
85.124	Psychiatrists	No. of employees	Number of employees	.	14	Stave (2006)	158	n.a.	n.a.
85.125	Out-pat. ment. health clin.,adults	No. of employees	Number of employees	.	14	Stave (2006)	67	n.a.	n.a.
85.126	Out-pat. ment. health clin., child	No. of employees	Number of employees	.	14	Stave (2006)	68	n.a.	n.a.
85.127	Outpatient drug treatment units	No. of employees	Number of employees	.	14	Stave (2006)	7	n.a.	n.a.
85.130	Dental practice activities	No. of employees	Number of employees	.	14	Stave (2006)	2946	n.a.	n.a.
85.141	Home nursing care	No. of employees	Number of employees	.	14	Stave (2006)	304	n.a.	n.a.
85.142	Physiotherapy services	No. of employees	Number of employees	.	14	Stave (2006)	2061	n.a.	n.a.
85.143	School health services, etc.	No. of employees	Number of employees	.	14	Stave (2006)	495	n.a.	n.a.
85.144	Other preventive health care	No. of employees	Number of employees	.	14	Stave (2006)	645	n.a.	n.a.
85.145	Psychologists	No. of employees	Number of employees	.	14	Stave (2006)	554	n.a.	n.a.
85.146	Medical laboratories	No. of employees	Number of employees	.	14	Stave (2006)	55	n.a.	n.a.
85.147	Ambulance services	No. of employees	Number of employees	.	14	Stave (2006)	232	n.a.	n.a.
85.149	Other health activities	No. of employees	Number of employees	.	14	Stave (2006)	1539	n.a.	n.a.
85.151	Drug treatment units	No. of employees	Number of employees	.	14	Stave (2006)	37	n.a.	n.a.
85.200	Veterinary activities	No. of employees	Number of employees	.	14	Stave (2006)	616	n.a.	n.a.

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85.311	Child welfare institutions	No. of users	Number of employees	.	61	Stave (2006)	195	n.a.	n.a.
85.312	Inst. for alcohol. and drug adicts	No. of users	Number of employees	.	61	Stave (2006)	116	n.a.	n.a.
85.313	Inst. for elderly and disabled	No. of users	Number of employees	.	61	Stave (2006)	506	n.a.	n.a.
85.319	Other social care institutions	No. of users	Number of employees	.	61	Stave (2006)	108	n.a.	n.a.
85.321	Home help	No. of employees		.	.	E	699	.	.
85.322	Dwell. w. accomm., elderly/disabled	No. of users	Number of employees	.	4	Stave (2006)	934	n.a.	n.a.
85.323	Child welfare services	No. of employees	Number of employees	.	4	Stave (2006)	568	n.a.	n.a.
85.324	Soc.welf.serv.,alcoh.,drug addicts	No. of employees	Number of employees	.	4	Stave (2006)	121	n.a.	n.a.
85.325	Family counselling services	No. of employees	Number of employees	.	4	Stave (2006)	112	n.a.	n.a.
85.326	Munic. soc. serv. offices act.	No. of employees	Number of employees	.	4	Stave (2006)	529	n.a.	n.a.
85.327	Early childh. educ. and care inst.	No. of users	Number of employees	.	4	Stave (2006)	6039	n.a.	n.a.
85.328	Play groups	No. of users	Number of employees	.	4	Stave (2006)	205	n.a.	n.a.
85.331	School-age child care	No. of users	Number of employees	.	208	1	1732	2	0,1
85.332	Leis. time club act. child./adolesc.	No. of users		.	.	E	396	.	.
85.333	Day care act., elderly/disabl.	No. of users	Number of employees	.	28	1	594	2	0,3
85.334	Train. work act.for ord. lab.market	No. of users	Number of employees	.	27	1	253	7	2,8
85.335	Perm. sheltered work act.	No. of users	Number of employees	.	6	1	279	1	0,4
85.336	Soc. welfare org. activities	No. of users	Number of employees	.	8	1	292	4	1,4
85.337	Recept. centres for asylum seekers	No. of users		.	.	E	85	.	.
85.338	Empl./train. for work under munic.	No. of users		.	.	E	17	.	.
85.339	Other soc. work act. without accom.	No. of users	Number of employees	.	459	1	448	2	0,4
85.340	Soc. charitable foundations	No. of employees	Number of employees	.	1646	1	55	1	1,8
90.010	Coll. and treatment of sewage	No. of cubicmeteres treated	Number of employees	.	265	Stave (2006)	286	n.a.	n.a.
90.020	Coll. and treatment of other waste	No. of employees	Number of employees	.	265	Stave (2006)	460	n.a.	n.a.
90.030	Sanitation, remedist. and sim. act.	No. of employees	Number of employees	.	265	Stave (2006)	293	n.a.	n.a.
91.110	Act. of business,emplyers org.	No. of employees	Number of employees	.	64	Stave (2006)	426	n.a.	n.a.
91.120	Act. of professional org.	No. of employees	Number of employees	.	64	Stave (2006)	155	n.a.	n.a.
91.200	Activities of trade unions	No. of employees	Number of employees	.	64	Stave (2006)	453	n.a.	n.a.
91.310	Activities of religious org.	No. of employees	Number of employees	.	64	Stave (2006)	2061	n.a.	n.a.
91.320	Activities of political org.	No. of employees	Number of employees	.	64	Stave (2006)	149	n.a.	n.a.
91.330	Act. of other membership org. n.e.c.	No. of employees	Number of employees	.	64	Stave (2006)	1077	n.a.	n.a.
92.110	Motion picture and video prod.	No. of employees	Number of employees	.	64	Stave (2006)	992	n.a.	n.a.
92.120	Motion picture and video distrib.	No. of employees	Number of employees	.	64	Stave (2006)	24	n.a.	n.a.
92.130	Motion picture projection	No. of employees	Number of employees	.	64	Stave (2006)	181	n.a.	n.a.
92.200	Radio and television activities	No. of employees	Number of employees	.	64	Stave (2006)	328	n.a.	n.a.

NACE 5-digit-level	Title	Water use (assumed driving force)	Applied variable	Coefficient (m^3 water per 1 million NOK and year)	Coefficient (m^3 water per employee and year)	Coefficient calculation	N (CRE)	N (sample)	Per cent of population (%)
92.310	Art.,lit. creation and interpret.	No. of employees	Number of employees	.	64	Stave (2006)	2430	n.a.	n.a.
92.320	Operation of arts facilities	No. of guests	Economic turnover	884	.	Stave (2006)	398	n.a.	n.a.
92.330	Fair and amusement park act.	No. of guests	Economic turnover	884	.	Stave (2006)	38	n.a.	n.a.
92.340	Other entertainment act. n.e.c.	No. of guests	Economic turnover	884	.	Stave (2006)	240	n.a.	n.a.
92.400	News agency activities	No. of employees	Number of employees	.	64	Stave (2006)	591	n.a.	n.a.
92.510	Library and archives activities	No. of employees	Number of employees	.	64	Stave (2006)	533	n.a.	n.a.
92.521	Museums activities	No. of employees	Number of employees	.	64	Stave (2006)	220	n.a.	n.a.
92.522	Preserv.of hist. sites and build.	No. of employees	Number of employees	.	64	Stave (2006)	112	n.a.	n.a.
92.530	Bot.,zool. gardens,nat. reserve act.	No. of animals	Number of employees	.	64	Stave (2006)	17	n.a.	n.a.
92.610	Oper. of sports arenas,stadiums	Precipitation and irrigation needs	Economic turnover	652	.	Stave (2006)	645	n.a.	n.a.
92.621	Sports clubs and associations	No. of members	Economic turnover	652	.	Stave (2006)	722	n.a.	n.a.
92.622	Oper. of arenas by sports clubs etc.	No. of members	Economic turnover	652	.	Stave (2006)	285	n.a.	n.a.
92.629	Other sporting act. n.e.c.	No. of employees	Economic turnover	652	.	Stave (2006)	504	n.a.	n.a.
92.710	Gambling and betting activities	No. of employees	Number of employees	.	64	Stave (2006)	332	n.a.	n.a.
92.721	Act. and adventure companies	No. of employees	Number of employees	.	64	Stave (2006)	128	n.a.	n.a.
92.722	Leisure establishments	No. of guests	Number of employees	.	64	Stave (2006)	19	n.a.	n.a.
92.729	Other recreational serv. n.e.c.	No. of guests	Number of employees	.	64	Stave (2006)	78	n.a.	n.a.
93.010	Washing,dryclean. of textiles etc.	No. of washes	Economic turnover	151	.	Stave (2006)	338	n.a.	n.a.
93.020	hairdress,other beauty treatment	No. of washes	Economic turnover	176	.	Stave (2006)	6075	n.a.	n.a.
93.030	Funeral and related activities	No. of employees	Number of employees	.	64	Stave (2006)	401	n.a.	n.a.
93.040	Physical well-being activities	No. of customers	Economic turnover	344	.	Stave (2006)	924	n.a.	n.a.
93.050	Other service activities n.e.c.	No. of employees	Number of employees	.	64	Stave (2006)	226	n.a.	n.a.
95.000	Domestic services	No. of employees	Number of employees	.	1429	1	386	4	1
99.000	Extra-territorial org. and bodies	No. of employees	Number of employees	.	248	1	27	1	3,7

Appendix 4 - Correspondence table for water use groups, Joint Questionnaire-categories and NACE-codes

Possible conflicting group	JQ group (table 2-1 and 2-2)	JQ group (table 3-1)	JQ group (table 3-2)	Water use group	NACE-5-digit (subclass)												
	*	*	*	Unknown	00.000												
	01_05	01_05	*	Growing, gen.	01.110	01.122	01.130	01.300									
	01_05	01_05	*	Growing of vegetables	01.121												
	01_05	01_05	*	Animal husbandry	01.210	01.220	01.230	01.240	01.250								
	01_05	01_05	*	Service activities for primary industries	01.410	01.420	01.500	02.020	05.023								
	01_05	01_05	*	Forestry	02.011	02.012											
	01_05	01_05	*	Fishing and catching	05.011	05.012	05.013										
	01_05	01_05	*	Fish farming	05.021												
	01_05	01_05	*	Operation of hatcheries	05.022												
	10_14	10_14/10_45	10_14	Coal mining	10.100	10.200											
	10_14	10_14/10_45	10_14	Peat extraction	10.300												
	10_14	10_14/10_45	10_14	Oil and gas extraction	11.100	11.200											
	10_14	10_14/10_45	10_14	Mining of ores	12.000	13.100	13.200										
	10_14	10_14/10_45	10_14	Quarrying	14.110	14.120	14.130	14.210	14.220	14.300	14.400	14.500					
	15_37	15_37/10_45	15_/15_37	Manufacture of meat products and cooking oil	15.110	15.120	15.130	15.720	15.810	15.820	15.830	15.840	15.850	15.860	15.870	15.880	15.890
	15_37	15_37/10_45	15_/15_37	Manufacture of fish products	15.201	15.202	15.203	15.209									
	15_37	15_37/10_45	15_/15_37	Manufacture of fruit and vegetables	15.310	15.320	15.330										
	15_37	15_37/10_45	15_/15_37	Manufacture of crude fish oils and fats	15.411	15.419	15.421	15.422	15.430								
	15_37	15_37/10_45	15_/15_37	Manufacture of dairy products	15.510	15.520											

Possible conflicting group	JQ group (table 2-1 and 2-2)	JQ group (table 3-1)	JQ group (table 3-2)	Water use group	NACE-5-digit (subclass)													
	15_37	15_37/10_45	15_/15_37	Manufacture of grain mill products	15.610	15.710												
	15_37	15_37/10_45	15_/15_37	Manufacture of starch and starch prod.	15.620													
	15_37	15_37/10_45	15_/15_37	Manufacture of beverages	15.910	15.930	15.940	15.950	15.960	15.970	15.980							
	15_37	15_37/10_45	15_/15_37	Production of ethyl alcohol	15.920													
	15_37	15_37/10_45	15_37	Tobacco products	16.000													
	15_37	15_37/10_45	17_19/15_37	Spinning and weaving	17.110	17.120	17.130	17.140	17.150	17.160	17.170	17.210	17.220	17.230	17.240	17.250		
	15_37	15_37/10_45	17_19/15_37	Manufacture of textiles	17.300	17.401	17.409	17.510	17.530	17.540	17.600	17.710	17.720	18.100	18.210	18.220	18.230	18.240
					19.200	19.300												
	15_37	15_37/10_45	17_19/15_37	Manufacture of articles of fur etc.	18.300	19.100												
x	15_37	15_37/10_45	17_19/15_37	Light manufacturing	17.520													
	15_37	15_37/10_45	15_37		20.101	20.102	20.200	20.301	20.302	20.400	20.510	20.520						
	15_37	15_37/10_45	21_/15_37		21.210	21.230	21.240	21.250										
	15_37	15_37/10_45	15_37		22.230													
	15_37	15_37/10_45	23_24/15_37		23.100													
	15_37	15_37/10_45	15_37		25.220	25.230	25.240	26.120	26.130	28.110	28.120	28.210	28.220	28.300	28.400	28.510	28.520	28.610
					28.620	28.630	28.710	28.720	28.730	28.740	28.750	29.111	29.119	29.120	29.130	29.140	29.210	29.221
					29.229	29.230	29.240	29.310	29.320	29.410	29.420	29.430	29.510	29.520	29.530	29.540	29.550	29.560
					29.600	29.710	29.720	30.010	30.020	31.100	31.200	31.300	31.400	31.500	31.610	31.620	32.100	32.200
					32.300	33.100	33.200	33.300	33.400	33.500	34.100	34.200	34.300	36.110	36.120	36.130	36.140	36.150
					36.210	36.220	36.300	36.400	36.500	36.610	36.620	36.630						
	15_37	15_37/10_45	21_/15_37	Manufacture of mechanical pulp	21.111													
	15_37	15_37/10_45	21_/15_37	Manufacture of chem. processed pulp	21.112													
	15_37	15_37/10_45	21_/15_37	Manuf. of paper and paperboard	21.120	21.220												

