

## EN14 Discharge of oil from refineries and offshore installations

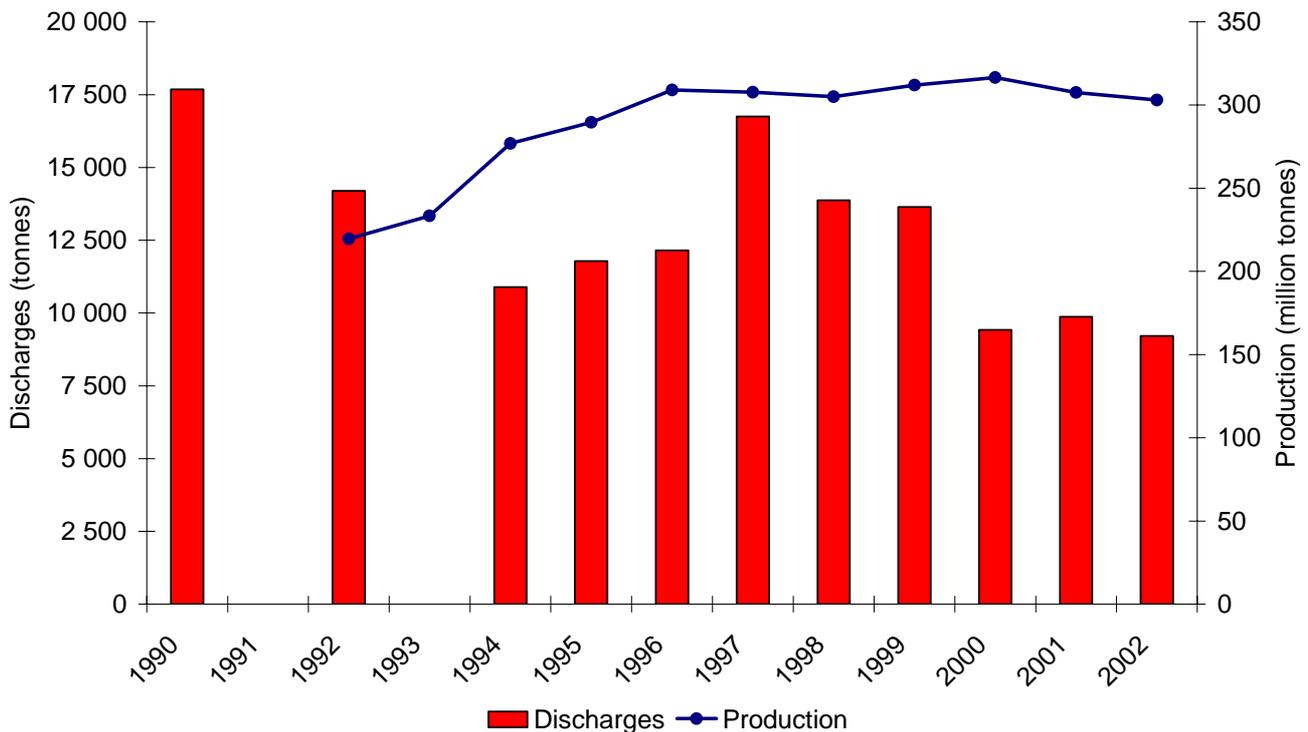
### Key message

Oil discharges from offshore installations and coastal refineries in the EU decreased between 1990 and 2002, despite an increase in oil production. This is mainly due to the increased application of cleaning and separation technologies.

### Rationale

Oil discharges from offshore installations occur mainly through produced water and to a lesser degree from spills and cuttings contaminated with drilling muds. They can cause surface contamination and smothering of marine biota, and the chemical components of oil can cause acute toxic effects and long-term impacts. In addition, disposals of cuttings contaminated with oil and chemicals in the immediate vicinity of the installations affect the benthic biodiversity near the installations by imposing anoxia and toxic contamination.

**Fig. 1: Oil production and discharges from offshore oil installations in north-east Atlantic**



**Data source:** OSPAR 2004, Eurostat, 2004

**Note:** Data available only from Denmark, Germany, Ireland, the Netherlands, United Kingdom and Norway; hence coverage is restricted to the north-east Atlantic; no data for 1991 and 1993. Production data for 1990 and 1991 not available

