OSPAR COMMISSION

Riverine Inputs and Direct Discharges to Convention Waters

OSPAR Contracting Parties' RID 2007 Data Report

Monitoring and Assessment Series

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OSPAR Comprehensive Study on Riverine Inputs and Direct Discharges (RID) of Selected Pollutants:

RID 2007 data report and assessment

OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.

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Bioforsk

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Executive Summary

This report presents the results of monitoring undertaken by OSPAR Contracting Parties within the framework of the Comprehensive Study on Riverine Inputs and Direct Discharges (RID) during 2007. The purpose of the report is to pinpoint some of the challenges to be faced in order to improve the reliability and usefulness of the results of the RID Principles[1], and to suggest how to meet these challenges. They include: uncertainties, knowledge gaps, lack of documentation on harmonised practices, approaches and methodologies amongst Contracting Parties. Furthermore, the report provides an overview of compliance by Contracting Parties with their reporting requirement for RID 2007 data and its completeness, an analysis of the generation and reporting of RID 2007 inputs by Contracting Parties, including a comparison with 2005 and 2006 total inputs and, in the light of this analysis, an overview of the riverine inputs and direct discharges reported for 2007.

The volume of water flow influences the inputs to the sea of the different compounds. One challenge is to separate the human-induced (anthropogenic) variability and trends from the natural variability (hydro-meteorology). No such separation has been made in this report.

Assessment of data

Completeness of monitoring

According to the RID Principles, 90% of the land area draining into the OSPAR maritime area should be monitored. Of the countries that have submitted information, only Germany, the Netherlands and Belgium report that more than 90% of the land area draining into the OSPAR maritime area is monitored. France, Norway, Sweden and UK all monitor less than the required area. However, these countries do monitor direct discharges downstream of the river sampling sites, and also report on unmonitored rivers.

Direct discharges

A number of Contracting Parties reported discharges from point sources such as industries, sewage treatment plants and fish farming.

There are large variations in the way that direct discharges are accounted for amongst Contracting Parties. Some countries report direct discharges from sewage treatment plants, industries and fish farming, others do not report any direct discharges. Given that large cities are located along the shores of the marine coastline of basically all relevant OSPAR countries, the reported discharges could be seriously underestimated. However, direct discharges appear to be relatively less important than riverine inputs.

Sampling procedures

It is not clear whether all Contracting Parties have standard procedures for sampling and whether these are used consistently within each country. Common sampling standards should therefore be an issue of consideration when the RID Principles are being evaluated. In slow flowing rivers, depth integrated samples will usually provide a better estimate of the total transport of particles and substances transported associated with particulate matter. Sampling during flood events is regarded as important in order to achieve realistic estimates of the loads, but most Contracting Parties that have submitted information do not allow for extra sampling during floods.

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[1] Principles of the Comprehensive Study on Riverine Inputs and Direct Discharges, agreement 1998-5 (as amended).

Laboratory analyses

For chemical analysis of samples, several countries use different laboratories both for riverine inputs and direct discharges. Only Ireland, Norway and Sweden (except for mercury) use the same laboratory for all rivers monitored. Differences in laboratory analyses contribute to uncertainties in quantifying inputs and detecting and interpreting temporal trends.

According to the RID Principles, countries should choose an analytical method that gives at least 70% of positive findings (*i.e.* no more than 30% of the samples below the detection limit). Some countries have rather high limits of detection (LODs) or limits of quantification (LOQs) for some substances, and especially for substances detected at low concentrations, such as the metals cadmium and mercury. This leads to considerable differences in input estimates for some substances when either upper or lower estimates are used.

In the on-going trend assessment of riverine inputs and direct discharges[2] in the period 1990–2006 to the OSPAR maritime area under the OSPAR Joint Assessment and Monitoring Programme, which will contribute to the 2010 Quality Status Report of the OSPAR maritime Area, one important explanatory factor is linked to the fact that detection limits may vary considerably for river sample analyses within the same country or between countries when different laboratories perform the analyses. Another important factor is that laboratories use different analytical methods or change analytical method at different moments in time. Hence, improvements in analytical laboratory techniques between 1990 and 2006 enable concentrations of many parameters to be detected at much lower levels and with higher accuracy and precision than earlier years. This makes it more difficult to detect real trends and to accurately quantify reductions in inputs. Varying completeness of reporting across OSPAR countries, varying monitoring coverage and differences in analytical performances add to the uncertainties.

Hydrological data

The interpolation method used to calculate riverine inputs has a significant impact on the results. Most countries use the recommended RID method, although there are variations for some rivers and countries, which in particular seem to be due to the lack of continuous flow data, or flow data for the actual sampling date. Three Contracting Parties have reported continuous flow measurements, whereas two countries have reported daily recordings. For all practical purposes, daily measurements should be sufficient for calculating inputs from large rivers.

Quality assurance

There are a number of Quality Assurance (QA) issues linked to data quality that need to be considered: harmonisation and transparency in procedures, principles applied, reliability (methods and measurements, analyses, uncertainty), comparability of results, procedures and tools, and sufficient resource allocation per country to reach required common goals. The data quality will be influenced by *e.g.* selection of rivers (in countries where not all rivers can be monitored for practical and financial reasons), sampling strategy (when and where to sample), sampling frequency, considerations linked to storm flow events, detection limits, analytical methods and load calculations. Contracting Parties should endeavour to assess the uncertainty of the results that they ‘accept’, *i.e.* costs and benefits of more accurate data should be assessed and become a common understanding to all parties involved.

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[2] Trends in waterborne inputs. Assessment of riverine inputs and direct discharges of nutrients and selected hazardous substances to the OSPAR maritime area in 1990–2006. OSPAR Commission, London, 2009. Publication 448/2009.

Total inputs to the OSPAR Maritime Area in 2007

General

Differences in achieved limits of detection and the reporting of upper and lower estimates can influence the results of RID monitoring, as well as the data comparability between countries and data reliability. There is a need for additional information to supplement RID monitoring results for the purpose of improving their reliability.

There are discrepancies in how Contracting Parties report upper and lower values. The general idea is that for the lower estimates, the analytical results below the detection limit will be reported as zero; whereas for the upper estimates, the analytical results below the detection limit may either be reported as equal to the detection limit or as half the value of the detection limit.

Taking into account the differences in the methodology used by Contracting Parties to calculate the upper estimate (use of LOD or LOQ and/or use of 100% or 50% of these values for analytical results below the LOD/LOQ), a direct comparison of the upper estimations of loads of pollutants reported by Contracting Parties could not be done. In general, the values included in Annex 3 could show higher values for Contracting Parties using LOQ instead LOD. The lower estimate values are not affected by this problem and they can be directly compared.

RID 2007 data reports have been submitted by all Contracting Parties expect Iceland and the Netherlands. As Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline, these data are not included in the tables and charts of this report. The lack of reports from so many Contracting Parties undermines the value of the assessment of the total inputs of the various determinants to the entire OSPAR regions not only in 2007, but also the comparison with the inputs in 2005 and 2006.

Cadmium

Total cadmium inputs to the OSPAR maritime area in 2007 reported by Contracting Parties range from less than 0.5 tonnes in Sweden to 36 tonnes reported by the UK (based on upper estimates). Reported inputs for most countries were of similar magnitude in 2005–2006, with the exception of Belgium that reported more than double inputs (lower estimates) in 2007 compared to 2005 and 2006. Spain reported more than a 50% decline in inputs compared to 2005 and 2006 (upper estimates). Inputs reported as lower estimates would suggest that inputs are highest in Germany and the UK, whereas Spain would be the single largest contributor if upper estimates are used.

Mercury

Total mercury inputs (upper estimates) in 2007 reported by Contracting Parties range from 0.1 tonnes in Sweden to almost 11 tonnes reported by Spain. The input data for mercury provide another example of how the relative contribution of each Contracting Party to total inputs may differ depending on whether lower or upper estimates are used. Based on upper estimates (LOQ based), Spain provided almost 70% of the total mercury inputs, whereas only about 10% if based on lower estimates. In the latter case, Germany contributed with the highest inputs of mercury to the OSPAR maritime area in 2007 (about 40%).

Lead

The total inputs of lead to the maritime area in 2007 reported by Contracting Parties range from 13 tonnes in Sweden to 345 tonnes reported by the UK. As for cadmium and mercury, the relative contribution of each country to the total inputs depends on whether the lower or upper estimates are used. The differences in results are, however, less significant than for the cadmium and mercury. The reason for this is assumed to be that lead is often found in significantly higher concentrations than cadmium and mercury, an aspect that will reduce the uncertainty linked to detection limits.

The inputs reported by the UK represent the largest contribution to total inputs of lead to the Maritime Area at a magnitude around 50% for both upper and lower estimates. Spain contributed to almost 20% of the total inputs based on upper estimates, whereas close to 0% when based on lower estimates. Again, this illustrates the differences in detection limits and the subsequent difficulties in comparing data from Contracting Parties.

Copper

The total inputs of copper to the OSPAR maritime area in 2007 reported by Contracting Parties range from 46 tonnes in Sweden to 976 tonnes reported by Norway. Norway reported the largest inputs of copper, regardless of whether upper or lower estimates are used. This is due to the fact that Norway report losses of copper from anti-fouling treatment of net cages used in mariculture. The increase in Cu-losses from this source in 2007 compared to 2005 and 2006 is due to improved estimation method as well as increased mariculture production.

As for lead, the relative contribution of each country to the total copper inputs does not differ as much as for cadmium and mercury depending on whether upper or lower estimates are used. This is again assumed to be explained by the fact that copper is often detected in relatively high concentrations, so that the respective detection limits affect less the calculation of inputs.

Zinc

The total inputs of zinc to the maritime area in 2007 reported by Contracting Parties range from 150 tonnes in Sweden and France to more than 2110 tonnes reported by the UK. The UK was, for all three years 2005, 2006 and 2007, the single largest contributor of zinc inputs regardless of whether upper or lower estimates are used, followed by Germany.

As zinc is often detected in relatively high concentrations, the upper and lower estimates reported by Contracting Parties are more or less consistent, and the relative contribution of each country is less dependent on the use of upper or lower estimates. In this case, detection limits are a less distorting factor. Only the figures reported by Spain show an almost 20% discrepancy between the LOQ based upper and lower estimates.

Nitrogen

The total inputs of nitrogen to the OSPAR maritime area in 2007 reported by Contracting Parties range from 35 kilotonnes in Sweden to 535 kilotonnes reported by France. For France, this is almost five times more than reported in 2006. Slightly higher inputs in 2007 compared to the two earlier years were also noted for Germany, Norway, Spain and UK.

In general, the reported total nitrogen inputs show less difference between the upper and lower estimates than the inputs reported for metals.

Phosphorus

The total inputs of phosphorus to the OSPAR maritime area in 2007 reported by Contracting Parties range from 0.7 kilotonnes in Sweden to almost 21 kilotonnes reported by the UK (Figure 14).

As for total nitrogen, the differences between upper and lower estimates are less explicit than for metals, possibly due to the lower detection limits and higher concentrations of nutrients compared to metals.

The UK reported the highest inputs of phosphorus in 2007, followed by France, regardless of whether upper or lower estimates are used.

Suspended particular matter

Suspended particulate matter (SPM) is the determinant for which most Contracting Parties reported similar values for upper and lower estimates. The consistency between upper and lower limits for this substance does, however, not necessarily reflect that the estimates are correct, as it only reflects the results of the laboratory analyses and not the reliability of the monitoring methodology.

The reported riverine inputs of SPM are higher than the corresponding direct discharges for all countries. However, the difference between the two sources is less explicit for Norway and Spain. Sweden does not report on SPM inputs. France did not report direct discharges of suspended solids in 2007.

The UK and France reported the highest riverine inputs of SPM in 2007. Norway was the single largest contributor of SPM to total SPM direct discharges.

Water discharge to the OSPAR Maritime Area in 2007

The total inputs to the OSPAR maritime area can also be assessed based on the total amount of water discharged to the sea from each country. However, such an assessment becomes difficult as Contracting Parties have based their calculations of water discharge on differing data sets, as follows:

- Belgium has included the water discharge for monitored rivers and tributaries, but not for unmonitored areas or direct discharges;
- France and Norway have included water discharge for monitored rivers, tributaries and unmonitored areas, but not for direct discharges;
- Germany has included water discharge for rivers, tributaries and industrial and sewage effluents, but not for unmonitored areas;
- Sweden reported water discharges from unmonitored areas, but not from tributaries;
- The Netherlands have included water discharge for monitored riverine inputs, but reported zero for water discharge for the Ems Dollard Estuary, the Western Scheldt and the Southern Delta Coast;
- Spain and UK have reported water discharge as a total for the maritime sub-areas, and it is unclear whether the direct discharges and the unmonitored areas are included.

Thus, the total water discharge is based on different calculation methods and does not reflect the total discharge to the maritime area.

In the on-going trend assessment of riverine inputs and direct discharges in the period 1990–2006 to the OSPAR maritime area undertaken under the OSPAR Joint Assessment and Monitoring Programme which contributes to the development of the 2010 Quality Status Report of the OSPAR maritime area, no trend has been detected in the annual water discharges to the OSPAR maritime area during the period 1990–2006.

Récapitulatif

Le présent rapport présente les résultats de la surveillance réalisée par les Parties contractantes OSPAR dans le cadre de l'Etude exhaustive des apports fluviaux et des rejets directs (RID) en 2007. Ce rapport a pour objectif de préciser certains des problèmes rencontrés afin d'améliorer la fiabilité et l'utilité des résultats des Principes du RID[3], et de suggérer comment résoudre ces problèmes. Il s'agit notamment des incertitudes, des lacunes dans les connaissances, du manque de documentation sur les pratiques, approches et méthodologies harmonisées parmi les Parties contractantes. De plus, le rapport comporte un récapitulatif de la conformité des Parties contractantes à leurs engagements quant à la notification des données RID de 2007 et sa complétude, une analyse de la production et de la notification des apports par les Parties contractantes, notamment une comparaison avec le total des apports en 2005 et en 2006 et, à la lumière de cette analyse, un récapitulatif des apports fluviaux et des rejets directs notifiés pour 2007.

Le débit de l'eau influence les apports des divers composés à la mer. La séparation de la variabilité et des tendances introduites par l'homme (anthropiques) et de la variabilité naturelle (hydrométéorologique) présente des difficultés. Cette séparation ne figure pas dans le présent rapport.

Evaluation des données

Complétude de la surveillance

Selon les Principes du RID, 90% de la zone terrestre versant dans la zone maritime OSPAR doit être surveillée. Parmi les pays ayant communiqué des informations, seuls l'Allemagne, les Pays-Bas et la Belgique ont notifié la surveillance de plus de 90% de la zone terrestre versant dans la zone maritime OSPAR. La France, la Norvège, la Suède et le Royaume-Uni surveillent tous une zone plus petite que la zone requise. Ces pays surveillent cependant les rejets directs en aval des sites d'échantillonnage et notifient également des informations sur les fleuves non surveillés.

Rejets directs

Un certain nombre de Parties contractantes ont notifié des rejets provenant de sources ponctuelles telles que l'industrie, les usines de traitement des eaux usées et la pisciculture.

Les méthodes de notification des rejets directs varient grandement d'une Partie contractante à l'autre. Certains pays notifient les rejets directs provenant des usines de traitement des eaux usées, de l'industrie et de la pisciculture, d'autres ne notifient aucun rejet direct. On risque de sous-estimer considérablement les rejets notifiés étant donné que des villes importantes se situent le long du littoral de tous les pays pertinents OSPAR. Les rejets directs semblent cependant être relativement moins importants que les apports fluviaux.

Pocédures d'échantillonnage

On ne sait pas précisément si toutes les Parties contractantes possèdent des procédures standard d'échantillonnage et si celles-ci sont utilisées de manière cohérente au sein de chaque pays. Lors de l'évaluation des Principes du RID il faudra donc envisager des normes communes d'échantillonnage. Dans le cas des fleuves à faible débit, des échantillons à profondeur intégrée donnent habituellement une meilleure estimation du transport total de particules et des substances transportées associées à la matière particulaire. On considère que l'échantillonnage réalisé au cours de crues est important pour pouvoir parvenir à des estimations réalistes des charges mais la plupart des Parties contractantes qui ont communiqué des informations n'ont pas pris de dispositions pour effectuer un échantillonnage au cours de crues.

[3] Principes de l'étude exhaustive sur les apports fluviaux et les rejets directs, accord 1998-5 (tel qu'amendé).

Analyses en laboratoire

Plusieurs pays utilisent des laboratoires différents pour l'analyse chimique des échantillons aussi bien pour les apports fluviaux que pour les rejets directs. Seules l'Irlande, la Norvège et la Suède (sauf pour le mercure) utilisent le même laboratoire pour tous les fleuves surveillés. Les différences que présentent les analyses en laboratoire causent des incertitudes lorsqu'il s'agit de quantifier les apports et d'interpréter les tendances temporelles.

Selon les Principes du RID, les pays devraient opter pour une méthode analytique donnant au moins 70% d'échantillons positifs (c'est-à-dire pas plus de 30% d'échantillons se situant au dessous de la limite de détection). Certains pays ont des limites de détection (LOD) ou des limites de quantification (LOQ) assez élevées pour certaines substances et en particulier pour les substances détectées à faible concentration, telles que les métaux cadmium et mercure. Ceci entraîne des différences considérables dans les estimations d'apports pour certaines substances lorsque l'on utilise soit les estimations les plus élevées soit les estimations les plus faibles.

Dans l'évaluation en cours des tendances des apports fluviaux et des rejets directs[4] dans la zone maritime OSPAR, entre 1990 et 2006, dans le cadre du Programme conjoint OSPAR d'évaluation et de surveillance, qui contribue au Bilan de santé 2010 de la zone maritime OSPAR, un facteur explicatif important est lié au fait que les limites de détection risquent de varier considérablement dans les analyses des échantillons fluviaux au sein d'un pays ou d'un pays à l'autre lorsque des laboratoires différents réalisent les analyses. Le fait que les laboratoires utilisent des méthodes analytiques différentes ou en changent à divers moments, représente un autre facteur important. L'amélioration des techniques analytiques utilisées par les laboratoires entre 1990 et 2006 permet donc de détecter les teneurs de nombreux paramètres à des niveaux beaucoup plus bas et avec une plus grande exactitude et précision qu'au cours des années précédentes. Ceci rend plus difficile la détection des tendances réelles et la quantification exacte des réductions des apports. Les variations de l'état de complétude de la notification parmi les pays OSPAR, les variations de la couverture de la surveillance et les différences relevées dans les performances analytiques accentuent ces incertitudes.

Données hydrologiques

La méthode d'interpolation appliquée au calcul des apports fluviaux a un impact significatif sur les résultats obtenus. La plupart des pays appliquent la méthode recommandée par le RID, bien que des variations existent pour certains fleuves et pays, qui semblent être dues en particulier au manque de données continues sur les débits ou de données sur les débits pour la date réelle d'échantillonnage. Trois Parties contractantes ont notifié des mesures continues de débit alors que deux pays ont notifié des enregistrements quotidiens. A toutes fins utiles, les mesures quotidiennes du débit devraient suffire pour calculer les apports provenant des grands fleuves.

Assurance de qualité

Il convient de considérer un certain nombre de questions d'assurance de qualité (QA) liées à la qualité des données: harmonisation et transparence des procédures, principes appliqués, fiabilité (méthode et mesures, analyses, incertitudes), comparabilité des résultats, procédures et outils, et affectation de ressources suffisantes par pays afin de parvenir aux objectifs communs exigés. La qualité des données sera influencée par exemple par la sélection des fleuves (dans les pays où tous les fleuves ne peuvent pas être surveillés pour raisons pratiques et financières), la stratégie d'échantillonnage (moment et lieu de l'échantillonnage), la fréquence d'échantillonnage, les considérations liées à des tempêtes, les limites de détection, les méthodes

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[4] Tendances des apports aquatiques. Evaluation des apports fluviaux et des rejets directs de nutriments et de substances dangereuses sélectionnées à la zone maritime OSPAR entre 1990 et 2006. Commission OSPAR, Londres, 2009. Publication 448/2009.

analytiques et le calcul des charges. Les Parties contractantes devront s'efforcer d'évaluer l'incertitude des résultats qu'elles acceptent, à savoir les avantages et les inconvénients de données plus précises qui devront constituer une perception commune à toutes les parties concernées.

Total des apports dans la zone maritime OSPAR en 2007

Généralités

Les différences entre les limites de détection atteintes et la notification des estimations élevées et des estimations basses peuvent influencer les résultats de la surveillance RID ainsi que la comparabilité des données entre pays et la fiabilité des données. Des informations supplémentaires sont nécessaires pour compléter les résultats de la surveillance RID afin d'améliorer leur fiabilité.

La notification par les Parties contractantes des valeurs élevées et des valeurs basses présente des divergences. Il s'agit dans l'ensemble de notifier, pour les estimations basses, les résultats analytiques inférieurs à la limite de détection comme étant égaux à zéro alors que pour les estimations élevées les résultats analytiques inférieurs à la limite de détection peuvent être notifiés soit comme étant égaux à la limite de détection soit comme correspondant à la moitié de la valeur de la limite de détection.

Il n'est pas possible d'effectuer une comparaison directe entre les estimations élevées des charges de polluants notifiées par les Parties contractantes car celles-ci utilisent des méthodologies différentes pour le calcul de l'estimation élevée (utilisation de la LOD ou de la LOQ et/ou utilisation de 100% ou de 50% de ces valeurs pour les résultats analytiques inférieurs à la LOD/LOQ). En général, les valeurs figurant à l'annexe 3 pourraient être supérieures pour les Parties contractantes utilisant la LOQ plutôt que la LOD. Les valeurs basses estimées ne sont pas affectées par ce problème et peuvent faire l'objet d'une comparaison directe.

Toutes les Parties contractantes, à l'exception de l'Islande et des Pays-Bas, ont communiqué les rapports de données RID de 2007. Le Danemark, l'Irlande et le Portugal ayant communiqué leurs données de 2007 après la date limite convenue, leurs données ne sont pas incluses dans les tableaux et graphiques du présent rapport. Un grand nombre de Parties contractantes n'ont pas communiqué de rapport ce qui déprécie non seulement la valeur de l'évaluation du total des apports des divers déterminants dans l'ensemble des régions OSPAR en 2007 mais également la comparaison avec les apports en 2005 et 2006.

Cadmium

Le total des apports de cadmium à la zone maritime OSPAR en 2007, notifiés par les Parties contractantes, se situe entre 0,5 tonnes en Suède et 36 tonnes notifiées par le Royaume-Uni (se fondant sur les estimations élevées). Les apports notifiés par la plupart des pays sont du même ordre de grandeur qu'en 2005 et 2006, à l'exception de la Belgique qui notifie plus du double d'apports (estimation basse) en 2007 par rapport à 2005 et 2006. L'Espagne a notifié un déclin des apports de plus de 50% par rapport à 2005 et 2006 (estimations élevées). Les apports notifiés en tant qu'estimations basses semblent indiquer qu'ils sont plus élevés en Allemagne et au Royaume-Uni alors que l'Espagne serait le plus important contributeur unique si on utilise les estimations élevées.

Mercure

Le total des apports de mercure (estimations élevées) en 2007 notifiés par les Parties contractantes se situe entre 0,1 tonne en Suède et presque 11 tonnes notifiées par l'Espagne. Les données sur les apports de mercure constituent un autre exemple de la manière dont la contribution relative de chaque Partie contractante au total des apports risque de varier selon que l'on utilise les estimations basses ou élevées. Si on se fonde sur les estimations élevées (à partir de la LOQ), la contribution de l'Espagne au total des apports de mercure s'élève à presque 70%. Cependant, si on se fonde sur les estimations basses, cette contribution s'élève à environ 10% seulement et celle de l'Allemagne est la plus importante dans la zone maritime OSPAR en 2007 (environ 40%).

Plomb

Le total des apports de plomb à la zone maritime OSPAR en 2007, notifiés par les Parties contractantes, se situe entre 13 tonnes en Suède et 345 tonnes notifiées par le Royaume-Uni. De même que pour le cadmium et le mercure, la contribution relative de chaque pays au total des apports varie selon que l'on utilise les estimations basses ou élevées. Les résultats présentent cependant des différences moins significatives que pour le cadmium et le mercure. On présume que ceci est dû au fait que les teneurs en plomb sont souvent beaucoup plus élevées que celles de cadmium et de mercure, ce qui réduit les incertitudes liées aux limites de détection.

