OSPAR COMMISSION

Protecting and conserving the North-East Atlantic and its resources

Discharges of Radionuclides from the Non-nuclear Sectors in 2013

Radioactive Substances Series

2015

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.

The Contracting Parties are Belgium, Denmark, the European Union, Finland, France, Germany, Iceland, Ireland, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

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.

Les Parties contractantes sont l'Allemagne, la Belgique, le Danemark, l'Espagne, 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, la Suisse et l'Union européenne.

Acknowledgement

This report has been prepared by the Expert Assessment Panel of the OSPAR Radioactive Substances Committee, comprising of Mr Henning Natvig (convenor), Norway, Mr Michel Chartier, France, Ms Inge Krol, Germany and Mr Andy Mayall (United Kingdom) with the support of Ms Luisa Rodriguez Lucas and Miss Lucy Ritchie of the OSPAR Secretariat.

Contents

Executive summary

Annual data collection by OSPAR on discharges from the non-nuclear sector has only been taking place since 2006 (collecting data from 2005). Due to the incompleteness of datasets, no data have been published until 2009. This is the seventh annual report and assessment of discharges from the non-nuclear sector published by OSPAR.

The 2013 data reported by Contracting Parties were sufficient to make an assessment of discharges from the offshore oil and gas sub-sector, which is the major non-nuclear source. It is also possible to judge the relative contribution from the medical sub-sector. Data are available for the other non-nuclear sub-sectors (universities and research, radiochemical manufacturing and various others), but they are considered to be of minor importance.

The radionuclides reported from the offshore oil and gas industry are: Ra-226, Ra-228, Pb-210, discharged via produced water. The data are converted into total alpha and total beta (excluding tritium) activity in order to be able to compare the magnitude with discharges from other sectors. In 2013, it was agreed that a baseline could be established for Ra-226 and Ra-228 based on reported discharge data from 2005 – 2011 although a baseline for Pb-210 had not been considered, as datasets available needed further examination.

Récapitulatif

Le recueil annuel, par OSPAR, des données sur les rejets provenant du secteur non-nucléaire n'a lieu que depuis 2006 (recueil des données de 2005). Aucune donnée n'a été publiée avant 2009, les séries de données étant jusque-là incomplètes. Il s'agit donc du septième rapport annuel, et évaluation, des données sur les rejets provenant du secteur non nucléaire publié par OSPAR.

Les données de 2013, notifiées par les Parties contractantes, sont suffisantes pour permettre une évaluation des rejets provenant du sous-secteur pétrolier et gazier offshore, qui représente la source principale non nucléaire. Il est également possible d'évaluer la contribution relative du sous-secteur médical. Des données sont disponibles pour les autres sous-secteurs non nucléaires (universités et recherche, industrie radiochimique et divers autres), mais elles sont considérées comme étant d'importance mineure.

Les radionucléides notifiés, provenant de l'industrie pétrolière et gazière d'offshore, sont les Ra-226, Ra-228, et Pb-210, rejetés avec l'eau de production. Les données sont converties en activité alpha total et activité bêta total (à l'exception du tritium) afin de pouvoir en comparer la magnitude avec les rejets provenant d'autres secteurs. En 2013, il a été convenu qu'une ligne de base pouvait être établie pour le Ra-226 et le Ra-228 sur la base des données de rejet notifiées à partir de 2005-2011, bien qu'aucune ligne de base n'ait été envisagée pour le Pb-210, car les ensembles de données disponibles doivent faire l'objet d'un examen supplémentaire.

1. Introduction

Work to prevent and reduce pollution from ionising radiation in the North-East Atlantic was first undertaken within the framework of the former 1974 Convention for the Prevention of Marine Pollution from Land-based Sources (the "Paris Convention") and then under the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention"), which replaces the Paris Convention and establishes the OSPAR Commission.

At the first Ministerial Meeting of the OSPAR Commission (20-24 July 1992, Sintra, Portugal) an OSPAR Strategy for Radioactive Substances was adopted to guide the future work of the OSPAR Commission on

protecting the marine environment of the North-East Atlantic against radioactive substances arising from human activities. This strategy was revised at the third Ministerial Meeting of the OSPAR Commission (23-24 September 2010, Bergen, Norway), where the Strategy of the OSPAR Commission for the Protection of the Marine Environment of the North-East Atlantic 2010-2020 (the "North-East Atlantic Environment Strategy") was adopted.