## 1. Indicator assessment

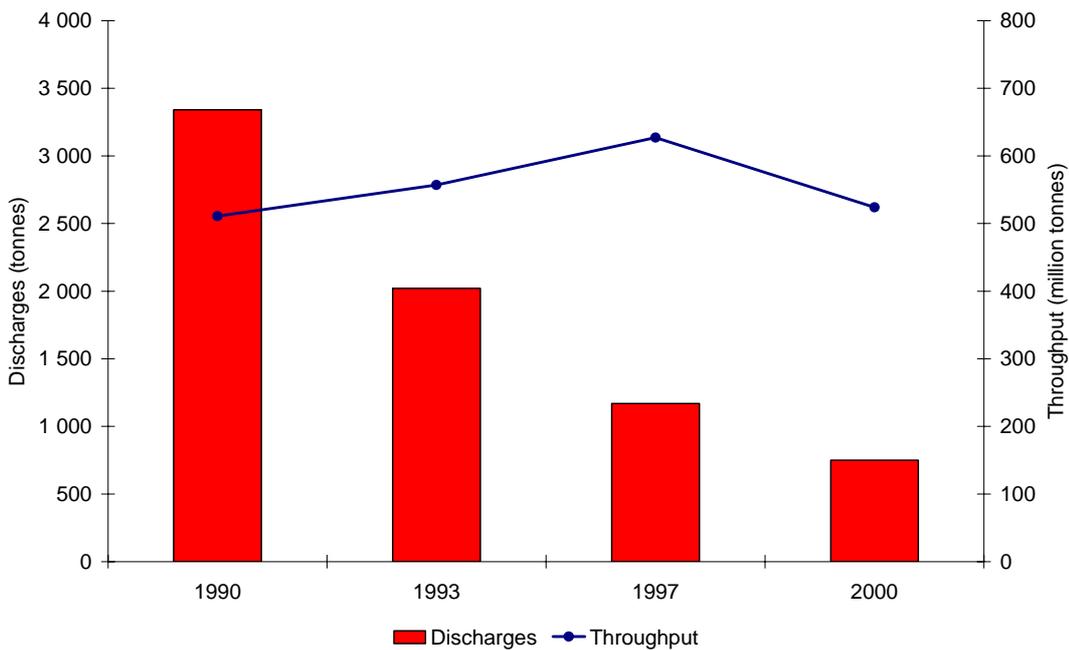
Oil discharges from refineries and offshore installations have been decreasing significantly since the 1980s. Overall inputs of oil from the offshore oil and gas sector have decreased by 48 % between 1990 and 2002 and the quantity of oil discharged by refineries decreased by 78 % between 1990 and 2000. These figures indicate a similar trend to the one reported by OSPAR (2000) for the period 1985-1997, stating that the decrease of oil inputs from the offshore oil and gas sector was reported to be over 60 % and that from the refineries more than 90 %, albeit at a slower rate.

The reductions in oil discharges were achieved despite the increased production and the ageing of many major oil fields. Production from offshore installations increased by 38 % between 1992 and 2002, while oil discharges from offshore installations of Denmark, United Kingdom, the Netherlands and Norway decreased by 35 % over the same period. The main reason for this development lies in the measures introduced under the Offshore Strategy (Offshore Oil and Gas Strategy, see policy context section), which have succeeded in sustaining the decreasing trends (OSPAR Commission, 2003).

Despite the one-off increase of oil discharges from offshore installations in 1997, which was mainly due to an exceptional accidental spillage, it is likely that a further reduction of oil discharges will continue in the future. This will be supported by a new regulation on drill cuttings (OSPAR Decision 2000) that entered in force in 2000.

Oil discharges from refineries are small compared with discharges of the offshore industry and are decreasing at a faster rate. While in 1990 refineries accounted for 16 % of oil discharges from refineries and offshore installations together, their share was only 7 % in 2000. Within the NE Atlantic, refineries are located mainly in coastal areas or on large rivers where they can have a localised impact. Their effluents are a source of oil and other substances (but in general there has been a large reduction in discharged oil due to rationalisations and technical improvements in this sector). Between 1990 and 2000, the total refinery throughput across the EU increased by 2.5 %, while discharges decreased by 77 %. The improvement is reflected in OSPAR's conclusion to cease regular surveys on refineries because of the reduction in their discharges. The European Pollutant Emission Register might subsequently undertake this role.

**Fig. 2: Refinery discharges and throughput in Europe (EU-15 +Norway)**



**Data Source:** CONCAWE, 2004

**Notes:** Data is available only from EU-15 and NO; the number of refineries reporting data in 2000 were 20 % less than those in 1997.