Les apports notifiés par le Royaume-Uni constituent la contribution la plus importante au total des apports de plomb dans la zone maritime et représentent environ 50% aussi bien pour les estimations élevées que pour les estimations basses. Si on se fonde sur les estimations élevées, la contribution de l'Espagne au total des apports de mercure s'élève à presque 20% alors que si on se fonde sur les estimations basses, cette contribution est proche de 0%. Ceci montre à nouveau les différences entre les limites de détection et les difficultés qui en découlent pour la comparaison des données des Parties contractantes.

Cuivre

Le total des apports de cuivre à la zone maritime OSPAR en 2007, notifiés par les Parties contractantes, se situe entre 46 tonnes en Suède et 976 tonnes notifiées par la Norvège. La Norvège a notifié les apports de cuivre les plus importants, qu'elle utilise les estimations élevées ou les estimations basses. Ceci est dû au fait que la Norvège notifie les pertes de cuivre provenant du traitement antisalissure des cages-filets utilisés en mariculture. L'augmentation des pertes de cuivre provenant de cette source en 2007 par rapport à 2005 et 2006 est due à une meilleure méthode d'estimation ainsi qu'à une augmentation de la production maricole.

De même que pour le plomb, la contribution relative de chaque pays au total des apports de cuivre ne varie pas autant que pour le cadmium et le mercure selon que l'on utilise les estimations basses ou élevées. Ici encore on présume que ceci est dû au fait que le cuivre est souvent détecté dans des teneurs relativement élevées de telle sorte que les limites de détection respectives affectent moins le calcul des apports.

Zinc

Le total des apports de zinc à la zone maritime en 2007, notifiés par les Parties contractantes, se situe entre 150 tonnes en Suède et en France et plus de 2110 tonnes notifiées par le Royaume-Uni. Le Royaume-Uni était en 2005, 2006 et 2007 le plus important contributeur unique aux apports de zinc que l'on utilise les estimations basses ou élevées, suivi par l'Allemagne.

Du fait que le zinc est souvent détecté dans des teneurs relativement élevées, les estimations élevées et basses notifiées par les Parties contractantes sont plus ou moins cohérentes et la contribution relative de chaque pays dépend moins de l'utilisation des estimations élevées ou basses. Dans ce cas, les limites de détection représentent un facteur de distorsion moindre. Seules les statistiques notifiées par l'Espagne révèlent un écart de presque 20% entre les estimations élevées et basses basées sur les LOQ.

Azote

Le total des apports d'azote à la zone maritime OSPAR en 2007, notifiés par les Parties contractantes, se situe entre 35 kilotonnes en Suède et 535 kilotonnes notifiées par la France. Ceci correspond pour la France à presque cinq fois la quantité notifiée en 2006. L'Allemagne, la Norvège, l'Espagne et le Royaume-Uni ont également relevé une légère augmentation des apports en 2007 par rapport aux deux années précédentes.

Dans l'ensemble, le total des apports d'azote notifiés présente moins de différences entre les estimations élevées et les estimations basses que les rapports notifiés pour les métaux.

Phosphore

Le total des apports de phosphore à la zone maritime OSPAR en 2007, notifiés par les Parties contractantes, se situe entre 0,7 kilotonnes en Suède et presque 21 kilotonnes notifiées par le Royaume-Uni (Figure 14).

De même que pour l'azote total, les différences entre les estimations élevées et basses sont moins explicites que pour les métaux, ceci est éventuellement dû à des limites de détection plus basses et des teneurs plus élevées en nutriments par rapport aux métaux.

Le Royaume-Uni a notifié les apports de phosphore les plus élevés en 2007, suivi par la France, que l'on utilise les estimations basses ou élevées.

Matière particulaire en suspension

La matière particulaire en suspension (SPM) est le déterminant au sujet duquel la plupart des Parties contractantes notifient des valeurs semblables pour les estimations élevées et basses. Cependant, la cohérence entre les limites élevées et basses pour cette substance ne signifie pas nécessairement que les estimations sont correctes car elle ne reflète que les résultats des analyses des laboratoires et non pas la fiabilité de la méthodologie de surveillance.

Les apports fluviaux de SPM notifiés sont supérieurs aux rejets directs correspondants pour tous les pays. La différence entre les deux sources est cependant moins explicite que pour la Norvège et l'Espagne. La Suède ne notifie pas d'apports de SPM. La France n'a pas notifié de rejets directs de solides en suspension en 2007.

Le Royaume-Uni et la France ont notifié les apports fluviaux les plus élevés de SPM en 2007. La Norvège est le plus important contributeur unique de SPM au total des rejets directs de SPM.

Rejets d'eau dans la zone maritime OSPAR en 2007

Le total des apports à la zone maritime OSPAR peut également être évalué en se fondant sur la quantité totale d'eau rejetée à la mer à partir de chaque pays. Cette évaluation s'avère cependant difficile car les Parties contractantes fondent leurs calculs des rejets d'eau sur des séries de données différentes, comme suit:

- la Belgique a inclus les rejets d'eau pour les fleuves et les affluents surveillés mais pas pour les zones non surveillées ou les rejets directs;
- la France et la Norvège ont inclus les rejets d'eau pour les fleuves et les affluents surveillés, les zones non surveillées mais pas pour les rejets directs;
- l'Allemagne a inclus les rejets d'eau pour les fleuves et les affluents surveillés et les effluents industriels et les eaux usées mais pas pour les zones non surveillées;
- la Suède a notifié les rejets d'eau pour les zones non surveillées mais pas pour les affluents;
- les Pays-Bas ont inclus les rejets d'eau pour les apports fluviaux surveillés mais ont notifié des rejets d'eau pour l'estuaire de l'Ems Dollard, l'Escaut occidental et la côte méridionale du Delta équivalents à zéro;
- l'Espagne et le Royaume-Uni ont notifié des rejets d'eau sous forme de total pour les sous-zones marines et il n'est pas évident si les rejets directs et les zones non surveillées sont inclus.

Le total des rejets d'eau se base donc sur des méthodes de calcul différentes et ne reflète pas le total des rejets dans la zone maritime.

Aucune tendance n’a été détectée dans les rejets d’eau annuels dans la zone maritime OSPAR entre 1990 et 2006 au cours de l’évaluation continue des tendances des apports fluviaux et des rejets directs dans la zone maritime OSPAR entre 1990 et 2006 réalisée dans le cadre du Programme conjoint OSPAR d’évaluation et de surveillance qui contribue au développement du Bilan de santé 2010 de la zone maritime OSPAR.

1. Introduction

This report describes the results of the national RID monitoring and data reporting for 2007 carried out by Contracting Parties across the OSPAR area (see Figure 1) under the Comprehensive Study on Riverine Inputs and Direct Discharges (agreement 1998-5, update 2005).[5] It also includes a comparison of the 2007 inputs with reported inputs from 2005 and 2006. Previous reports included a Part 1 which encompassed national procedures and practices with regard to their national RID programmes linked to issues such as:

- Laboratory analyses and change of detection limits over time, methodology and calculation practices for the estimations of discharges and inputs, sampling sites and coverage of monitored areas, sampling procedures and hydrological data.
- Varying number of rivers reported from one year to another entailing varying completeness of reporting amongst Contracting Parties.
- Different practices amongst Contracting Parties in sampling methodology (frequency, distance from river mouth, site in river), pollutant losses covered by direct monitoring, by estimation and/or modelling, as well a land areas/sources not covered at all; direct discharges and how they are accounted for.

The purpose of the previous Part 1 of the report was partly linked to the need for transparency and partly to the need to improve the reliability, accuracy, comparability and completeness of the reported data. The information was based on national responses to a questionnaire, circulated specifically to collect information on data generation and reporting. This year, Contracting Parties were asked to check whether their national information compiled and presented in last year's report was still adequate, and to complete/amend the information as they deemed appropriate. The information/updates from those Contracting Parties that have replied to the request for information this year are included in the updated overview table presented in Annex 3 of this report.

Figure 1: OSPAR maritime area with its five Regions and the OSPAR catchment area.

5 At its Tenth Meeting (Lisbon, 1988) the Paris Commission[5] (PARCOM) adopted the Principles of the Comprehensive Study on Riverine Inputs (PARCOM 10/10/1, § 4.25 (e)). Such a comprehensive study was conducted for the first time in 1990. The RID Principles were reviewed in 1998 and 2005.

The RID Study forms one element within the wider Joint Assessment and Monitoring Programme of OSPAR. The purpose of the RID Study is to assess, as accurately as possible, all riverine inputs and direct discharges of selected pollutants to the OSPAR maritime area on an annual basis. The RID Principles set out the monitoring regime to be employed for generating and reporting input data and to this end describes for example the relevant substances and river systems covered, sampling approach, locations and frequency, detection limits, calculation methodologies and quality assurance. Further details regarding the RID Principles are given in Annex 1.

2. Country submission of information and RID data for 2007

Table 1 provides an overview of the status of submitted information by Contracting Parties on which this report is based. The agreed deadline for submission of national information was extended to 1 March 2009 due to a number of missing national reports by the agreed deadline of 1 November 2008.

Table 1. Overview of submitted information from Contracting Parties

Country	RID 2007 report submitted	RID 2007 data submitted	Questionnaire filled in (2006)	Questionnaire updated (2007)
Belgium[1]	Yes	Yes	Yes	Yes
Denmark[2]	Yes	Yes	No	No
France	Yes	Yes	Yes	No
Germany	Yes	Yes	No	No
Iceland[3]	No	No	No	No
Ireland[2]	Yes	Yes	No	No
Netherlands	No	No	Yes	No
Norway	Yes	Yes	Yes	Yes
Portugal[2]	Yes	Yes	No	No
Spain	Yes	Yes	Yes	Yes
Sweden	Yes	Yes	Yes	Yes
United Kingdom	Yes	Yes	Yes	Yes

1 In 2006, Belgium also submitted information on a river by river basis as requested in the questionnaire (see Annex 3).

2 The RID 2007 data reports from Denmark, Ireland and Portugal were submitted after the agreed deadline, too late to be taken into account in the assessment. Their 2007 data are however included in the annual overview tables in Annex 2 and the national reports are included in Addendum 1 to this report. Iceland submitted some information and data but did not report in the format of the RID Principles; Iceland's submission is not taken into account in the assessment but it is included in the compilation of national reports in Addendum 1.

RID 2007 data reports have been submitted by all Contracting Parties expect Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their data after the agreed deadline. The lack of reports from so many Contracting Parties undermines the value of the assessment of the total inputs of the various determinants to the entire OSPAR regions not only in 2007, but also the comparison with the inputs in 2005 and 2006.

Table 2: Overview of information for 2007 reported by Contracting Parties within the agreed deadline on inputs to the OSPAR Maritime Area (green = data reported; red = no information, NA = not applicable)

Country	Sewage effluents	Industrial effluents	Main rivers	Tributary rivers
Belgium	NA	NA		
Denmark[1]				
France				
Germany				
Iceland[1]				
Ireland[1]				
Netherlands				
Norway				
Portugal[1]				
Spain				
Sweden				
UK				

[1] Denmark, Ireland and Portugal reported RID data for 2007 too late to be taken into account in this report. The data are however included in the overview tables at Annex 2 and in the compilation of national reports in Addendum 1. Iceland submitted some information and data but did not report in the format of the RID Principles; Iceland's submission is not taken into account in the assessment but it is included in the compilation of national reports in Addendum 1.

3. Total inputs to the OSPAR Maritime Area in 2007

This section summarises and visualises national RID data reported for 2007 for five metals, five nutrient species and suspended particulate matter (SPM). The reporting on lindane and PCBs is too scarce and incomplete to enable a scientifically sound assessment.

Ideally, charts like those shown in this section should reflect actual differences in inputs between Contracting Parties, both in terms of the parameters measured and in terms of the two different input 'pathways' to the sea (riverine inputs and direct discharges). The inputs should, furthermore, properly reflect the pollution sources in each country, and thereby give indications and guidance as to how to reduce the inputs in the future. For the reasons set out in the 2005 and 2006 OSPAR RID data reports (Skarbøvik and Borgvang, 2006; Borgvang et al. 2006; Borgvang, Skarbøvik and Pengerud, 2008), this is, however, not always the case.

This section also intends to exemplify how differences in achieved limits of detection and the reporting of upper and lower estimates can influence the results of the RID Study, as well as data comparability and reliability, see also Annex 3.

The RID data presented in charts compare the national RID results, in order to demonstrate the factors interfering with comparability. They highlight the importance of how national data are reported and are supplemented by information which allows their interpretation. The charts shown are intended to raise awareness of the additional information needed to supplement RID monitoring results for the purpose of improving their reliability.

Furthermore, this section intends to help identifying issues that need to be given attention in future RID data reporting. For example, when considering the data for direct discharges there are significant differences in national RID data which indicate different reporting practices amongst Contracting Parties. Issues that may need further considerations are for example:

a. Are discharges from large cities located near the coast included in data reported for direct discharges?

b. Are there Contracting Parties, other than Norway, with extensive discharges from fish farming industry that are unaccounted for today?

c. How can the completeness of reporting on direct discharges that today appears to vary significantly amongst Contracting Parties' RID data be improved?

In the on-going trend assessment of riverine inputs and direct discharges to the OSPAR Maritime Area during the period 1990–2006 undertaken under the OSPAR Joint Assessment and Monitoring Programme which contributes to the development of the 2010 Quality Status Report of the OSPAR maritime area, one important explanatory factor is linked to the fact that detection limits may vary considerably for river sample analyses within the same country or between countries when different laboratories perform the analyses. Another important factor is that laboratories use different analytical methods or change analytical method at different moments in time. Hence, improvements in analytical laboratory techniques between 1990 and 2006 enable concentrations of many parameters to be detected at much lower levels and with higher accuracy and precision than in earlier years. This makes it more difficult to detect real temporal trends and to accurately quantify reductions in inputs. Varying completeness in reporting across OSPAR countries, varying monitoring coverage and differences in analytical performances add to uncertainties.

The national RID data reported by Contracting Parties are aggregated in the annual overview tables in Annex 2. Based on these tables, *Table 3* and *Table 4* have been compiled to give the total inputs to the OSPAR maritime area of five metals, lindane, PCBs, five nutrient species and suspended particulate matter (SPM). The reason for this differentiated presentation of reported data as upper and lower estimates is the discrepancies in the way Contracting Parties report upper and lower values. The concept of upper and lower values derives from the detection limits of each parameter and the reported data should be seen in light of the LODs/LOQs reported in Annex 3. The general idea is that for the *lower* estimates, the analytical results below the detection limit will be reported as *zero*; whereas for the *upper* estimates, the analytical results below the detection limit may either be reported as *equal to* the detection limit; or *as half the value of* the detection limit.

Another source of discrepancies for the upper estimates could have their origin in the use of the limit of quantification (LOQ) instead of the limit of detection (LOD). Countries using LOQ obtain inputs of contaminants (based on upper estimates), which are significantly higher than those using the LOD or half the LOD.

It should also be noted that whereas most Contracting Parties report their values as upper and lower estimates, some Contracting Parties do not. To improve the understanding of the charts on total inputs (riverine and direct), they have been organised so that all countries are listed both for upper and lower values, although not all countries have reported both estimates.

Taking into account the differences in the methodology used by Contracting Parties to calculate the upper estimate (use of LOD or LOQ and/or use of 100% or 50% of these values for analytical results below the LOD/LOQ), a direct comparison of the upper estimates of inputs of pollutants reported by Contracting Parties could not be done. In general, the values included in the tables and the following analysis could show higher values for Contracting Parties using LOQ instead of LOD. The lower estimate values are not affected by this problem and can therefore be directly compared.

Table 3: Upper total input estimates as the sum of Direct discharges and Riverine Inputs to the Maritime Area in 2007 country by country.

Country	Cd t	Hg t	Cu t	Pb t	Zn t	g-HCH kg	PCBs kg	NH_4-N kt	NO_3-N kt	PO_4-P kt	Total N kt	Total P kt	SPM kt
Belgium	3.4	0.5	53.2	50.7	500.3	20.2	90.2	3.2	38.8	1.4	49.7	3.4	488.3
Denmark[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
France[2]	61.5	5.0	174.2	195.5	800.0	385.9	-	12.6	438.4	6.9	535.5	14.0	4148.2
Germany	5.5	1.7	240.1	144.8	1125.6	22.7	38.3	9.3	181.8	3.0	231.3	10.1	1723.8
Ireland[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	3.1	0.3	976.4	57.8	721.0	13.6	105.4	44.2	39.8	7.3	116.1	11.4	1543.0
Portugal[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	40.8	10.8	740.4	136.6	1575.2	55.3	141.6	21.9	61.2	2.6	102.6	3.3	529.5
Sweden	0.5	0.1	45.6	13.4	150.6	-	-	2.4	17.4	0.3	35.2	0.7	-
UK	11.7	2.0	474.8	407.3	2110.5	204.9	256.4	42.9	303.3	19.5	378.7	21.9	2631.0

Table 4: Lower total input estimates as the sum of Direct discharges and Riverine Inputs to the Maritime Area in 2007 country by country.

Country	Cd t	Hg t	Cu t	Pb t	Zn t	g-HCH kg	PCBs kg	NH_4-N kt	NO_3-N kt	PO_4-P kt	Total N kt	Total P kt	SPM kt
Belgium	2.3	0.4	44.8	41.3	430.7	1.0	0	2.5	34.4	1.3	42.2	2.8	407.4
Denmark[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
France[2]	0.9	0.2	85.9	55.7	727.0	60.5	-	12.1	438.4	6.9	463.6	13.8	4147.2
Germany	4.9	1.6	239.5	139.2	1120.4	21.4	2.3	9.3	181.8	3.0	231.3	10.1	1565.8
Ireland[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
Norway	2.8	0.2	976.4	57.8	721.0	0	23.4	44.1	39.8	7.2	116.1	11.4	1542.8
Portugal[1]	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	6.9	0.4	656.5	25.5	1449.8	2.1	0	12.8	28.6	1.5	69.1	2.4	474.6
Sweden	0.5	0.1	45.6	13.4	150.6	-	-	2.4	17.4	0.3	35.2	0.7	-
UK	5.4	0.9	399.2	341.6	1937.5	31.6	0.9	41.7	303.0	19.0	376.4	21.0	2592.3

[1] No data reported within the agreed deadline

[2] The reported inputs from France do only reflect riverine inputs, as direct discharges data are not reported

3.1 Cadmium inputs

Total cadmium inputs to the OSPAR maritime area in 2007 reported by Contracting Parties range from less than 0.5 tonnes in Sweden to 36 tonnes reported by the UK (based on upper estimates) (*Figure 2*). Reported inputs for most countries were of similar magnitude in 2005–2006, with the exception of Belgium that reported more than double inputs (lower estimates) in 2007 compared to 2005 and 2006. Spain reported more than a 50% decline in inputs compared to 2005 and 2006 (upper estimates)

Figure 2 illustrates how the use of upper and lower estimates and related national reporting practices, can distort RID results and make comparison between Contracting Parties erroneous. Inputs reported as lower estimates would suggest that inputs are highest in Germany and the UK, whereas Spain would be the single largest contributor if upper estimates were used.

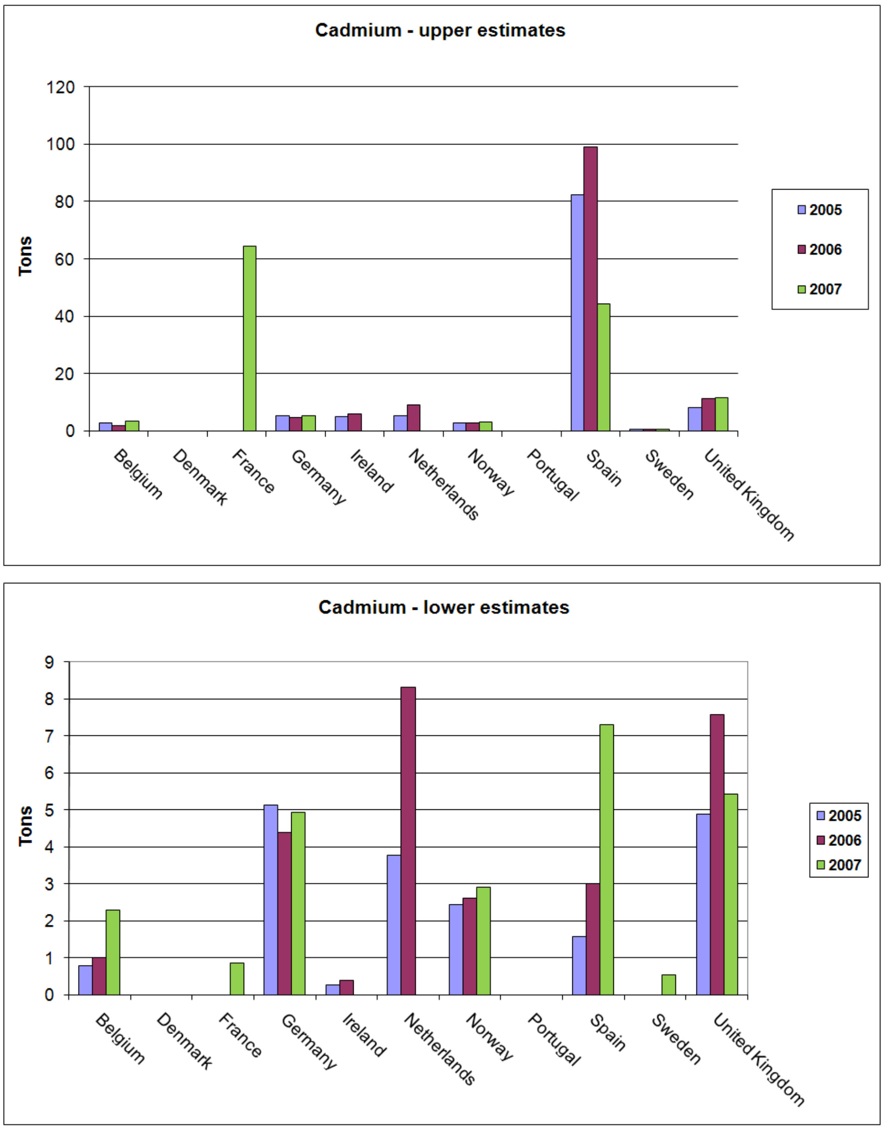


Figure 2: Illustration of total cadmium inputs (in tonnes) reported by Contracting Parties in 2005–2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

When segregating the data by input sources, riverine inputs are significantly larger than the direct discharges for all countries when comparing upper estimates (*Figure 3*). Reported riverine inputs from the UK and Germany are also significantly higher than the direct discharges reported by these two countries when comparing lower estimates. The riverine inputs reported by Spain based on lower estimates are almost negligible compared to the corresponding direct discharges. The inputs reported by Spain are highest for both riverine inputs and direct discharges when comparing upper estimates, but are significantly lower than the UK riverine inputs when comparing lower estimates.