Possible conflicting group	JQ group (table 2-1 and 2-2)	JQ group (table 3-1)	JQ group (table 3-2)	Water use group	NACE-5-digit (subclass)														
x	15_37	15_37/10_45	15_37	Office activities	22.110	22.120	22.130	22.140	22.150										
	*	10_45	*		40.130	40.220													
	50_93	50_93	*		63.211	63.212	63.213	63.219	63.402	63.403	63.409	64.210	64.220	64.230	64.240	65.110	65.120	65.210	
					65.220	65.231	65.238	65.239	66.010	66.020	66.030	67.110	67.120	67.130	67.200	70.111	70.112	70.120	
					70.201	70.202	70.310	70.321	72.100	72.210	72.220	72.300	72.400	72.600	73.100	73.200	74.110	74.121	
					74.122	74.123	74.130	74.140	74.150	74.201	74.202	74.203	74.209	74.300	74.400	74.501	74.502	74.600	
					74.700	74.810	74.820	74.851	74.852	74.860	74.871	74.874	74.875	74.876	75.110	75.120	75.130	75.140	
					75.210	75.230	75.240	75.300	85.340	91.110	91.120	91.200	91.310	91.320	91.330	92.710	92.721	92.722	
					93.030														
	15_37	15_37/10_45	15_37	Printing	22.210	22.220	22.240	22.250											
	15_37	15_37/10_45	15_37	Reproduction of recordings	22.310	22.320	22.330												
	15_37	15_37/10_45	23_24/15_37	Manufacture of refined petroleum prod.	23.200														
	15_37	15_37/10_45	23_24/15_37	Processing of nuclear fuel	23.300														
	15_37	15_37/10_45	23_24/15_37	Manufacture of industrial gases	24.110														
	15_37	15_37/10_45	23_24/15_37	Manufacture of chemical compunds	24.120	24.131	24.139	24.140	24.150	24.160	24.610								
	15_37	15_37/10_45	23_24/15_37	Manufacture of chemical products	24.170	24.200	24.301	24.302	24.410	24.420	24.510	24.520	24.620	24.630	24.640	24.650	24.660	24.700	
	15_37	15_37/10_45	15_37	Manufacturing	25.110	25.120	25.130	25.210	26.110	26.140	26.150	26.210	26.220	26.230	26.240	26.250	26.260	26.300	
					26.400	26.510	26.520	26.530	26.610	26.620	26.630	26.640	26.650	26.660	26.810	26.820			
x	15_37	15_37/10_45	27_/15_37		27.210	27.220	27.310	27.320	27.330	27.340	27.410	27.422							
	15_37	15_37/10_45	15_37	Stone cutting,shaping and finishing	26.700														
	15_37	15_37/10_45	27_/15_37	Smelting plants	27.100	27.421	27.430	27.440	27.450										
	15_37	15_37/10_45	27_/15_37	Casting of iron	27.510														
	15_37	15_37/10_45	27_/15_37	Casting of steel	27.520														
	15_37	15_37/10_45	27_/15_37	Casting of other metals	27.530	27.540													

Possible conflicting group	JQ group (table 2-1 and 2-2)	JQ group (table 3-1)	JQ group (table 3-2)	Water use group	NACE-5-digit (subclass)													
	15_37	15_37/10_45	35_/15_37	Manufacture of transport equipment	35.111	35.112	35.113	35.114	35.115	35.116	35.120	35.201	35.202	35.300	35.410	35.420	35.430	35.500
	15_37	15_37/10_45	15_37	Recycling	37.100	37.200												
	40_1	40_1/10_45	*	Production of electricity and fuels	40.110													
	*	10_45	*		40.120	40.210												
	*	10_45	*	Steam and hot water supply	40.300													
	41_	41_/10_45	*	Water supply	41.000													
	*	10_45	45_	Building and construction	45.110	45.120	45.211	45.212	45.221	45.229	45.230	45.240	45.250	45.310	45.320	45.330	45.340	45.410
					45.420	45.430	45.441	45.442	45.450									
x	*	10_45	45_	Wholesale and retail sale	45.500													
	50_93	50_93	*		50.101	50.102	50.301	50.302	50.500	51.110	51.120	51.130	51.140	51.150	51.160	51.170	51.180	51.190
					51.210	51.220	51.230	51.240	51.250	51.310	51.320	51.330	51.341	51.349	51.350	51.360	51.370	51.381
					51.389	51.390	51.410	51.421	51.422	51.431	51.432	51.433	51.434	51.441	51.442	51.450	51.460	51.471
					51.472	51.473	51.474	51.475	51.476	51.477	51.479	51.510	51.520	51.531	51.532	51.533	51.539	51.540
					51.550	51.561	51.569	51.570	51.810	51.820	51.830	51.840	51.850	51.860	51.871	51.872	51.873	51.874
					51.880	51.900	52.110	52.120	52.210	52.220	52.230	52.241	52.242	52.251	52.252	52.260	52.271	52.272
					52.279	52.310	52.320	52.330	52.410	52.420	52.431	52.432	52.441	52.442	52.443	52.449	52.451	52.452
					52.453	52.461	52.462	52.463	52.464	52.469	52.471	52.472	52.481	52.482	52.483	52.484	52.485	52.486
					52.487	52.489	52.501	52.502	52.509	52.611	52.612	52.613	52.614	52.615	52.619	52.620	52.630	52.710
					52.720	52.730	52.740	63.301	63.302	63.303	63.304	63.305	63.309	71.100	71.210	71.220	71.230	71.310
					71.320	71.330	71.340	71.400	74.877	74.879	93.050							
	50_93	50_93	*	Repair and retail sale of parts	50.200	50.401	50.402	50.403	72.500									
	50_93	50_93	*	Accommodation	55.101	55.102	55.210	55.220	55.230	85.337								
	50_93	50_93	*	Serving of food and beverages	55.301	55.302	55.401	55.402	55.510	55.520								
	50_93	50_93	*	Transport	60.100	60.211	60.212	60.213	60.220	60.230	60.240	60.300	61.101	61.103	61.104	61.106	61.109	61.200
					62.100	62.200	62.300	64.110	64.120									
	50_93	50_93	*	Terminals and harbours	63.110	63.120	63.221	63.223	63.224	63.229	63.230	63.401						
	50_93	50_93	*	Caretaker services	70.322													

Possible conflicting group	JQ group (table 2-1 and 2-2)	JQ group (table 3-1)	JQ group (table 3-2)	Water use group	NACE-5-digit (subclass)													
	50_93	50_93	*	Designers activities	74.872	74.873												
	50_93	50_93	*	Defence activities	75.220													
	50_93	50_93	*	Rescue activities	75.250	85.147												
	50_93	50_93	*	Education	80.101	80.102	80.103	80.104	80.105	80.210	80.220	80.301	80.302	80.303	80.309	80.410	80.421	80.422
					80.423	80.424	80.425	80.429										
	50_93	50_93	*	Health care and medical practice	85.111	85.112	85.113	85.114	85.115	85.116	85.117	85.118	85.121	85.122	85.123	85.124	85.125	85.126
					85.127	85.130	85.141	85.142	85.143	85.144	85.145	85.146	85.149	85.151	85.321			
	50_93	50_93	*	Veterinary activities	85.200													
	50_93	50_93	*	Welfare institutions	85.311	85.312	85.313	85.319										
	50_93	50_93	*	Social work	85.322	85.323	85.324	85.325	85.326	85.327	85.328							
	50_93	50_93	*	Social welfare, leisure and services	85.331	85.332	85.333	85.334	85.335	85.336	85.338	85.339						
	50_93	50_93	*	Coll. and treatment of sewage	90.010													
	50_93	50_93	*	Coll. and treatment of other waste	90.020													
	50_93	50_93	*	Sanitation, remedist. and sim. act.	90.030													
	50_93	50_93	*	Motion picture, radio and TV	92.110	92.120	92.130	92.200										
	50_93	50_93	*	Cultural activities	92.310	92.320	92.340	92.400	92.510	92.521	92.522	92.530						
	50_93	50_93	*	Operation of entertainment facilities	92.330													
	50_93	50_93	*	Operation of sports arenas and activities	92.610	92.621	92.622	92.629										
	50_93	50_93	*	Other recreational serv. n.e.c.	92.729													
	50_93	50_93	*	Washing,dryclean. of textiles etc.	93.010													
	50_93	50_93	*	Hairdressers, other beauty treatment	93.020													

Possible conflicting group	JQ group (table 2-1 and 2-2)	JQ group (table 3-1)	JQ group (table 3-2)	Water use group	NACE-5-digit (subclass)
	50_93	50_93	*	Physical well-being activities	93.040
	*	*	*	Domestic services	95.000
	*	*	*		99.000

Appendix 5 – SAS program (main calculations)

The two SAS-programs applied in the calculation of the coefficients and water use figures are as follows:

- STEP 1 Water account per nace - preliminary and main calculation.sas
- STEP 2 Water use group - final calculation.sas

```
/*************************************************************************
Project ..............: Improvement of methodoligies for water statistics, action 1
Name of program.......: STEP 1 Water account per nace - preliminary and main calculation.sas
Written by/date ......: Gisle Berge 02.02.2008
Program description...: Aggregation of different sources of water datasets into one single dataset;
                                                    preliminary calculation of water use coefficients; check of
validity.
Input files...........: kunde.kobla_kunder [custom register data]
                                                    industri.ind_samlet [industry survey data]
                                                    mattils.vannverk [Norwegian Food Safety Authority data]
Output files..........: Median_per_&nacenivaa. (faktor).sdv [water use coefficients etc., results]
                                                    resultat.totalliste_3 [businesses behind survey/calculations]

Changed by/when.......:
Changed by/name.......:
Reason for change ....:
*************************************************************************/

*Possible choice of nace level: NACE2, NACE3 eller NACE5. NB! Important to use capital letters;
%let nacenivaa = NACE5;
*%let limit = 20;
*%let antall = 5;

*Catalogue - industry survey;
libname industri 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Industri\output';

*Catalogue - custom register;
libname kunde 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Kunderegister\output';

*Catalogue - Norwegian Food Safety Authority (dataset);
libname mattils 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Mattilsynet\input';

*Catalogue - extraction of data from BOF;
libname bof 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\BOF';

*Catalogue - results of the calculations;
libname resultat 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Resultat';

/*********************************(1) Input data from industry surey**********************************/

Data industri (drop = vann_kjop vann_grunn vann_over vann_sjo sum_ferskvann sum_saltvann);
          set industri.ind_samlet;

          rename vanntotalt = vannmengde sysselsatt = sysselsatte bedr_nr = bnr;

          run;

/*********************************(2) Input data from custom registers**********************************/

*Collects custom register data (already merged with the Central Register of Establishments and Enterprises (BOF) in
          order to derrive information on NACE, economic turnover, and people employed);
data kunder;
          set kunde.kobla_kunder;
          *Rename variables;
          rename NACE1 = NACE5 oms = omsetning syss = sysselsatte;
          run;

proc sort data = kunder;
          by bnr;
          run;

*Aggregating water amount for multiple registrations of each and same establishment ID,
          interested in annual water use;
proc means data = kunder noprint;
          var vannmengde;
          by bnr;
          output out = analyse sum(vannmengde) = agg_vann;
          run;

*Deletes double registrations - only one registration per establishment ID needed;
proc sort data = kunder nodupkey;
          by bnr;
          run;


*Merged aggregated amouns of water with the custom register dataset again;
data kunder_2 ;
          merge analyse kunder;
          by bnr;
          *Transfer the value of aggregated water per establishment ID back in to the column "vannmengde";
          vannmengde = agg_vann;
          run;

data kunder_2 (keep = bnr nace5 vannmengde _navn navn sysselsatte ansatte omsetning kobltyp) kunderegister_slettet_kobling;
          set kunder_2;
```

```
          *Merging with BOF regarded as uncertain, that is merging is often erroneous;
          *NB! Numeration of merging types is different here compared with what has been applied later in the merging with the
data
          from Norwegian Food Safety Authority and BOF;
          if kobltyp in ('49','50','51','52','53','54','55','56') then output kunderegister_slettet_kobling;
                    else output kunder_2;

          run;

/*******************************(3) Input data from Norwegian Food Safety Authority**********************/

Data mattilsynet;
          set mattils.vannverk;
          run;

Proc sort data = mattilsynet;
          by descending org_nr;
          run;

Data mattilsynet (keep = org_nr bnr _navn navn nace5 vannmengde omsetning sysselsatte ansatte kobltyp)
mattilsynet_slettet_kobling;
          set mattilsynet;

          *Rename variables;
          rename nace1 = NACE5 oms = omsetning uttak = vannmengde  syss = sysselsatte;

          *Merging with BOF regarded as uncertain, that is merging is often erroneous;
          *NB! Numeration of merging types is different here compared with what has been applied earlier in the merging with
the data
          from Custom registers and BOF;
          if kobltyp in ('49','50','51','52','53','54') then output mattilsynet_slettet_kobling;
                    else output mattilsynet;

          run;

/*********************************Special case - weight of establishment = 1**********************************/

*The listed establishments are deleted here, but added again later in the program after the factors for nace5 and water
          use groups have been established (see program Step 2...). The corresponding NACE5 shows unproportionately
          large variance mainly because of these establishments. Corrected for here.;

option mprint;

Data industri;
          set industri;


          if bnr in ('01832700') then
                    do;
                              call symput ('vann1', vannmengde);
                              call symput ('syss1', sysselsatte);
                              call symput ('oms1', omsetning);
                              delete;
                    end;
          else if bnr in ('08644276') then
                    do;
                              call symput ('vann2', vannmengde);
                              call symput ('syss2', sysselsatte);
                              call symput ('oms2', omsetning);
                              delete;
                    end;

          run;


/*************************************Merging the three datasets into one**********************************/

Data totalliste;
          set industri (in = c)  kunder_2 (in = b) mattilsynet (in = a);
          *New variable - trace the source of information for particular budiness ID;
          if a = 1 then kilde = 'M';
                    else if b = 1 then kilde = 'K';
                    else if c = 1 then kilde = 'I';

          run;

title 'Estimation of number of employeed ("sysselsatte") based on number of "ansatte"(sysselsatte = ansatte + 1)';
Proc print data = totalliste N noobs uniform width = min;
          var bnr navn nace5 ansatte sysselsatte omsetning;
          where sysselsatte LT 1 and ansatte GE 1;
          run;

Data totalliste;
          set totalliste;
          *When missing - estimation of "sysselsatte" based on the variable "ansatte";
          if sysselsatte LT 1 and ansatte GE 1 then sysselsatte = ansatte + 1;
          run;

data totalliste;
          set totalliste;

          *Supplerer med nace koder hvor det mangler;
          if nace3 = '' and nace5 ne '' then nace3 = substr(nace5, 1, 4);
          if nace2 = '' and nace5 ne '' then nace2 = substr(nace5, 1, 2);
          else if nace2 = '' and nace3 ne '' then nace2 = substr(nace3, 1, 2);

          *Water use per employee or economic turnover;
          label     vannpersyss = 'Water use (m3) per employee'
                    vannperoms = 'Water use (m3) per economic turnover (1 million NOK)';

          if vannmengde > 0 and sysselsatte > 0 then vannpersyss = ROUND(vannmengde / sysselsatte, .01);
```

```
          *econmic turnover multiplied with 1000 - from 1000 NOK to 1 million NOK.;
          if vannmengde > 0 and omsetning > 0 then vannperoms = ROUND(1000 * vannmengde / omsetning, .01);

           run;


/************************Data check for double counting - double registrations deleted here*****************************/

data totalliste_2 mangler_bednr;
          set totalliste;

          *Extract busniesses with no establishment ID - added back into the dataset after the double counting check step;
          if length(bnr) > 1 then output totalliste_2;
                    else output mangler_bednr;
          run;

proc sort data = totalliste_2;
          by bnr kilde;
          run;

data dublett_bedrift;
          set totalliste_2;
          by bnr;
          *Listing double registrations of establishment ID - separate dataset;
          if not (first.bnr and last.bnr) then output;

          run;

title 'Establishment ID (bnr) which is double registration - keep only first registration of bnr in further computation';
title2 'Bedrifter uten bedriftsnummer i datasettet er holdt utenfor (ikke med her)';
proc print data = dublett_bedrift N noobs uniform width = min;
          var bnr navn nace5 sysselsatte omsetning vannmengde kilde;
          run;

proc sort data = totalliste_2 nodupkey;
          by bnr;
          run;

data totalliste_3;
          set totalliste_2 mangler_bednr;
          run;

title 'Businesses with negative number of people employed, economic turnover or water use - negative deleted';
Proc print data = totalliste_3 n ;
          var bnr navn &nacenivaa. sysselsatte omsetning vannmengde;
          where (sysselsatte GT . and sysselsatte LT 0) or (omsetning GT . and omsetning LT 0) or
                              (vannmengde GT . and vannmengde LT 0);
          run;

data totalliste_3;
          set totalliste_3;
          *Prevent negativ coefficients for water use - errors;
          if sysselsatte GT . and sysselsatte LT 0 then sysselsatte = .;
          if omsetning GT . and omsetning LT 0 then omsetning = .;
          if vannmengde GT . and vannmengde LT 0 then vannmengde = .;
          run;

Proc sort data = totalliste_3;
          by &nacenivaa.;
          run;



/*****************************Complete NACE list - five digits****************************************/
Data nace_liste;
    INFILE "X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Standard for
næringsgruppering (SIC 2002).csv"
          DELIMITER = ';' DSD TRUNCOVER firstobs=2;

    INPUT   rowno             :   $char5.
            code              :   $char6.
            levelno           :   $char1.
            title             :   $char170.
            footnote          :   $char10.
            generalnote       :         $char10.
            includes          :   $char10.
            includesalso      :   $char10.
            excludes          :    $char10.
            shorttitle        :   $char50.
            mediumtitle       :   $char150.
            ;

    run;


Data nace_liste_NACE2 (keep = shorttitle mediumtitle nace2 section)
           nace_liste_NACE3 (keep = shorttitle mediumtitle nace3 section)
           nace_liste_NACE5 (keep = shorttitle mediumtitle nace5 section);
          set nace_liste;

          *Assign corrrect section for overall nace-category;
          length section $2 NACE2 $6 NACE3 $6 NACE5 $6;

                    if substr(code, 1, 2) GE '01' and substr(code, 1, 2) LE '02'         then section = 'A';
                    else if substr(code, 1, 2) = '05'                                    then section = 'B';
                    else if substr(code, 1, 2) GE '10' and substr(code, 1, 2) LE '14'    then section = 'C';
                    else if substr(code, 1, 2) GE '15' and substr(code, 1, 2) LE '16'    then section = 'D';
                    else if substr(code, 1, 2) GE '17' and substr(code, 1, 2) LE '18'    then section = 'DB';
                    else if substr(code, 1, 2) = '19'                                    then section = 'DC';
                    else if substr(code, 1, 2) = '20'                                    then section = 'DD';
                    else if substr(code, 1, 2) GE '21' and substr(code, 1, 2) LE '22'    then section = 'DE';
                    else if substr(code, 1, 2) = '23'                                    then section = 'DF';
```

```
                    else if substr(code, 1, 2) = '24'                                   then section = 'DG';
                    else if substr(code, 1, 2) = '25'                                   then section = 'DH';
                    else if substr(code, 1, 2) = '26'                                   then section = 'DI';
                    else if substr(code, 1, 2) GE '27' and substr(code, 1, 2) LE '28'   then section = 'DJ';
                    else if substr(code, 1, 2) = '29'                                   then section = 'DK';
                    else if substr(code, 1, 2) GE '30' and substr(code, 1, 2) LE '33'   then section = 'DL';
                    else if substr(code, 1, 2) Ge '34' and substr(code, 1, 2) LE '35'   then section = 'DM';
                    else if substr(code, 1, 2) GE '36' and substr(code, 1, 2) LE '37'   then section = 'DN';
                    else if substr(code, 1, 2) Ge '40' and substr(code, 1, 2) LE '41'   then section = 'E';
                    else if substr(code, 1, 2) = '45'                                   then section = 'F';
                    else if substr(code, 1, 2) GE '50' and substr(code, 1, 2) LE '52'   then section = 'G';
                    else if substr(code, 1, 2) = '55'                                   then section = 'H';
                    else if substr(code, 1, 2) GE '60' and substr(code, 1, 2) LE '64'   then section = 'I';
                    else if substr(code, 1, 2) GE '65' and substr(code, 1, 2) LE '67'   then section = 'J';
                    else if substr(code, 1, 2) GE '70' and substr(code, 1, 2) LE '74'   then section = 'K';
                    else if substr(code, 1, 2) = '75'                                   then section = 'L';
                    else if substr(code, 1, 2) = '80'                                   then section = 'M';
                    else if substr(code, 1, 2) = '85'                                   then section = 'N';
                    else if substr(code, 1, 2) GE '90' and substr(code, 1, 2) LE '93'   then section = 'O';
                    else if substr(code, 1, 2) = '95'                                   then section = 'P';
                    else if substr(code, 1, 2) = '99'                                   then section = 'Q';
                    else if substr(code, 1, 2) = '00'                                   then section = 'Z';

          *Divide into different datasets - nace;
          if levelno = '3' then do;
                    NACE2 = code;
                    output nace_liste_NACE2;
          end;
          if levelno = '4' then do;
                    NACE3 = code;
                    output nace_liste_NACE3;
          end;
          if levelno = '6' then do;
                    NACE5 = code;
                    output nace_liste_NACE5;
          end;
          ;
          run;


Data totalliste_3;
          merge totalliste_3 (in=a) nace_liste_&nacenivaa. (in=b);
          by &nacenivaa.;

          if a=1;

          *Establishments with unknown/erroneous NACE;
          if navn NE '' and a=1 and b=0 then do;
                    nace2 = '00';
                    nace3 = '00.0';
                    nace5 = '00.000';
          end;

          drop shorttitle mediumtitle section;
          run;

Proc sort data = totalliste_3;
          by &nacenivaa.;
          run;

/***************Calculation of water use coefficient - per people employed or economic turnover*************/

*Calculation method (1): average and median per observation;
Proc means data = totalliste_3 noprint;
          var vannperoms vannpersyss;
          class &nacenivaa.;
          output out = nace_median      n(vannperoms) = n_oms
                                        nmiss(vannperoms) = nmiss_oms
                                        mean(vannperoms) = mean_oms
                                        median(vannperoms) = median_oms
                                        qrange(vannperoms) = qrange_oms
                                        min(vannperoms) = min_oms
                                        max(vannperoms) = max_oms
                                        var(vannperoms) = variance_oms
                                        cv(vannperoms) = cv_oms
                                        skewness(vannperoms) = skewness_oms
                                        kurtosis(vannperoms) = kurtosis_oms
                                        n(vannpersyss) = n_syss
                                        nmiss(vannpersyss) = nmiss_syss
                                        mean(vannpersyss) = mean_syss
                                        median(vannpersyss) = median_syss
                                        qrange(vannpersyss) = qrange_syss
                                        min(vannpersyss) = min_syss
                                        max(vannpersyss) = max_syss
                                        var(vannpersyss) = variance_syss
                                        cv(vannpersyss) = cv_syss
                                        skewness(vannpersyss) = skewness_syss
                                        kurtosis(vannpersyss) = kurtosis_syss
                                        ;
          run;

data median_per_nace (drop = _type_);
          merge nace_liste_&nacenivaa. nace_median;
          by &nacenivaa.;
          run;

title 'Median for water use per economic turnover and per person employed';
title2 'NB! Data set may contain missing values for water per economic turover or person employed';
proc print data = median_per_nace N noobs uniform width = min;
          format _numeric_ 8.;
          var &nacenivaa. shorttitle _freq_ median_oms median_syss;
          run;