## 2. Indicator rationale

### 2.1 Environmental context

Offshore installations and coastal refineries account for between 2 and 7 % of the total oil entering the oceans worldwide (Clark, 1999; Global Marine Oil Pollution Information Gateway, 2005)<sup>1</sup>. The input of oil to the maritime area can cause surface

(1) A rough estimate of the share of oil released from the offshore industry in the total amount of oil entering the European Seas for the period 1990-2004 brings its significance to 7 %. This is a rough estimate based on gap filling for the figures of offshore installation and refineries



contamination and smothering of marine biota. In addition, its chemical components can cause acute toxic effects and long-term impacts. Changes to benthic communities (reduction in species diversity near platforms, with opportunistic species dominating the biomass) have been detected over areas surrounding offshore installations up to 3 km. The majority of the present offshore installations are located in enclosed and shallow areas of the sea that are often more sensitive to oil pollution. Over submarine oil fields, installations often exist in large numbers. As the industry is expanding into previously unexploited areas (deeper waters and into environments seasonally covered by ice), concerns have been raised. Experiences in the North Sea suggest that with careful and sensitive environmental management, the impacts might be reduced (OSPAR, 2000).

Offshore installations constitute sources of contaminants mainly via produced water, drilling muds and cuttings, and spills. Produced water is the main source of oil from the offshore oil and gas sector (production water and drill cuttings represent more than 95 % of the discharges from offshore installations), especially since oil discharged via cuttings contaminated with oil-based drilling muds ceased at the end of 1996. In addition to oil, produced water also contains a range of other natural organic compounds including monocyclic aromatic hydrocarbons (i.e. BTEX), 2- and 3-ring PAHs, phenols and organic acids. Increased levels of PAHs in caged mussels and passive samplers have been found up to 10 km from produced water discharge sites (OSPAR, 2000). Leaching from old drill cuttings is a possible source of oil, but quantities released will be small if the cuttings are not disturbed. Other environmental impacts, such as damages to the benthos, are largely caused by past disposals of cuttings contaminated with oil and chemicals (particularly toxic sulphides) in the immediate vicinity of the installations.

## 2.2 Policy context

The main sources of oil pollution in the marine environment include land-based activities (either discharging directly or through river inputs), maritime transport, atmospheric deposition, and coastal refineries and offshore installations (Global marine oil pollution Information Gateway, 2005). The indicator includes discharges from refineries based on measurements of oil in refineries' effluents and discharges from offshore installations including from production water, drill cuttings, spills and flaring operations. They are presented together as both affect the same environmental media while their decrease depends mostly on industrial technology practices. However the impact of refineries is regarded to be of lesser importance.

Oil pollution from coastal refineries and offshore installations is controlled by the directive on Integrated Pollution Prevention and Control (IPPC; 96/61/EC). This directive targets integrated pollution from emissions to air, water and land, arising from a number of industrial activities, via the use of best available technology and environmental practice. A major component of this is the implementation of a European Pollutant Emission Register, EPER (Commission Decision 2000/479/EC) in accordance with Article 15 of IPPC Council Directive. In the field of water protection and management, the Dangerous Substances Directive 76/464/EEC includes targets such as the total elimination for persistent compounds and specific quality objectives set by member States for non-persistent compounds.

OSPAR (The Convention for the Protection of the Marine Environment of the North-East Atlantic) under the over arching Offshore Strategy and HELCOM (Helsinki Commission) regulations set target standards on oil discharged in water of 40 mg/l for offshore oil installations and 5 mg/l for refineries (PARCOM Recommendations 92/6 and 89/5 respectively). Oil discharges as part of the disposal of cuttings contaminated with oil-based drilling muds ceased at the end of 1996 (PARCOM Decision 92/2). PARCOM decision 2001/1 sets a target for reducing inputs of oil in produced water by 15 % by 2006 and sets a new target standard of 30 mg/l for individual installations by the end of 2006.

Since 1978 discharges from offshore oil and gas installation have been addressed and reported under the former Paris Convention (PARCOM) and under the OSPAR Convention. CONCAWE (The oil companies European association for environment, health and safety in refining and distribution) in conjunction with OSPAR conduct regular surveys on oil discharged with effluents from oil refineries. OSPAR has concluded that because of a reduction in discharges from refineries there was no need for regular surveys (CONCAWE, 2004). EPER might undertake this role.

## References

Clark, R.B., 1999. *Marine pollution*. Oxford University press, Fourth edition, pp 161

CONCAWE, 2004, Trends in oil discharged with aqueous effluents from oil refineries in Europe - 2000 survey Report No. 4/04 <http://www.concawe.be/>

EEA 2002. Europe's biodiversity - biogeographical regions and seas. Seas around Europe. The Caspian Sea. [http://reports.eea.eu.int/report\\_2002\\_0524\\_154909/en/page171.html](http://reports.eea.eu.int/report_2002_0524_154909/en/page171.html)

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discharges in order to cover the period 1990-2004, figures of oil tanker accidents > 7 tonnes per spill, and the assumption that only 25 % of maritime generated oil pollution (due to accidents and shipping operations) is estimated to come from accidents related to maritime oil transport

Global marine oil pollution Information Gateway, 2005. Facts on marine oil pollution <http://oils.gpa.unep.org/facts/facts.htm> (published by the UNEP Global Programme of Action for the Protection of the Marine Environment from Land-based Activities, UNEP GPA)

OSPAR Commission 2000. Quality Status Report 2000. OSPAR Commission, London.108 + vii pp.