Riverine inputs: Direct discharges :

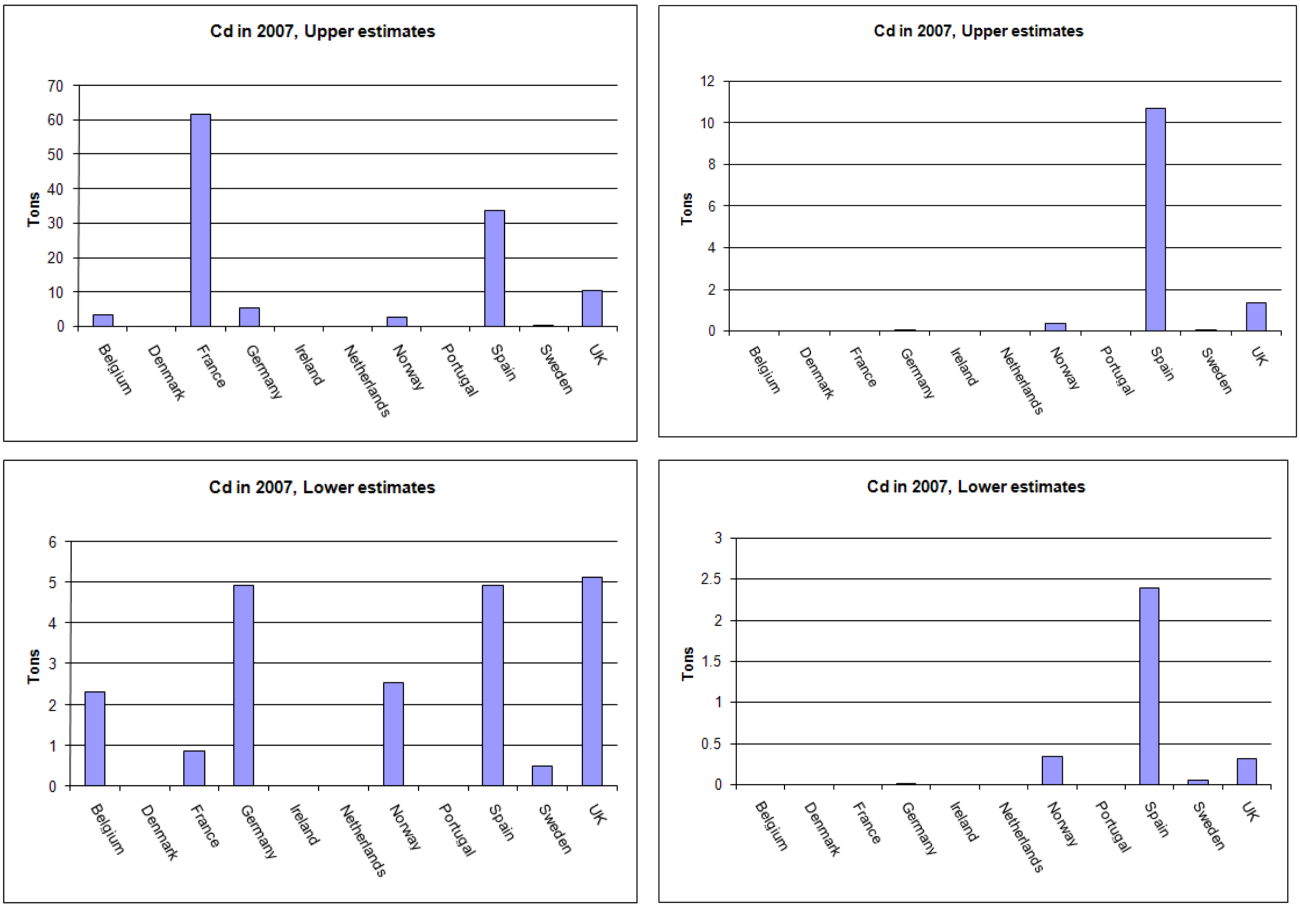
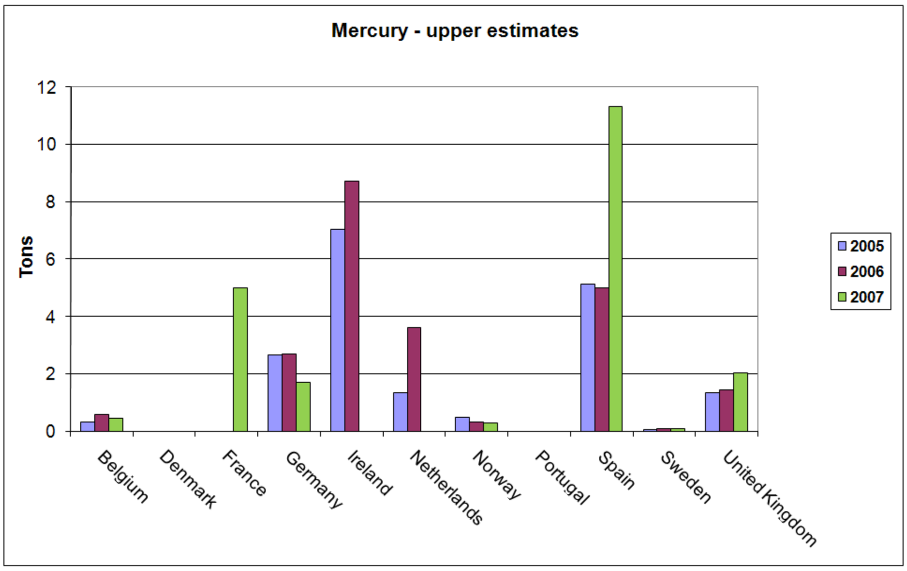


Figure 3: Illustration of riverine inputs (in tonnes) and direct discharges (in tonnes) reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.2 Mercury inputs

Total mercury inputs (upper estimates) in 2007 reported by Contracting Parties range from 0.1 tonnes in Sweden to almost 11 tonnes reported by Spain (*Figure 4*).

The input data for mercury provide another example of how the relative contribution of each Contracting Party to total inputs may differ depending on whether lower or upper estimates are used. Based on upper estimates (LOQ based), Spain provided almost 70% of the total mercury inputs; based on lower estimates, Spain's contribution would be only about 10%. Based on lower estimates, Germany contributed the highest inputs of mercury to the total inputs to the OSPAR maritime area in 2007 (about 40%).



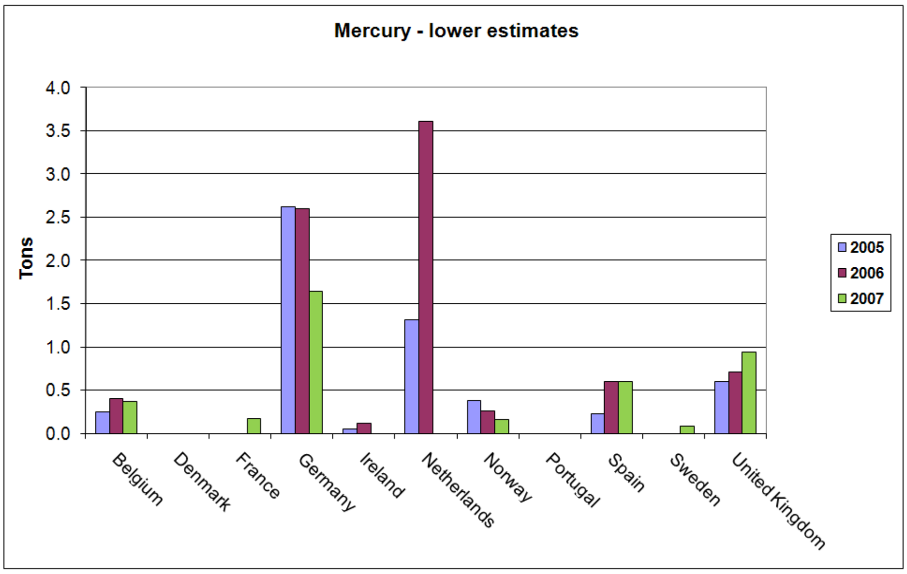


Figure 4: Illustration of total mercury inputs (in tonnes) reported by Contracting Parties in 2005-2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

When comparing the data on mercury inputs by input sources, riverine inputs are significantly higher than direct discharges for most countries (*Figure 5*). The inputs reported by Spain (LOQ based) are higher than the corresponding figures reported by other Contracting Parties for both riverine inputs and direct discharges when comparing upper estimates, and for direct discharges when comparing lower estimates. In contrast, the riverine inputs reported by Spain equal zero when based on lower estimates.

Riverine inputs: Direct discharges :

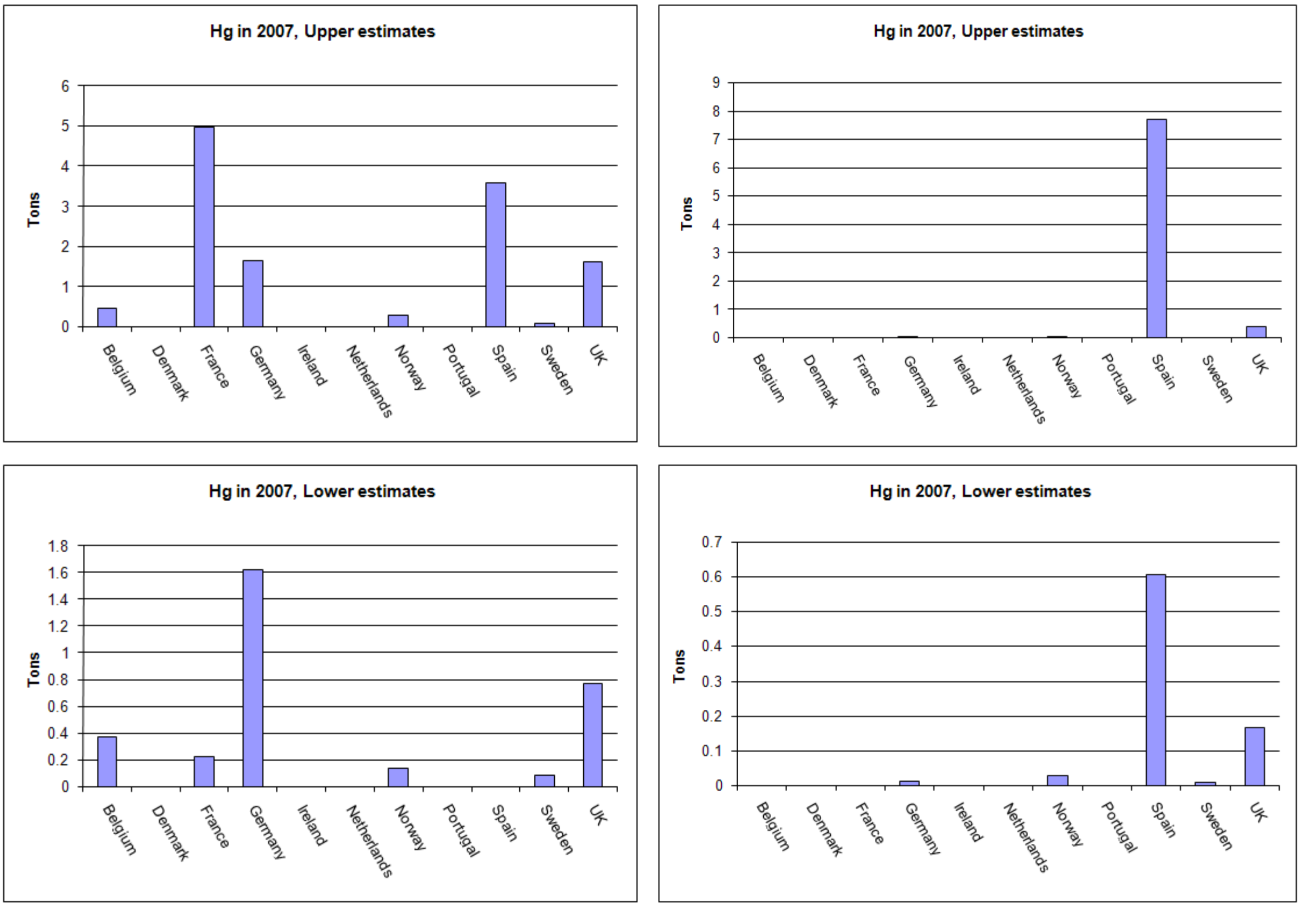
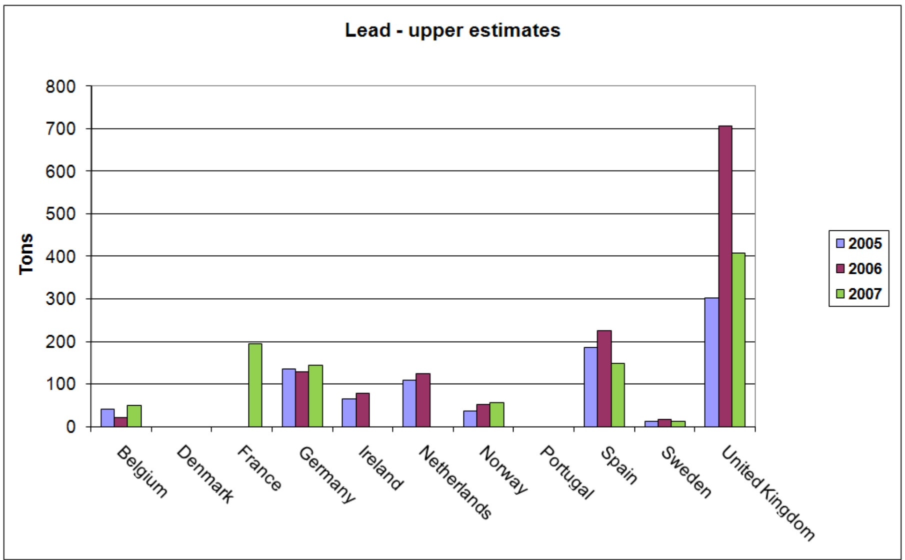


Figure 5: Illustration of riverine inputs (in tonnes) and direct discharges (in tonnes) of mercury reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.3 Lead inputs

The total inputs of lead to the maritime area in 2007 reported by Contracting Parties range from 13 tonnes in Sweden to 345 tonnes reported by the UK (*Figure 6*). As for cadmium and mercury, the relative contribution of each country to the total inputs depends on whether the lower or upper estimates are used. The differences in results are, however, less significant than for cadmium and mercury. The reason for this is assumed to be that lead is often found in significantly higher concentrations than cadmium and mercury, an aspect that will reduce the uncertainty linked to detection limits.

The inputs reported by the UK represent the largest contribution to total inputs of lead to the maritime area at a magnitude around 50% for both upper and lower estimates. Spain contributed almost 20% to the total inputs based on upper estimates, but only close to 0% when based on lower estimates. Again, this illustrates the differences in detection limits and the subsequent difficulties in comparing data from Contracting Parties.



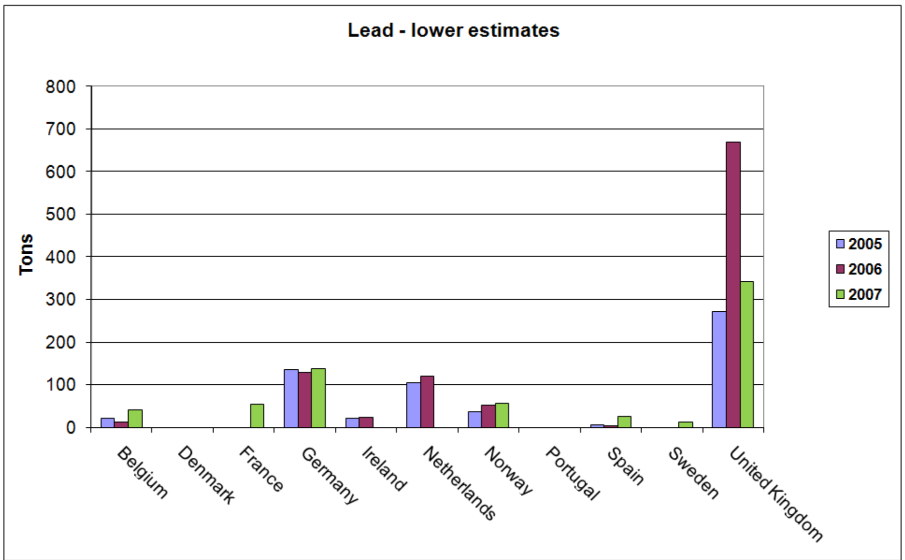


Figure 6: Illustration of total lead inputs (in tonnes) reported by Contracting Parties in 2005-2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

Reported riverine inputs of lead are for most countries significantly higher than the direct discharges (*Figure 7*). The riverine inputs reported by Spain (0.1 tonnes) based on lower estimates are significantly lower than corresponding direct discharges (1.3 tonnes). For the upper estimates, the riverine inputs are 3–4 times higher than the direct discharges. The differences in upper and lower estimates (LOQ based) reported by Spain for both riverine inputs and direct discharges are considerable.

Regardless of the estimate used, the riverine inputs reported by the UK are considerably higher than the riverine inputs reported by other Contracting Parties. For both riverine inputs and direct discharges, the UK reported fairly consistent upper and lower estimates.

Riverine inputs: Direct discharges :

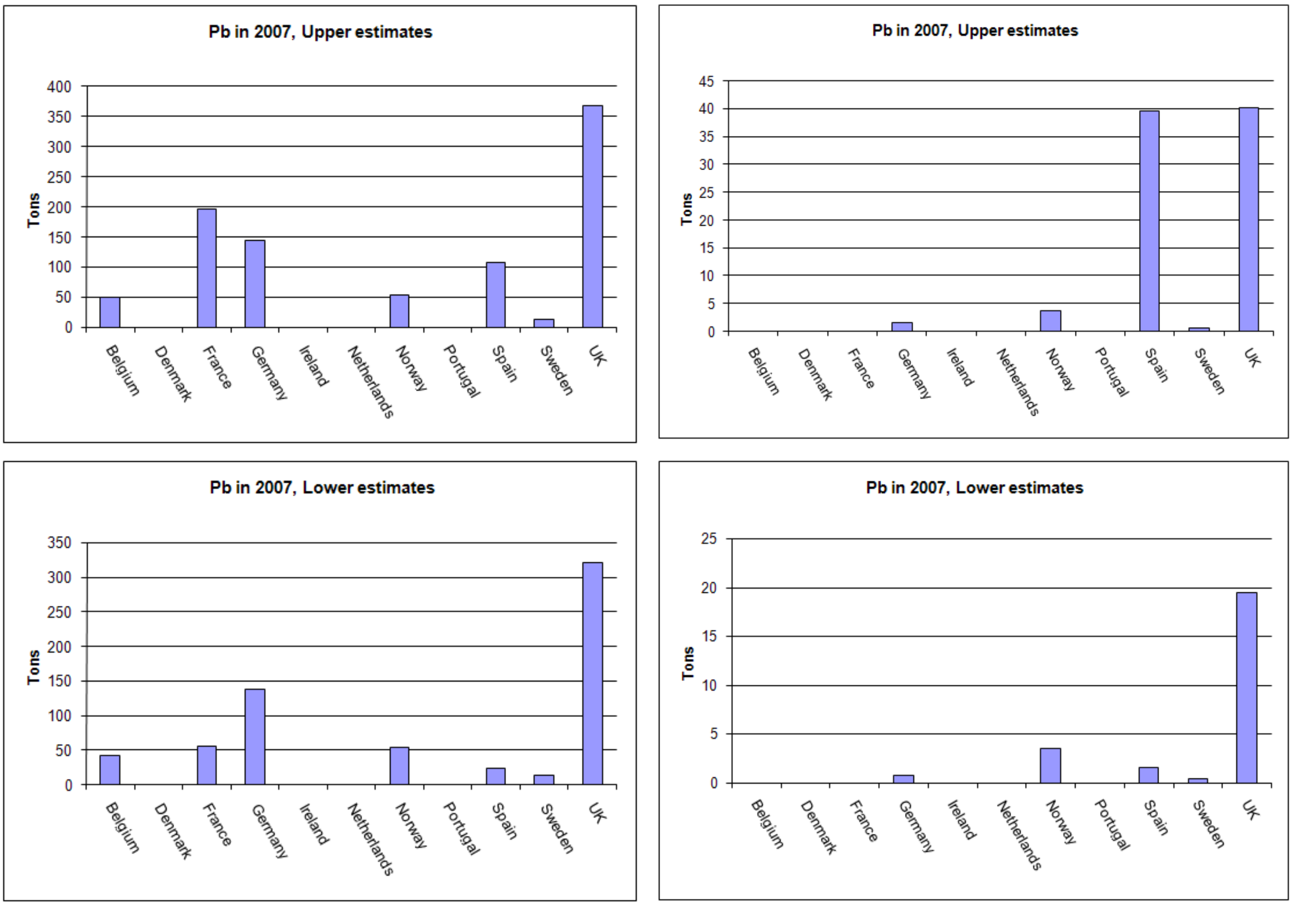
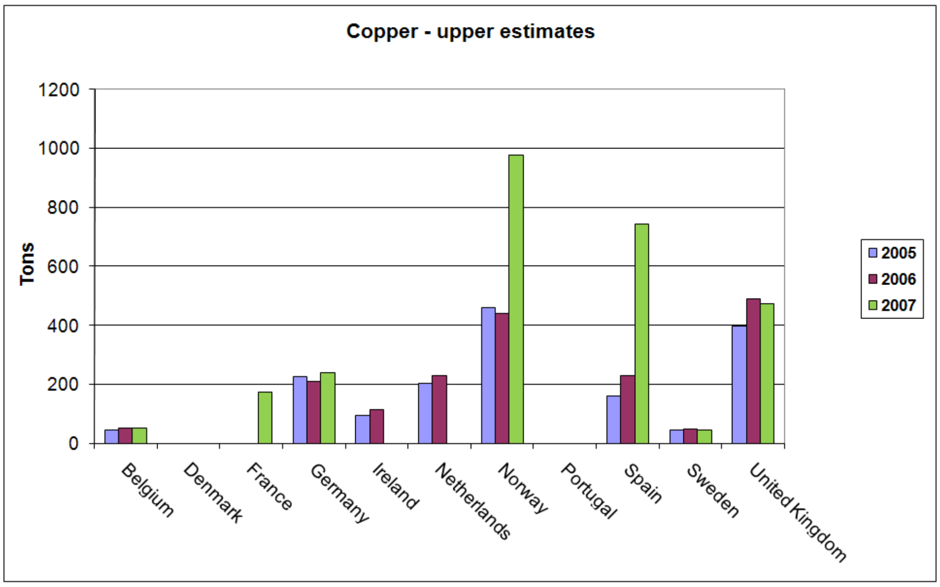


Figure 7: Illustration of riverine inputs (in tonnes) and direct discharges (in tonnes) of lead reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.4 Copper inputs

The total inputs of copper to the OSPAR maritime area in 2007 reported by Contracting Parties range from 46 tonnes in Sweden to 976 tonnes reported by Norway (Figure 8). Norway reported the largest inputs of copper, regardless of whether upper or lower estimates are used. This is due to the fact that Norway report losses of copper from anti-fouling treatment of net cages used in mariculture. The increase in Cu-losses from this source in 2007 compared to 2005 and 2006 is due to improved estimation method and increased mariculture production.

As for lead, the relative contribution of each country to the total copper inputs does not differ as much as for cadmium and mercury depending on whether upper or lower estimates are used. This is again assumed to be explained by the fact that copper is often detected in relatively high concentrations, so that the respective detection limits affect less the calculation of inputs.



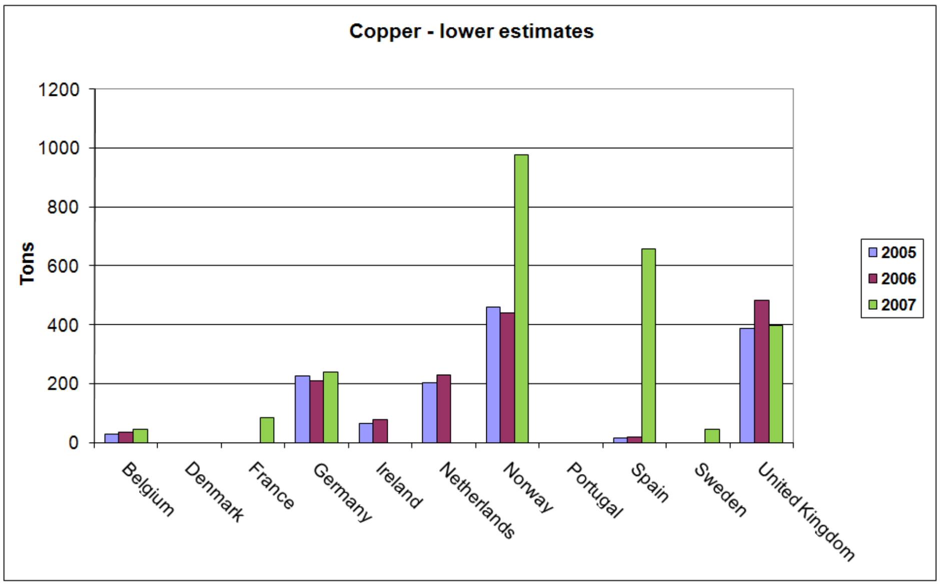


Figure 8: Illustration of total copper inputs (in tonnes) reported by Contracting Parties in 2005-2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

For most countries the reported direct discharges (based on both upper and lower estimates) are considerably lower than the riverine inputs. For Norway, however, the direct discharges are more than double the riverine inputs of copper (*Figure 9*). The high direct discharges reported by Norway are explained by the fact that Norway report losses of copper from the cleaning of fish cages in the fish farming industry. These cages are impregnated with a substance containing copper in order to prevent algal growth. The discharges reported by Norway are, however, uncertain as they are only estimates and not based on monitoring data.