```

```
*Calculation method (2): aggregated water use, people employed and economic turnover per &nacenivaa.;

*Calculate people employed with where-criteria;
Proc means data = totalliste_3 noprint;
         var vannmengde sysselsatte;
         class &nacenivaa.;
         where vannmengde GE 0 and sysselsatte GT 0;
         output out = nace_sum_syss    sum(vannmengde) = sum_vannmengde_s
                                                                                   sum(sysselsatte) = sum_syss
                                                                          ;
         run;

*Calculate economic turnover with where-criteria;
Proc means data = totalliste_3 noprint;
         var vannmengde omsetning;
         class &nacenivaa.;
         where vannmengde GE 0 and omsetning GT 0;
         output out = nace_sum_oms     sum(vannmengde) = sum_vannmengde_o
                                                                                   sum(omsetning) = sum_oms
                                                                          ;
         run;

Data nace_sum;
         merge nace_sum_oms nace_sum_syss;
         by &nacenivaa.;
         run;

Data nace_sum;
         set nace_sum;
         *New variable: divide sum water use with sum people employed or sum economic turnover;
         label     sum_vann_div_oms = 'Coefficient sum water divided with sum economic turnover'
                           sum_vann_div_syss = 'Coefficient sum water divided with sum people employed';
         *Economic turnover - from 1000 NOK to 1 million NOK;
         sum_vann_div_oms = round(1000 * sum_vannmengde_o / sum_oms, .01);
         sum_vann_div_syss = round(sum_vannmengde_s / sum_syss, .01);
         run;

Data nace_sum2 (keep = &nacenivaa. sum_vann_div_syss sum_vann_div_oms);
         set nace_sum;
         run;

Data median_per_nace;
         merge median_per_nace nace_sum2;
         by &nacenivaa.;
         run;

/******************************************Regression ************************************************/

*(1) regression - economic turnover;
proc reg data = totalliste_3 noprint tableout rsquare adjrsq mse outest = regresjon_oms;
         model vannmengde = omsetning;
         by &nacenivaa.;
         run;

data reg_parm_oms (keep = &nacenivaa. _type_ intercept omsetning _edf_ _mse_ _rsq_ _adjrsq_)
          reg_pvalue_oms (keep = &nacenivaa. omsetning);
         set regresjon_oms;
         if _type_ ='PARMS' then output reg_parm_oms;
                  else if _type_ = 'PVALUE' then output reg_pvalue_oms;
                  else delete;
         run;

data reg_parm_oms (drop = _type_);
         set reg_parm_oms;
         rename  intercept = reg_oms_intercept
                           omsetning = reg_oms_stigning
                           _edf_ = reg_oms_edf
                           _mse_ = reg_oms_mse
                           _rsq_ = reg_oms_rsq
                           _adjrsq_ = reg_oms_adjrsq;
         run;

data reg_pvalue_oms;
         set reg_pvalue_oms;
         rename  omsetning = reg_oms_pvalue;
         run;

data median_per_nace;
         merge median_per_nace reg_parm_oms reg_pvalue_oms;
         by &nacenivaa.;
         run;

*(2)regression - people employed;
proc reg data = totalliste_3 noprint tableout rsquare adjrsq mse outest = regresjon_syss;
         model vannmengde = sysselsatte;
         by &nacenivaa.;
         run;

data reg_parm_syss (keep = &nacenivaa. _type_ intercept sysselsatte _edf_ _mse_ _rsq_ _adjrsq_)
          reg_pvalue_syss (keep = &nacenivaa. sysselsatte);
         set regresjon_syss;
         if _type_ ='PARMS' then output reg_parm_syss;
                  else if _type_ = 'PVALUE' then output reg_pvalue_syss;
                  else delete;
         run;

data reg_parm_syss (drop = _type_);
         set reg_parm_syss;
         rename  intercept = reg_syss_intercept
                           sysselsatte = reg_syss_stigning
                           _edf_ = reg_syss_edf
```

```
                                _mse_ = reg_syss_mse
                                _rsq_ = reg_syss_rsq
                                _adjrsq_ = reg_syss_adjrsq;
          run;

data reg_pvalue_syss;
          set reg_pvalue_syss;
          rename  sysselsatte = reg_syss_pvalue;
          run;

data median_per_nace;
          merge median_per_nace reg_parm_syss reg_pvalue_syss;
          by &nacenivaa.;
          run;


/************Possible &nacenivaa.-digits for regression - check plot and regression analysis in sas insight**************/

*Selection of &nacenivaa. - relevant for regression analysis;
data median_per_nace;
          set median_per_nace;
          label     reg_oms = 'Possible nace to renter regression - economic turnover'
                              reg_syss = 'Possible nace to renter regression - people employed';
          *R2 higher than 0.6, p-value less than 5 % and number of observations more than 5;
          if n_oms GE 5 and reg_oms_rsq > 0.6 and reg_oms_pvalue GE 0 and reg_oms_pvalue LT 0.05 then reg_oms = 'X';
          if n_syss GE 5 and reg_syss_rsq > 0.6 and reg_syss_pvalue GE 0 and reg_syss_pvalue LT 0.05 then reg_syss = 'X';
          run;

title 'NACE digits relevant for regression analysis? Needs further verification.';
Proc print data = median_per_nace N noobs uniform ;
          var &nacenivaa. shorttitle n_oms reg_oms_pvalue reg_oms_rsq reg_oms n_syss reg_syss_pvalue reg_syss_rsq reg_syss;
          where reg_oms = 'X' or reg_syss = 'X';
          format _numeric_ 4.1 n_oms 4. n_syss 4.;
          run;

data regresjon_nace (keep = &nacenivaa.);
          set median_per_nace;
          *Listing - nace digits where regression may be an option (satisfies criteria mentioned earlier);
          if (reg_oms = 'X' or reg_syss = 'X') and &nacenivaa. NE '';
          run;

data resultat.totalliste_3_reg_&nacenivaa. (keep = &nacenivaa. navn omsetning sysselsatte vannmengde kilde);
          merge totalliste_3 (in = a) regresjon_nace (in = b);
          by &nacenivaa.;
          if b=1;
          run;


/*************************************Criteria - selection of
coefficients*****************************************************/

title "Number of observations per &nacenivaa. for calculation of average, median and regression";
Proc means data = median_per_nace N missing ;
          var median_oms reg_oms_pvalue median_syss reg_syss_pvalue;
          where &nacenivaa. NE '';
          run;


* CRITERIA FOR SELECTION OF FACTOR - SEQUENCE;
Data median_per_nace2;
          set median_per_nace;

          length faktor_id $2;

          *(1) Criteria: Number of observations relatively higher for economic turnover;
                    if n_oms  > 0 and n_syss > 0 and n_oms / (n_oms + n_syss) GE 0.65 then do;
                              if (skewness_oms GE -1 and skewness_oms LE 1) and n_oms GE 5 and (cv_oms GE 0 and cv_oms LE 100)
then do;
                                                  faktor_o = sum_vann_div_oms;
                                                  faktor_s = .;
                                                  faktor_id = '1o';
                                        end;
                              else if (skewness_oms GE -1 and skewness_oms LE 1) and (cv_oms GE 0 and cv_oms < 100) then do;
                                                  faktor_o = sum_vann_div_oms;
                                                  faktor_s = .;
                                                  faktor_id = '2o';
                                        end;
                              else if (abs((median_oms - mean_oms)/median_oms) GE 0 and abs((median_oms -
mean_oms)/median_oms) LE 1) then do;
                                                  faktor_o = median_oms;
                                                  faktor_s = .;
                                                  faktor_id = '3o';
                                        end;
                              else if median_oms GT 0 then do;
                                                  faktor_o = median_oms;
                                                  faktor_s = .;
                                                  faktor_id = '4o';
                                        end;
                    end;

          *(2) Criteria: Number of observations relatively higher for people employed;
                    else if  n_oms  > 0 and n_syss > 0 and n_syss / (n_syss + n_oms) GE 0.65 then do;
                              if (skewness_syss GE -1 and skewness_syss LE 1) and n_syss GE 5 and (cv_syss GE 0 and cv_syss LE
100) then do;
                                                  faktor_o = .;
                                                  faktor_s = sum_vann_div_syss;
                                                  faktor_id = '1s';
                                        end;
                              else if (skewness_syss GE -1 and skewness_syss LE 1) and (cv_syss GE 0 and cv_syss < 100) then
do;
                                                  faktor_o = .;
                                                  faktor_s = sum_vann_div_syss;
```

```
                                                faktor_id = '2s';
                                        end;
                                else if (abs((median_syss - mean_syss)/median_syss) GE 0 and abs((median_syss -
mean_syss)/median_syss) LE 1) then do;
                                                faktor_o = .;
                                                faktor_s = median_syss;
                                                faktor_id = '3s';
                                        end;
                                else if median_syss GT 0 then do;
                                                faktor_o = .;
                                                faktor_s = median_syss;
                                                faktor_id = '4s';
                                        end;
                        end;


                *(3) Criteria: Number of observations nearly the same for economic turnover and people employed;

                        else if (skewness_syss GE -1 and skewness_syss LE 1) and n_syss GE 5 and (cv_syss GE 0 and cv_syss LE 100)
then do;
                                        faktor_o = .;
                                        faktor_s = sum_vann_div_syss;
                                        faktor_id = '1s';
                                        end;

                        else if (skewness_oms GE -1 and skewness_oms LE 1) and n_oms GE 5 and (cv_oms GE 0 and cv_oms LE 100) then
do;
                                        faktor_o = sum_vann_div_oms;
                                        faktor_s = .;
                                        faktor_id = '1o';
                                        end;

                        else if (skewness_syss GE -1 and skewness_syss LE 1) and (cv_syss GE 0 and cv_syss < 100) then do;
                                        faktor_o = .;
                                        faktor_s = sum_vann_div_syss;
                                        faktor_id = '2s';
                                        end;

                        else if (skewness_oms GE -1 and skewness_oms LE 1) and (cv_oms GE 0 and cv_oms < 100) then do;
                                        faktor_o = sum_vann_div_oms;
                                        faktor_s = .;
                                        faktor_id = '2o';
                                        end;

                        else if (abs((median_syss - mean_syss)/median_syss) GE 0 and abs((median_syss - mean_syss)/median_syss) LE
1) then do;
                                        faktor_o = .;
                                        faktor_s = median_syss;
                                        faktor_id = '3s';
                                        end;

                        else if (abs((median_oms - mean_oms)/median_oms) GE 0 and abs((median_oms - mean_oms)/median_oms) LE 1)
then do;
                                        faktor_o = median_oms;
                                        faktor_s = .;
                                        faktor_id = '3o';
                                        end;

                        else if median_syss GT 0 then do;
                                        faktor_o = .;
                                        faktor_s = median_syss;
                                        faktor_id = '4s';
                                        end;

                        else if median_oms GT 0 then do;
                                        faktor_o = median_oms;
                                        faktor_s = .;
                                        faktor_id = '4o';
                                        end;

                run;


title 'Coefficients - preliminary, number per criteria (faktor_id)';
Proc freq data = median_per_nace2;
                table faktor_id;
                run;

title 'Attempts to make coefficients - preliminary';
Proc print data = median_per_nace2 N noobs uniform width = min;
                var &nacenivaa. shorttitle n_oms n_syss faktor_o faktor_s faktor_id;
                run;

Data median_per_nace2;
                set median_per_nace2;
                length faktor_id1 $6;
                *Assign letter for possible nace for regression to variable faktor_id;
                        if reg_oms = 'X' and reg_syss = 'X' and faktor_id NE '' then faktor_id1 = faktor_id||'RoRs';
                        else if  reg_oms = 'X' and faktor_id NE ''       then faktor_id1 = faktor_id||'Ro';
                        else if reg_syss = 'X' and faktor_id NE ''       then faktor_id1 = faktor_id||'Rs';
                        else if reg_oms = 'X' and reg_syss = 'X'         then faktor_id1 = 'RoRs';
                        else if reg_oms = 'X'                            then faktor_id1 = 'Ro';
                        else if reg_syss = 'X'                           then faktor_id1 = 'Rs';
                        else faktor_id1 = faktor_id;
                drop faktor_id;
                rename faktor_id1 = faktor_id;
                run;


/***********************************Coverage of survey compared to BOF*************************************/

Proc sort data = median_per_nace2;
```

```
          by &nacenivaa.;
          run;

*Program - extract information about real population in BOF on number of businesses per nace, and corresponding
          people employed and economic turnover (creates the two files "bof.bedrifter_bof_&nacenivaa." and
"bof.bedrifter_bof");
*%include 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\BOF_population_number of
businesses.sas' / SOURCE2;

Data median_per_nace2;
          merge median_per_nace2 (in = a) bof.bedrifter_bof_&nacenivaa. (in = b);
          by &nacenivaa.;
          *Only nace digits in dataset median_per_nace2 included;
          if a=1;
          *Deleted observations with missing nace digits;
          if &nacenivaa. = '' then delete;
          run;

Data median_per_nace2;
          set median_per_nace2;
          *Calculated coverage of survey compared to BOF;
          andel_BOF_oms = round(n_oms / n_bof , .001);
          andel_BOF_syss = round(n_syss / n_bof , .001);
          run;



/*****************Preliminary attempt to inflate water use to country level**************/

*Inflated water use based on coefficients - faktor_o (per economic turnover) or faktor_s (per people employed);
Data median_per_nace3;
          set median_per_nace2;

          *Economic turnover from 1000 NOK to 1 million NOK - coefficient is amount of m3 with water per 1 million NOK);
          if faktor_o > . then tot_vann_oms = faktor_o * (sum_oms_bof / 1000);
          if faktor_s > . then tot_vann_syss = faktor_s * sum_syss_bof;

          *Inflation of water use based on selected criteria - either use of economic turnover og people employed
                    in coefficients;
          if substr(faktor_id,2,1) = 'o' then tot_vann = tot_vann_oms;
                    else if substr(faktor_id,2,1) = 's' then tot_vann = tot_vann_syss;
                    else tot_vann = .;

          *Alternative calculation using regression - result in water use;
          label     tot_vann_reg_oms = 'Estimated water use using regression - economic turnover'
                              tot_vann_reg_syss = 'Estimated water use using regression - people employed'
                              ;
          if reg_oms = 'X' then tot_vann_reg_oms = reg_oms_intercept + reg_oms_stigning * sum_oms_bof;
          if reg_syss = 'X' then tot_vann_reg_syss = reg_syss_intercept + reg_syss_stigning * sum_syss_bof;


          run;

title 'Attempt: Inflated amounts to country level, total water use';
Proc means data = median_per_nace3 sum;
          var tot_vann;
          run;

/*****************************Additional information added to the dataset************************************/

*NB! This section applies only to nace5 - must be deactivated in case &nacenivaa. are set to nace2 or nace3;

*The assumed driving force for water use in subclass (NACE5);
Data additional_info;
    INFILE 'X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann
action1\Data\SAS\Vannforbruksgruppe\additional info.csv'
    DELIMITER = ';' DSD TRUNCOVER firstobs=2;
    INPUT   nace5                     :         $char6.
            explain_var               :         $char40.
            no                        :         $char2.
            water_group               :         $char50.
          ;
          label explain_var = 'Ideal explaining variabel explaining water use'
                    water_group = 'Water use group'
                    no = 'Sorting column'
                    ;

          *Criteria for entering - must have been assigned a nace5;
          if nace5 NE '';
    run;

Proc sort data = additional_info;
          by &nacenivaa.;
          run;

Data median_per_nace3;
          merge  median_per_nace3 (in=a) additional_info (in=b);