The North-East Atlantic Environment Strategy sets out OSPAR's vision, objectives, strategic directions and action for the period up to 2020. In Part I, the new Strategy gives prominence to the overarching implementation of the ecosystem approach and the need for integration and coordination of OSPAR's work across themes and groups. In Part II, the Strategy provides its thematic strategies for Biodiversity and Ecosystems, Eutrophication, Hazardous Substances, Offshore Oil and Gas Industry and Radioactive Substances.

The Radioactive Substances thematic Strategy (Radioactive Substances Strategy) sets the objective of preventing pollution of the OSPAR maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances, with the ultimate aim of concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances. In achieving this objective the following issues should, *inter alia*, be taken into account: (1) radiological impacts on man and biota, (2) legitimate uses of the sea, and (3) technical feasibility.

As its timeframe, the Radioactive Substances Strategy further declares that the OSPAR Commission will implement this Strategy progressively by making every endeavour, through appropriate actions and measures to ensure that by the year 2020 discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses, are close to zero.

The Radioactive Substances Strategy provides that in accordance with the provisions of the OSPAR Convention and the findings of the Quality Status Report 2010, the OSPAR Commission will, where appropriate, develop and maintain programmes and measures to identify, prioritise, monitor and control the emissions, discharges and losses of the radioactive substances caused by human activities which reach, or could reach, the marine environment.

To this end, the Radioactive Substances Strategy requires the OSPAR Commission to continue the annual collection of data on discharges from the non-nuclear sector. Regular reporting is therefore required in order to review progress towards the targets of the Radioactive Substances Strategy.

The OSPAR Commission adopted in 2005 a set of reporting procedures to be used for annual reporting of data on discharges from the non-nuclear sector which were updated in 2013 (OSPAR Agreement number 2013-11). Trial runs of reporting made in accordance with the procedures were conducted in 2006 and 2007 with data from 2004 and 2005. Both these datasets and the 2006 data reported in 2008 were incomplete and could not be published. This report presents and assesses the 2013 data, and for the offshore oil and gas sector, also presents the total discharges from 2005 to 2013.

This report includes an estimate on uncertainty (given as +/- numerical values after the value of discharged water) for Ra-226, Ra-228 and Pb-210 for the oil and gas sectors. The estimate was requested by the Expert Assessment Panel so that they can report on discharge data measurement uncertainty.

An overview of potential non-nuclear sources of radioactive discharges is given in Table 1 below.

Contracting Party	Oil/gas extraction (inc. on-shore)	Phosphate Industry	Titanium-Dioxide Pigment	Steel	Rare Earth	Medical	Universities and Research Centres	Radio chemical production
Belgium	Not present	Present	Present	Present	Not present	Present	Present	?
Denmark	Present	Present	Not present	Not present	Not present	Present	Present	?
Finland	Not present	Present	Present	Present	Not present	Present	Present	?
France	Present	Present	Present	Present	Present	Present	Present	?
Germany	Present	Not present	Present	Present	Not present	Present	Present	?
Iceland	Not present	Not present	Not present	Not present	Not present	Present	Present	?
Ireland	Present	Not present	Not present	Not present	Not present	Present	Present	Not present[1]
Luxembourg	Not present	Not present	Not present	Present	Not present	Present	Present	?
Netherlands	Present	Present	Present	Present	Not present	Present	Present	?
Norway	Present	Not present	Present	Present	Not present	Present	Present	?
Portugal	Not present	Present	Not present	Present	Not present	Present	Present	?
Spain	Present	Present	Present	Present	Not present	Present	Present	Not present
Sweden	Not present	Not Present	Not present	Not Present	Not present	Present	Present	?
Switzerland	Not present	Not present	Not present	Not Present	Not present	Present	Present	Present (GTLD manufacture)
United Kingdom	Present	Not present	Present	Present	Present	Present	Present	Present

Table 1 Non-nuclear sectors with the potential to discharge radioactive substances to the OSPAR maritime area

[1] Fluorine (F-18) is produced in Ireland for Positron Emission Tomography (PET). However, F-18 has a half life of 109,8 minutes and so is not reported.

2. Assessment of the radioactive discharges from non-nuclear sources in 2013

2.1 Introduction

RSC 2004 agreed that Contracting Parties should report the discharges from their non-nuclear sub-sectors annually using the agreed reporting template. The data for 2013 have been reported in accordance with the Revised Reporting Procedures for Discharges of Radioactive Substances from Non-Nuclear Sectors. Data have been collected for the years from 2005 to 2013. Not all Contracting Parties (CPs) have provided data for 2013: 6 out of 8 CPs reported for oil/gas; 8 CPs reported on their university and research; and 7 CPs reported on their medical sector. The number of CPs reporting and the completeness of the reports is less than 100% and have remained unchanged in recent years.