Regardless of whether upper or lower estimates are used, the riverine inputs of copper reported by the UK, Norway and Germany are higher than the inputs reported by the other four Contracting Parties that have reported 2007 inputs.

Riverine inputs: Direct discharges :

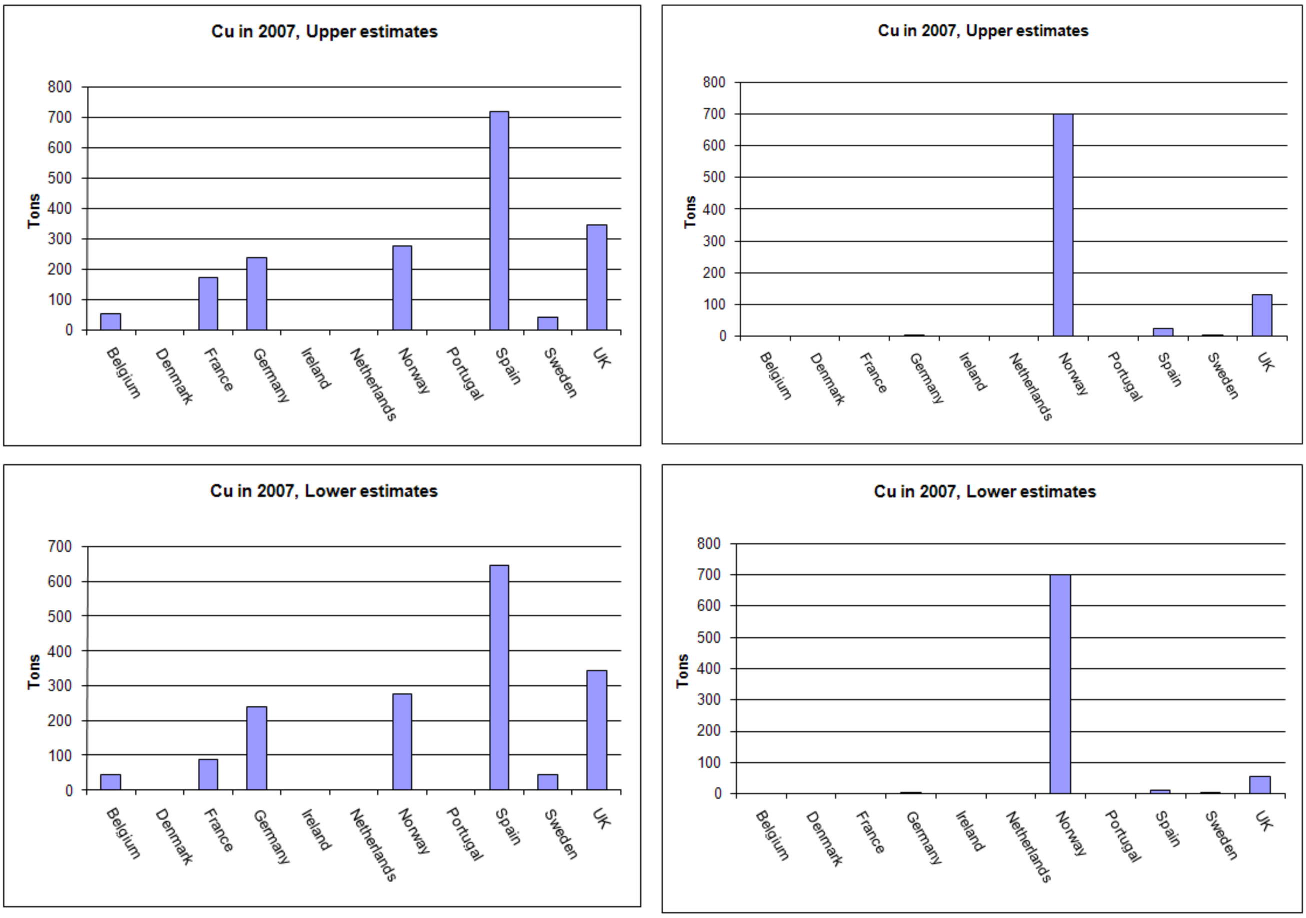


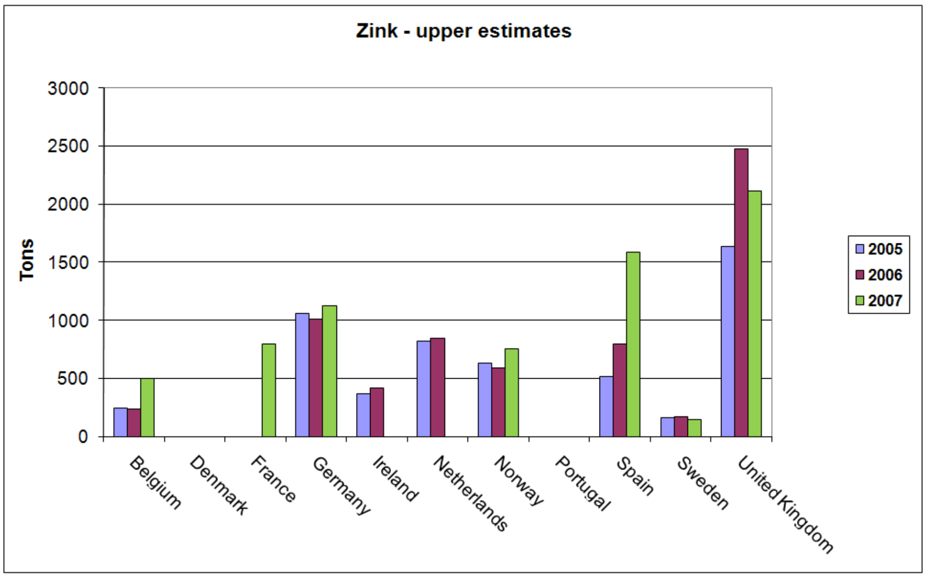
Figure 9: Illustration of riverine inputs (in tonnes) and direct discharges (in tonnes) of copper reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.5 Zinc inputs

The total inputs of zinc to the maritime area in 2007 reported by Contracting Parties range from 150 tonnes in Sweden and France to more than 2110 tonnes reported by the UK (Figure 10).

The UK was, for all three years 2005, 2006 and 2007, the single largest contributor of zinc inputs regardless of whether upper or lower estimates are used, followed by Germany.

As zinc is often detected in relatively high concentrations, the upper and lower estimates reported by Contracting Parties are more or less consistent, and the relative contribution of each country is less dependent on the use of upper or lower estimates. In this case, detection limits are a less distorting factor. Only the figures reported by Spain show an almost 20% discrepancy between the LOQ based upper estimate and the lower estimate.



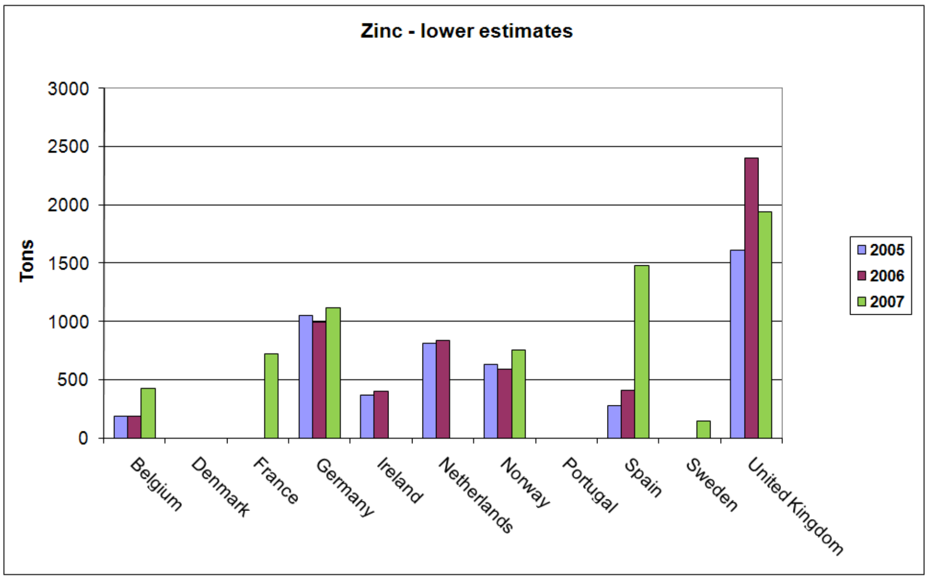


Figure 10: Illustration of total zinc inputs (in tonnes) reported by Contracting Parties in 2005-2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

For all countries the reported riverine inputs of zinc are considerably higher than the direct discharges. The UK reported the highest riverine inputs and direct discharges, regardless of whether upper or lower estimates are used (*Figure 11*). Germany was the second largest contributor to the total riverine inputs of zinc in 2007. Spain was the second largest contributor to direct discharges. The discrepancy between upper and lower estimates in Spanish data is mainly due to riverine inputs.

Riverine inputs: Direct discharges :

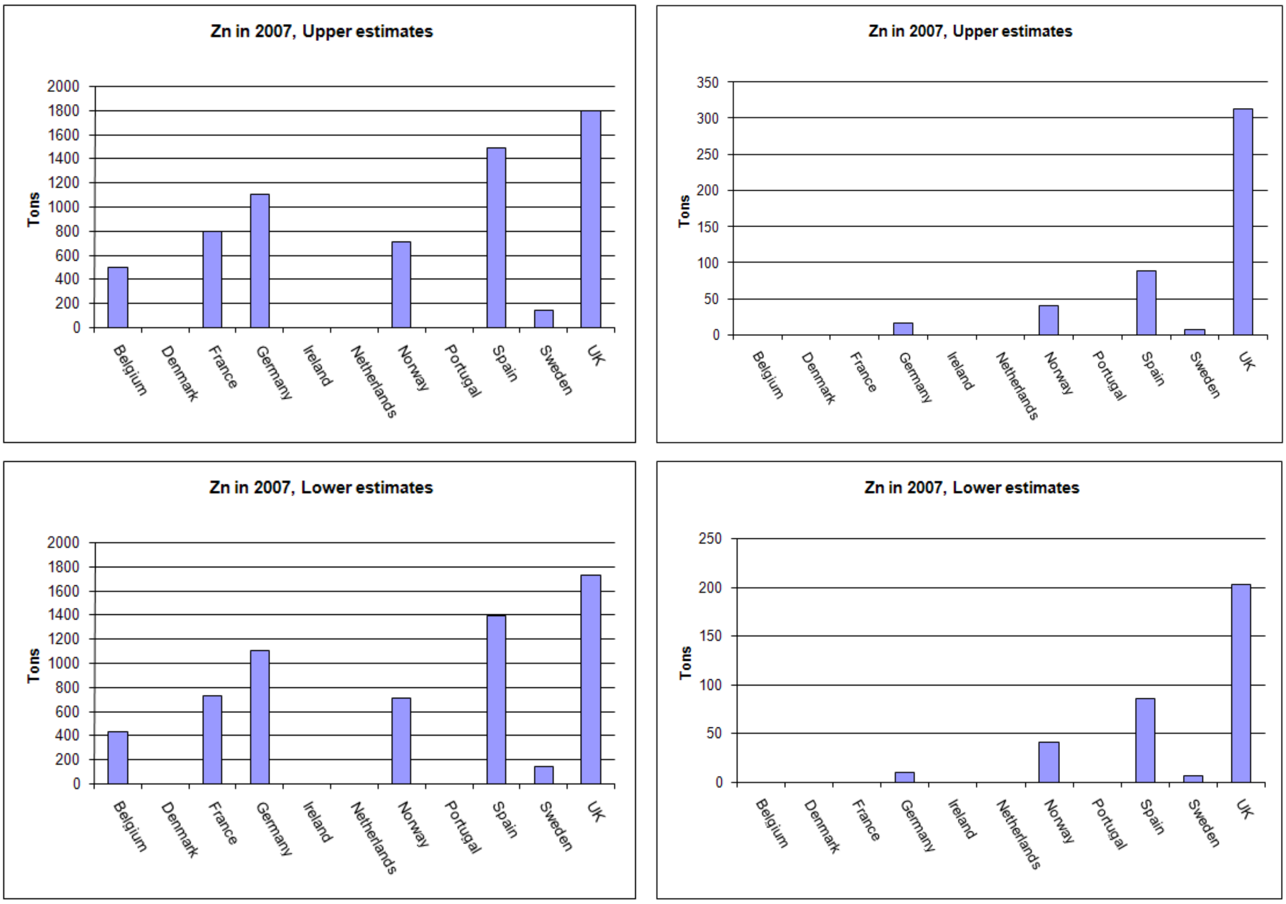


Figure 11: Illustration of riverine inputs (in tonnes) and direct discharges (in tonnes) of zinc reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.6 Inputs of total nitrogen

The total inputs of total nitrogen to the OSPAR maritime area in 2007 reported by Contracting Parties range from 35 kilotonnes in Sweden to 535 kilotonnes reported by France (*Figure 12*). For France, this is almost five times more than reported in 2006. Slightly higher inputs in 2007 compared to the two previous years were also noted for Germany, Norway, Spain and U.K.

In general, the reported total nitrogen inputs show less difference between the upper and lower estimates than the inputs reported for metals.

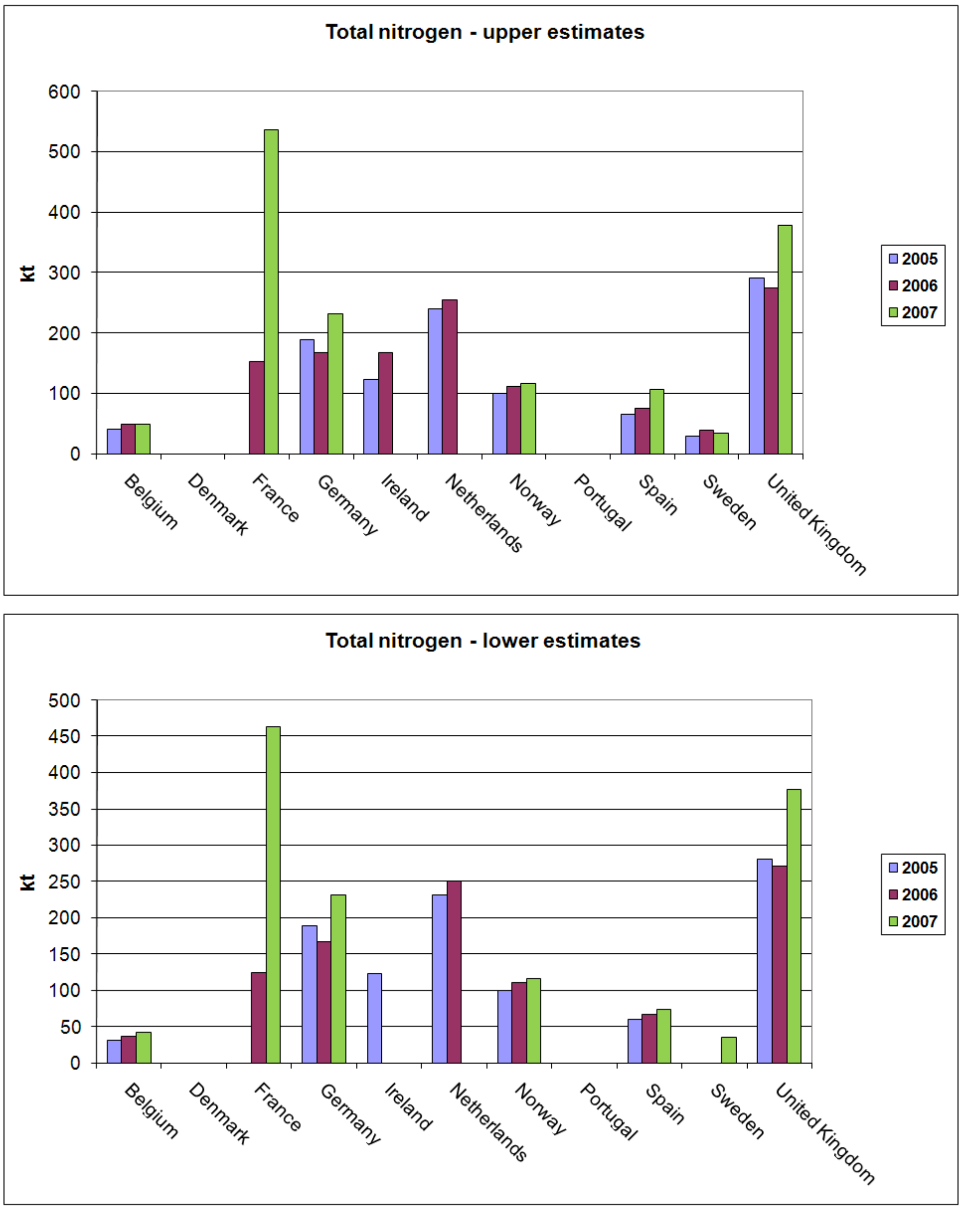


Figure 12: Illustration of total nitrogen inputs (in kilotonnes) reported by Contracting Parties in 2005–2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

For all countries riverine inputs contribute the larger part of the inputs of total nitrogen to the maritime area in 2007 (*Figure 13*).

The highest contributions to riverine inputs of total nitrogen were reported by France, followed by the UK, and Germany. The UK reported the highest direct discharges, followed by Norway and Spain. A large part of the Norwegian direct discharges is related to losses from the fish farming industry. France did not report on direct discharges of nitrogen.

Riverine inputs: Direct discharges :

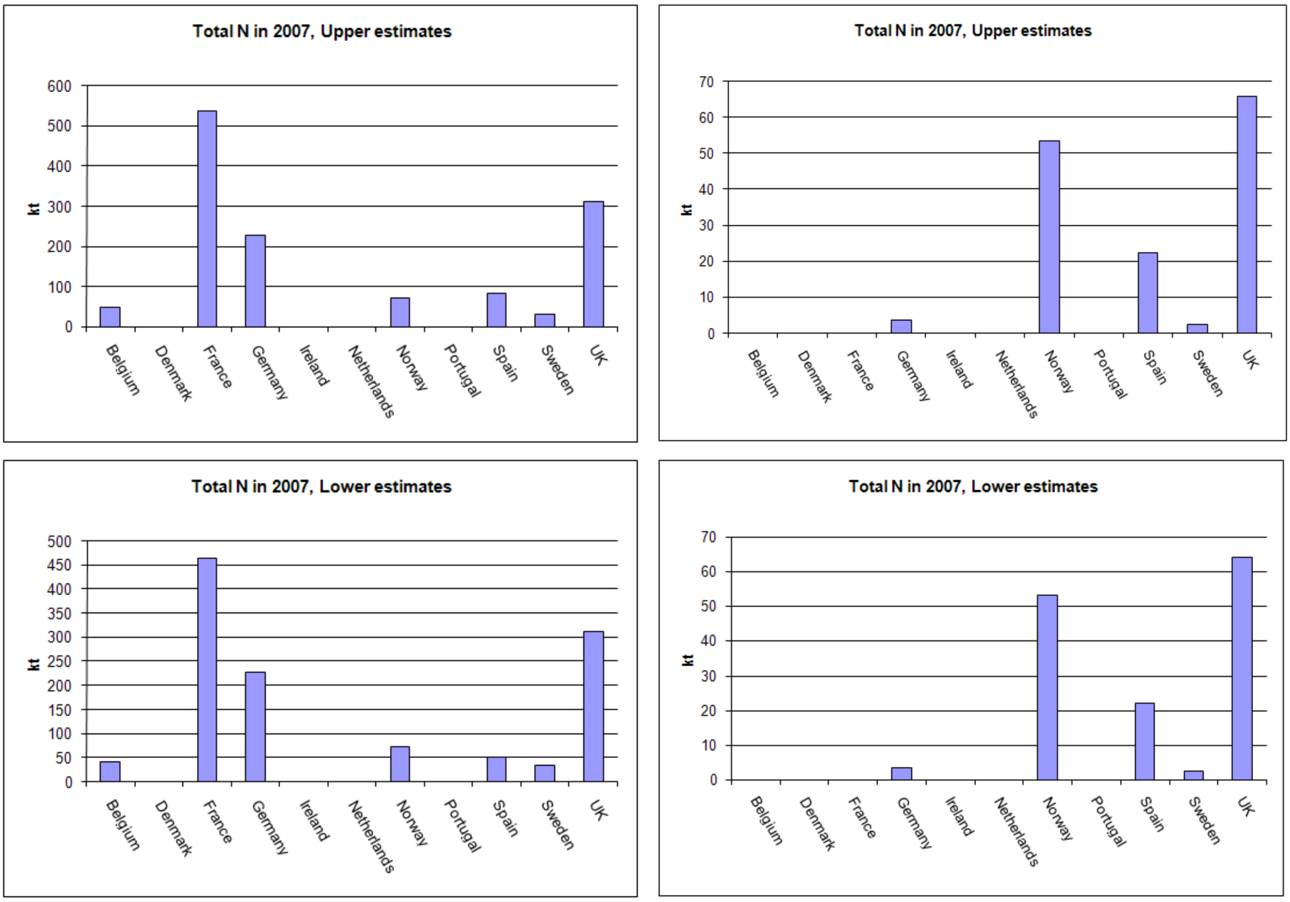


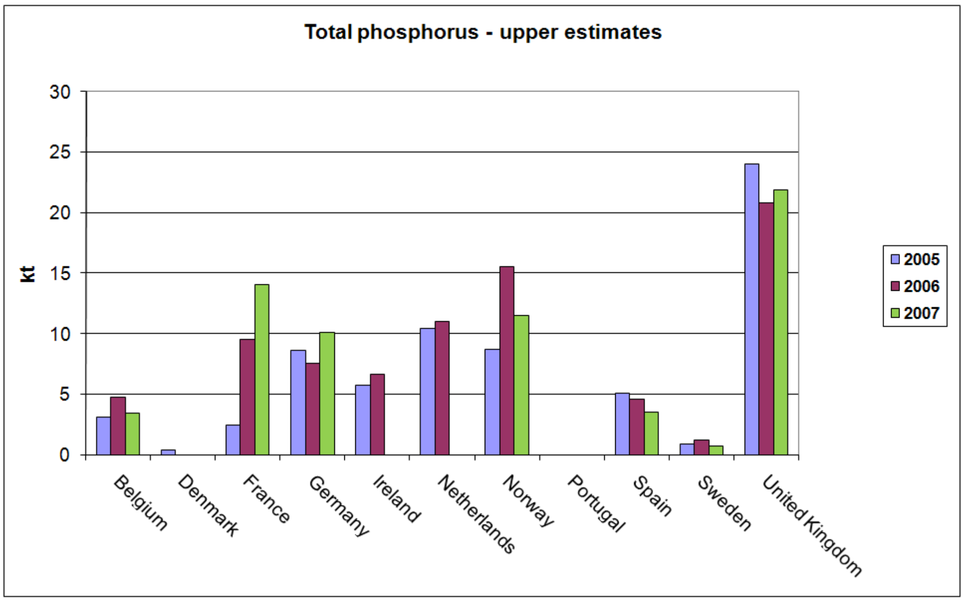
Figure 13: Illustration of riverine inputs (in kilotonnes) and direct discharges (in kilotonnes) of total nitrogen reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.7 Inputs of total phosphorus

The total inputs of phosphorus to the OSPAR maritime area in 2007 reported by Contracting Parties range from 0.7 kilotonnes in Sweden to almost 21 kilotonnes reported by the UK (*Figure 14*).

As for total nitrogen, the differences between upper and lower estimates are less explicit than for metals, possibly due to the lower detection limits and higher concentrations of nutrients compared to metals.

The UK reported the highest inputs of phosphorus in 2007, followed by France, regardless of whether upper or lower estimates are used.