          by &nacenivaa.;
          if a=1;

          rename  _freq_ = N_sample;
          run;

/*****************************************Exporting file*****************************************************/

Proc sql;
          create table median_per_nace4 as
                    select
                    no
                    ,section
                    ,&nacenivaa.
                    ,mediumtitle
```

```
                    ,shorttitle
                    ,water_group
                    ,explain_var
                    ,N_sample
                    ,n_oms
                    ,nmiss_oms
                    ,mean_oms
                    ,median_oms
                    ,qrange_oms
                    ,min_oms
                    ,max_oms
                    ,variance_oms
                    ,cv_oms
                    ,skewness_oms
                    ,kurtosis_oms
                    ,sum_vann_div_oms
                    ,n_syss
                    ,nmiss_syss
                    ,mean_syss
                    ,median_syss
                    ,qrange_syss
                    ,min_syss
                    ,max_syss
                    ,variance_syss
                    ,cv_syss
                    ,skewness_syss
                    ,kurtosis_syss
                    ,sum_vann_div_syss
                    ,reg_oms_intercept
                    ,reg_oms_stigning
                    ,reg_oms_edf
                    ,reg_oms_mse
                    ,reg_oms_rsq
                    ,reg_oms_adjrsq
                    ,reg_oms_pvalue
                    ,reg_oms
                    ,reg_syss_intercept
                    ,reg_syss_stigning
                    ,reg_syss_edf
                    ,reg_syss_mse
                    ,reg_syss_rsq
                    ,reg_syss_adjrsq
                    ,reg_syss_pvalue
                    ,reg_syss
                    ,faktor_o
                    ,faktor_s
                    ,faktor_id
                    ,N_BOF
                    ,N_oms_bof
                    ,NMISS_oms_bof
                    ,N_syss_bof
                    ,NMISS_syss_bof
                    ,andel_BOF_oms
                    ,andel_BOF_syss
                    ,SUM_oms_bof
                    ,SUM_syss_bof
                    ,tot_vann_reg_oms
                    ,tot_vann_reg_syss
                    ,tot_vann_oms
                    ,tot_vann_syss
                    ,tot_vann

                    FROM median_per_nace3;

    quit;

*Exporting file with results and preliminary water use coefficients;
PROC EXPORT DATA= median_per_nace4
            OUTFILE= "X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann
action1\Data\SAS\Resultat\Median_per_&nacenivaa. (faktor).sdv"
            DBMS=DLM REPLACE;
     DELIMITER='3B'x;
RUN;
```

```
/*************************************************************************
Project ..............: Improvement of methodoligies for water statistics, action 1
Name of program.......: STEP 2 Water use group - final calculation.sas
Written by/date ......: Gisle Berge 02.02.2008
Program description...: Establish water use coefficients for each water use group.
Input files...........: median_per_nace4 (SAS-file, generated in STEP1…)
Output files..........:
Changed by/when.......:
Changed by/name.......:
Reason for change ....:
*************************************************************************/

*Household - factors;

*People living in Norway 1.1.2006;
%let peopleinnorway = 4640219;

*Use in litres per person and day - households;
%let waterperperson = 210;

%let filbane = X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Vannforbruksgruppe;

*Water use - NACE 41 (in m3) - separate calculation;
%let waterNACE41 = 59099151;

*Input data from STEP1 - first SAS program;
Data input_file (keep = no section nace5 shorttitle water_group explain_var faktor_o faktor_s
                                        faktor_id N_bof N_sample sum_oms_bof sum_syss_bof sum_vann_div_syss sum_vann_div_oms);
          set median_per_nace4;
          run;


Data input_file;
          set input_file;

          *Description on what type of information the coefficient was based on;
          length applied_var $19;
          if substr(faktor_id,2,1) = 'o' then applied_var = 'Economic turnover';
          if substr(faktor_id,2,1) = 's' then applied_var = 'Number of employees';

          *Description on what type of calculation the coefficient was based on (1) median og (2) sum water consumed divided
          by sum people employed or divided by sum economic turnover;
          length factor_explain $18;
          if substr(faktor_id, 1,1) in ('1','2') then factor_explain = '2';
           else if substr(faktor_id, 1,1) in ('3','4') then factor_explain = '1';
           else factor_explain = '';

          run;

Proc sort data = input_file;
          by water_group;
          run;


/**********************************ADJUSTMENT TO ACTION 1 - SERVICE**********************************/


*Input data from Stave (2006), earlier report;
Data Stave_2006 (drop = title_St);
    INFILE "&Filbane.\Stave 2006.csv"
    DELIMITER = ';' DSD TRUNCOVER firstobs=2;
    INPUT   nace5                       :   $char6.
            title_St                    :   $char50.
                            coeff_oms_St                :         8.
                            coeff_syss_St               :         8.
            ;

          *Criteria for entering the calculation - coefficient must represeted by a NACE;
          if nace5 NE '';

          *Only want those nace subclasses relevant for service sector;
          if coeff_oms_st = . and coeff_syss_st = . then delete;

          *Change ',' to '.';
          nace5 = tranwrd(nace5,',','.');

    run;

Proc sort data = input_file;
          by nace5;
          run;
Proc sort data = stave_2006;
          by nace5;
          run;

Data input_file;
          merge     input_file (in=a)
                            stave_2006 (in=b)
                            ;
          by nace5;

          if a=1;

          if coeff_oms_st > 0 then
                    do;
                            faktor_o = coeff_oms_st;
                            faktor_s = .;
                            faktor_id = 'Stave';
                            factor_explain = '2';
                            applied_var = 'Economic turnover';
                    end;
```

```
          if coeff_syss_st > 0 then
                    do;
                              faktor_o = .;
                              faktor_s = coeff_syss_st;
                              faktor_id = 'Stave';
                              factor_explain = '2';
                              applied_var = 'Number of employees';
                    end;

          run;



/*****************************************CALCULATION OF WEIGHTED AVERAGE)*********************************/


*Weighted average per water use group;
Proc means data = input_file noprint;
          var faktor_o;
          weight sum_oms_bof;
          class water_group;
          output out = faktor_o mean(faktor_o)=new_faktor_o;
          run;

Proc means data = input_file noprint;
          var faktor_s;
          weight sum_syss_bof;
          class water_group;
          output out = faktor_s mean(faktor_s)=new_faktor_s;
          run;

Proc sort data = input_file;
          by water_group;
          run;

*Merging the datasets;
Data water_cons_group;
          merge input_file faktor_o faktor_s;
          by water_group;
          drop _type_ _freq_;
          *Avrunder;
          new_faktor_o = round(new_faktor_o);
          new_faktor_s = round(new_faktor_s);
          run;

*Assigning a group based coefficient for each water use group;
Data water_cons_group;
          set water_cons_group;

                    *Delete if subclass (NACE5) is missing;
                    if nace5 = '' then delete;

                    *Calculates water use for water use groups;
                    if substr(faktor_id,2,1) = 's' then do;
                                        water_use = new_faktor_s * sum_syss_bof;
                                        new_faktor_o = .;
                              end;
                    else if substr(faktor_id,2,1) = 'o' then do;
                                        water_use = new_faktor_o * (sum_oms_bof / 1000);
                                        new_faktor_s = .;
                              end;
                    else if new_faktor_s > 0 and sum_syss_bof > 0 then do;
                                        water_use = new_faktor_s * sum_syss_bof;
                                        new_faktor_o = .;
                              end;
                    else if new_faktor_o > 0 and sum_oms_bof > 0 then do;
                                        water_use = new_faktor_o * (sum_oms_bof / 1000);
                                        new_faktor_s = .;
                              end;
                    else do;
                                        water_use = .;
                                        new_faktor_o = .;
                                        new_faktor_s = .;
                              end;

                    run;

/*********************************NACE 41 - special case/calculation*************************************************/

Data water_cons_group;
          set water_cons_group;

          if nace5 = '41.000' then
                    do;
                              applied_var = 'Special calculation';
                              water_use = "&waternace41.";
                    end;
          run;


/*********************************NACE 5 subclasses - estimated*****************************************************/

Data water_cons_group;
          set water_cons_group;

          *E (estimated) NACE 5 subclass - based on other subclasses in the same water use group;
          if (new_faktor_o > 0 or new_faktor_s > 0) and factor_explain = '' then factor_explain = 'E';

          run;

title 'NACE5 subclasses - estimated based on subclasses in the same water use group';
Proc print data = water_cons_group n noobs width=min;
```

```
where factor_explain = 'E';
var nace5 shorttitle /*water_group*/ n_sample faktor_o faktor_s new_faktor_o new_faktor_s factor_explain;
run;


/*********************************SPECIAL CASE - WEIGTH OF ESTABLISHMENT = 1*********************************/

*Refer to STEP 1... of the program. Influential establishments deleted in step1 is added back in again here;

Data water_cons_group;
          set water_cons_group;

          if nace5 = '11.100' then
                    do;
                              if new_faktor_s GE 0 then
                                        do;
                                                  water_use = water_use
                                                                      - (new_faktor_s * symget('syss1'))
                                                                      - (new_faktor_s * symget('syss2'))
                                                                      + symget('vann1')
                                                                      + symget('vann2')
                                                                                          ;
                                                  n_sample = n_sample + 2;
                                        end;
                              else if new_faktor_o GE 0 then
                                        do;
                                                  water_use = water_use
                                                                      - (new_faktor_o * symget('oms1'))
                                                                      - (new_faktor_o * symget('oms2'))
                                                                      + symget('vann1')
                                                                      + symget('vann2')
                                                                                          ;
                                                  n_sample = n_sample + 2;
                                        end;

                    end;

          run;

/*********************************TABLES OF RESULTS - APPENDIX IN REPORT*****************************************/

Proc sort data = water_cons_group;
          by nace5;
          run;

ods html file="X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Resultat\NACE5 -
coefficients and sample coverage.html";
title 'NACE5 - coefficients and coverage of sample';
proc report data = water_cons_group headline headskip nowindows missing;
          column nace5 shorttitle explain_var applied_var faktor_o faktor_s factor_explain faktor_id N_bof N_sample andel;
          define nace5 / 'NACE 5-digit-level' width=7;
          define shorttitle / 'Title' width=30;
          define explain_var / 'Water use (assumed driving force)' width=30;
          define applied_var / 'Applied variable' width=20;
          define faktor_o / 'Coefficient (m3 water per 1 million NOK and year)' width=10 format=10.;
          define faktor_s / 'Coefficient (m3 water per employee and year)' width=10 format=10.;
          define factor_explain /  'Coefficient calculation' width=18;
          define faktor_id / 'Factor ID - source of information' width = 10;
          define n_bof / 'N (CRE)' width=10;
          define N_sample / 'N (sample)' width=10;
          define andel /computed 'Per cent of population (%)' F=numx5.1;

          compute andel;
                              andel= (_C10_ * 100 )/ _C9_;
          endcomp;
          run;
ods html close;


Proc sort data = water_cons_group;
          by water_group;
          run;

ods html file="X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Resultat\Water use
groups.html";
title 'Water use groups - NACE 5 coverage';
proc report data = water_cons_group headline headskip nowindows missing;
          column no water_group nace5 shorttitle new_faktor_o new_faktor_s;
          define no / 'Sorting_no' width=8;
          define water_group / 'Water use group' group width=40;
          define nace5 / 'NACE5' width=10;
          define shorttitle / 'Title' width=50;
          define new_faktor_o / 'Factor (m3 per 1 million NOK and year)' width=10;
          define new_faktor_s / 'Factor (m3 per employee and year)' width=10;
          break before water_group /skip;
          run;
ods html close;


ods html file="X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Resultat\Water
consumed - m3.html";
title 'National level: Water use per water use group (m3)';
Proc tabulate data = water_cons_group FC=' ----------' noseps F=10. missing;
    class water_group;
    var water_use n_bof;
          table   ALL='Total water use' water_group=''
                                        ,
                              n_bof= 'Number of establishments' * sum=''
                              water_use= 'Water use (m3)' * sum=''    /misstext='-' box=''
                    ;
    run;
ods html close;
```

```
/*************************************Water use - households*************************************************/

Proc sort data = water_cons_group;
          by water_group;
          run;

Data households;
          input @01 water_group $char50.

          ;
cards;
Households
;
run;

data households;
          set households;
          *Water use for households in Norway - m3 per year;
          water_use = (&peopleinnorway. * &waterperperson.)* 365 / 1000;
          run;

Data sector;
          set water_cons_group households;
          run;

/*********************************WATER USE - DISTRIBUTION BETWEEN SECTORS**************************/

data sector;
          set sector;

          if nace5 ne '' then nace2 = substr(nace5,1,2);
                    else if water_group = 'Households' then nace2 = 'XX';

          keep nace2 nace5 water_use;
          run;

Proc format;
          value $sector
                    'XX' = 'Households'
                    '01'-'05' = 'Primary industry'
                    '10'-'14' = 'Mining and quarrying'
                    '15'-'37' = 'Manufacturing'
                    '50'-'93' = 'Service'
                    OTHER = 'Other'
                    ;
          run;


ods html file="X:\220\VANN\VANNRESSURSREGNSKAP\Prosjektarbeid 2007\Grantprosjekt vann action1\Data\SAS\Resultat\Water
consumed - sector wise.html";
title 'Sector wise water use (m3)';
Proc tabulate data = sector FC=' ----------' noseps F=10. missing;
    class nace2;
    var water_use;
          table   ALL='Total water use' nace2=''
                                        ,
                              water_use= 'Water use (m3)' * sum=''
                              water_use= 'Per cent (%)' * pctsum=''*F=numx4.1/misstext='-' box=''
                    ;
          format nace2 $sector.;
    run;
ods html close;



/*************************************Data check and overview*************************************************/

title 'Nace5 group with no factor';
Proc print data = water_cons_group N noobs;
          where new_faktor_o = . and new_faktor_s = .;
          var nace5 shorttitle water_group new_faktor_o new_faktor_s;
          run;

data frequency;
          set water_cons_group;
          run;

Proc format;
          value freq
                    .   = 'Missing'
                    0   = '0'
                    1-2 = '1-2'
                    3-5 = '3-5'
                    other = 'More than 5'
                    ;
          run;

title 'Frequency table - coverage of subclass, NACE5';
Proc means data = frequency N nmiss missing;
          var N_sample;
          class N_sample;
          format N_sample freq.;
          run;

title 'Frequency table - coefficient, calculated by (1) median, (2) sum water/sum auxilerary data';
title2 'or (E) estimated based on nace5 subclasses in the same water use group';
Proc freq data = frequency ;
          table factor_explain /missing;
          run;
```