OSPAR Commission 2004, Annual Report on Discharges, Waste Handling and Air Emissions from Offshore Oil and Gas Installations, in 2002. Offshore Oil and Gas Industry, 207 <http://www.ospar.org/>

OSPAR Commission, 2003. Annual Report 2002 - 2003, Volume 1. OSPAR Commission, London.79 + ii pp.

UKHO (United Kingdom Hydrography Office). Notices to mariners. <http://www.hydro.gov.uk/SHOM> (Service Hydrographique et Océanographique de la Marine - France). Groupes d'avis aux navigateurs. <http://www.shom.fr/>

## Meta data

### Technical information

1. Data source:  
Oil production in Europe: EUROSTAT <http://europa.eu.int/comm/eurostat>  
Refineries: CONCAWE, 2004, Trends in oil discharged with aqueous effluents from oil refineries in Europe - 2000 survey Report No. 4/04 <http://www.concawe.be/>  
Offshore installations: OSPAR Commission 2004, Annual Report on Discharges, Waste Handling and Air Emissions from Offshore Oil and Gas Installations, in 2002. Offshore Oil and Gas Industry, 207 <http://www.ospar.org/>
2. Description of data / Indicator definition:  
Oil discharges from refineries are based on regular chemical measurements on effluents.  
Oil discharges from offshore installations include oil discharged in production water, oil discharged via drill cuttings, and oil discharged in spillage and flaring operations. Normally spillage is a minor contributor, and flaring is a very minor contributor to the total discharge.  
Primary production of crude oil within national boundaries including offshore production is covered. Production should only include marketable production, excluding volumes returned to formation. Such production should include all crude oil, NGLs (Natural Gas Liquids), condensates and oil from shale and tar sands, etc.
3. Geographical coverage:  
Offshore installations: North Sea. (DK, DE, IR, NE, UK, and NO)
4. Temporal coverage:  
Offshore installations: Biannual up to 1994 then annual: 1995-2002  
Refineries: Sporadic: 1990, 1993, 1997, 2000  
Oil production: annual 1992- 2002  
Throughput production (refineries): Sporadic: 1990, 1993, 1997, 2000
5. Methodology and frequency of data collection:  
Offshore installations: Annual questionnaires to countries within the OSPAR convention. Other data collection methodology are not available.  
Refineries: Regular questionnaires to CONCAWE Member companies.  
Oil production: Data compiled by Eurostat through the annual Joint Questionnaires, shared by Eurostat and the International Energy Agency, following a well established and harmonised methodology. Methodological information on the annual Joint Questionnaires and data compilation can be found in Eurostat's web page for metadata on energy statistics: [http://europa.eu.int/estatref/info/sdds/en/sirene/energy\\_sm1.htm](http://europa.eu.int/estatref/info/sdds/en/sirene/energy_sm1.htm)  
Eurostat definitions for energy statistics: <http://forum.europa.eu.int/irc/dsis/coded/info/data/coded/en/Theme9.htm>
6. Methodology of data manipulation:  
No data manipulation.

### Qualitative information

7. Strength and weaknesses (at data level)  
Offshore: Convenient indicator based on long term collection of data in the framework of a coordinated activity (OSPAR) for the North Sea. Data from the Mediterranean and Black Sea are missing.  
Refineries: Data provided by non scientific organisation based on questionnaires to oil companies. Problem in frequency of reporting (almost 20 % of the refineries reported in 1997 did not do so in 2000).  
Temporal data coverage for offshore industries and refineries does not coincide.
8. Reliability, accuracy, robustness, uncertainty (at data level):  
In general according to OSPAR there are a number of issues that limit an assessment of the impact of the offshore oil and gas industry: possible effects of disturbance of cutting piles; lack of ecotoxicological assessment criteria and/or background/reference concentrations for oil; and long-term impacts of the chemicals found in produced water.  
Based on 4. the data sets cannot always be compared for the same year".
9. Overall scoring – historical data (1 = no major problems, 3 = major reservations):  
Relevance: 1- Offshore, 2 - Refineries  
Accuracy: 1- Offshore, 2 - Refineries  
Comparability over time: 2 - Offshore (Onshore Processing Facility discrepancies), 3 - Refineries  
Comparability over space: 1- Offshore (for OSPAR region), 2 Refineries