There are sufficient data to make an assessment for 2013. The reports for produced water discharges from the oil/gas sub-sector cover the major contributions and, although incomplete, it is possible to judge the relative contribution from the medical sub-sector. Other sub-sectors are either well reported or make relatively insignificant contributions.

It has been necessary to estimate certain discharges from incomplete data – consequently care needs to be taken in using this assessment report for purposes other than those envisaged by OSPAR RSC. In this assessment report the term “total beta” means total beta (excluding tritium) – the full definition is used in headings, but the abbreviation is used in the text.

2.2 Discharges from the oil/gas sub-sector

Data were provided by Norway, the Netherlands, UK, Ireland, Germany and Denmark. The total discharges of the three radionuclides radium-226 (Ra-226), radium-228 (Ra-228) and lead-210 (Pb-210) from this sub-sector in 2013 were 1.50 TBq, a decrease of about 0.35 TBq from the previous year. The discharges of Ra-226 decreased by 0.27 TBq and the discharges of Ra-228 decreased by 0.06 TBq relative to the discharges in 2012. The UK, Norway and the Netherlands are the principal contributors, and in 2013 the relative contributions, based on produced water activities, were: Norway 49%, UK 33% and the Netherlands 15%. The contribution from Denmark was about 2%. The total discharges reported by the other CPs amounted to less than 0.1%. The contribution from Norway returned to its 2011 level increasing by about 6% compared with 2012. The contributions from UK and the Netherlands decreased by about 3.5% and 2% respectively. There is an unknown, but probably minor, contribution from the other two CPs with an oil/gas industry.

Figure 1 gives the discharges to sea of Ra-226, Ra-228 and Pb-210 for the years 2005 – 2013.

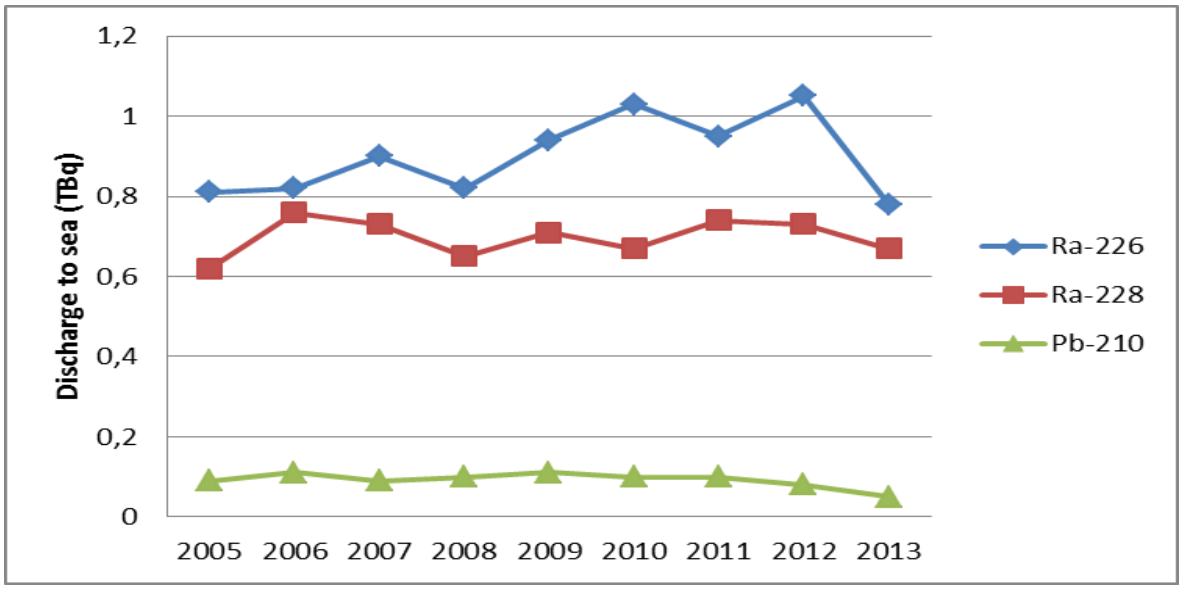

Figure 1: Discharges of Ra-226, Ra-228 and Pb-210 to sea from the oil and gas sub-sector 2005 - 2013

Figure 1 shows that there have been some variation in the discharges of Ra-226 and Ra-228 in the nine years with data, and that the graphs do not show a clear trend. The highest discharges of Ra-226 took place in 2012 where the discharges were 1.05 TBq, the highest discharges of Ra-228 took place in 2006 (0.76 TBq). The lowest values for discharges of Ra-226, 0.78 TBq, are found in 2013 while the lowest value for discharges of Ra-228 occurred in 2005.