ACTION 2: WATER USE IN AGRICULTURE, FORESTRY AND FISHING – ESTABLISHMENT AND APPLICATION OF A COEFFICIENT METHOD

1 Introduction

1.1 Background

Background
Statistics Norway has during the last couple of years developed several areas of water statistics with the primary objective to improve Norway's reporting to the OECD/Eurostat Joint Questionnaire (JQ) on Inland Waters. The different projects, of which several have been co-financed by Eurostat, have contributed in the development of a comprehensive water accounts system for Norway by providing information on the availability, abstraction and use of water resources in formerly little or un-explored areas.

One of the remaining little explored areas of the water accounts system is water use in agriculture, forestry and fishing (NACE 01-05), where in particular fish hatcheries (NACE 05.02) is assumed to use considerable amounts of water. Statistics Norway has earlier carried out some estimations of water use in agriculture, forestry and fishing based on a set of coefficients for water use per head of livestock, irrigation of cropland, biomass in fish farming, etc (Grant Agreement 200271400001).

The coefficient methodology approach has also been applied in a pilot study on water use in food processing and the service industries (Grant Agreement 71301.2005.001-2005.014). The experiences from these pilots have shown that the methodology could be applicable for all parts of the water accounts system under development.

The above conclusion has materialised into a pilot study supported by Eurostat grants (Grant Agreement 71301.2006.002-2006.468), called “Establishment of a unified methodological system for producing statistics on water abstraction and use” (or “Action 1”). The outcome was a system for estimation of water use in all industries based on a set of sector or industry-specific coefficients. However, for the primary industries, the preliminary results indicate that there is a need to look more closely at the coefficients applied in Action 1. For some industries it seems necessary to investigate alternative estimation methods based on coefficients for a wider range of features in the primary productions than number of employees and economic turnover.

This pilot study (or “Action 2”) can be seen as a test case for the methodological system described in Action 1, where the methodology is tuned as to give reliable results for the primary industries.

1.2 Objectives

With reference to the work programme in the grant agreement, the objectives of this pilot study are:

1. Collection of water use data, auxiliary data and structural statistics needed for estimations of total water use.
2. Estimation of total water use by NACE division (2 digit level), and for irrigation separately according to the reporting units in JQ tables 2.1-3.2.

3. Collection of information from alternative data sources i.e. amounts of public water supplied to farms, hatcheries and fish farms recorded in business registers of public water suppliers, for comparisons and verifications of the coefficients.
4. Comparisons of results based on the different data sources and possible adjustments of the coefficients on basis of the comparisons.
5. Estimation of water abstraction on basis of available sources of information on water leakage and other loss in the water supply systems used in NACE 01-05.
6. Documentation of the results (report and article for web publication)

1.3 Definitions

Aquaculture
Also known as aquafarming, implies the cultivation of aquatic populations under controlled conditions.

Central Register of Establishments and Enterprises (CRE)
The CRE is Statistic Norway's register of all enterprises and establishments in public and private sector in Norway. For every unit there are registered data which describes geographical location, type of activity and how many employees that work there.

Employee
An employee is defined as persons with income from work.

Establishment
An establishment is defined as a local kind of activity unit, which mainly conducts activities within a specific industry group.

Nomenclature generale des Activites economiqes dans les Communautes Europeenes (NACE)
NACE Rev 1. is an international standard for industrial classification. The classification system is applied in a range of different statistics in Statistics Norway, in particular in economic statistics.

Water use group
A water use group is for the purpose of this project referring to a group of NACE subclasses that is expected to have relatively the same water use per employee or economic turnover.

2 Methodology

2.1 The data collection and data sources

This pilot study has made use of data from a wide range of sources. In addition to data from the central registers on waterworks, customer registers from municipal waterworks, the Central Register of Establishments and Enterprises, carrying out this pilot has also required detailed information on: Precipitation, factors on cropland irrigation, number of heads in livestock, factors on livestock drinking water requirements, number of hatchery-produced fish for stocking and factors on their water requirements. See Table 2.1 for more details.

Existing coefficients and datasets:
In a previous pilot study by Statistics Norway (Undelstvedt, 2004) there are sketches to a methodology and information available on water use in the primary industries. The earlier study has functioned as a basis for further development of our calculation methods in this pilot study.

The data collection has resulted in datasets or other types of information as presented in Table 2.1.

Table 2.1. Major sources to data and other information collected

Topic	Source	Year	Type of data/information	Number of records	Industry coverage (NACE)
Irrigation	The Norwegian Meteorological Institute	2006, 2007	Precipitation in the growing season, by county, for areas up to 700 metres above sea level	*Not applicable*	*Not applicable*
	Statistics Norway	2006	Agricultural area irrigated at least once a year	*Not applicable*	01.110, 01.121, 01.130, 01.3
	Statistics Norway	2006	Greenhouses in use, area in square metres	*Not applicable*	01.122
	"Norwegian Association of Gardeners" (Norsk Gartnerforbund - NGF)	*Not applicable*	Coefficient on irrigation in greenhouses	*Not applicable*	01.122
Livestock drinking	Statistics Norway	2007	Livestock, number of heads	*Not applicable*	01.2 – 01.3
	Norwegian University of Life Sciences	*Not applicable*	Coefficients, drinking requirements per animal category	*Not applicable*	01.2 – 01.3
On-land fish farming	The Norwegian Food Safety Authority – district office in Valdres	2006	Amounts of fish, in tonnes	*Not applicable*	05.021

Operation of hatcheries, for stocking	Nofima (former Akvaforsk), SINTEF and NIVA	*Not applicable*	Coefficients on water requirements, production time, losses	*Not applicable*	05.022
	Directorate of fisheries	2006	Number of fish	*Not applicable*	05.022
Register data on abstraction and use					
Abstraction	Norwegian Food Safety Authority	2006	Register on all approved water supply systems	4 200	Multiple, businesses with self supply waterworks + NACE 41
Use	Municipal waterworks – 8 customer registers	2006	Use data for establishments or businesses	6 000	Multiple

2.2 Coverage

For the improvement of the methodology studied in Action 1, the statistics and coefficients available in-house and gathered from other institutions are satisfactory for the purpose of this study. The collected material seems to be of good quality and coverage.

As for the register data applied in calculations where number of employees or economic turnover are the main aspect in terms of water use, it should be sufficient to quote from the report on Action 1:

> "The number of establishments or businesses in Norway extracted from the Central Register of Establishments and Enterprises in Statistics Norway (CRE) and applied in this project was approximately 360 000. These were units with information on employees or economic turnover, and for that reason considered applicable for our purposes. The datasets applied in this study contains roughly 12 500 records on water abstraction or use distributed on various industries. This is 3.4 per cent of all establishments in Norway. The distribution of these records is broken down by 5-digit NACE-codes and the exact coverage is presented in appendix 3.
>
> **Waterworks – Customer registers**
> The response rate itself was not uplifting. Only 8 out of 50 waterworks returned data. That is a response rate of approximately 16 per cent. Still, the total number of records in the dataset (around 6 300) is adequate for the purposes of this pilot study, although more data would have been a valuable contribution to this project.
>
> The overall coverage in terms of business-population is presented in appendix 3."

For fish farming on land, in NACE 05.021, only one district is covered. It should be noted that it is the most renowned and productive district that has been included, and the water use associated with that production equals approximately 3 per cent of all known on-land fish farming and regular production in fish hatcheries.

2.3 Development of calculation methods

2.3.1 Considerations

The methodology investigated in Action 1 revealed a considerable uncertainty when applied to the primary industries. Although it is rather obvious that there is a connection between economic turnover and water use in for instance livestock husbandry (since the turnover is closely knit to number of heads sold), the results from Action 1 proved to be unsatisfactory. The reason is the high possibility of erroneous merging of datasets on use from waterworks with data from the Central Register of Establishments and Enterprises in Statistics Norway (CRE). This calls for another approach to the calculations for primary industries.

Another issue that calls for an alternative approach, or methodology, is the fact that some of the major industries (both in terms of water use and economic turnover) are not supplied by regular waterworks (private or commercial). This is the case for on-land fish farming, for operation of hatcheries for stocking, for irrigation in agriculture and to some extent livestock husbandry. Then, for these sectors, there are no relatively easy accessible sources of data on use. In agriculture there is also the element of climate/precipitation involved, which is decisive for irrigation.

2.3.2 Assessment of Action 1 and implications for Action 2

After an assessment of the results from Action 1, it was concluded that activities sorting under NACE-codes:
01.420 Livestock husbandry service activities
01.500 Hunting and related service activities
02.011 Logging
02.012 Other forestry activities
02.020 Forestry and logging related service activities
05.023 Fish farming related service activities,
are fairly well estimated using the coefficients assigned and presented in the first part of the pilot study (Action 1) based largely on waterworks data. To a large extent these industries are services or other activities that are not easily expressed in quantities related to the physical primary production involved.

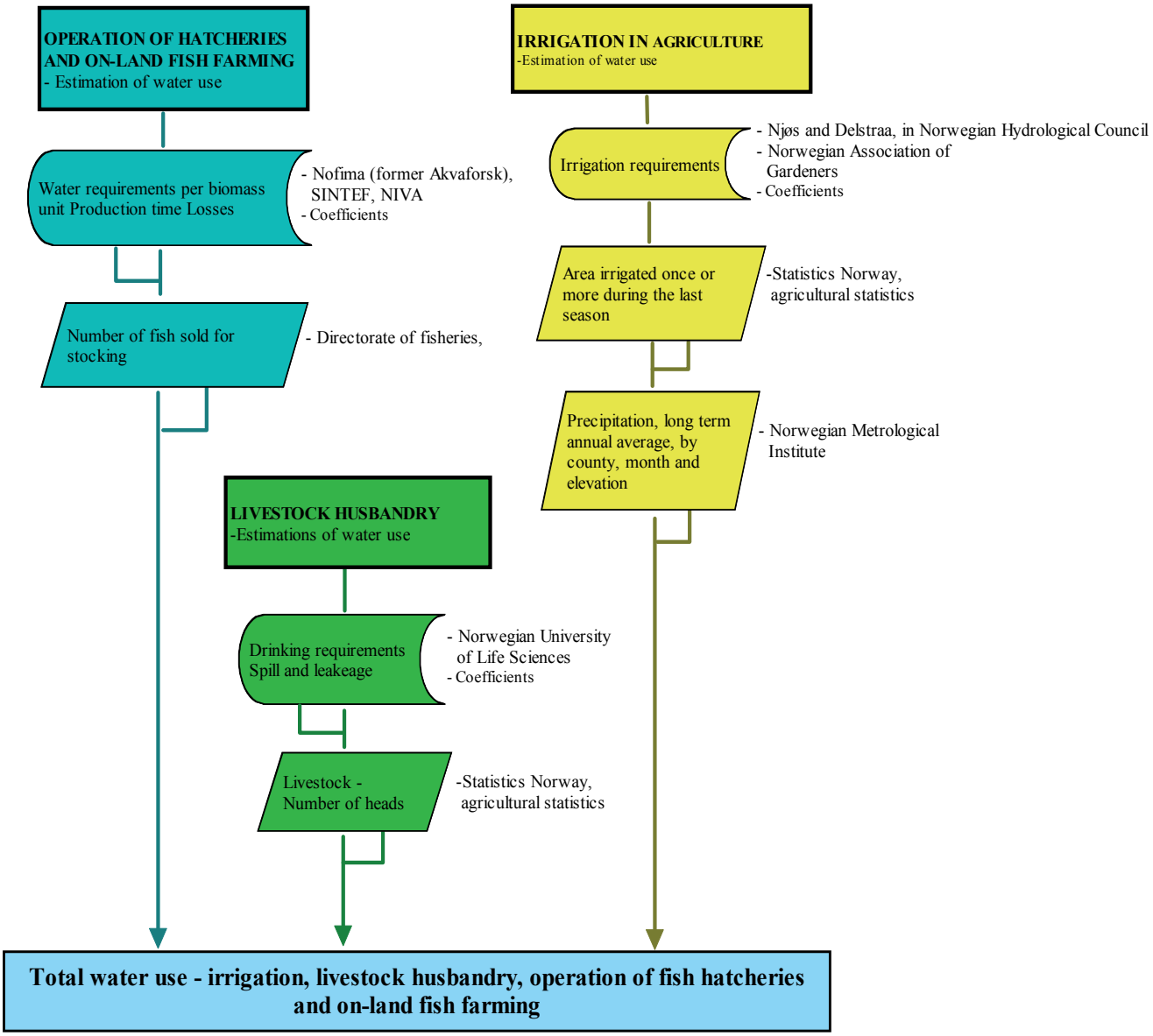
For activities sorting under NACE-codes “01.410 Agricultural service activities” and “05.011 Ocean and coastal waters fishing”, the situation should to a certain extent be as for the activities mentioned above, but for these two industries it is also likely that water requirements are met using other suppliers/sources than waterworks. This kind of information is only available at the establishment level and such data collection is outside the scope of this pilot study.

For activities sorting under NACE-code “05.012 Whaling”, there are no establishments to be found in the total sample for Action 1. The volumes used by this marginal industry are negligible, and in this pilot (Action 2) it has been given low priority and set aside for future improvement.

For activities sorting under NACE-code “05.013 Fishing in inland water”, there are no establishments to be found in the total sample for Action 1. Inland water fishing has been grouped together with “05.011 Ocean and coastal waters fishing” and are covered by the equation based on economic turnover. The same comments as for “05.011 Ocean and coastal waters fishing” apply.

For primary industries not mentioned specifically in the above, an alternative coefficient approach, which has been slightly investigated in the earlier pilot study mentioned above (Undelstvedt 2004) came up as a promising option. Since Statistics Norway has an extensive portfolio of statistics on the primary industries, and other national institutions dealing with the primary industries also quite effortlessly can provide essential data upon request, it seemed fruitful to expand the coefficient approach to encompass parameters more directly related to the production activities.