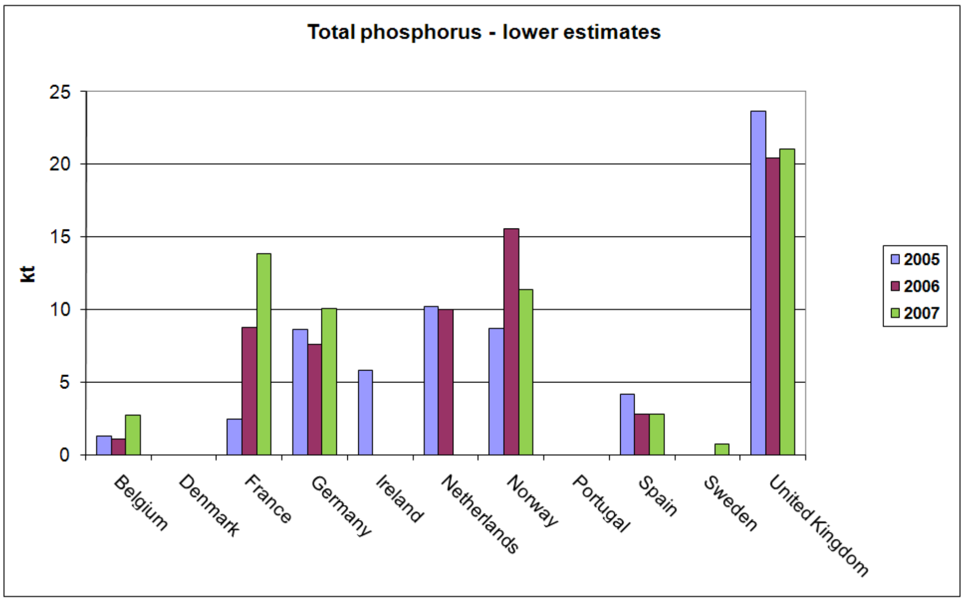


Figure 14: Illustration of total phosphorus inputs (in kilotonnes) reported by Contracting Parties in 2005–2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

The differences between reported riverine inputs and direct discharges are less significant for phosphorus inputs than for other substances (*Figure 15*). The reported riverine inputs are slightly higher than the corresponding direct discharges for most countries. For Norway, however, the reported direct discharges are considerably higher than the riverine inputs. The relatively high phosphorus figures from direct discharges in Norway are due to high contributions from the fish farming industry. France and the UK reported the highest riverine inputs of phosphorus in 2007, followed by Germany.

Riverine inputs: Direct discharges :

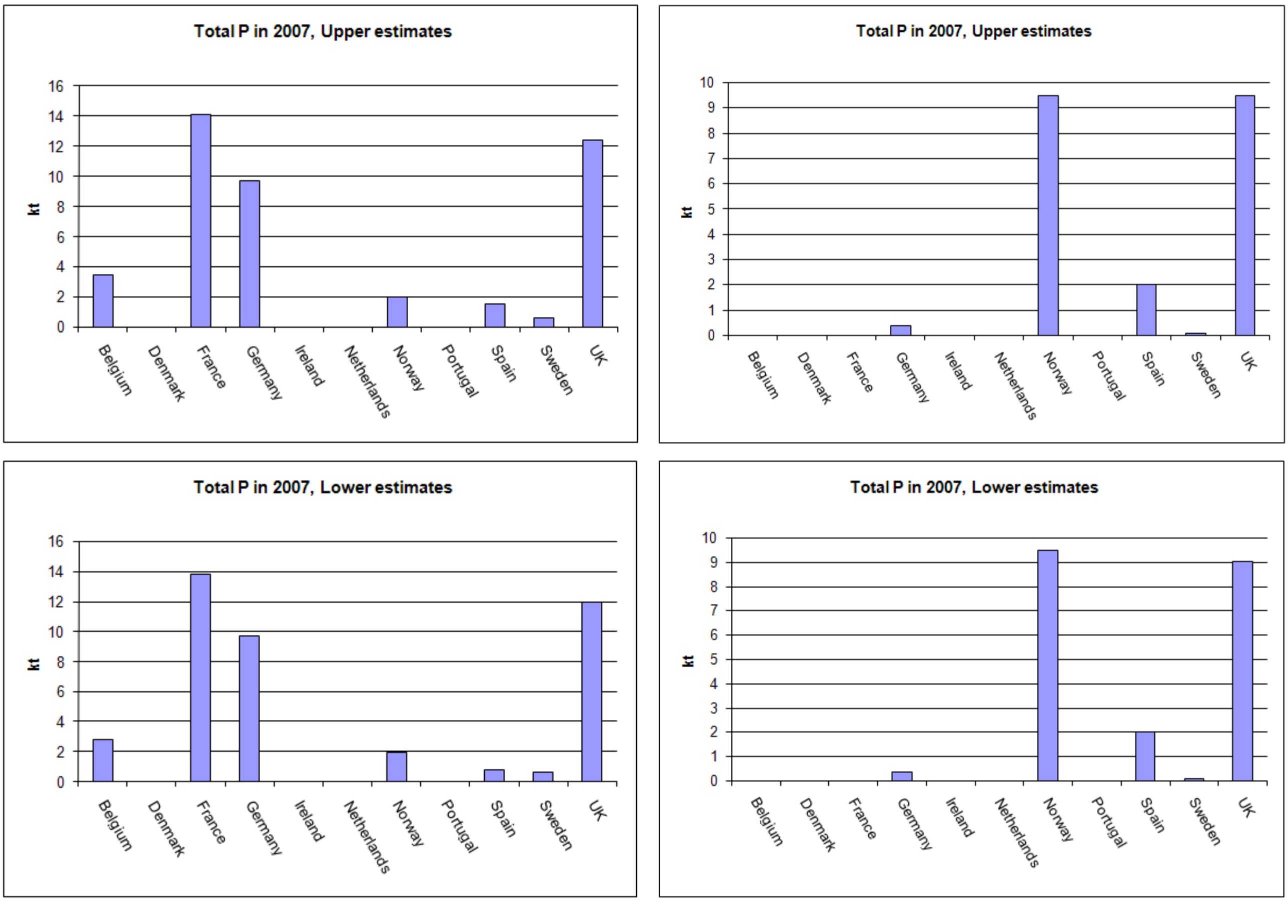


Figure 15: Illustration of riverine inputs (in kilotonnes) and direct discharges (in kilotonnes) of total phosphorus reported by Contracting Parties in 2007 as upper and lower estimates and. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as ‘not applicable’. No direct discharges reported by France. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.8 Inputs of suspended particulate matter (SPM)

Suspended particulate matter (SPM) is the determinant for which most Contracting Parties reported similar values for upper and lower estimates (*Figure 16*). The consistency between upper and lower limits for this parameter does, however, not necessarily reflect that the estimates are correct, as it only reflects the results of the laboratory analyses and not the reliability of the monitoring methodology.

France reported the highest SPM inputs in 2007, followed by the UK and Germany.

Figure 16: Illustration of total inputs of suspended particulate matter (in kilotonnes) reported by Contracting Parties in 2005–2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. Sweden does not report SPM inputs. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

The reported riverine inputs of SPM are higher than the corresponding direct discharges for all countries (*Figure 17*). However, the difference between the two sources is less explicit for Norway and Spain. France did not report direct discharges of suspended solids in 2007.

The UK and France reported the highest riverine inputs of SPM in 2007. Norway was the single largest contributor to total direct discharges.

Riverine inputs: Direct discharges :

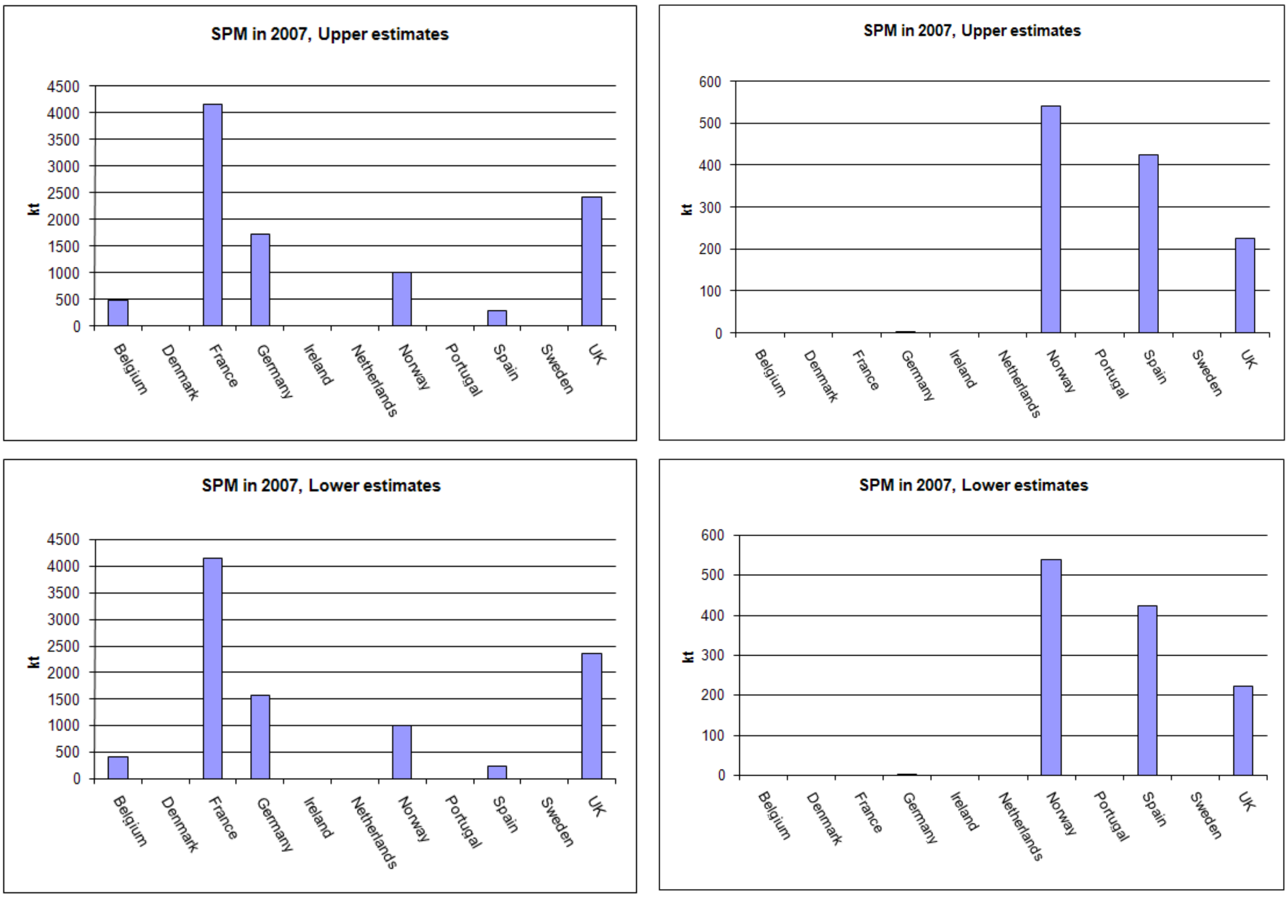


Figure 17: Illustration of riverine inputs (in kilotonnes) and direct discharges (in kilotonnes) of total suspended particulate matter reported by Contracting Parties in 2007 as upper and lower estimates. Belgium reports that there are no direct discharges to their Convention Waters and reporting on direct discharges is therefore qualified as 'not applicable'. No direct discharges reported by France. Sweden does not report SPM inputs. No 2007 data reported by Iceland and the Netherlands. Denmark, Ireland and Portugal submitted their 2007 data after the agreed deadline and their data are not included in the assessment.

3.9 Water discharge to the OSPAR maritime area in 2007

The total inputs of nutrients and selected hazardous substances to the OSPAR maritime area can also be assessed based on the total amount of water discharged to the sea from each country. However, such an assessment becomes difficult as Contracting Parties have based their calculations on water discharge on differing data sets, as follows:

- Belgium has included the water discharge for monitored rivers and tributaries, but not for unmonitored areas or direct discharges;
- France and Norway have included water discharge for monitored rivers, tributaries and unmonitored areas, but not for direct discharges;
- Germany monitored 82% of the Eider catchment and extrapolated the remainder to 100% (included in the river inputs), monitored the Elbe (95%) and its tributaries, monitored 90% of the Weser catchment and estimated sewage and industrial effluents for the remaining 10 %, estimated sewage and industrial effluents to the Jade Bay, monitored 70% of the Ems catchment and included estimates for the unmonitored bay areas in the direct discharge figures;
- Sweden reported water discharges from unmonitored areas, but not from tributaries;
- The Netherlands have included water discharge for monitored riverine inputs, but reported zero for the water discharge for the Ems Dollard Estuary, the Western Scheldt and the Southern Delta Coast;
- Spain and UK have reported water discharge as a total for the maritime sub-areas, and it is unclear whether the direct discharges and the unmonitored areas are included.

Thus, the total water discharge is based on different calculation methods and does not reflect the total discharge to the maritime area. Given this, these data are not shown.

4. General conclusions and recommendations

Long-term monitoring of inputs of nutrients and selected hazardous substances provides an indication of whether implemented measures are working. Future assessments of the quality status of the OSPAR maritime area will benefit from annual assessments of Contracting Parties' riverine inputs and direct discharges and from improvements in national procedures and practices with regard to the implementation of the RID Principles.

There are differences in understanding of 'main rivers' and 'tributary rivers' (see glossary for the RID Principle definition of 'tributary river'). This includes the use of the term 'tributary river' for example in its 'hydrological meaning', i.e. a stream or river which flows into a mainstream (or parent) river, hence a tributary does not flow directly into a sea. This use of 'tributary' results in double counting of inputs under the RID Principles. To facilitate understanding and harmonizing of procedures it is recommended to abandon the notion of main and tributary rivers and only refer to 'rivers'.

It is recommended that Contracting Parties provide information on a catchment basis to allow more reliable explanations of trends in inputs. This information should include data on land use and catchment information on discharges from point and diffuse sources, e.g. based on the HARP Guidelines.

Since countries have applied considerably different detection limits, and since different laboratories use different practices related to LODs and LOQs, this may heavily influence the reliability of trend assessments of riverine inputs and direct discharges. It is therefore recommended that Contracting Parties report which detection methods are used and whether they vary amongst laboratories. Contracting Parties should have a good overview of which samples are analysed in which laboratory, and which detection limits and analytical methods are used. Changes in laboratories and detection limits over time should be duly registered – preferably in a common database, since this will influence the trends significantly; perhaps more than factual variations.

5. References

Borgvang, S.A., Skarbøvik, E., Selvik, J.R., Stålnacke, P.G., Bønsnes, T.E. and Tjomsland, T. 2006. Load and Source Orientated Approaches for Quantifying Nutrient Discharges and Losses to Surface Waters. May the methodologies of and the synergies between the two approaches be improved? NIVA Report 5307-2006. 84 pp.

Skarbøvik, E. and Borgvang, S.A, 2007. Comprehensive Study on Riverine Inputs and Direct Discharges (RID): Overview of the RID 2005 Data and an Analysis of the Reliability, Accuracy, Comparability and Completeness of the Data OSPAR Commission. ISBN 978-1-905859-65-8, OSPAR Publication Number 326/2007.

Borgvang, S.A., Skarbøvik, E. and Pengerud, A. 2008. Comprehensive Study on Riverine Inputs and Direct Discharges (RID): Presentation and Assessment of the OSPAR Contracting Parties' RID 2006 Data. ISBN 978-1-906840-17-4. OSPAR Publication Number: 376/2008.

6. Glossary

Catchment	For the purpose of the RID Principles, the whole of an area having one common outlet for its drainage water. A catchment area could be subdivided into a monitored and unmonitored area, depending on where the monitoring point is located
Cd	Cadmium
Cu	Copper
Direct discharges	For the purpose of the RID Principles, a mass of a determinand discharged to the Maritime Area from point sources (sewage effluents, industrial effluents or other) per unit of time at a point on a coast or to an estuary downstream of the point at which the riverine estimate of inputs is made
Heavy metals	Refers to the five metals whose direct discharges and riverine inputs were studied in this report, namely cadmium, copper, lead, mercury and zinc
Hg	Mercury
LOD	Limit of Detection is, according to the definitions (IUPAC, IS/TR 13530), “the limit of detection (LOD) is, in broad terms, the smallest amount or concentration of an analyte in the test sample that can be reliably distinguished from zero”.
LOQ	The limit of quantification (LOQ) is the smallest amount or concentration of analyte in the test sample which can be determined with a fixed precision, e.g. relative standard deviation s_{rel} = 33,3 %. This means in other words, that a substance can only be correctly qualified from LODs, while it only can be quantified from LOQs.
Main river	For the purpose of the RID Principles, a river to be monitored at least once a month (12 datasets) every year in accordance with the objectives of the Comprehensive Study. Main rivers should be major load bearing rivers
Monitored area	The catchment upstream of the river monitoring point
Nutrients	Refers to the nutrients whose direct discharges and riverine inputs were examined in this report, namely total nitrogen and total phosphorus
Pb	Lead
RID Principles	Principles of the Comprehensive Study on Riverine Inputs and Direct Discharges (reference number: 1998-5), as amended by ASMO 2005 (Annex 5 to the ASMO 2005 Summary Record, ASMO 05/13/1).
Riverine inputs	For the purpose of the RID Principles, a mass of a determinant carried to the maritime area by a watercourse (natural river or man-made watercourse) per unit of time
SPM	Suspended Particulate Matter
Total inputs	Sum of direct discharges and riverine inputs
Total-N	Total nitrogen
Total-P	Total phosphorus
Tributary river	For the purpose of the RID Principles, a river with separate catchment from a main river and with an outlet directly to the maritime area or to a main river downstream of a river monitoring point. A tributary river should be a minor load bearing river and can be sampled at a frequency determined by each Contracting Party
Unmonitored area	For the purpose of the RID Principles, any sub-catchment(s) located downstream the riverine monitoring points within catchments and any areas between catchments. The unmonitored areas may contribute to the losses/discharges of substances downstream of the monitoring point or directly to the sea (OSPAR maritime area)
Zn	Zinc

Annex 1 Details about the RID Principles

Under the RID Principles, Contracting Parties should aim to monitor, on a regular basis, 90 % of the inputs of each selected pollutant.

The following determinants are to be monitored on a mandatory basis:

- Total Mercury (Hg)
- Total Cadmium (Cd)
- Total Copper (Cu)
- Total Zinc (Zn)
- Ammonia, expressed as N
- Nitrates, expressed as N
- Orthophosphates, expressed as P
- Total N

The following determinants are recommended for monitoring on a voluntary basis:

a. Hydrocarbons, in particular PAHs[6] and mineral oil[7] (strongly recommended);

b. PCBs (the following congeners: IUPAC Nos 28, 52, 101, 118, 153, 138, 180);

c. Other hazardous substances (particularly organohalogen compounds - in order to determine which organohalogen compounds should be included in future input studies)[8]."

Contracting Parties are requested to report the relevant data annually (by 1 November) and to provide, for a selection of their main rivers, information on the annual mean/median concentration of selected pollutant.

Sources for monitoring and reporting of direct discharges under the RID Principles include sewage effluents, industrial effluents and mariculture. As far as practicable, estimate inputs from unmonitored areas (including diffuse sources, and minor direct sources and rivers) should complement the percentage monitored to 100%.

Contracting Parties are requested to report their annual RID data together with an explanatory text report using the reporting format appended to the RID Principles. The results of annual RID data reporting are published by OSPAR each year.

RID data are to be reviewed periodically with the objective of determining temporal and long-term trends of contaminant concentrations and inputs as a basis for trend assessment. Such an assessment of data collected under RID in 1990–2002 was carried out by the Environmental Assessment and Monitoring Committee (ASMO) in 2005 (publication number: 2005/233). A further assessment is currently being prepared for 2009 (publication number 448/2009).

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[6] These are as follows: phenanthrene, anthracene, fluoranthene, pyrene, benzo[*a*]anthracene, chrysene, benzo[*a*]pyrene, benzo[*ghi*]perylene, indeno[*1,2,3-cd*]pyrene.

[7] Provided that a suitable method is available.

[8] INPUT November 1995 agreed not to advocate routine monitoring of riverine inputs of pesticides Conventionwide, but to address specific requests from SIME or DIFF* on a case by case basis. (* Secretariat note: DIFF was discontinued by OSPAR 2000. The work formerly undertaken by DIFF has been carried out by SPDS until 2004/2005 and, since then, by HSC.)

Annex 2 Annual overview tables

Table 1a. Information received on inputs to the maritime area of the OSPAR Convention in 2007

Country	Direct Discharges			Riverine Inputs	
	Sewage Effluents	Industrial Effluents	Coastal Areas (1)	Main Rivers	Tributary Rivers (2)
Belgium					
- North Sea (BE)	NA	NA		+	+
Denmark					
- Skagerrak (DK)	+	+		+	NI
- Kattegat (DK)	+	+		+	NI
- North Sea (DK)	+	+		+	NI
France					
- Channel	NI	NI		+	+
- Atlantic	NI	NI		+	+
Germany					
- North Sea (GER)	+	+		+	+ (3)
Iceland					
- Atlantic	NI	NI		NI	NI
Ireland					
- Irish Sea	+	+		+	+
- Celtic Sea	+	+		+	+
- Atlantic	+	+		+	+
Netherlands					
- North Sea (NL)	NI	NI		NI	NI
Norway					
- Norwegian Sea (NO)	+	+		+	+
- Barents Sea (NO)	+	NI		+	+
- Skagerrak (NO)	+	+		+	+
- North Sea (NO)	+	+		+	+
Portugal					
- Bay of Biscay and Iberian Coast (PO)	NI	NI		+ (4)	NI
Spain					
- Atlantic (ESP)	+	+		+	+
Sweden					
- Kattegat (SWE)	+	+		+	NI
- Skagerrak (SWE)	+	+		+	NI
UK					
- North Sea (North)	+	+		+	+ (5)
- North Sea (South)	+	+		+	+ (5)
- Channel	+	+		+	+ (5)
- Irish Sea	+	+		+	+ (5)
- Celtic Sea	+	+		+	+ (5)
- Atlantic	+	+		+	+ (5)

\+ = Information available

NI = No information

NA = Not applicable

1) Coastal areas: - "downstream areas" of main and tributary rivers and rivers not monitored;
- areas discharging to the maritime area which, however, are located outside the catchment area of a river.

2) Tributary Rivers: - any tributary river flowing into (the estuary of) a main river, downstream from the sampling point;
- any minor river which was not deemed to be a main river

3) Included in data on main riverine inputs.

4) River Tejo only.

5) All rivers are reported as main rivers.