Total alpha and total beta discharges from produced water have been estimated based on reported measured values for Pb-210, Ra-226 and Ra-228 and using the formulae agreed at RSC to include contributions from key radioactive daughter products in the respective decay chains. The results of the calculations are presented in Table 2 and Table 3 for total alpha and total beta respectively. The assessments are based on produced water discharge data, while the data on scale discharges are improving the magnitude of discharge from this source is very small compared to the produced water contribution.

Although the formulae for calculating the total alpha and total beta discharges from the oil/gas sub-sector were derived in order that comparison could be made with the equivalent discharges from the nuclear sector, it should be remembered that total alpha and total beta discharges for the oil/gas sector are estimated values, rather than directly measured values. To that extent they differ from the measured values reported for the nuclear sector.

a) Total alpha from produced water discharges

The agreed formula for the calculation of total alpha discharges from produced water is:

Total alpha (TBq) = (5xRa-228)+(4xRa-226)+(1xPb-210).

The formula assumes equilibrium in these decay chains at the time of discharge.

The total alpha discharges, not including scale, are given below; for comparison the reported Ra-226 and the total measured alpha discharge from the nuclear sector are also illustrated.

	Oil/gas		**Nuclear**
	Total alpha	**Ra-226**	**Total alpha**
2005	6.4	0.81	0.52
2006	6.9	0.78	0.34
2007	7.4	0.90	0.19
2008	6.76	0.82	0.17
2009	7.4	0.94	0.18
2010	7.6	1.03	0.18
2011	7.6	0.95	0.17
2012	7.9	1.05	0.19
2013	6.5	0.78	0.2

Table 2: Total alpha discharges 2005-2013 from oil and gas subsector. Total alpha from nuclear sector is presented for comparison (TBq).

While a large number (>100) of offshore installations contribute to the total alpha discharge, approximately 19% arises from just two installations in the Troll Oilfield in the Norwegian sector of the North Sea.

b) Total beta (excluding tritium) from produced water discharges

The agreed formula for the calculation of total beta discharges from produced water is:

Total beta (TBq) = (4xRa-228)+(2xRa-226)+(2xPb-210)

The formula assumes equilibrium in these decay chains at the time of discharge.

The total beta discharges, not including scale, are given below; for comparison the equivalent nuclear contributions are also illustrated.

	Oil/gas	**Nuclear**
	Total beta (TBq)	**Total beta (TBq)**
2005	4.25	160
2006	4.67	58
2007	4.94	33.4
2008	4.54	27.2
2009	5.02	29.8

2010	4.94	23.1
2011	5.03	25.9
2012	5.2	20.1
2013	4.34	16

Table 3: Total beta (excluding tritium) discharges 2005-2013 from oil and gas subsector. Total beta from nuclear sector is presented for comparison. (TBq)

c) Tritium and other radionuclides

Tritium is used as a tracer in the oil industry, and 0.14 TBq was used in the Norwegian sector during 2013 in connection with data collection from exploration wells. This is more than ten times the 2012 number. The discharges are still insignificant compared to the discharges from the nuclear industry. In addition about 0.03 GBq of bromine-82 (Br-82) were discharged in the Norwegian sector as part of an investigation into the dehydration of gas at one installation and 0.002 GBq of a beta/gamma emitting tracer was discharged in the British sector.

2.3 Medical sub-sector

RSC originally agreed that iodine-131 and technetium-99 (arising from the decay of the medical product technetium-99m) should be reported from the medical sub-sector. At RSC 2009 it was decided that so little technetium-99 was generated from the medical use of technetium-99m that data collection for technetium-99 could cease, and consequently no data have been provided since 2009.