Figure 2.1. Inputs to models for estimation of water use – in irrigation, livestock husbandry, operation of fish hatcheries and on-land fish farming



2.3.3 Data processing and calculations

Irrigation on cropland
This subsection explains the methodology for estimations of irrigation in industries NACE 01.110 (Growing of cereals etc.), 01.121 (Outdoor growing of vegetables etc. and 01.21 (Farming of cattle, dairy farming).

Irrigation needs depend on several factors, such as; soil conditions, sort of crop, variations in water needs through the growth season, terrain, altitude, evaporation, and of course, precipitation. In this study we have focused solely on precipitation, as we also did in an earlier study (Undelstvedt 2004). We are aware of the inaccuracy connected with this approach, but it was not feasible within the scope of this pilot to perform further improvement of this particular part of the unified system for water statistics under development. (However, it should be noted that Statistics Norway together with the Norwegian Institute for Agricultural and Environmental Research recently have applied for grants for a new Eurostat pilot study specifically on irrigation (Grant Programme 2008, invitation from Eurostat, Unit E-1 Farms, agro-environment and rural development)).

Precipitation data are provided by the Norwegian Meteorological Institute. The data are broken down by county and month (narrowed down to the growing season – May- September) and covers altitudes up to 700 metres above sea level. This model encompasses all holdings with irrigation systems and which were irrigated at least once during the last season (Statistics Norway, 2006).

Njøs and Delstraa (1996) have estimated that the annual average irrigation requirement equals 100 mm of precipitation. The model applied is as follows:

Irrigation in mm =
Long-term annual average precipitation (in mm)
- actual precipitation (in mm)
\+ 100 mm

The model expressed in more detail; coefficients and equation inputs:

p_a = precipitation in mm, long term annual average in the growing season, by county
p_n = precipitation in mm in the growing season, year n, by county
r_a = irrigation requirements in an average year = 100 mm/year
r_n = irrigation requirements in year n, by county
a_n = area with irrigation equipment available and irrigated once or more last year, by county
Q_{ic} = irrigation, by county
Q_I = total volume of water for irrigation on cropland, million m^3

$r_n = (p_a - p_n) + r_a$
Q_{ic} = if (r_n >0 then (r_n * a_n /1 000 000) else 0)

$Q_I = (\sum Q_{ic_1} .... Q_{ic_n})$

The volume of irrigation is calculated by multiplying the area that can be irrigated in each county with the estimated need for irrigation (in millimetres). The volume is given in million cubic metres.
In counties where actual precipitation exceeds the annual average with more than 100 mm, the need for irrigation is considered non-existent.

Irrigation in greenhouses (NACE 01.122 - Growing of nursery products.)
Water use for irrigation in greenhouses (Q_G) is estimated using a coefficient associated to greenhouse area in use: **750 litres/m^2/year** (provided by the Norwegian Association of Gardeners" (Norsk Gartnerforbund - NGF).

Statistics on holdings with greenhouses is available (Statistics Norway, 2008).

The model includes a coefficient to adjust for leakage and water spilled in greenhouses:

- 30 per cent of the estimated volumes required are added to the total.

a_g = greenhouse area in use, in 1000 m^2
r_g = irrigation requirements in greenhouses = 750 litres/m^2/year
S = spill and leakage = 30 per cent (30/100)
Q_G = total volume of water for irrigation in greenhouses, million m^3/year

$Q_G = ((a_g * r_g) + (a_g * r_g * S))$

The "contribution" from greenhouses has not been included in previous estimations on irrigation volumes carried out by Statistics Norway, and is a considerable element in the unified system under development.

Drinking water in livestock husbandry
The methodology applied has been investigated by Statistics Norway in a previous pilot (Undelstvedt 2004), but it was not feasible within the scope of this pilot to perform further improvement of this particular part of the unified system for water statistics.

Drinking coefficients are obtained from the Norwegian University of Life Sciences (1997). Data on livestock is gathered from agricultural statistics (Statistics Norway, 2007). Livestock on rough grazing in the summer is excluded in the model. Also excluded is water for cleaning of premises and equipment, as well as water for dilution of manure.

The model includes a coefficient to adjust for leakage and water spilled by livestock when drinking:

- 30 per cent of the estimated volumes required are added to the total.

Table 2.2. Drinking coefficients for livestock

Animal category	Litres/day
Horse	40
Dairy cow	110
Beef cow	80
Other cattle	35
Sheep	6
Goat	12
Pig	7
Hen and chicken	0.2
Turkey	0.5
Rabbit	0.2
Ostrich	5
Fur-bearing animals	0.4

N_h = number of heads per livestock in the year n.
W_d = coefficient for drinking water, specific to animal category
S = spill and leakage = 30 per cent (30/100)
Q_L = water use in livestock husbandry

$$Q_L = (\sum(W_{d1} * N_{h1} \ldots . W_{dn} * N_{hn})) + (\sum(W_{d1} * N_{h1} \ldots . W_{dn} * N_{hn})) * S$$

Water use in aquaculture

The model concentrates on two major fish productions:

1. Operation of hatcheries with juvenile fish for stocking
2. On-land farming of trout (for a traditional speciality called "rakfisk").

The model on aquaculture (a simple version of this presented by Undelstvedt, 2004) has been improved by new coefficients on water/biomass and annual average mass of fish in hatcheries. The data collected are also more detailed in regards to number of fish by age-classes in hatcheries, and the on-land farming of trout has been included.

1. Operation of fish hatcheries for stocking:

The water use is dependent on the present biomass, i.e. the number of fish, fish seize, and time spent in the hatcheries. According to Kittelsen *et al* (2006) approximately 40 per cent of fish for stocking is sold in the autumn, with a lower weight than fish sold in spring. The average age of fish for stocking is 1.1 years.

Before estimating the total biomass, first an average weight per fish sold for stocking has to be calculated. This calculation has to consider both the average weight of fish sold in spring and autumn, and the proportion of fish sold at the different seasons.

The average fish weight depends on the growth rate through the season. For the purpose of this study, an average has been calculated on the basis of data from a series of weekly examining of fish in an ordinary batch of salmon fry (Table 9.3 in Kittelsen *et al* 2006).

The average fish weight combined with a coefficient for conversion of sold biomass to average annual biomass and the number of fish sold in a year gives the average annual biomass.

The average annual biomass combined with a coefficient for water required per minute gives the total volume of water needed in operation of Norwegian fish hatcheries for stocking. The inputs are as follows:

- **Average fish weight at delivery**

$\overline{W_a}$ = average fish weight at delivery in autumn

$\overline{W_s}$ = average fish weight at delivery in spring

P_a = percentage of "autumn-fish"

P_s = percentage of "spring-fish"

$\overline{W_F}$ = average fish weight at delivery

$$\overline{W_F} = (\overline{W_a} * P_a) + (\overline{W_s} * P_s)$$

- **Coefficient for conversion of sold biomass to average annual biomass**

N_w = number of weight registrations

S_w = total sum of all weight registrations

W_S = total weight of fish sold from hatcheries

$\overline{S_W}$ = average fish weight during a year = $\dfrac{S_W}{N_W}$

B_C = coefficient for conversion of sold biomass to average annual biomass = $\frac{\overline{S}_W}{W_S}$

- **Average annual biomass**

The average annual biomass ($\overline{W_A}$) is calculated by the following equation and inputs:
N_F = number of juvenile fish sold for stocking in a given year (estimated by the Directorate of Fisheries.)

$\overline{W_A} = N_F * \overline{W_F} * B_C$

- **Total annual water use in operation of fish hatcheries for stocking**

The total annual water use in fish hatcheries (Q_H) is calculated by the following equation and inputs:
The median use of water in hatcheries, $\widetilde{Q}_n$ = 0.22 litres/minute/kg biomass (Kittelsen *et al* 2006)

$Q_H = \overline{W_A} * \widetilde{Q}_n$ * minutes/year

2. On-land fish farming:

This industry is modest in terms of economic turnover, compared to fish farming in seawater. Nevertheless, the production requires large quantities of water and should be taken into account in a pilot study of this character.

According to regulations the producers have to report the amount of fish sold to a district office of the Norwegian Food Safety Authority. The data are not submitted to a central register and must be collected by contacting the district offices. In this project Statistics Norway has contacted the district where most of this production is located. The coefficient on water volume/biomass ($\overline{Q}_m$) is based on water use data and amounts of fish sold from a small sample of establishments.

In order to estimate the total amount of water used in this industry; the total amount of fish sold, in tonnes, is collected from the district offices of the Norwegian Food Safety Authority.

The average use of water in on-land fish farming, $\overline{Q}_m$ = X m^3/year/tonnes fish sold.
W_S = fish sold, tonnes/year

Total water use in on-land fish farming (Q_L) is:
$Q_L = \overline{Q}_m * W_S$

Total water use in operation of fish hatcheries and on-land fish farming (Q_A) is given by the following equation:

$Q_A = Q_L + Q_H$

3 Results

The expected results from this project, as stated in the grant agreement, are:

1. Water coefficients equations for water use in agriculture, forestry and fishing (NACE 01-05) will be established.
2. Water coefficients representing the present water use in NACE 01-05 will be calculated.
3. Total national water use by NACE division will be calculated.
4. The total water use figures will be compared with information from other data sources, and adjusted if necessary.
5. The pilot study will be documented in a report, which will contain:
    a. The water use coefficients equations for different water use groups.
    b. A description of the data sources to be used in the equations.
    c. Procedures for converting water use groups to NACE divisions and to industrial categories used in JQ.
    d. Estimated figures for water abstraction and use in NACE 01-05.
    e. Comparisons with other data sources on water use, and a general assessment of data quality and the uncertainty of the estimated figures.
6. The action will enable Norway to improve the figures reported for agriculture, forestry and fishing (NACE 01-05), including irrigation, in JQ tables 2.1-3.2. The methodological approach taken will also enable Norway to revise and improve the JQ time series for NACE 01-05.

This chapter presents the methodologies investigated and applied, in addition to highly(!) preliminary results from calculations based on the data available to date and the methods suggested in both Action 1 and Action 2 regarding water use in the primary industries.

3.1 Equations for calculation of water use

This subsection presents the equations applied as alternatives to the methodology investigated in Action 1. The basic calculations carried out in this pilot have been done in Excel. The outcome of the calculations has been integrated in the unified methodological system, i.e. the SAS®-programme developed in Action 1, by a direct replacement of water amounts estimated.

3.1.1 Irrigation on cropland

p_a = precipitation in mm, long term annual average, by county
p_n = precipitation in mm, year n, by county
r_a = irrigation requirements in an average year = 100 mm/year
r_n = irrigation requirements in year n, by county
a_n = area with irrigation equipment available and irrigated once or more last year, by county
Q_{ic} = irrigation, by county
Q_I = total volume of water for irrigation on cropland, million m^3

$r_n = (p_a - p_n) + r_a$

Q_{ic} = if (r_n >0 then (r_n * a_n /1 000 000) else 0)

$Q_I = (\sum Q_{ic\,1} .... Q_{ic\,n})$

3.1.2 Irrigation in greenhouses

a_g = greenhouse area in use, 1000 m^2
r_g = irrigation requirements in greenhouses = 750 litres/m^2/year
S = spill and leakage = 30 per cent (30/100)
Q_G = total volume of water for irrigation in greenhouses, million m^3/year

$$Q_G = ((a_g * r_g) + (a_g * r_g * S))$$

3.1.3 Livestock husbandry drinking water

N_h = number of heads per animal category in the year n.
W_d = coefficient for drinking water, specific to animal category
S = spill and leakage = 30 per cent (30/100)
Q_L = water use for drinking in livestock husbandry

$$Q_L = (\sum(W_{d1} * N_{h1} .... W_{dn} * N_{hn})) + (\sum(W_{d1} * N_{h1} .... W_{dn} * N_{hn})) * S$$

3.1.4 Operation of fish hatcheries for stocking

$\overline{W_a}$ = average fish weight at delivery in autumn
$\overline{W_s}$ = average fish weight at delivery in spring
P_a = percentage of "autumn-fish"
P_s = percentage of "spring-fish"
$\overline{W_F}$ = average fish weight at delivery

$$\overline{W_F} = (\overline{W_a} * P_a) + (\overline{W_s} * P_s)$$

N_w = number of weight registrations
S_w = total sum of all weight registrations
W_S = total weight of fish sold from hatcheries
$\overline{S_W}$ = average fish weight during a year = $\frac{S_W}{N_W}$

B_C = coefficient for conversion of sold biomass to average annual biomass = $\frac{\overline{S}_W}{W_S}$

$\overline{W_A}$ = average annual biomass
N_F = number of juvenile fish sold for stocking

$$\overline{W_A} = N_F * \overline{W_F} * B_C$$

Q_H = total annual water use in fish hatcheries
$\tilde{Q}_n$ = median use of water in hatcheries = 0.22 litres/minute/kg biomass

Q_H = $\overline{W_A}$ * $\tilde{Q}_n$ * minutes/year

3.1.5 On-land fish farming

$\overline{Q}_m$ = average use of water in on-land fish farming = X m^3/year/tonnes fish sold

W_S = fish sold, tonnes/year

Q_L = total water use in on-land fish farming

$$\mathbf{Q_L = \overline{Q}_m * W_S}$$

3.2 Water use groups and corresponding coefficients

Results from this pilot have not caused any changes in the classification of use groups and corresponding coefficients presented in Action 1.

3.3 Water use in the primary industries – results from the alternative coefficient calculations

Table 3.1. Water use in primary industries. Million m^3.