Table 1b. Determinands reported by Contracting Parties in 2007

Country	Determinands													
	Cd	Hg	Cu	Pb	Zn	g-HCH	PCBs (1)	NH4-N	NO3-N	PO4-P	N-Total	P-Total	SPM (2)	others
Belgium														
- direct inputs	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	
- riverine inputs	R	R	R	R	R	R	R	R	R	R	R	R	R	
Denmark														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	+	+	+	+	+	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	+	+	+	+	+	+	
France														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	R (4)	R (4)	R (4)	R (4)	R (4)	R (4)	NI	R (3)	R (3)	R (3)	R (3)	R (3)	R (3)	
Germany														
- direct inputs	R	R	R	R	R	R	R	+	R	+	+	+	+	
- riverine inputs	R (4)	R (4)	+ (3)	R (3)	+ (3)	R (3)	R (4)	R (3)	+ (3)	R (3)	+ (3)	+ (3)	R (4)	
Iceland														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
Ireland														
- direct inputs	+	NI	+	+	+	NI	NI	NI	NI	NI	+	+	+	
- riverine inputs	+	NI	+	+	+	NI	NI	+	+	+	+	+	+	
Netherlands														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
Norway														
- direct inputs	+	+	+	+	+	+	+	+	+	R+	+	+	+	As,Total Cr,Ni,TOC
- riverine inputs	R (3)	R (4)	+ (3)	R (3)	R (3)	R (4)	R (3)	R (3)	R (3)	R (4)	+ (3)	R (3)	R (3)	As,Total Cr,Ni,TOC
Portugal														
- direct inputs	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	
- riverine inputs (5)	+	+	+	+	+	NI	NI	+	+	+	+	+	+	
Spain														
- direct inputs	R	R	R	R	R	R	R	R	R	R	R	R	R	
- riverine inputs	R (4)	R (4)	R (4)	R (4)	R (4)	R (4)	R (4)	R (4)	R (3)	R (4)	R (4)	R (4)	R (4)	
Sweden														
- direct inputs	+	+	+	+	+	NI	NI	R	NI	NI	+	+	NI	
- riverine inputs	+	+	+	+	+	NI	NI	+	+	+	+	+	NI	
UK														
- direct inputs	R	R	R	R	R	R	R	R	R	R	R	R	R	
- riverine inputs	R	R	R	R	R	R	R	R	R	R	R	R	R	

+ : Data provided

NI: No information

NA: Not applicable

R: Estimate given as a range

1) IUPAC Nos 28, 52, 101, 118, 153, 138, 180

2) Suspended particulate matter

3) 70 % of measurements above detection limit

4) Less than 70 % of measurements above detection limit

5) River Tejo only

Table 2. Direct discharges to the maritime area of the OSPAR Convention in 2007 by country

	Region		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs (1) [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM (2) [kt/a]
Belgium	North Sea (BE)	lower	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
		upper	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Denmark	Kattegat (DK)	lower	NI	NI	NI	NI	NI	NI	NI	58.6	437.8	24.7	586.16	52.48	NI
		upper	NI	NI	NI	NI	NI	NI	NI	58.6	437.8	24.7	586.16	52.48	NI
	North Sea (DK)	lower	NI	NI	NI	NI	NI	NI	NI	13.5	86	4.2	135.34	10.37	NI
		upper	NI	NI	NI	NI	NI	NI	NI	13.5	86	4.2	135.34	10.37	NI
	Skagerrak (DK)	lower	NI	NI	NI	NI	NI	NI	NI	1.9	11.2	0.6	18.67	1.38	NI
		upper	NI	NI	NI	NI	NI	NI	NI	1.9	11.2	0.6	18.67	1.38	NI
France	Atlantic	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
	Channel	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Germany	North Sea (GER)	lower	0.01	0.01	2.2	0.8	11	0.02	0.04	1.7	1.7	0.08	3.6	0.4	1.9
		upper	0.05	0.06	2.8	1.5	16	0.3	2.8	1.7	1.7	0.08	3.6	0.4	1.9
Iceland	Atlantic	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Ireland	Atlantic	lower	0.01	NI	0.83	0.39	7.7	NI	NI	NI	NI	NI	0.70	0.21	4.3
		upper	0.01	NI	0.83	0.39	7.7	NI	NI	NI	NI	NI	0.70	0.21	4.3
	Celtic Sea	lower	0.02	NI	3.2	4.4	21.5	NI	NI	NI	NI	NI	2.67	0.65	18.6
		upper	0.02	NI	3.2	4.4	21.5	NI	NI	NI	NI	NI	2.67	0.65	18.6
	Irish Sea	lower	0.06	NI	7.5	3.3	63	NI	NI	NI	NI	NI	6.83	1.58	38.1
		upper	0.06	NI	7.5	3.3	63	NI	NI	NI	NI	NI	6.83	1.58	38.1
Netherlands	North Sea (NL)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Norway (3)	Barents Sea (NO)	lower	0	0	30.0	0	0	0	0	1.56	0.22	0.27	1.97	0.40	0
		upper	0	0	30.0	0	0	0	0	1.56	0.22	0.27	1.97	0.40	0
	North Sea (NO)	lower	0.20	0.002	247	2.13	20.53	0	0	14.13	1.88	2.30	17.90	3.39	11.49
		upper	0.20	0.002	247	2.13	20.53	0	0	14.13	1.88	2.30	17.90	3.39	11.49
	Norwegian Sea (NC	lower	0.08	0	412	0.86	13.13	0	0	22.09	3.05	3.76	27.87	5.51	524.1
		upper	0.08	0	412	0.86	13.13	0	0	22.09	3.05	3.76	27.87	5.51	524.1
	Skagerrak (NO)	lower	0.08	0.03	11.6	0.61	7.13	0	23.41	4.19	0.28	0.11	5.59	0.18	4.51
		upper	0.08	0.03	11.6	0.61	7.13	0	23.41	4.19	0.28	0.11	5.59	0.18	4.51
Portugal	Bay of Biscay and	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
	Iberian Coast (PO)	upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Spain (3)	Atlantic (ESP)	lower	1.97	0.41	8.85	1.25	58.58	0.84	0.00	9.24	1.54	0.88	18.04	1.64	236.3
		upper	7.26	7.22	20.74	28.11	81.33	3.21	8.70	10.28	1.57	1.12	18.60	1.83	249.9
Sweden	Kattegat (SWE)	lower	0.05	0.01	2.26	0.17	6.09	NI	NI	1.34	NI	NI	2.08	0.08	NI
		upper	0.05	0.01	2.26	0.17	6.09	NI	NI	1.49	NI	NI	2.08	0.08	NI
	Skagerrak (SWE)	lower	0.00	0.00	0.36	0.35	0.74	NI	NI	0.17	NI	NI	0.36	0.01	NI
		upper	0.00	0.00	0.36	0.35	0.74	NI	NI	0.17	NI	NI	0.36	0.01	NI
UK	Atlantic	lower	0.04	0.00	4.66	0.68	18.84	2.84	0	4.49	2.75	1.53	11.81	1.91	19.60
		upper	0.24	0.02	4.93	0.99	18.97	3.07	0.01	4.49	2.77	1.53	12.41	2.05	20.15
	Celtic Sea	lower	0.04	0.00	1.70	2.98	34.62	0.25	0	3.23	1.05	0.55	1.87	0.55	6.75
		upper	0.05	0.01	1.70	3.14	34.63	1.45	1.71	3.27	1.09	0.55	1.87	0.55	6.78
	Channel	lower	0.01	0.01	4.55	0.81	13.01	0.47	NI	6.87	2.72	0.93	10.04	0.93	14.02
		upper	0.03	0.01	4.55	0.96	13.01	4.01	NI	6.90	2.83	0.97	10.07	0.97	14.05
	Irish Sea	lower	0.01	0.00	1.00	3.99	12.99	0.01	0.14	3.74	1.71	0.65	5.84	0.60	6.11
		upper	0.74	0.22	73.46	23.59	122.0	1.23	0.48	3.76	1.73	0.69	6.77	0.80	7.27
	North Sea (North)	lower	0.07	0.01	14.33	3.18	38.09	2.60	0	10.22	3.12	1.66	17.78	2.28	34.05
		upper	0.08	0.02	14.33	3.28	38.09	4.44	6.63	10.22	3.12	1.66	17.78	2.28	34.07
	North Sea (South)	lower	0.15	0.14	29.20	7.81	85.81	2.43	0	5.01	9.02	2.79	16.91	2.79	142.4
		upper	0.20	0.15	29.20	8.12	85.81	12.54	2.17	5.03	9.02	2.81	16.91	2.81	142.5

NI: No information
NA: Not applicable

1) IUPAC Nos 28, 52, 101, 118, 153, 138, 180

2) Suspended particulate matter

3) Includes data on fish farming effluents

Table 3. Riverine inputs to the maritime area of the OSPAR Convention in 2007 by country

Country	Sea Area		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs (1) [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM (2) [kt/a]
Belgium	North Sea (BE)	lower	2.30	0.37	44.84	41.30	430.73	0.95	0	2.53	34.37	1.28	42.21	2.76	407.41
		upper	3.44	0.46	53.20	50.68	500.32	20.24	90.21	3.17	38.84	1.42	49.68	3.44	488.27
Denmark	Kattegat (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.66	19.47	0.39	24.18	0.88	32.50
		upper	NI	NI	NI	NI	NI	NI	NI	0.66	19.47	0.39	24.18	0.88	32.50
	North Sea (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.67	17.95	0.17	22.25	0.61	40.03
		upper	NI	NI	NI	NI	NI	NI	NI	0.67	17.95	0.17	22.25	0.61	40.03
	Skagerrak (DK)	lower	NI	NI	NI	NI	NI	NI	NI	0.06	1.14	0.02	1.48	0.07	10.31
		upper	NI	NI	NI	NI	NI	NI	NI	0.06	1.14	0.02	1.48	0.07	10.31
France	Atlantic	lower	0.003	0.001	8.17	0.05	437.4	0	NI	5.79	262.4	4.11	285.59	8.78	2979
		upper	53.09	3.63	74.62	126.0	437.7	269.3	NI	6.25	262.5	4.12	341.33	8.85	2980
	Channel	lower	0.86	0.23	77.70	55.64	289.7	60.49	NI	6.27	175.9	2.79	178.06	5.03	1168
		upper	8.39	1.34	99.54	69.44	362.3	116.6	NI	6.36	175.9	2.83	194.19	5.19	1168
Germany	North Sea (GER)	lower	4.9	1.6	237	138	1110	21	2.3	7.6	180	2.9	228	9.7	1564
		upper	5.4	1.7	237	143	1110	22	35.5	7.6	180	2.9	228	9.7	1722
Iceland	Atlantic	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Ireland	Atlantic	lower	0.0	NI	40	0	66	NI	NI	0.3	14	0.3	26	0.7	120
		upper	1.8	NI	47	18	71	NI	NI	0.4	14	0.3	26	0.7	120
	Celtic Sea	lower	0.0	NI	56	1	86	NI	NI	0.8	57	0.5	79	1.4	186
		upper	2.5	NI	71	25	93	NI	NI	0.8	57	0.6	79	1.4	186
	Irish Sea	lower	0.3	NI	6	10	110	NI	NI	0.3	16	0.2	23	0.4	145
		upper	0.8	NI	10	14	110	NI	NI	0.3	16	0.2	23	0.4	145
Netherlands	North Sea (NL)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Norway	Barents Sea (NO)	lower	0.13	0.01	54.34	1.83	19.85	0	0	0.22	0.48	0.03	3.92	0.14	23.9
		upper	0.20	0.03	54.34	1.84	19.85	0.71	4.80	0.23	0.49	0.04	3.92	0.14	23.9
	North Sea (NO)	lower	0.70	0.06	34.53	14.02	149.0	0	0	0.51	11.11	0.14	17.30	0.45	206.3
		upper	0.75	0.08	34.53	14.02	149.0	0.35	2.09	0.53	11.11	0.16	17.30	0.45	206.3
	Norwegian Sea (NO)	lower	0.44	0.05	70.58	6.19	185.3	0	0	0.33	4.61	0.12	10.84	0.34	181.5
		upper	0.60	0.09	70.58	6.19	185.3	1.64	9.84	0.37	4.61	0.14	10.84	0.34	181.7
	Skagerrak (NO) (3)	lower	1.26	0.02	159.9	23.88	360.4	0	0	1.34	25.67	0.49	41.41	1.05	35.5
		upper	1.26	0.09	159.9	23.88	360.4	14.7	88.2	1.35	25.67	0.50	41.41	1.05	35.5
Portugal	Bay of Biscay and	lower	0.65	0.74	21.8	11.6	76.3	NI	NI	0.47	9.5	1.2	15.7	2	60
	Iberian Coast (PO)	upper	0.65	0.74	21.8	11.6	76.3	NI	NI	0.47	9.5	1.2	15.7	2	60
Spain (4)	Atlantic (ESP)	lower	4.92	0	647.6	24.28	1391	1.23	0	3.56	27.09	0.59	51.10	0.81	238.2
		upper	33.5	3.58	719.7	108.5	1494	52.12	132.9	11.63	59.67	1.45	84.03	1.51	279.7
Sweden	Kattegat (SWE)	lower	0.46	0.08	40.9	12.22	136.2	NI	NI	0.84	16.75	0.261	31.3	0.60	NI
		upper	0.46	0.08	40.9	12.22	136.2	NI	NI	0.84	16.75	0.261	31.3	0.60	NI
	Skagerrak (SWE)	lower	0.03	0.01	2.1	0.69	7.6	NI	NI	0.05	0.63	0.023	1.5	0.05	NI
		upper	0.03	0.01	2.1	0.69	7.6	NI	NI	0.05	0.63	0.023	1.5	0.05	NI
UK	Atlantic	lower	0.03	0.04	36.23	14.70	95.82	3.46	0	0.97	10.14	0.90	13.29	1.46	188.7
		upper	1.95	0.39	36.44	15.14	110.1	13.03	9.00	1.17	10.20	0.96	13.75	1.54	196.0
	Celtic Sea	lower	0.53	0.24	57.30	45.23	273.7	0.32	0	0.94	55.98	1.64	57.84	1.64	997.9
		upper	1.84	0.37	58.09	61.44	283.0	41.66	28.69	1.10	55.98	1.71	57.92	1.71	1002
	Channel	lower	0.43	0.12	48.19	8.05	158.1	0.04	NI	0.52	30.56	0.85	25.35	0.85	129.0
		upper	0.66	0.17	48.52	17.37	161.9	15.61	NI	0.61	30.56	0.87	25.42	0.87	130.8
	Irish Sea	lower	1.14	0.18	75.91	55.25	368.0	3.09	0.72	3.07	38.57	2.30	41.66	2.46	329.3
		upper	2.38	0.31	76.90	63.83	379.1	40.61	64.82	3.46	38.69	2.37	41.66	2.53	342.1
	North Sea (North)	lower	1.51	0.10	52.25	132.5	464.6	3.81	0	0.91	33.19	0.66	47.75	1.05	372.3
		upper	1.56	0.20	52.75	135.9	488.6	18.23	40.70	1.04	33.20	0.81	47.93	1.23	379.1
	North Sea (South)	lower	1.48	0.09	73.88	66.42	373.9	12.25	0	1.74	114.13	4.53	126.22	4.53	352.2
		upper	2.01	0.19	73.91	73.55	375.2	49.04	102.3	1.80	114.13	4.54	126.22	4.54	356.1

NI: No information

1) IUPAC Nos 28, 52, 101, 118, 153, 138, 180

2) Suspended particulate matter

3) Includes inputs from all reported rivers. Higher than the reported totals as the reported totals do not correspond to the sum of inputs.

4) Also includes inputs from Tinto (metals). These have not been taken into account in the reported totals due to high natural background concentration values.

Table 4a. Sum of direct (Table 2) and riverine (Table 3) inputs to the maritime area of the OSPAR Convention in 2007 by country

Country	Region		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs (1) [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM (2) [kt/a]
Belgium	North Sea (BE)	lower	2.30	0.37	44.84	41.30	430.7	0.95	0	2.53	34.37	1.28	42.21	2.76	407.4
		upper	3.44	0.46	53.20	50.68	500.3	20.24	90.21	3.17	38.84	1.42	49.68	3.44	488.3
Denmark	Kattegat (DK)	lower	NI	NI	NI	NI	NI	NI	NI	59.26	457.3	25.09	610.3	53.36	32.50
		upper	NI	NI	NI	NI	NI	NI	NI	59.26	457.3	25.09	610.3	53.36	32.50
	North Sea (DK)	lower	NI	NI	NI	NI	NI	NI	NI	14.17	104.0	4.37	157.6	10.98	40.03
		upper	NI	NI	NI	NI	NI	NI	NI	14.17	104.0	4.37	157.6	10.98	40.03
	Skagerrak (DK)	lower	NI	NI	NI	NI	NI	NI	NI	1.96	12.34	0.62	20.15	1.45	10.31
		upper	NI	NI	NI	NI	NI	NI	NI	1.96	12.34	0.62	20.15	1.45	10.31
France	Atlantic	lower	0.003	0.001	8.17	0.05	437.4	0	NI	5.79	262.4	4.11	285.59	8.78	2979
		upper	53.09	3.63	74.62	126	437.7	269.3	NI	6.25	262.5	4.12	341.33	8.85	2980
	Channel	lower	0.86	0.23	77.70	55.64	289.7	60.49	NI	6.27	175.9	2.79	178.06	5.03	1168
		upper	8.39	1.34	99.54	69.44	362.3	116.6	NI	6.36	175.9	2.83	194.19	5.19	1168
Germany	North Sea (GER)	lower	4.9	1.6	239	139	1121	21	2.3	9.1	182	3.0	231	10.0	1566
		upper	5.5	1.7	240	145	1126	23	38.3	9.1	182	3.0	231	10.0	1724
Iceland	Atlantic	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Ireland	Atlantic	lower	0.01	NI	41.0	0.4	73.7	NI	NI	NI	NI	NI	26.2	0.9	124
		upper	1.85	NI	47.4	18.8	78.6	NI	NI	NI	NI	NI	26.2	0.9	124
	Celtic Sea	lower	0.05	NI	59.5	5.1	107.2	NI	NI	NI	NI	NI	81.7	2.0	204
		upper	2.51	NI	74.1	29.4	114.3	NI	NI	NI	NI	NI	81.7	2.0	204
	Irish Sea	lower	0.38	NI	13.4	13.1	173.0	NI	NI	NI	NI	NI	29.9	1.9	183
		upper	0.87	NI	17.6	17.2	173.2	NI	NI	NI	NI	NI	29.9	1.9	183
Netherlands	North Sea (NL)	lower	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
		upper	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI	NI
Norway	Barents Sea (NO)	lower	0.13	0.01	84.34	1.83	19.85	0	0	1.78	0.70	0.30	5.89	0.54	23.89
		upper	0.20	0.03	84.34	1.84	19.85	0.71	4.80	1.80	0.71	0.31	5.89	0.54	23.89
	North Sea (NO)	lower	0.90	0.06	281.3	16.15	169.5	0	0	14.64	13.00	2.45	35.20	3.84	217.8
		upper	0.94	0.09	281.3	16.15	169.5	0.35	2.09	14.66	13.00	2.46	35.20	3.85	217.8
	Norwegian Sea (NO)	lower	0.51	0.05	482.3	7.04	198.5	0	0	22.41	7.66	3.88	38.71	5.85	705.6
		upper	0.67	0.09	482.3	7.04	198.5	1.64	9.84	22.46	7.66	3.90	38.71	5.85	705.8
	Skagerrak (NO)	lower	1.34	0.05	171.5	24.50	367.5	0	23.41	5.53	25.95	0.60	47.00	1.23	40.00
		upper	1.34	0.12	171.5	24.50	367.5	14.70	111.60	5.54	25.95	0.61	47.00	1.23	40.00
Portugal	Bay of Biscay and	lower	0.65	0.74	21.8	11.6	76.3	NI	NI	0.47	9.5	1.2	15.7	2.0	60.0
	Iberian Coast (PO)	upper	0.65	0.74	21.8	11.6	76.3	NI	NI	0.47	9.5	1.2	15.7	2.0	60.0
Spain	Atlantic (ESP)	lower	6.89	0.41	656.5	25.53	1450	2.08	0	12.79	28.63	1.47	69.14	2.44	474.6
		upper	40.78	10.8	740.4	136.6	1575	55.33	141.6	21.91	61.24	2.57	102.64	3.34	529.5
Sweden	Kattegat (SWE)	lower	0.51	0.08	43.16	12.39	142.3	NI	NI	2.18	16.75	0.26	33.38	0.68	NI
		upper	0.51	0.08	43.16	12.39	142.3	NI	NI	2.33	16.75	0.26	33.38	0.68	NI
	Skagerrak (SWE)	lower	0.03	0.01	2.46	1.04	8.34	NI	NI	0.21	0.63	0.02	1.86	0.06	NI
		upper	0.03	0.01	2.46	1.04	8.34	NI	NI	0.22	0.63	0.02	1.86	0.06	NI
UK	Atlantic	lower	0.07	0.05	40.89	15.39	114.7	6.30	0	5.46	12.89	2.44	25.09	3.37	208.3
		upper	2.19	0.41	41.37	16.13	129.1	16.10	9.01	5.66	12.96	2.49	26.16	3.60	216.1
	Celtic Sea	lower	0.57	0.24	59.00	48.21	308.3	0.56	0	4.16	57.03	2.19	59.71	2.19	1005
		upper	1.89	0.37	59.79	64.57	317.6	43.11	30.40	4.38	57.07	2.26	59.79	2.26	1009
	Channel	lower	0.44	0.13	52.74	8.863	171.1	0.51	NI	7.39	33.28	1.77	35.39	1.77	143.0
		upper	0.68	0.17	53.07	18.33	174.9	19.62	NI	7.52	33.39	1.84	35.49	1.84	144.9
	Irish Sea	lower	1.15	0.19	76.91	59.24	381.0	3.10	0.86	6.81	40.28	2.95	47.49	3.06	335.4
		upper	3.12	0.52	150.4	87.43	501.1	41.84	65.30	7.21	40.42	3.06	48.43	3.32	349.4
	North Sea (North)	lower	1.57	0.11	66.57	135.6	502.7	6.42	0	11.13	36.31	2.32	65.53	3.33	406.3
		upper	1.64	0.22	67.08	139.1	526.7	22.68	47.33	11.26	36.32	2.47	65.71	3.52	413.2
	North Sea (South)	lower	1.63	0.23	103.1	74.23	459.7	14.67	0	6.75	123.2	7.32	143.1	7.32	494.6
		upper	2.21	0.33	103.1	81.67	461.1	61.58	104.4	6.83	123.2	7.34	143.1	7.34	498.6

NI: No information
1) IUPAC Nos 28, 52, 101, 118, 153, 138, 180
2) Suspended particulate matter

Table 4b. Sum of direct and riverine inputs to the maritime area of the OSPAR Convention in 2007 by sea area

Sea Area		Cd [t/a]	Hg [t/a]	Cu [t/a]	Pb [t/a]	Zn [t/a]	g-HCH [kg/a]	PCBs (1) [kg/a]	NH4-N [kt/a]	NO3-N [kt/a]	PO4-P [kt/a]	N-Total [kt/a]	P-Total [kt/a]	SPM (2) [kt/a]
Arctic Ocean	lower	0.13	0.01	84.34	1.83	19.85	0	0	1.78	0.70	0.30	5.89	0.54	23.89
	upper	0.20	0.03	84.34	1.84	19.85	0.71	4.80	1.80	0.71	0.31	5.89	0.54	23.89
Atlantic Ocean	lower	0.08	0.05	81.85	15.78	188.3	6.30	0	5.46	12.89	2.44	51.31	4.24	332.3
	upper	4.04	0.41	88.73	34.97	207.7	16.10	9.01	5.66	12.96	2.49	52.37	4.47	340.2
Bay of Biscay and	lower	7.55	1.15	686.4	37.18	1964	2.08	0.00	19.06	300.6	6.78	370.4	13.22	3514
Iberian Coast	upper	94.52	15.17	836.9	274.3	2089	324.6	141.6	28.63	333.2	7.90	459.7	14.19	3570
Celtic Sea	lower	0.62	0.24	118.46	53.29	415.5	0.56	0	4.16	57.03	2.19	141.43	4.23	1209
	upper	4.39	0.37	133.85	93.98	431.9	43.11	30.40	4.38	57.07	2.26	141.51	4.30	1213
Channel	lower	1.30	0.35	130.4	64.50	460.8	61.00	NI	13.66	209.2	4.57	213.4	6.80	1311
	upper	9.07	1.51	152.6	87.76	537.2	136.2	NI	13.87	209.3	4.67	229.7	7.04	1313
Irish Sea	lower	1.53	0.19	90.27	72.34	554.0	3.10	0.86	6.81	40.28	2.95	77.34	5.00	518.8
	upper	3.99	0.52	167.9	104.64	674.3	41.84	65.30	7.21	40.42	3.06	78.28	5.26	532.8
Kattegat	lower	0.51	0.08	43.16	12.39	142.3	NI	NI	61.44	474.0	25.35	643.7	54.04	32.50
	upper	0.51	0.08	43.16	12.39	142.3	NI	NI	61.59	474.0	25.35	643.7	54.04	32.50
North Sea (main body)	lower	11.33	2.41	735.3	406.5	2683	43.46	2.34	58.50	492.6	20.74	675.0	38.28	3132
	upper	13.71	2.80	744.8	432.5	2783	127.5	282.4	59.37	497.1	21.06	682.6	39.17	3382
Norwegian Sea	lower	0.51	0.05	482.3	7.04	198.5	0	0	22.41	7.66	3.88	38.71	5.85	705.6
	upper	0.67	0.09	482.3	7.04	198.5	1.64	9.84	22.46	7.66	3.90	38.71	5.85	705.8
Skagerrak	lower	1.37	0.05	173.9	25.53	375.9	0	23.41	7.71	38.92	1.24	69.00	2.74	50.31
	upper	1.37	0.13	173.9	25.53	375.9	14.70	111.6	7.73	38.92	1.25	69.00	2.74	50.31

NI: No information

1) IUPAC Nos 28, 52, 101, 118, 153, 138, 180

2) Suspended particulate matter

Annex 3 Compilation of submitted information

In the 2005 and 2006 OSPAR RID data reports, overviews of the information on data assessment in Contracting Parties were organised in two tables (Skarbøvik and Borgvang 2007; Borgvang, Skarbøvik and Pengerud, 2008). Contracting Parties submitted additional information for the assessment of RID data reported for 2007, and updated tables have therefore been compiled.

The information in Tables I and II are organised as follows:

- Number of rivers monitored
- Number of maritime areas per country
- Size of Convention area for each country
- Whether one or more laboratories have been involved in the analyses of the water samples
- Whether monitoring has been carried out by one or several institutes
- The number of samples per year in the main rivers
- The number of samples per year in the tributary rivers
- What is measured and/or calculated downstream of the riverine sampling points
- Which strategy is taken to include direct discharges to the Maritime areas
- Whether all parameters have been analysed, in compliance with the RID Principles.