Reporting of iodine-131 discharges is not required where delay tanks are used to deal with liquid effluents.

a) Total alpha discharges

No alpha emitting radionuclides are reported from this sub-sector.

b) Total beta (excluding tritium) discharges

The reported yearly discharges of iodine-131 up to 2010 have been in the range 16 TBq to 26 TBq with the highest value recorded in 2010. The following three years the total reported discharges of Iodine-131 discharged and in 2013 the total reported discharges have decreased to 13.2 TBq. The reported discharge of I-131 is likely to be an under-estimate as not all CPs reported. Iodine-131 is widely used in medicine, and in Europe its use is assumed to be approximately proportional to population. Therefore for those CPs that did not report discharges of I-131 a very rough estimate has been made on the basis of the relative population size of the catchment area. The total discharge of iodine-131 in 2013 is likely to be 17.2 $\pm$ 5 TBq/y. This is about 1 TBq higher than the discharges of total beta from the nuclear industry, which in 2013 amounted to 16 TBq.

2.4 University and research sub-sector

It is difficult to make an assessment of the discharges from this sector as reporting is very variable. From the data that have been provided it has been possible to conclude that this sector is not a significant contributor to total beta (< 0.4 TBq/y) or tritium (< 0.1 TBq/y) discharges and there are no reported alpha emitting radionuclide discharges.

2.5 Radiochemical manufacturing sub-sector

Radiochemical manufacturing is carried out in several of the Contracting Parties, however only the UK and Switzerland have reported separately on this sub-sector in 2013?. The discharges from this sub-sector are usually included in those for the nuclear site on which the processes are carried out. The data below reflects the discharges from UK and Switzerland.

a) Total alpha

The reported total alpha discharge for 2013 was 4.8 MBq. This is a very minor contribution to the overall total alpha discharge to the maritime area.

b) Total beta (excluding tritium)

The total discharges of beta emitters during 2013 from this sub-sector are reported to 6.3 GBq which is much less than the previous year and is a minor contribution of the total beta discharges to the marine environment. Of these discharges about 4 GBq are reported as discharges of C-14.

c) Tritium

In 2013 tritium discharges amounted to 0.03 TBq, This is only about 15 % of the magnitude previous year. These discharges represent a minor contribution to tritium discharges in the OSPAR maritime area; nuclear sector discharges of tritium are more than five order of magnitude greater than this. These discharges of tritium are often in the form of tritium labelled organic compounds, which have different environmental pathways/fates to that of tritiated water, which is the most common form of tritium discharged by the nuclear industry.

2.6 Other non-nuclear sub-sectors.

Discharges were reported for the phosphate industry and titanium dioxide pigment manufacture and rare earth mineral production. None of these sub-sectors made a significant contribution to the overall discharges of total alpha, total beta or tritium.

2.7 Summary and conclusions.

For 2013 the overall summary including comparison with the nuclear sector is shown below:

	Non-nuclear sector (TBq)					**Nuclear sector (TBq)**
	Oil/gas	Medical	Univ/R&D	Radiochem	**Total**	
Total alpha	6.5	-	-	-	**6.5**	0.2
Total beta	4.3	17.2 ± 5*	0.32	0.006	**21.8± 5**	16
Tritium	0.14	-	0.08	0.03	**0.25**	18000

* estimate based on 13.2 TBq reported by 7 Contracting Parties

The oil/gas sub-sector is the principal source of total alpha discharges to the OSPAR area, accounting for 97 % of the total from all sectors (non-nuclear and nuclear). This sub-sector also makes a 11.3 % contribution to the overall total beta from all sectors (nuclear and non-nuclear). In total, the non-nuclear sector contributed an estimated 57 % of the total beta discharges from all sectors, with the largest single contribution 45 % coming from the iodine-131 discharges from the medical sub-sector. Tritium discharges from the non-nuclear sector are insignificant in comparison with those from the nuclear sector.

3. 2013 data and information

In this section of the report, data and information on discharges from the non-nuclear sectors are presented for each Contracting Party.

The columns, headings and abbreviations used in the tables correspond to the reporting requirements set out in the reporting format (OSPAR Agreement number 2013-11). The following abbreviations for radionuclides (elements) are used in the tables:

C:	Carbon	Po:	Polonium
Cr:	Chromium	Ra:	Radium
H-3:	Tritium	S:	Sulphur
I:	Iodine	Th:	Thorium
P:	Phosphorus	Pu:	Plutonium
Pb:	Lead		

3.1 Data reported on discharges from the offshore oil and gas industry

Contracting Parties have been invited to report the estimated discharges from offshore installations of radioactive substances:

a. in produced water (Pb-210, Ra-226, Ra-228);

b. from descaling and decommissioning operations (Pb-210, Ra-226, Ra-228, Th-228);

c. from tracer experiments (H-3, other beta and gamma emitters).