Sector \ Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Agriculture												
- Irrigation in agriculture[1]	232.1	188.6	211.2	132.7	143.9	80.0	176.8	113.1	68.5	73.5	102.9	112.8
- of which: surface water	*218.2*	*177.3*	*198.5*	*124.7*	*135.3*	*75.2*	*166.2*	*106.3*	*64.4*	*69.1*	*96.8*	*106.0*
- of which: ground water	*13.9*	*11.3*	*12.7*	*8.0*	*8.6*	*4.8*	*10.6*	*6.8*	*4.1*	*4.4*	*6.2*	*6.8*
- Livestock husbandry, drinking water	35.0	35.4	35.4	35.9	36.6	35.9	34.9	34.7	34.0	33.4	32.3	32.2
Aquaculture												
- Operation of fish hatcheries for stocking			512.1	524.3	585.3	650.3	648.1	660.2	643.9	782.3	587.9	659.7
- On-land fish farming of trout[2]												23.4
Other primary industries (from Action 1.)												16.7
Total volume	**267.1**	**224.0**	**758.8**	**692.9**	**765.9**	**766.3**	**859.7**	**808.0**	**746.4**	**889.2**	**723.1**	**844.9**

1) Irrigation in greenhouses included from 2004 onwards.

2) In this pilot study - data for on-land fish farming of trout is collected for 2006 only. Data for the previous years are not as easy accessible, but should be included in future work on water statistics.

Aquaculture accounts for nearly 75 per cent of all water used in primary production. Water for aquaculture is almost without exception untreated water, i.e. not from public or private waterworks. This is quite often the case also for irrigation of cropland. Irrigation of greenhouses is often supplied by waterworks. Drinking water for livestock is assumed to mostly originate from waterworks.

Figure 3.1. Water use in the primary industries (aggregated). Per cent. 2006

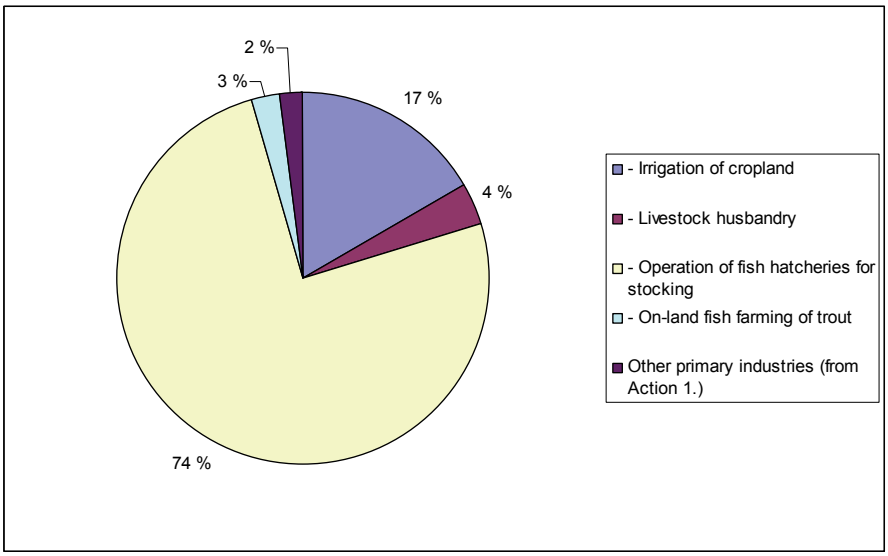


Table 3.2. Water use in all industries and households – comparison of estimations in Action 1 and Action 2.

	Action 1		Action 2	
Sector/industry	**m^3**	**per cent**	**m^3**	**per cent**
Primary industries	42 707 513	1.4	*844 933 909*	*21.9*
Mining and quarrying	362 611 928	12.1	362 611 928	*9.4*
Manufacturing	1 993 470 718	66.8	1 993 470 718	*51.7*
Service industries	116 181 798	3.9	116 181 798	*3.0*
Other industries	178 998 280	4.0	178 998 280	*4.6*
Households	358 806 315	11.7	358 806 315	*9.3*
Total	**3 052 776 554**	**100.0**	**3 855 002 948**	**100.0**

Table 3.3. Comparison of estimations for primary industries likely to be supplied by waterworks, in m^3/year.

NACE-code		**Action 1**	**Action 2, leakage included**	***Action 2, leakage excluded***
01.122	Growing of nursery products	691 134	1 419 000	*1 091 538*
Total, livestock husbandry		**17 103 449**	**32 301 558**	***24 847 352***
- 01.210	Farming of cattle, dairy farming	9 241 519	24 842 291	*19 109 455*
- 01.220	Farming of sheep, goats, horses etc.	*5 560 732*	3 860 526	*2 969 635*
- 01.230	Farming of swine	607 932	2 527 950	*1 944 577*
- 01.240	Farming of poultry	285 347	700 266	*538 666*
- 01.250	Other farming of animals	*695 449*	370 524	*285 018*
- 01.300	Mixed farming	712 470	-	

4 Assessments and further work

4.1 Assessment of the results

4.1.1 Considerations

One significant contribution from this pilot to the unified system for water statistics is a set of calculation methods or equations basically put up as alternatives to the ones already established in Action 1. Some of the methods suggested have to some extent been investigated by Statistics Norway in earlier studies. The "value added" in this pilot regarding the "old" approaches to estimation of water use in primary industries is:

1. Introduction of a more precise terminology for the equations
2. Improvements in calculation methods for irrigation and aquaculture
3. The possibility to compare or calibrate with the findings in Action 1.
4. A much more "streamlined" chain of production.

A direct outcome of the study is a set of equations for estimating the water used. The equations are not, however, linked to specific water use groups as was the intention. In Action 2 the use group-approach was abandoned, since it was found to be less time consuming and probably more rewarding in terms of accuracy to apply existing statistics on primary industries as auxiliary variables, rather than to search for auxiliary variables at the establishment level like the ones investigated in Action 1. The equations are described in the methodology chapter and listed under results.

An important feature of a unified methodological system for statistics production is access to reliable sources for data, coefficients and other types of information. As far as Statistics Norway can see, the sources employed should be of good integrity and lasting. Table 2.1 presents the most important data sources. The list of references and sources should cover the remaining not mentioned in table.

In Action 1 establishing the water use groups and accompanying use coefficients was vital. For some areas this was more difficult than in others; the primary industries being the most important of the troublesome sectors. The coefficients based on number of employees or economic turnover in the various industries, or in aggregates of such, did not reflect the actual water use. This became clear after some cross checking and trial calculations.

In the unified system for compilation of water statistics that is under development, there are several industries, or aggregates of such, that must be estimated by alternative methods. The results from these alternative calculations replace the figures from the calculations in Action 1. The conversion between the breakdowns of water use groups, NACE and Joint Questionnaire is presented in appendix 4 to the final report for Action 1.

4.1.2 The preliminary figures – consistency check

The total figures on water use in the primary industries presented in Table 3.1 are slightly lower than the figures reported for the NACE-codes 01-05 in the 2006 OECD/Eurostat Joint Questionnaire for Inland Waters. There are two main reasons to this:

1. In earlier calculations 30 per cent were added to the volume for cropland irrigation. This element has now been taken out of the equation, since today's irrigation systems mainly are made of reinforced hoses. In addition, if any leakage should occur, most of the water would still find its way to the fields since most areas irrigated in Norway are placed close to the water source. The risk of leakage is highest at both ends of the irrigation system i.e. at the pump or at the spraying nozzle. Leakage at the nozzle would be no problem, since the water technically speaking is spread on the field anyway. Leakage at the pump should be taken into account, but so far we have no information available to adjust for this in the equation.

2. In the equation for fish hatcheries, the coefficient for median water use, $\widetilde{Q}_n$, (litres/minute/kg biomass) has been adjusted from 0.29 to 0.22. The adjusted value is included from 2004 onwards. The establishments in this industry seek to reduce their water use, and this is mainly achieved through improvement of technology.

4.1.3 Comparison of results from Action 1 and this pilot

As stated in the report for Action 1, the preliminary results from the coefficient approach based on number of employees or economic turnover and water data from waterworks did not turn out satisfactory regarding the primary industries. Now, with the results from this pilot available, it should be possible to explore the differences in output from the two approaches.

It is apparent that the great difference in table 3.2, for the primary industries, derives from the fact that nearly 95 per cent of the water used in this sector comes from some sort of self supply. This is particularly true for aquaculture, but also quite common in agriculture. Consequently, the calculations in Action 1 only covered the amounts supplied by waterworks.

For the industries that in most cases are supplied by waterworks, a more detailed picture is given in Table 3.3. Generally, the figures from Action 2 are higher (with the exceptions of *"Farming of sheep, goats, horses etc"* and *"Other farming of animals"*). This is interpreted to indicate that the methodology applied in Action 1 is inadequate for the majority of primary industries. The calculations in Action 2 represents the minimum water requirements, since the equation only covers the water needed for drinking, and drinking is strongly correlated to the kind of fodder given to the domestic animals. The estimates in Table 3.3 are given with leakage both included and excluded, and in both cases the estimates from Action 2 generally exceed the figures from Action 1. Water for cleaning and dilution of manure is not in the model.
The two exceptions mentioned above must be subject to more investigation, primarily with focus on the findings in Action 1.

4.1.4 Coefficients – quality

Some of the coefficients are quite old. An update of the drinking requirements for livestock is appropriate. That is also the case for the rule-of-thumb for irrigation – the 100 mm of Njøs and Delstraa (1996).

The 30 per cent added in some equations to adjust for spill and leakage should also be subject to investigation. The origin of that coefficient is somewhat unclear. Another issue in terms of leakage is the system boundary for the different parts of the unified system for water statistics. The principle applied here is that leakage from pipelines for public supply is assigned to NACE 41 "Water supply". Leakage from house connections and pipelines for self supply is assigned to the industry involved. The adjustments attempted in this study follow that principle.

4.2 Further work

4.2.1 Calculation methods

Improvement of calculation methods should be considered for the following topics:

Leakage and spill: More accurate information on leakage and spill in greenhouses, cropland irrigation and livestock husbandry is needed. The 30 per cent added to the totals is not satisfactory.

Irrigation:
The model applied for irrigation of cropland is not accurate enough. As mentioned in chapter 2.3.3 Statistics Norway together with the Norwegian Institute for Agricultural and Environmental Research recently have applied for grants for a new Eurostat pilot study specifically on irrigation in agriculture. The pilot aims at developing a model based on geo-referenced data on coordinate level. The data involved will encompass precipitation, evaporation, soil, agriculture land, crops and specific information on growth periods and irrigation requirements. The modelling will be performed by application of geographical information systems.

For NACE 01.410, Agricultural service activities there are a connection between water use and economic turnover, but it is not obvious to which industry the water should be allocated to. It should also be investigated if it is possible to relate the water volumes to the irrigation needs for the areas subject to the service activities.

On-land fish farming:
For this sector it is necessary to define system boundaries. In many cases the fish farming installations are merely supplied by tributaries to a larger water system, and the terms “water use” or “water use” are not clearly valid. For many installations it is nearly impossible to monitor the water running through. It can be argued that this kind of water exploitation is similar to water running through hydro-electric power stations, which is considered in-situ use, and not included in the OECD/Eurostat Joint Questionnaire for Inland Waters (see definition no. 19 Gross water abstraction in the JQ). The limitations in licences for on-land fish farming is put on the discharges of nutrients from the installations. The volume of water involved is only limited by the dimensioning of the installations and the magnitude of the water sources available. The amounts of water involved may be so overwhelming that it may take the focus away from other more interesting aspects in the statistics.

Cleaning and dilution of manure:
We assume this activity is not a major contributor to water use in livestock husbandry, but it may be significant in some industries and should be investigated.

NACE-code 05.01 – Fishing and catching:
For these industries estimations have been made in Action 1, based on waterworks data. Still, we assume that these industries also make use of water from other sources. So far we have not had the capacity to look into this issue, and it may be a matter of system boundaries and interpretation of the definition of water use.

Dimensions in the statistics:
So far, in our attempt to develop a unified system for water statistics, we have neither managed to fully incorporate the dimensions of water source and manner of supply, nor incorporate the distinction between volume abstracted from the source and actual volume used. For Statistics Norway, this is perhaps the greatest challenge among the issues listed for future activities in the field of water statistics.

4.2.2 Plan for updating of coefficients and water use statistics

Statistics Norway aims at the following timetable for updating of the water use statistics:

- Updating of data collection – **see Table 4.1.**
- Updating of coefficients equations – **2011 and every fourth year onwards.**
- Updating of water use statistics – **2010 and every second year onwards.**

Table 4.1. Data collection for water statistics in the primary industries – time table

Data source	Type of data/information	Industry coverage	Frequency of data collection
Statistics Norway	Livestock, number of heads	01.2 – 01.3	Annually
Norwegian University of Life Sciences	Coefficients, drinking requirements per animal category	01.2 – 01.3	Every **fourth** year
Statistics Norway	Agricultural area irrigated at least once a year	01.110, 01.121, 01.130, 01.3	Annually
The Norwegian Meteorological Institute	Precipitation in the growing season, by county, for areas up to 700 metres above sea level	*Not applicable*	Every **second** year
Statistics Norway	Greenhouses in use, area in square metres	01.122	Every **fourth** year
"Norwegian Association of Gardeners"	Coefficient on irrigation in greenhouses	01.122	Every **fourth** year
The Norwegian Food Safety Authority – district offices	Amounts of fish from on-land fish farming sold, in tonnes	05.021	Every **second** year
Sample survey – Fish farming establishments	Water volume and fish biomass	05.021	Every **fourth** year
Directorate of fisheries	Number of fish sold for stocking, from hatcheries	05.022	Annually
Nofima, SINTEF and NIVA?	Coefficients on water requirements, production time, losses	05.022	Every **fourth** year

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