Table I: Compilation of submitted information on data quality – A (2007 update)

Country	Number of rivers	Number of areas	Size of Convention Area (for the country)	One or many labs	Monitoring carried out by one or more institutes?
Belgium	2 main rivers, 8 tributaries	1 North Sea Again divided into Scheldt estuary and Belgian Coastal zone; again divided into 3 sub-areas	Surface area covered by RID river's catchment: 15.392 km^2 100% of the Belgian area drains into Convention Area. 50% drains directly into it through the Scheldt estuary and the coastal basins and is represented by the RID reporting. The other 50% drains indirectly into the Convention Area through the Meuse and Rhine basins and contributes to the Dutch inputs.	Source of data for all analyses: Vlaamse Milieumaatschappij (VMM), A. Van De Maelestraat 96, B-9320 Erembodegem.	One and the same organisation (VMM – Vlaamse Milieu Maatschappij) A. Van De Maelestraat 96, B-9320 Erembodegem co-ordinates the sampling and does the analyses for all rivers.
Denmark	25 rivers	3 North Sea, Kattegat, and Skagerrak.	Total catchment area in Denmark to OSPAR is 27.500 km^2, which constitutes 64% of the Danish land area.	NI	NI
France	3 main rivers, 35 tributaries and 13 unmonitored areas.	2 (Channel/North Sea and Atlantic, again divided into four sub-regions.	Surface covered by RID program : 382,162 km^2 (70% of the total surface of the country) Monitored area : 319,557 km^2	Different labs but all must be authorised by the ministry for environment (at least, accredited).	4 different river basin district authorities called "Water Agencies" for the OSPAR area.
Germany	4 main rivers (plus tributaries in the case of the Elbe)	1 North Sea	Total German OSPAR Catchment area: 275 852 km^2 Draining via German Rivers: 165 884 km^2 Ems 15 008 km^2 (German catchment share) Weser 49 000 km^2 Elbe 97 175 km^2 (German catchment share) Eider 4 701 km^2 Draining via rivers discharging in the Netherlands: 109 968 km^2 Rhine 106 000 km^2 (German catchment share) Meuse 3 968 km^2 (German catchment share)	Many: Ems: Niedersächsicher Landesbetrieb für Wasserwirtschaft, Künsten- und Naturschutz + contractors Weser: Niedersächsicher Landesbetrieb für Wasserwirtschaft, Künsten- und Naturschutz + contractors Elbe: ARGE Elbe + contractors Eider: Landeslabor Schleswig-Holstein + contractors	Coordinating Institutions: Ems: Niedersächsicher Landesbetrieb für Wasserwirtschaft, Künsten- und Naturschutz Weser: Flussgebietsgemeinschaft Weser Elbe: ARGE Elbe Eider: Landesamt für Natur und Umwelt Schleswig-Holstein (LANU)

Country	Number of rivers	Number of areas	Size of Convention Area (for the country)	One or many labs	Monitoring carried out by one or more institutes?
Iceland	2	1 Atlantic	100% Monitored area: 13.000 km^2 of total 103.000 km^2	One lab for nutrients. Change from 1998 for total P. After 1998, P = ICP-MS (SGAP). Some discrepancies were observed at the transition period.	One University
Ireland	17 main rivers; of which 4 to the Irish Sea, 10 to the Celtic Sea and 3 to the Atlantic. . Several tributaries.	3 Irish Sea, Celtic Sea and the Atlantic	98 %	All samples are analysed in the EPA's regional laboratory in Richview, Clonskeagh and Dublin.	Sampling is organised and carried out by Environmental Protection Agency staff.
Netherlands	4 main rivers Rhine, Ems, Schelde, Maas	1 North Sea	100%	Samples from main rivers analysed by RIZA, from tributary rivers by other laboratories.	In main rivers sampling is organised by RIZA, in tributaries by other water administrations.
Norway	10 main rivers and 36 tributaries	4 Skagerrak, North Sea, Norwegian Sea, Barents Sea	The river basin register system has classified the Norwegian river basins into 20.000 units, or 252 main catchments areas. According to this system, 247 of the 252 Norwegian rivers are draining into coastal areas. 100% drain into Convention areas.	Same laboratory for all analyses	One institute responsible for the monitoring, but many people are sampling.
Spain	43 main rivers and 9 tributaries	1 Atlantic. Again divided into 8 areas: País Vasco and Norte III; Norte II, Galicia costa; Norte I, Guadiana and Guadalquivir are controlled by Spain;Duero and Tajo controlled by Portugal.	61,56% of the surface of Spain drains into the Convention Area, but 34,96% is controlled by Spain and 26,61% (Duero and Tajo) by Portugal	Each River Basin District has its own laboratory or laboratories. In some cases monitoring is carried out by contracts with private laboratories	Different River Basin Districts. CH Norte, CH Guadiana, CH Guadalquivir, País Vasco, Galicia Costa, Junta de Andalucía
Sweden	10 main rivers (9 monitored). Under the heading "unmonitored	2 (Kattegat and Skagerrak)	75 393 km^2 , corresponding to 16 % of the total land area of Sweden. Of this, 88.7 % is monitored, the rest	One laboratory except for Hg analyses, which are performed by a sub-	One institute responsible for the monitoring within the National programme. Several persons perform the actual sampling

Country	Number of rivers	Number of areas	Size of Convention Area (for the country)	One or many labs	Monitoring carried out by one or more institutes?
	areas" is also reported 8 smaller rivers (2 monitored) No tributaries.	Divided into 18 coastal areas.	is estimated.	contractor.	(generally made by local/regional authorities). Some smaller rivers are monitored by regional authorities.
UK	233 rivers aggregated into 39 sampling regions	6 North Sea North, North Sea South, North Sea Channel, Celtic Sea, Irish Sea, Atlantic.	100% of the UK, as all rivers drain into Convention Waters. Riverine inputs: 80 % of the land mass Direct discharges: 10 %. The remaining 10 % is not estimated (in order to assure comparability with former years)	9 different laboratories	3 regions which do the sampling. The same sampling protocols are used by all regional offices within a particular region.

Table II: Compilation of submitted information on data quality –B (2007 update)

Country	Number of samples/ year main rivers	Number of samples/ year tributary rivers	Downstream sampling points – what is measured/ calculated?	Direct discharges	Are all parameters included?
Belgium	8 to 13 for heavy metals, 12 to 13 for nutrients, 9 to 10 for γ-HCH and PCB's	6 to 12 for heavy metals, 12 for nutrients, 0 to 9 for γ-HCH and PCB's	The only areas that could be qualified as "unmonitored" in Belgium are situated in a very narrow (no more than a few hundred metres and mostly less) fringe along the coast. In those areas a seepage and diffuse runoff go straight into the sea. These are not materially measurable, of very little impact and do not have to be covered in the RID reporting. All other downstream areas and polders are covered by monitoring and thus quantified in RID.	Since 1996 there are no longer direct inputs in convention waters under Belgian jurisdiction. No industrial effluents are discharged directly to Belgium's convention waters. No urban run-off or storm water overflows discharge to Convention Waters under Belgian jurisdiction.	All parameters are monitored
Denmark	Varies from 9-27 (34) times a year. On average for all 25 main rivers: 16 times a year.	None		Wastewater treatment plant outflow are sampled from 2-24 times a year. All point sources larger than 30 PE are monitored, even if they are situated in an unmonitored part of the river.	Metals and PCBs not included, except Gudenå and Skjernå (for metals).
France	12 measures per year – at least.	Main tributary rivers: 12/yr. Others, at least 4/yr.	For main rivers, the part of the river downstream the monitoring station is considered as an OSPAR coast.	Direct discharges were estimated for the years 2003 to 2005 (sewage and industrial effluents) for the nitrogen and phosphorus inputs. We show that the direct discharges are minor compared to riverine inputs.	All parameters are monitored but not for all the stations.
Germany	Elbe: 24/yr Eider : 13/yr for other parameters than nutrients. Weser and Ems: 12/yr.	For Elbe tributaries 12/yr Weser and Ems: NA Eider (Treene): 13/yr	Within the Eider catchment area the loads of the unmonitored part were determined by extrapolating the loads of the monitored parts of the catchment area. Inputs from unmonitored areas of the Ems catchment are estimated and reported together with direct discharges. Jade (see direct discharges)	Sewage and industry: Elbe, direct discharges of sewage effluents determined downstream of the measurement site. Weser and Jade: estimates based on population equivalents and industry. Ems: partly measured (major discharges), partly estimated. Eider: included in the riverine inputs.	In the river Elbe and its tributaries as well as in the river Eider no measurements for PCBs (in water) were carried out, because the concentrations are mostly below the detection limit. This is also the case for γ-HCH measurements in water in the Elbe tributaries.
Iceland	7 samples/yr in 2005.	None	Nothing is calculated downstream of sampling points.	Seems as if direct discharges are not included at all. Only discharges in the two monitored rivers are included. No discharges from	NI

Country	Number of samples/ year main rivers	Number of samples/ year tributary rivers	Downstream sampling points – what is measured/ calculated?	Direct discharges	Are all parameters included?
				industrial plants along the coast.	
Ireland	In general 6-7 sampling runs are made for each river in the January to March and October to December periods. Sampling also takes place in May. Sampling frequency is less than 12 times per annum but is concentrated in the period of expected higher river flows (October to May). The reason for the non-compliance is the lack of resources.	NA	Loads for unmonitored areas are estimated by extrapolation from those calculated for relevant main rivers on the basis of catchment areas.	NI	Mercury not measured (all concentrations have been less than the detection limit of 0.15 µg/l). It should be noted that this value is used to give an upper estimate of loading to the receiving water. Lindane is not measured due to lack of resources.
The Netherlands	For Noordzeekanaal, IJsselmeer and Haringvlietsluizen 12-13 samples per year. For Maassluis 24-25 samples per year. Loads calculated following each flow weighed concentration method. Calculations for PCBs not included due to lack of measurements.	Monthly or bimonthly (at Maassluis).	Generally sampling sites are so far downstream that this is not necessary. Except for Maassluis, where some direct discharge are reported downstream of sampling point,	Information is collected from • Environmental annual reports of (larger) industries in which discharges are reported • Annual questionnaire to administrators of rivers on annual direct and indirect loads from smaller industries • An annual questionnaire send out by the Netherlands Central Bureau of Statistics to the administrators of Sewage treatment plants for annual loads Used methodology is: product of annual flow and flow weighted concentrations.	No PCBs and lindane in sewage effluents; instead an estimate of total national load in all sewage effluents available. No SPM in industrial effluents in 2005, but usually this is included.
Norway	12 / yr, two large rivers in Southern Norway 16 /yr	Four times a year in 36 tributaries	See details in section 3.7. The calculation model TEOTIL is used for estimating losses of nutrients, direct discharges are monitored.	Industry Sewage treatment plants Fish farming	All, except lindane which is not monitored in tributaries or direct discharges.
Spain	Basically 12 a year, but differs for each discharge area and parameter.	Basically 12 a year	Loads for unmonitored areas not calculated	Industrial effluents based on industries' discharge declarations, regional discharge registries, direct control measurements, discharge permits, concentration values from previous years when effluents were similar and data were not available, and fixed values when measurements were below detection limits. The number of samples varies among different discharge sites.	All mandatory parameters are monitored and some voluntary parameters in some areas

Country	Number of samples/ year main rivers	Number of samples/ year tributary rivers	Downstream sampling points – what is measured/ calculated?	Direct discharges	Are all parameters included?
				Fish farming is included	
Sweden	Rivers: Generally 12/yr. Point sources: Tot-N, Tot-P, BOD7 and CODCr are sampled (in proportion to flow) 12 – 52 times annually. Metals are sampled 1 – 12 times annually, on the largest plant even 52 times.	NA.	Quantified by the area specific loss from the monitored parts and the loads are included in the amounts given for the monitored areas. Generally, the monitored parts of the rivers cover some 95-100% of the total areas. Two exceptions: Rivers Enningdalsälven and Rönneån cover only 80 and 51 %, respectively, of the total areas.	Annual reporting is restricted to municipal treatment plants designed for more than 2000 “population equivalents” and “the most important” industrial point sources Industries: Varies. Emissions generally reported above certain threshold values, mostly well below those applied in the EPER register. Water flows are often not reported. A few facilities discharge very large (unreported) water amounts, mostly cooling water	Rivers: Lindane, PCB and Suspended particulate matter are not measured.
United Kingdom	Generally 12 samples are collected per year at approximately monthly intervals from sampling points at the various rivers in a designated sampling region.	NA	Riverine inputs cover some 80% of the landmass. Monitoring of direct inputs downstream the stations, => it is considered that the 90% coverage target has been met.	Direct discharges downstream monitoring points measured	Yes, but where previous monitoring has shown that levels are consistently below the detection limit (e.g. PCBs) monitoring may be discontinued or reduced.

New questionnaire for the 2006 assessment

For the 2006 assessment, a new questionnaire was developed, partly aimed at filling some of the gaps of the 2005 assessment, partly to cover new issues and challenges in the RID Programme. In 2007, Contracting Parties were asked to check the status of their replies to the 2006 questionnaire, and, if necessary, complement with additional information.

The questions are related to the following issues:

- Completeness of monitoring (related to the requirement of monitoring 90% of the total land area);
- Sampling sites and coverage of monitored areas (related to the distance from the sampling site to the sea, with information on what is done to estimate the areas downstream of the sampling sites).
- Direct discharges and diffuse losses (related to methodology estimations)
- Sampling procedures (related to the representativeness of the samples, as well as the question on common sampling strategies).
- Laboratory analyses and change of detection limits over time (related in particular to the long-term RID assessment in order to be able to produce reliable trend analyses).
- Hydrological data and calculation practices (related to the type of hydrological monitoring performed by the Contracting Parties).
- Transboundary rivers and harmonisation (related to the need for harmonisation of monitoring in shared river basins).
- Use of the RID data for other purposes than reporting within OSPAR.

Completeness of monitoring and reporting on unmonitored areas

According to the RID Principles, 90% of the land area draining into the Maritime Area shall be monitored. The question on whether or not all Contracting Parties fulfil this requirement was also raised in the 2005 assessment, but since the answers given were incomplete the issue has been raised again. Of the countries that have submitted information, only the Netherlands, Germany and Belgium report that more than 90% is monitored.

Table III: Completeness of monitoring.

Country	Is monitoring carried out in more than 90% of the land area draining into the Maritime Area?
Belgium	Yes
Denmark	No information submitted
France	No, 84 % is monitored.
Germany	Yes
Iceland	No information submitted
Ireland	No information submitted
Netherlands	Yes
Norway	No, about 50% is monitored, the remaining modelled.
Portugal	No information submitted
Spain	Under study
Sweden	No, 88.7% is monitored
UK	No, about 80% is monitored, the rest is assumed to be covered by monitoring direct discharges downstream.

France, Norway, Sweden and UK all monitor less than the required area. However, these countries also monitor direct discharges downstream of the riverine sampling sites, as well as in unmonitored rivers; these inputs are not covered by the overview. The inputs from remaining areas are estimated by different methods.

Sampling sites and coverage of monitored areas

As stated in the 2005 Assessment Report (Skarbøvik and Borgvang 2007), monitoring downstream of river sampling points is covered by the RID Principles as follows:

a. "direct discharges" defined as the mass of a determinant discharged to the maritime area from point sources (sewage effluents, industrial effluents or other) per unit of time at a point on a coast or to an estuary downstream of the point at which the riverine estimate of input is made, and;

b. "unmonitored area" defined as any sub-catchment(s) located downstream the riverine monitoring points within catchments and any areas between catchments. The unmonitored areas may contribute to the losses/discharges of substances downstream of the monitoring point or directly to the sea (OSPAR Maritime Area).

INPUT 2007 considered a proposal, included and illustrated at Annex III in Skarbøvik and Borgvang (2007), for a definition to promote a common understanding of "unmonitored area". The proposal suggested that the concept of unmonitored areas should include all areas that are not upstream a RID sampling point, i.e. including:

- areas downstream the sampling point in monitored rivers;
- unmonitored coastal areas;
- catchment area of all unmonitored rivers (rivers without a RID sampling station).

Contracting Parties have been asked to give either the area downstream each sampling point, or, if this was not readily available, the distance from the sampling point to the sea.

A detailed description of how unmonitored areas downstream sampling points are dealt with and the methodology for estimations, where these are conducted, are given in Table II.

To date, only France, Norway and Sweden have provided information on the unmonitored areas downstream the sampling points. For these countries, the unmonitored area ranges from about 3000 to about 30.000 km^2.

This preliminary overview suggests that for some countries, a relative significant area in catchments reported as "monitored" is in fact not monitored. Four of the Contracting Parties have reported that they do not estimate the inputs from these areas, whereas six Contracting Parties have reported different methodologies for estimates, as follows (based on Skarbøvik and Borgvang 2007):

- Belgium: Reports that there are no sources downstream of sampling points.
- France: The area downstream of the river sampling points is regarded as "OSPAR Coast" for the main rivers. All other areas downstream of the sampling points are included as tributaries or unmonitored areas.
- Germany: Calculations of loads by extrapolation of the monitored areas, for the Eider catchment.
- Iceland: Pollution sources downstream of the two monitored rivers are not included in the reporting.
- Ireland: Calculations of loads by extrapolation of the monitored areas.
- Netherlands: Losses from unmonitored areas are generally not reported as most sampling points are at sluices and river mouths. The exception is Maassluis, where some direct discharges downstream of the sampling points are reported.
- Norway: Modelling is used to determine the inputs from the unmonitored areas; the model is based on estimated inputs from diffuse sources (natural background values; agricultural land; sewage from scattered dwellings) and point sources (industry; waste water treatment plants; fish farming).

- Spain: Loads from unmonitored areas are not calculated
- Sweden: Calculations of loads by extrapolation of the monitored areas.

From the above listed information, it is clear that Contracting Parties have different ways of dealing with the areas downstream of the river sampling points. Since coastal areas in Europe often are important sites for industry, cities or tourist resorts, fish farming, harbours and other activities, it is possible that the areas downstream the sampling points may contribute significantly to the total inputs.

Direct discharges and losses

A number of Contracting Parties has reported data from point sources such as industries, sewage treatment plants and fish farming. Table IV gives information on how such discharges/losses are estimated. Some countries do not seem to include such data in their reporting. This includes e.g., Iceland. In Sweden, annual reporting of direct discharges is restricted to municipal treatment plants designed for more than 2000 "population equivalents" and the most important industrial point sources. In Spain, the industrial effluents reported are based on industries' discharge declarations, regional discharge registries, direct control measurements, discharge permits, concentration values from previous years when effluents where similar and data were not available, and fixed values when measurements were below detection limits. Belgium reported that no point sources exist outside the monitored rivers' catchments. This area is estimated to be around 30 km^2 and the losses are mainly through seepage.

For all point sources estimations made by Contracting Parties it is believed that the number of samples varies among the different discharge sites, but no specific information has been made available.

Table IV: Methods for estimation of direct discharges and diffuse losses.

Country	General	Sewage effluents	Industrial effluents	Urban runoff/ storm water
Belgium	No inputs downstream monitoring points	NA	NA	NA
Denmark	NI	NI	NI	NI
France	The French register collected for EPER should take into account the diffuse losses with estimation methods.	The wastewater treatment plants located downstream the monitoring stations are taken into account. For the unmonitored areas, only the discharges located at the outlet are accounted for. France uses the efficiency data of the wastewater treatment plant. The efficiency is calculated each year thanks to regular measurements made by the operators of the treatment plants.	The data used to estimate industrial discharges are extracted from the French database collected for EPER/E-PRTR. All the industrial facilities declared for EPER and located downstream the monitoring station of the zone accounted for. For the unmonitored areas, only the discharges located at the outlet are accounted for.	NI
Germany	Direct discharges are partly based on monitoring data, partly based on estimates.	For the **Elbe,** direct discharges of sewage effluents were determined downstream the "Seemannshöft" measurement site. Dischargers have to carry out a mandatory monitoring of their discharges. The results of such monitoring (based on 4 to 8 2-hour-mixed-samples) were used to determine the	For the **Elbe,** all direct discharges of industrial effluents were determined downstream the "Seemannshöft" measurement site. Dischargers have to carry out a mandatory monitoring of their discharges. The results of such monitoring were used to determine the inputs of the major dischargers.	NI

Country	General	Sewage effluents	Industrial effluents	Urban runoff/ storm water
		inputs of the major dischargers. Inputs of minor dischargers are estimates. The loads of **Weser** downstream of the measurement sites for riverine inputs and those of the **Jade** are estimates based on population equivalents. Direct discharges to the **Ems** downstream of the measurement site for riverine inputs are partly measured (major discharges), partly estimated. Estimates for the **Eider** are included in the riverine inputs.	Measurements are based on 2-hour-mixed-samples. Input figures for small discharges are based on estimates. The loads of direct industrial discharges to **Weser** and **Ems** downstream of the measurement sites for riverine inputs and those of the **Jade** are estimates. Estimates for the **Eider** are included in the riverine inputs.	
Ireland	NI	NI	NI	NI
Netherlands	Environmental annual reports of (larger) industries in which discharges are reported. Annual questionnaires are completed by administrators of rivers on annual direct and indirect loads from smaller industries No info on diffuse losses quantification reported	An annual questionnaire sent out by the Netherlands Central Bureau of Statistics to the administrators of Sewage treatment plants for annual loads. Provides the information used to estimate loads from sewage effluents.	Used methodology is: Product of annual flow and flow weighted concentrations	NI
Norway	In addition to estimations of discharges from industrial plants and sewage effluents, discharges from fish farming and diffuse losses are estimated.	The annual discharges of nutrients from municipal wastewater effluents are usually estimated as the product of annual flow and flow-weighted concentrations. For plants with no reporting requirements, as well as for population not connected to public treatment systems, the discharges are estimated by multiplying the number of people with standard Norwegian per capita load figures reduced by the removal efficiency of the treatment plants.	The estimates of industrial discharges are based on the discharges reported by industries. Only industries required to report such discharges are registered. Sampling frequency for industrial wastewater varies from weekly composite samples to random grab samples, at least twice a year. Total nitrogen and total phosphorus loads from industry not connected to municipal treatment plants are modelled (TEOTIL).	None
Portugal	NI	NI	NI	NI
Spain	Marine culture discharges are calculated through the maximum authorised difference in concentration from input water and discharges. Diffuse losses are not quantified No quantification of losses/discharges from	There are basically four data sources for flow calculations: annual discharge declarations provided by sewage plant managers, discharge permits issued, official discharge registries based on direct measurement from sewage plants (performed daily,	The sources of information for industrial effluents are: the industries' discharge declarations, regional discharge registries, direct control measurements, discharge permits, concentration values from previous years when effluents were	NI

Country	General	Sewage effluents	Industrial effluents	Urban runoff/ storm water
	unmonitored areas	weekly or monthly depending on the plant), and population estimations (taking into account seasonal population variations). For concentration values, data sources are: annual discharge declarations provided by sewage plant managers, laboratory measurements from samples of sewage effluents and other direct discharges, estimations based on RID methodology or on historical studies, and different detection limits depending on the lab analyses.	similar and data were not available, and fixed values when measurements were below detection limits. In general, flow values are the sum of authorised discharges, whereas concentration values are calculated through sampling. Load calculations are therefore obtained multiplying the volume of discharges authorised and the concentrations obtained in lab analyses.	
Sweden	No inland fish farms are situated downstream the monitoring stations. Marine fish farms are not included. 88.7% of area monitored, remaining estimated out of area specific loss from monitored reference areas	Information about discharges is collected from a national database containing emission declarations from all facilities with an environmental permit. Estimates are based on legally binding measurement programmes and the sampling frequency is normally 2-4 times a month.	Information about discharges is collected from a national database containing emission declarations from all facilities with an environmental permit. Estimates are based on legally binding measurement programmes and the sampling frequency is normally 2-4 times a month.	Only the part entering the sewage collection systems and reach UWWTPs is sampled.
United Kingdom	As direct inputs account for the most significant inputs downstream of the riverine monitoring stations, it is considered that for most regions, the 90% coverage target has probably been met. However some work is currently underway to check coverage in some less populated areas of the UK where the estimates of coverage are less certain. Diffuse losses are not quantified	RID principles guidance applied for quantification	Information on the industrial discharges entering the sewerage is not held centrally and has not been provided due to lack of resources. However, it is likely to be significant. RID principles guidance applied for quantification	No storm water overflows were sampled. It is considered that the contribution of storm water to total UK inputs will have been small and, with ongoing improvements relating to such discharges, it is progressively diminishing. Also, the riverine (tidal limit) sampling covers storm water overflows to inland river systems. Consequently, it is believed that no significant error will have resulted from not specifically monitoring these inputs.