Table 3.1 shows the data from the offshore oil and gas industry.

Table 3.1. Discharges from the offshore oil and gas industry in 2013, in terabecquerel (TBq). Shaded boxes are not applicable.

		CP	OSPAR Region [1]	Pb-210	Ra-226	Ra-228	Th-228	H-3	Other b/g emitters
Produced water, TBq (DE1 - DE3) (NL1 - NL3) (NO1 - NO6) (IE1) (ES1) (UK1 - UK5)		DK	II	0,00E+00	1,88E-02	1,18E-02			
		DE	II	9,00E-06	3,30E-04	2,10E-05			
		IE	III	1,26E-06	1,83E-06	3,19E-07			
		NL	II	7,00E-03	9,60E-02	1,24E-01			
		NO	I	4,08E-03	4,36E-02	4,58E-02			
		NO	II	2,67E-02	3,36E-01	2,87E-01			
		UK	II	1,47E-02	2,89E-01	1,99E-01			
		UK	III	4,56E-07	8,73E-06	5,91E-06			
Descaling operations, both offshore and onshore, from normal production that leads to discharges (UK6)	Radioactivity in suspended solids arising from water-jet descaling (TBq)	NO	II	4,08E-07	6,69E-07	3,71E-07			
		UK	II	6,01E-05	6,92E-05	2,74E-05	1,51E-05		
	Radioactivity in solution as a result of descaling using acids or scale dissolvers (TBq) (UK7)	NO	II	8,50E-09	2,00E-08	1,00E-08			
Descaling operations, both offshore and onshore, from decommissioning of oil and gas installations that leads to discharges (UK8)	Radioactivity in suspended solids arising from water-jet descaling (TBq)	UK	II	7,67E-08	1,12E-06	1,43E-07			
	Radioactivity in solution as a result of descaling using acids or scale dissolvers (TBq)	NO	II	1,10E-06	1,40E-06	1,00E-06			
Radioactivity discharged as a result of tracer experiments (TBq) (UK9)		NO	I					1,09E-01	
		NO	II					2,60E-02	3,00E-05
		UK	II						2,00E-06
Total discharged radioactivity, TBq (UK10)									

Further details on the data reported in Table 3.1 are given below.

1. The five OSPAR sub-regions are:

   (I) The Arctic,

   (II) The Greater North Sea (including the English Channel),

   (III) The Celtic seas,

   (IV) The Bay of Biscay/Golfe de Gascogne and Iberian coastal waters, and

   (V) The wider Atlantic.

   The definitions of these and a map are given in the Strategy for the Joint Assessment and Monitoring Programme.

Denmark

DK1 Produced Water Uncertainty for Pb-210: +/- 1,19E-02

DK2 Produced Water Uncertainty for Ra-226: +/- 1,70E-02

DK3 Produced Water Uncertainty for Ra-228: +/- 3,84E-03

Germany

DE1 Activity of Pb-210 in the produced water of A6-A is lower than the MDA (minimal detectable activity). Total activity is lower than 9 MBq, based on volume of produced water x MDA.

Ireland

IE1 Uncertainties in the discharges were not quoted as all the radioactivity measurements were below detection limits.

Luxembourg

LU1 there has been no change in the data regarding the discharges of radioactive substances from the non-nuclear sectors and the data published in the last report therefore remain valid.

The Netherlands

NL1 Produced Water Uncertainty for Pb-210: +/- 0,0007

NL2 Produced Water Uncertainty for Ra-226: +/- 0,0096

NL3 Produced Water Uncertainty for Ra-228: +/- 0,0124

Norway

NO1 Area I Produced Water Uncertainty for Pb-210: +/- 0,0009

NO2 Area I Produced Water Uncertainty for Ra-226: +/- 0,0041

NO3 Area I Produced Water Uncertainty for Ra-228: +/- 0,0065

NO4 Area II Produced Water Uncertainty for Pb-210: +/- 0,005

NO5 Area II Produced Water Uncertainty for Ra-226: +/- 0,0018

NO6 Area II Produced Water Uncertainty for Ra-228: +/- 0,0011

Spain

ES1 Two Spanish off-shore gas production platforms are located in the OSPAR area. One of them produces gas and the other is only used to store gas. According to the current Spanish legislation (Royal decree adopted in 2000 under Article 32 of the Law on Hydrocarbons) no discharges are allowed from offshore installations. Produced water is re-injected or treated onshore. Therefore, no radioactive substances in produced water and scale are discharged to the marine environment.

3.2 Data reported on discharges from other non-nuclear sectors

Contracting Parties have been invited to report the estimated discharges from the following other non-nuclear sources of radioactive substances:

a. the medical sector (I-131);
b. universities and research centres (H-3, C-14, P-32, S-35, Cr-51, I-125);
c. phosphate industry (Pb-210, Po-210, Ra-226);
d. titanium dioxide pigment manufactures (Pb-210, Po-210, Ra-226, Ra-228);
e. primary steel manufacture (Pb-210, Po-210);
f. radiochemical production (H-3, C-14, S-35, Cr-51, I-125, Pb-210, Po 210).

Table 3.2 shows the data reported from non-nuclear sector other than offshore oil and gas.

Table 3.2. Discharges from non-nuclear sector other than offshore oil and gas in 2013, in terabecquerel (TBq). Shaded boxes are not applicable.

			Discharges of specified radionuclides (TBq)														
Sector	CP	OSPAR Region [1]	I-131	H-3	C-14	P-32	S-35	Cr-51	I-125	Pb-210	Po-210	Ra-226	Ra-228	Th-228	Am-241	Total Alpha	Total Beta/ Gamma
Medical Sector [BE1) (DK1) (CH1) (NL1) (ES1) (UK1)]	BE	II	0,00E+00														
	CH	II	7,50E-03														
	DK	II	1,48E+00														
	IE	III	6,39E-01														
	IE	V	1,53E-01														
	NO	I	7,24E-01														
	NO	II	3,79E-01														
	SE	II	7,39E-01														
	UK	II	7,42E+00														
	UK	III	1,68E+00														
Universities & Research centres [BE2) (IE1) (IE2) (LU1) (UK2)]	BE	II		5,61E-03	7,15E-04	0,00E+00	0,00E+00	0,00E+00	1,83E+00								
	CH	II		9,16E-03	9,10E-04												
	IE	III		1,32E-03	2,50E-03	0,00E+00	0,00E+00	0,00E+00	1,07E-04								
	IE	V		9,00E-06	4,00E-07	4,00E-05	0,00E+00	0,00E+00	0,00E+00								
	LU	II		2,00E-04	1,50E-04	5,00E-06	4,00E-06		2,50E-05								
	NO	I		2,44E-05	1,88E-06	1,00E-06	1,00E-06	2,50E-06	9,00E-07								
	NO	II		1,27E-04	4,06E-06	0	0	0	3,048E-06								
	ES	IV		1,84E-03	8,92E-04	4,09E-02	2,73E-02	1,08E-03	7,33E-04								
	SE	II		8,27E-04	1,01E-03	2,00E-05	2,50E-05	3,50E-05	5,50E-05								
	UK	II		1,65E-02	1,82E-01	2,72E-02	1,98E-02	2,07E-03	1,43E-01								
	UK	III		4,20E-02	8,89E-03	2,09E-03	3,04E-03	1,73E-04	3,83E-02								
Phosphate industry [BE3) (ES2) (UK3)]	BE	II										3,00E-03					
Titanium dioxide pigment manufacturers [ES3) (UK4)]	BE	II											2,00E-03				
	NL	II								3,40E-03	3,40E-03	3,40E-03	1,40E-03				
	ES	IV								3,00E-05	3,00E-05	2,00E-05	<5,00E-03				
Primary steel manufacture [BE4) (ES4) (UK5)]	NL	II															
Rare Earth [BE5)(ES5)]	FR												2,87E-05	<5,91E-05			
Radiochemical production [CH2) (ES5)]	CH	II		2,32E-02													
	SE	II															
	UK	II		1,39E-03	1,14E-03											4,80E-06	4,17E-04
	UK	III		4,70E-03	2,87E-03												1,84E-03

Further details on the data reported in Table 3.2 are given below.

1. The five OSPAR sub-regions are:

   (I) The Arctic,

   (II) The Greater North Sea (including the English Channel),

   (III) The Celtic seas,

   (IV) The Bay of Biscay/Golfe de Gascogne and Iberian coastal waters, and

   (V) The wider Atlantic.

   The definitions of these and a map are given in the Strategy for the Joint Assessment and Monitoring Programme.

Belgium

BE1 I-131: Holding tanks are used to reduce concentrations of I-131 in the liquid discharges to below 10 Bq/l.