Sampling procedures

It is not clear whether all Contracting Parties have standard procedures for sampling and whether these are used consistently within each country. In the 2005 Assessment, it became clear that the usual procedure is that a (large) number of persons are involved in the sampling of rivers. *Common sampling standards should therefore be considered by Contracting Parties.*

For particles and substances transported associated with particulate matter, the concentration distribution in the river cross section is usually not homogeneous unless the water is turbulent. Thus*, in slow flowing rivers, depth integrated samples will usually provide a better estimate of the total transport*. Similarly, in wide rivers, and especially downstream tributary inlets, the concentrations may vary from one bank to the other.

In the 2006 questionnaire, the Contracting Parties were therefore asked to describe how the samples were taken. Whereas all Contracting Parties reported that only one sample is taken in the river cross section, the answers are more varying in terms of the depth distribution, as summarised in the table below.

Table V: Sampling depth.

Country	Sampling depth
Belgium	Unknown
Denmark	No information submitted
France	Mid-depth
Germany	No information submitted
Iceland	No information submitted
Ireland	No information submitted
Netherlands	1 m below surface level.
Norway	Sampling sites in turbulent water, about 0.30 m below surface.
Portugal	No information submitted
Spain	Surface samples
Sweden	0.5 m below river surface
UK	0.25 m below river surface.

Consequently, the practices vary, but most countries seem to collect the samples somewhere between the surface and 1 meter below the surface. If this is done in slow-flowing reaches of the rivers, there is a risk of underestimating the particulate and particle associated loads.

Riverine loads are usually highest during floods and in some types of rivers a majority of the load may be transported during a few days of high flood conditions. Hence, sampling during flood events is regarded as important in order to achieve realistic estimates of the loads. However, most Contracting Parties that have submitted information do not allow for extra sampling during floods, see table below. This may be due to the extra costs associated with such additional sampling, which not only comprise costs of analyses, but also the logistics of organising sampling at short notice during flood events.

Table VI: Extent of flood sampling.

Country (River name)	Extent of flood or event based sampling
Belgium	Unknown
Denmark	No information submitted
France	No event based sampling, but the hydrological situation during the sampling has to be indicated and the sample has to be as representative as possible.
Germany	Additional sampling triggered by (major) flood events is performed (Elbe).
Iceland	No information submitted
Ireland	No information submitted
Netherlands	No
Norway	During extreme floods additional sampling is undertaken in some of the main rivers. For tributary rivers, the samples should preferably be event based samples, taken 4 times a year during snowmelt floods, summer low flow, autumn rains and winter low flow.
Portugal	No information submitted
Spain	No
Sweden	No
UK	No. Sampling done on pre-determined days selected by statistics to give random sampling.

Laboratory analyses and change of detection limits over time

For chemical analysis of samples, several countries use different laboratories both for riverine inputs and direct discharges. However, Ireland, Norway and Sweden (except for mercury) use the same laboratory for all rivers monitored.

As shown in Tables VI and VII, some countries have rather high LODs/LOQs for some substances, and especially for substances that are detected at low concentrations, such as the metals cadmium and mercury. For instance, the recommended detection limit of cadmium is 0,01 µg/l, but there are examples of detection limits of 1, 4.9, 20 and even in one case 100 µg/l in the tables. This leads to striking differences in input estimates for some substances when either upper or lower estimates are used as exemplified by the data submitted by Contracting Parties for 2007 in Section 2.

According to the RID Principles, it is necessary to choose an analytical method which gives at least 70 % of positive findings (i.e. no more than 30% of the samples below the detection limit). It has not been possible to produce a table showing the results for all Contracting Parties, Table VII also shows the analytical method applied for each parameter. Evidently, many of these methods have national standard references, and can therefore not be readily compared between Contracting Parties.

Table VI: Limits of Detection or Quantification achieved by Contracting Parties, as far as reported, for river sample analysis.

Parameter	Recommended		Belgium[9]	Denmark	France	Germany	Ireland	Netherlands	Norway	Spain	Sweden	UK
Cd	**0.01**	**(µg/l)**	0.06 - 2	NI	0.1 - 10	0.01 - 0.02	0.1	0.01 - 0.1	0.005	0.1 - 20	0.005	0.008 - 0.11
Hg	**0.005**	**(µg/l)**	0 - 0.1	NI	0.005 - 1	0.001- 0.005	0.15	0.001- 0.02	0.001	0.002 - 6.8	0.0001	0.002 - 0.02
Cu	**0.1**	**(µg/l)**	0.6 - 5	NI	1 - 20	0.1 - 0.5	1	0.1 - 1.0	0.01	0.003 - 20	0.04	0.05 - 0.6
Pb	**0.01**	**(µg/l)**	0.35 - 11	NI	0.2 – 10	0.2	1	0.1 - 2.0	0.005	1.0 - 50	0.02	0.03 - 0.2
Zn	**0.1**	**(µg/l)**	2 - 30	NI	1 – 50	0.1 - 1.0	1	1.0 - 5.0	0.05	0.1003- 100	0.2	0.79 - 4.0
γ-HCH	**0.5**	**(ng/l)**	2 - 6	NI	1.0 – 20	0.8 – 1.0	NI	1.0	0.2	0.000 - 10	--	0.1 - 1.0
PCB	**--**	**(ng/l)**	1 - 12	NI	NI	1.8	NI	[10]	0.2	0.001 - 40	--	1.0
NH_4-N	**0.01**	**(mg/l)**	0.03 - 0.5	>0.01	0.007 - 0.077	0.01 - 0.05	NI	0.01 - 0.2	0.005	0.004 - 0.09	0.001	0.003 - 0.03
NO_3-N	**0.05**	**(mg/l)**	0.1 - 0.77	>0.02	0.112 - 2.258	0.05 - 0.5	0.01	0.01 - 0.05	0.001	0.020 - 2.5	0.001	0.0014 - 0.1
PO_4-P	**0.005**	**(mg/l)**	0 - 0.5	>0.005	0.003 - 0.081	0.005 - 0.03	5	0.005 - 0.01	0.001	0.001 - 0.261	0.001	0.0012 - 0.008
Total N	**0.05**	**(mg/l)**	--	>0.06	NI	0.05 - 1.0	0.01	0.1	0.01	0.02 - 1.46	0.05	0.021 - 0.1
Total P	**0.005**	**(mg/l)**	0.07 - 1	>0.01	0.02 - 0.1	0.01 - 0.1	NI	0.02 - 0.1	0.001	0.01 - 0.1	0.001[11]	0.003 - 4.0
SPM	**2.0**	**(mg/l)**	2.4 - 4.7	>2.0	1.0 - 2.0	1.0 - 20	10	5.0	0.1	0.1 - 5.0	--	2.0

NI: no information

[9] Detection limits for Belgium are based on answers to questionnaire. As samples from the same site sometimes have more than one detection limit throughout the year for the same parameter, the minimum and the maximum detection limits are listed

[10] PCBs are measured in the sediment-phase. Detection limits for PCBs are: PCB138 = 2 µg /kg, PCB153 = 3 µg /kg, other PCBs = 1 µg /kg.

[11] 0.005 up to 1996, 0.002 as from 1996, and 0.0001 as from 2007.

Table VII: Limits of Detection or Quantification achieved by Contracting Parties, as far as reported, for analysis of direct discharge samples.

Parameter	Recommended		Germany	Netherlands	Spain[1]	UK
Cd	**0.5**	**(µg/l)**	0.1 - 0.5	1.0	0.001 - 100	0.02 - 0.11
Hg	**0.5**	**(µg/l)**	0.1 - 0.5	0.1	0.0001 - 60	0.005 - 0.02
Cu	**10.0**	**(µg/l)**	1.0 - 30	1.0	0.001 - 100	0.05 - 20
Pb	**1.0**	**(µg/l)**	1.0	30	0.001 - 200	0.03 - 10
Zn	**5.0**	**(µg/l)**	10	1.0	0.001 - 100	0.31 - 40
γ-HCH	**--**	**(ng/l)**	--	50	0.04	0.1 - 10
PCB	**--**	**(ng/l)**	1.0	--	0.01	1.0
NH_4-N	**0.05**	**(mg/l)**	0.05	0.1	0.02 - 1.0	0.003 - 0.04
NO_3-N	**0.1**	**(mg/l)**	0.1	0.01	0.1 - 6.0	0.0014 - 0.15
PO_4-P	**0.1**	**(mg/l)**	0.01	0.01	0.02 - 0.20	0.0012 - 0.08
Total N	**1.0**	**(mg/l)**	1.0	0.1	0.5 - 10	0.021 - 0.1
Total P	**0.05**	**(mg/l)**	0.02 - 0.05	0.2	<0.02 - 0.5	0.003 - 4.0
SPM	**--**	**(mg/l)**	--	10	1.0 - <5	2.0

1 Spain has reported very low LOD values for 2007. Possible unit-error.

Hydrological data and calculation practices

As demonstrated by Borgvang et al. (2006), the interpolation method used to calculate riverine loads have a significant impact on the result. The RID Principles require that the load of a specific determinant transported by a river should be estimated by taking the product of the mean flow-weighted concentration and the total flow, expressed by the following formula:

$$Load = Q_r \frac{\sum_{i=1}^{n}(C_i \cdot Q_i)}{\sum_{i=1}^{n}(Q_i)}$$

where

Ci = measured concentration in sample i

Qi = corresponding flow for sample i

Qr = mean flow rate for each sampling period (i.e., annual flow)

N = number of samples taken in the sampling period

As noted in the 2005 assessment, most countries use this formula, although there are variations for some rivers and countries, which in particular seem to be due to the lack of continuous flow data, or flow data for the sampling date. In order to study this further, an overview has been produced of the hydrological data coverage for the RID catchments, see table below.

Table VIII: Water flow monitoring.

Country	Water flow monitoring				Comments
	Continuous	Daily	Weekly	Monthly	
Belgium				X	Monthly water flow monitoring in Scheldt. Monitoring procedures in other rivers vary, i.e., continuous, daily or monthly monitoring. In some rivers the water flow measured in 1993 is used as annual mean. In the Gent-Oostende canal hourly measurements have been used since 2004.
Denmark					NI
France	X				Daily data are used for the calculations.
Germany	X				Load calculations are based on mean daily flows.
Iceland					NI
Ireland					NI
Netherlands		X			
Norway	X				Continuous monitoring in the main rivers, modelled water discharge in tributaries.
Spain					Cannot give a general answer because it depends on the authority performing the analysis.
Sweden				X	No tributaries reported on
UK		X			Depends, but generally daily

Consequently, three Contracting Parties have reported continuous flow measurements, whereas two countries have reported daily recordings. For all practical purposes, daily measurements should be sufficient for calculating loads in larger rivers. On the other hand, monthly measurements, as applied by Belgium for the Scheldt, are preferred in that catchment for hydrological reasons in order to enhance the accuracy of the load estimates. The monitoring point is situated in the tidal region where the water flow balance is calculated with a monthly frequency only.

Main and tributary rivers- harmonisation of approaches

The frequency of river sampling required by the RID Principles differs for main and tributary rivers. The RID Principles define *main river* as a river to be monitored at least once a month (12 datasets) every year in accordance with the objectives of the RID Study, as set out in its paragraph 1.4. Main rivers should be major load bearing rivers. *Tributary river* is defined as a river with separate catchment from a main river and with an outlet directly to the maritime area or to a main river downstream of a river monitoring point. A tributary river should be a minor load bearing river and can be sampled at a frequency determined by each Contracting Party.

The data and supplementary information reported by Contracting Parties for 2007 suggest that different approaches are used by Contracting Parties in classifying rivers as main or tributary rivers and in reporting related inputs.

Main rivers

Contracting Parties have very different river patterns. Whereas some countries report on a few, large rivers (such as Germany), others have a large set of smaller rivers draining into the coastal areas (e.g. UK, Ireland, Norway, Denmark and Sweden). This necessarily also reflects the number of samples annually collected from each river. However, most countries sample a minimum of 12 samples a year from the main rivers, but there are exceptions (e.g. Ireland and Iceland). Whereas most Contracting Parties report that these samples are distributed as once per month (e.g. Norway, UK) or more often (e.g. Belgium, the Netherlands), Germany reports "cross-section measurements" (i.e. several samples at defined locations and depths on a river cross-section) for Elbe, Weser and Ems and "representative random sampling" for the Eider (i.e. several random samples across the river, but not in a pre-defined pattern as in the cross-section sampling). Germany also performs flood triggered additional sampling.

Tributary rivers

It follows from the information submitted by Contracting Parties that their interpretation of what is meant by ‘tributary rivers’ varies widely. Germany seems to define “tributaries” true to the word – i.e. rivers which are tributaries to the main rivers entering the sea. In countries such as Norway, where altogether 247 rivers are entering the sea, rivers directly discharging into the OSPAR Maritime Area are treated as “tributary rivers” either because they are smaller rivers or because these rivers carry less pollutant loads to the sea. Thus, in order to monitor this large number of rivers within reasonable costs, Norway has identified under the RID Principles 10 rivers as “main rivers” and 36 rivers as ”tributaries”. In Iceland, where population is scarce, only two rivers are monitored and none is a tributary. Some countries do not report on tributary rivers at all (e.g. Iceland, the Netherlands), and others, like Ireland, report all rivers without any distinction of type. UK does not report on specific rivers, but on regions, sub-regions and zones.

For those countries reporting ‘tributaries’, the sampling frequency varies. Germany samples their tributaries up to 12 to 13 times a year (e.g. Elbe, Eider tributaries), whereas in France the frequency for sampling tributaries varies between 4 and 12 times a year. In Spain and Belgium the tributaries are mainly sampled 12 times a year. In Norway, “tributary rivers” entering the sea are sampled 4 times a year. However, an effort is made to sample during different climatic conditions (such as snow melt season, summer low flow and autumn rains).

INPUT 2007 considered a proposal for arriving at a more common understanding of tributary rivers by using the sampling frequency rather that riverine channel patterns as determining feature. One other possibility could be to refer to ‘main rivers’ and ‘other rivers’, where the main rivers are those with substantial inputs/loads. Finally, one could get completely ‘rid of’ the notion of main and tributary rivers by only referring to ‘rivers’.

Use of the RID data for other purposes

In the context of the RID programme and RID reporting, international reporting and implementation of e.g. EC Directives (such as the Water Framework Directive and the Nitrates Directive), OSPAR measures, such as PARCOM Recommendations 88/2 and 89/4, reporting to international organisations such as the EEA (EIONET), it is important to seek synergies, avoid duplication of efforts and maximise the use of available reliable and comparable monitoring results.

In that respect the use and availability of long-term time series such as the monitoring carried out within RID may prove to be of importance, also for e.g. the development of catchment related Management Plans and detection of trends.

In order to assess the current situation with regard to the use of RID data amongst Contracting Parties and suggest improvements based on some Contracting Parties experiences, the questionnaire also deals with how RID data are made use of.

Table IX shows the current situation amongst those Contracting Parties that have responded. *Contracting Parties will be invited to study the status of the use of RID data and suggest, whenever appropriate, how to maximise the use within the various countries and at international level.*

Table IX: The use of RID data for other purposes than the OSPAR reporting.

Type of use:	Yes	No	Comments
General national watershed planning	Spain, Sweden, UK		Spain: National sewage treatment plan
Used for setting environmental goals	Spain, Sweden		Spain: In application of Directive 2006/11 EC on Hazardous Substances
Used in connection with the implementation of the EU Water Framework Directive	France, The Netherlands, Spain, Sweden, UK		France: The OSPAR recommendations have been taken into account for the selection of monitoring stations in the monitoring programme. The Netherlands: Riverine input data are used for WFD, but as WFD has defined water bodies, calculations are made using raw data, not the compiled RID data Spain: Used for the analyses of pressures on coastal and transitional waters.
Regional and local watershed planning	France, Spain, Sweden		France: Planning, some Water Agencies integrate the results obtained within RID to programme measurements. Spain: Taken into account in drafting river basin management plans
Other international reporting	France, Sweden		France. EIONET Water data flows by the European Environment Agency Sweden: HELCOM, EEA (EIONET)
Research and development:	France, Sweden, UK		France: In progress with the French institute Ifremer, involved in another OSPAR programme (EUC)
Other (please specify):	Norway		Norway: RID data are used within other monitoring programmes in Norway to complement and/or assess results, e.g. Outer Oslofjord, coastal monitoring programme, as well as within the SOA linked to the TEOTIL estimates.

Papers/ reports where national (or international) RID data have been used:

France: A co-operation is in progress with Ifremer to highlight the RID Data.

Spain: Medio ambiente en España 2006 – Annual report from the Spanish Ministry of the Environment

Quality Assurance

A riverine input is a mass of a determinant carried to the Maritime Area by a watercourse (natural river or man-made watercourse) per unit of time. The objective of the water sampling, analyses and quantification process is to obtain as accurate as possible an estimate of the inputs of the agreed RID parameters to coastal waters, and to obtain information on the long-term trends in inputs where such information might provide an additional or a better basis for a trend assessment.

In general, the RID Principles (OSPAR agreement 1998-5, update 2005) should ensure that important QA issues are handled adequately by each Contracting Party, and the RID Programme results should be such as to allow comparison between countries.

However there are a number of Quality Assurance (QA) issues that need to be considered commonly. These are issues linked to:

- data quality as such;

- harmonisation and transparency in procedures, principles applied;
- reliability (methods in measurements, analyses, uncertainty);
- comparability of results, of procedures and tools;
- sufficient resource allocation per country to reach required common goals; and how this should be achieved amongst Contracting Parties.

Issues linked to detection limits and analytical methods, technology linked to automatic monitoring stations-or increased sampling frequency (e.g. event based sampling) are ‘cost driven’.

In 2007, most Contracting Parties reported that the quality assurance procedures were available only in their respective national languages and not in English, making their assessment more difficult. To support a review of the QA arrangements under the RID Principles in the light of national practice, Norway prepared, in 2006, proposals for possible QA steps based on their QA procedures for the Norwegian RID Report. This covered some main aspects of QA relating to sampling strategies, analytical methods, detection limits, technical and historical quality assessment, load calculation and some general considerations. INPUT 2007 agreed that the proposal should be used as a starting point for the review of section 10 of the RID Principles by INPUT 2008.

The QA issues are linked to uncertainty, selection of rivers (in countries where not all rivers can be monitored for practical and financial reasons), sampling strategy (when and where to sample, frequency, considerations linked to storm flow events), detection limits, analytical methods and load calculations.

Uncertainty

A number of questions can also be raised under the ‘chapeau’ of data uncertainty, viz.:

- Why is an awareness of uncertainty essential in evaluating the state of knowledge about environmental variables/systems?
- How can information on uncertainty be obtained in the first place and what are the problems to be solved?
- How can the uncertainty related information be organised and used in a way that is useful for answering practical questions about the sufficiency and accuracy of results?
- Uncertainty at all levels of data gathering and ’data manipulation’
- What is ’acceptable’ uncertainty for water managers, for countries, for OSPAR?

Contracting Parties should endeavour to assess the uncertainty of the results that they ‘accept’, or phrased in a different way, costs and benefits of more accurate data should be assessed and become a common understanding to all parties involved.

Selection of rivers

- Every Contracting Party should aim to measure 90 % of the total inputs to the Maritime Area, as outlined in the PARCOM requirements. This is obviously most difficult for countries with a large number of rivers (e.g. Denmark, UK and Norway), as all cannot, for practical and budgetary reasons be monitored. In the case of unmonitored rivers, issues for QA are e.g., the transferability of results from none monitored river to a river with similar hydrological-chemical regime, and modelling practices.

Sampling Strategy

With regard to sampling strategy, the following important aspect should be considered:

- Importance of agreed Sampling Protocol, same procedures for everybody’

- Trained workers (often best to involve local staff, as they will easily recognise changes and abnormal variations in the rivers, and they will also be able to take action if any unforeseen events occur.
- Quick and safe transfer of samples to laboratory. You will probably never get too many samples. There are few, if any, sensors that can analyse RID parameters continuously. If not all rivers are monitored, monitoring efforts should be directed towards the rivers with the highest inputs. Insufficient sampling frequency is obviously a challenge when assessing whether the monitoring provide reliable results.

The sites should be located in regions of unidirectional flow (no back eddies). In order to ensure as uniform water quality as possible, sites where the water is well mixed should be chosen, such as at or immediately downstream a weir, in waterfalls, rapids or in channels in connection with hydroelectric power stations. Sampling sites should be located as close to the freshwater limit as possible, without being influenced by seawater (issue of 'unmonitored areas'). *Contracting Parties should report the distance from the monitoring points to the sea, and any problems with seawater intrusion.*

Chemical parameters – detection limits and analytical methods

The RID principles state that it is necessary to choose an analytical method, which gives at least 70 % of positive findings (i.e. no more than 30% of the samples below the detection limit). The detection limit should be at least as low as the limits adopted by OSPAR in 2005.

The use of different detection limit issue is clearly a considerable problem both within countries and for comparison of result between countries.

Optimally the same accredited laboratory should be used for all rivers within a country. If this is not possible, intercomparison of results should take place. In cases of changes of laboratories, over time an intercomparison should be carried out during a certain 'transfer of responsibility period'. This is most likely a problem in some countries both in terms of using several laboratories and in cases where laboratories have changed in the period 1990 to date.

Technical QA is to be performed by laboratory staff to ensure that the technical aspects of the analysis have been appropriate. Historical QA, i.e. monitoring results checked against historical data should be undertaken by qualified researchers with experience in assessing water quality data. This should be done as soon as possible after analysis so whenever anomalies are found, the samples can be re-analysed.

Trend analysis QA, i.e. long time-series e.g. 15 years, and possibly no data gaps will allow trend analysis to be undertaken. In addition to really giving an indication as to whether there is an upward or downward trend in concentrations/loads, it can also point to possible errors in data.

Trustworthy trend analyses may be difficult to undertake in many cases, but is ideally an important tool for the forthcoming RID assessments.

Load calculations

The formula given by the RID Principles should be used for calculating loads for all of the rivers (the annual load expressed as the product of a flow-weighted estimate of annual mean concentration and annual flow). The issue of how to handle concentrations below detection limits (upper and lower estimates) needs to be clarified (upper equals detection limit, lower equals zero or half of detection limit).

The HARP Guidelines or equivalent principles should be applied to calculate loads from:

- Municipal wastewater and scattered dwellings
- Aquaculture

- Industry
- Losses from urban areas

It is important to include as many (optimally all) WWTPs and industrial plants as possible. Monitoring of discharges from industrial plants may, in many catchments and countries, introduce underestimation as monitoring only takes place for licensed discharges. Furthermore, *the actual sampling frequency at industrial plants may be insufficient*.

Losses from urban areas may be underestimated or not taken account of at all. They may represent a large source of underestimation of inputs as many large cities are located close to the sea.

With regard to diffuse losses, there is no common methodology, neither in HARP-NUT Guideline 6 (which deals only with N and P), nor is it an outcome of the EUROHARP project (see www.euroharp.org). Some countries have their own models for quantifying diffuse losses of nutrients, but in many cases data unavailability, accuracy and reliability introduce considerable errors in inputs. The problem is probably even larger for diffuse losses of heavy metals. The issue of comparability of results between countries is in this case probably even more important than for riverine inputs.

Concluding remarks on QA

It follows from the foregoing analysis that there is a whole range of possible sources of errors that are linked to RID data and might influence their accuracy, reliability and comparability. This includes for example different practices in:

- sampling methodology (frequency, distance from river mouth, site in river);
- pollutant losses covered by direct monitoring, by estimation and/or modelling, as well as land areas/sources not covered at all;
- direct discharges and how they are accounted for;
- which parameters are analysed;
- calculation practices;
- quality assessment procedures; and
- the number of institutions involved per country in the various parts of the national programmes.

RID data reported by Contracting Parties must be seen and assessed against this background. Contracting Parties are invited to summarise principles from the foregoing for inclusion in revised RID Principles.

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