BE2 Holding tanks are used to reduce concentrations of P-32, S-35 and Cr-51.

BE3 Pb-210 and Po-210 are not monitored.

BE4 According to our knowledge, release of Pb-210/Po-210 from the steel industry would rather affect atmospheric discharge.

BE5 There is no primary rare earth production in Belgium. Production only occurs on basis of recycling what makes a significant release of natural nuclides unlikely

Ireland

IE1 In 2013 there was a significant increase in the amount of C-14 discharged, from 622 MBq in 2012 to 2504 MBq in 2013. The vast majority of C-14 discharges in Ireland originate from one licensee who had stockpiled significant quantities of waste which originated from one hospital's nuclear medicine department. This licensee is currently disposing of this legacy waste under licence from the RPII (now EPA's Office of Radiological Protection).

IE2 The discharges from the educational sector is likely to vary from year to year and is highly dependent on the specific research projects that are currently being undertaken by the colleges that use unsealed radionuclides. The most notable change in discharges in this sector was an increase in H3 discharges from 760 MBq in 2012 to 1327 MBq in 2013 which was attributable to increase discharges from one university.

Luxembourg

LU1 there has been no change in the data regarding the discharges of radioactive substances from the non-nuclear sectors and the data published in the last report therefore remain valid.

Spain

ES1 There are holding tanks to reduce the concentration of I-131 in the liquid discharges to below 10 Bq/l.

ES2 In 2011, one of the two Spanish plants producing phosphate fertilizers in the OSPAR area (Fertiberia) ceased the production of phosphoric acid by treating the phosphate rock with sulfuric acid (process in which phosphogypsum is generated). Since then the phosphoric acid to be used in the process is imported from Morocco. Additionally, the other plant (FMC Foret) was shutdown in 2012. Therefore, there is no production of phosphogypsum anymore. On the other hand, a restoration project of the phosphogypsum piles and ponds located in the area has been submitted to the CSN and it is under evaluation.

ES3 There is only one titanium dioxide plant that is located on the South West coast. According to the current Spanish legislation, NORM industries are not obliged to report on radioactive discharges. The provided activity values have been estimated from a study that is being carried out by the Sevilla and Huelva Universities. Therefore they are generic values.

ES4 According to the available information, in Spain there are not integrated steel plants. The Spanish steel making plants (conversion of pig iron to steel) operate a dry gas cleaning process and, for this reason, no discharges of Pb-210 and Po-210 take place.

ES5 Not present

Switzerland

CH1 Discharges from holding tanks in hospitals.

CH2 Swiss authorities require universities and research centres to use holding tanks to reduce concentration of P-32, S-35 and Cr-51 in liquid discharges.

CH3 Manufactures of gaseous Tritium Light Devices (GTLD) and tritium-labelling service of various organic compounds

Table: Percentage contribution to universities & research sector discharges

Radionuclide	Region II			Region III		
	Others*	Pharma-ceuticals	Laboratories	Others*	Pharma-ceuticals	Laboratories
H-3	46.0%	48.6%	5.36%	21.9%	75.8%	2.33%
C-14	7.88%	91.9%	0.19%	2.79%	97.2%	0.01%
P-32	96.4%	0.15%	3.44%	100%	0.00%	0.00%
S-35	96.3%	0.59%	3.10%	96.4%	3.60%	0.00%
Cr-51	99.5%	0.49%	0.00%	100%	0.00%	0.00%
I-125	26.2%	73.7%	0.11%	0.00%	100%	0.00%

[*] includes universities, educational establishments and medical research facilities

Due to the range of facilities, the method of estimation and origin is not uniform. Information from previous reviews suggests the majority of organisations determine discharges through direct measurement.

UK1 Phosphate Industry: There is no phosphate industry in the UK.

UK2 Titanium Dioxide Industry: One operator reported discharges of total alpha (3.74E-03 TBq), total beta/gamma (excluding tritium) (2.29E-02 TBq) and Th-232 (1.33E-02 TBq) to controlled waters in 2013.

UK3 Primary Steel Manufacturing: There are three primary steel manufacturing plants in the UK, two on the east coast of England (sub-region II) and one in Wales (sub-region III). However, the plants operate a dry gas cleaning process and any dust removed from the stack is either retained, recycled or sent to landfill. There are no liquid discharges arising from this process.

UK4 Rare Earth production: There is no rare earth production in the UK.

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